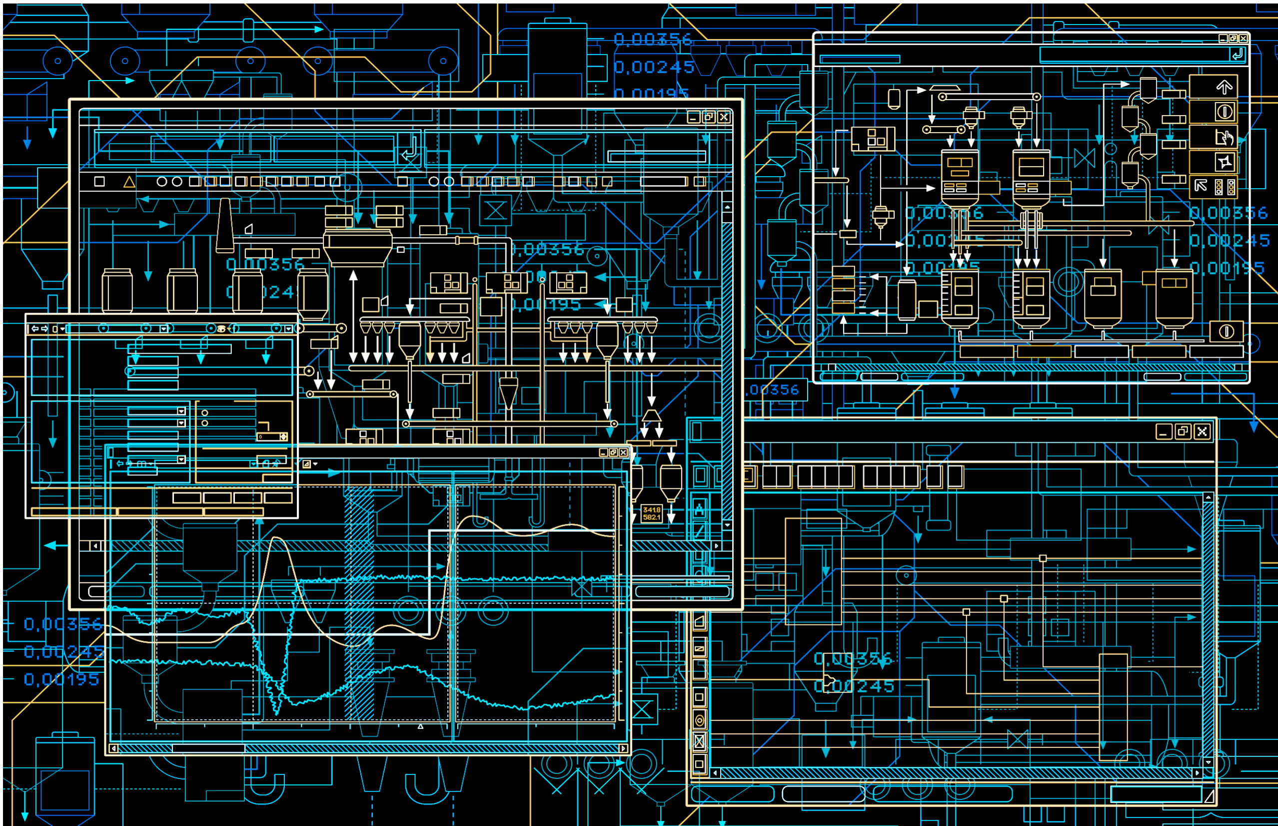

S800 I/O

Getting Started

Power and productivity
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ABB

S800 I/O

Getting Started

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TRADEMARKS

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Revision History

Safety Summary

E S D	**Electrostatic Sensitive Device** Devices labeled with this symbol require special handling precautions as described in the installation section.

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

SPECIFIC WARNINGS	Page-99: Explosion hazard! Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous. Page-99: Explosion hazard! Substitution of components may impair suitability for Class 1, Division 2. Page-99: Explosion hazard! Do not replace batteries unless power has been switched off or the area is known to be non-hazardous. Page-107: Work with care when supply voltage is applied to the system. Voltages within the cabinet can cause serious injury or death. Page-120: Work with care when supply voltage is applied in the system. The voltage in the cabinet can cause serious injury or death. Page -121: Work with care when supply voltage is applied in the system. The voltage in the cabinet can cause serious injury or death. Page-183: A restart of the I/O system or controller can have very serious consequences. It is important to be aware of the local requirements for safety when starting and stopping the I/O system or controller.

Safety Summary

SPECIFIC WARNINGS (continued)	Page-184: Switch off the process voltage before removal of the module, if the plastic cover for the I/O modules DI802, DI803, DI820, DI821, DO802, DO820 or DO821 is damaged, and there is risk for contact with live parts.

SPECIFIC CAUTIONS	Page-84: 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. Page-107: Observe the following safety rules: - Avoid direct contact with the bus connector of the I/O modules. - Always switch off the voltage before extracting a module which can not to be exchanged with power applied, for example, processor units, extension cable adaptors and extension cables, see Section 5, Maintenance. Wait a sufficient time for the capacitors to discharge before removing a power sensitive module. Page-113: Be aware of the risk of “accidents”. Short-circuit and over-voltage can damage the equipment, for example, a process I/O board or field element. Page:-143: Care must be taken that no I/O clusters have the same address setting. This could result in output modules in the same ModuleBus position but in different I/O clusters putting out the same value. Page-186: If TB842 should be replaced in a running system the carrier (TB806 or TB846) of TB842 have to be disconnected from the FCI first. Page-188: If TB842 should be replaced in a running system the carrier (TB806 or TB846) of TB842 have to be disconnected from the FCI first.

About This User Manual

General

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

This user manual provides a general description of the S800 I/O and reference information about equipment common to all types of installations, for example power supplies and ModuleBus components. It provides overall instructions for site planning and installation, start-up and shutdown procedure, and information regarding capacity and performance. This book is not intended to be the sole source of instruction for the S800 I/O system.

User Manual Conventions

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

Feature Pack

The Feature Pack content (including text, tables, and figures) included in this User Manual is distinguished from the existing content using the following two separators:

Feature Pack Functionality

<Feature Pack Content>

Feature Pack functionality included in an existing table is indicated using a table footnote (*) :
* Feature Pack Functionality

Feature Pack functionality in an existing figure is indicated using callouts.

Unless noted, all other information in this User Manual applies to 800xA Systems with or without a Feature Pack installed.

Warning, Caution, Information, and Tip Icons

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

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

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

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

Information icon alerts the reader to pertinent facts and conditions.

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

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

Terminology

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

Table 1. Terminology

Term	Description
AF 100	Advant Fieldbus 100 is the communications bus between the I/O stations and the Advant Controllers. (FCI to CI52x)
Base cluster	Consists of single or redundant ModuleBus masters plus I/O modules connected directly to the ModuleBus master.
FCI	The Fieldbus Communication Interface (FCI) device contains the interface to the fieldbus (for example PROFIBUS or AF 100).
G3 compliant	The module withstand more severe environmental conditions according to ISA-S71.04.
I/O cluster	An extension of the I/O Station's ModuleBus connected to the ModuleBus master by fiber optic connections. Up to 12 I/O devices per cluster.
I/O device	A complete I/O device consists of one MTU and one I/O module.
I/O module	Is an active, electronic and signal conditioning unit. Can be a part of an I/O device or a S800L I/O module.

Table 1. Terminology (Continued)

Term	Description
I/O station	An I/O station consists of one or two FCI(s), 1-7 I/O clusters and up to 24 I/O devices.
I.S.	Intrinsic Safety is a protection technique to prevent explosion in hazardous areas of a process plant.
ModuleBus	Is an incremental, electrical or optical, bus for interconnection of I/O devices.
ModuleBus master	ModuleBus master can be a controller (AC 800M) or a FCI. A ModuleBus master contains a ModuleBus interface and power regulators. The FCI module can manage 24 I/O devices and the controller up to 96 I/O modules (up to 12 directly and to the others in 1 to 7 I/O clusters).
(ModuleBus) Extension cable	Is used when extending the electrical ModuleBus (within the max. 2 meters).
MTU	The Module Termination Unit is a passive base unit containing process terminals and a part of the ModuleBus.
OSP	Outputs Set as Predetermined. A user configurable action on an output module when communications is lost to the FCI or Controller.
PROFIBUS-DP	PROFIBUS-DP is a fieldbus standard.
PROFIBUS-DPV1	PROFIBUS-DPV1 is a fieldbus standard.
RTD	Resistance Temperature Detector.
SOE	Sequence of events. Time stamping of status changes for digital inputs.
TC	Thermocouples

Related Documentation

The following is a listing of documentation related to the S800 I/O system.

Table 2. Related Documentation

Title	Description
S800 I/O Modules and Termination Units	Describes the I/O modules and termination units in the S800 I/O system.
S800 I/O Modules and Termination Units with Intrinsic Safety Interface	Describes I/O modules and termination units with I.S. interface in the S800 I/O system.
S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 User's Guide	Describes the AF100 FCI in the S800 I/O system.
S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1	Describes the PROFIBUS-DP FCI in the S800 I/O system.
S800 I/O PROFIBUS FCI Memory Maps for CI801	Describes the memory mapping on PROFIBUS for the S800 I/O system in CI801.
S800 I/O PROFIBUS FCI Memory Maps for CI830	Describes the memory mapping on PROFIBUS for the S800 I/O system in CI830.
S800 I/O PROFIBUS FCI Memory Maps for CI840	Describes the memory mapping on PROFIBUS for the S800 I/O system in CI840.
Advant Fieldbus 100 User's Guide	Describes the equipment and contains information required to install and commission AF100.

Released User Manuals and Release Notes

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

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

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

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

Section 1 Introduction

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

Figure 1. S800 I/O with Fieldbus Communication Interface CI801 and I/O Modules Mounted on Compact Type of Termination Units.

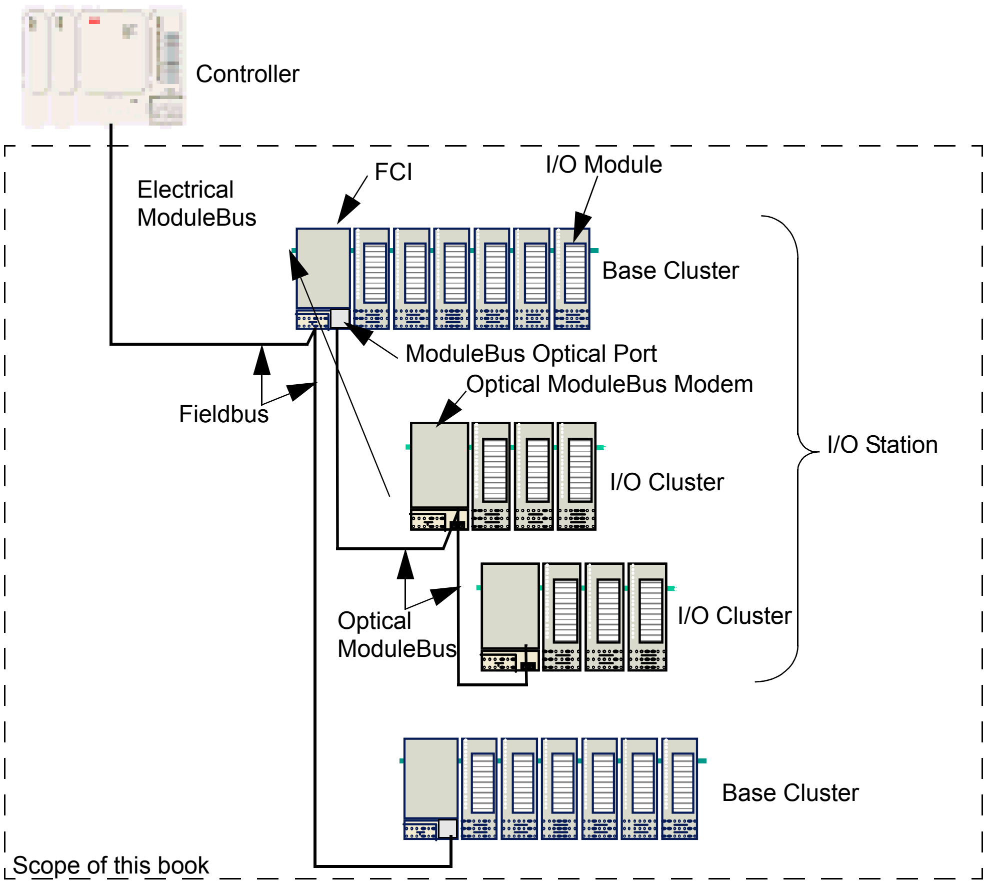


Figure 2. S800 I/O Station Overview

Product Overview

The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that the I/O modules can be combined to suit many applications including the most types of signals, HART and Intrinsic Safety Interface.

The S800 I/O modules and a Fieldbus Communication Interface (FCI) are combined to form an I/O Station. S800 I/O can be used in both single and redundant applications.

In general, all S800 I/O units are G3 compliant. G3 compliant units withstand more severe environmental conditions according to ISA-S71.04. The following S800 I/O units are G2 compliant - SD821, SD822, SD823, SD831, SD832, SD833, SD834, SS822, SS832, TB811 and CI830. G3 compliant versions of SD822 and SS822 are available, refer to SD822Z and SS822Z.

The modules are marked with a bar code that shows serial number, article ID and product revision number. A separate bar code strip is enclosed for optional placing on the module. The bar code is of type Bar-code 128.

The equipment that is used as part of the I/O Station with S800 I/O is presented in Table 3.

Table 3. I/O Station with S800 I/O Components

Device Type Designator	Function
AI801	8 AI channels (1x8), 0(4)...20 mA
AI810	8 AI channels (1x8), 0(4)...20 mA, 0(2)...10 V
AI815	8 AI channels (1x8) 4...20 mA, 0...20 mA, 1...5 V, 0...5 V. Advanced diagnostics, HART interface, for single application.
AI820	4 AI channels (differential), -20...20 mA, 0(4)...20 mA, -10...10V, 0(2)...10 V, -5...5 V, 0(1)...5 V
AI825	4 AI channels (4 x 1) for applications requiring galvanic isolated channels, -20...20 mA, 0(4)...20 mA, -10...10V, 0(2)...10 V
AI830/ AI830A	8 AI channel for Resistance Measurements (e.g. Pt 100 sensors)
AI835/ AI835A	7+1 AI channels for Thermocouple or mV Inputs

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
AI843	8 AI channels for Thermocouple or mV Inputs. Advanced diagnostics, for single and redundant applications.
AI845	8 AI channels (1x8) 4...20 mA, 0...20 mA, 1...5 V, 0...5 V. Advanced diagnostics, HART interface, for single and redundant applications.
AI880/AI880A	8 High Integrity AI channels (1x8) 0...20 mA, 4...20 mA. For single and redundant applications, HART interface. Also used in function Loop Supervised DI.
AI890	8 AI channels (1x8), 0(4)...20 mA, I.S. interface
AI893	8 AI channels for RTD or Thermocouple/mV Inputs, I.S. interface.
AI895	8 AI channels (1x8), 4...20 mA, I.S. and HART interface.
AO801	8 AO channels (1x8), 0(4)...20 mA
AO810/ AO810V2	8 AO channels (1x8), 0(4)...20 mA
AO815	8 AO channels (1x8), 4...20mA. Advanced diagnostics, HART interface, for single application.
AO820	4 AO channels (4 x 1) galv. isolated (bipolar), -20...20 mA, 0(4)...20 mA, -10...10V, 0(2)...10 V
AO845/ AO845A	8 AO channels (1x8) 4...20mA. Advanced diagnostics, HART interface, for single or redundant applications.
AO890	8 AO channels (1x8), 0(4)...20 mA, I.S. interface
AO895	8 AO channels (1x8), 4...20 mA, I.S. and HART interface.
CI801	Fieldbus Communication Interface (FCI) for PROFIBUS-DPV1, Hot Configuration In Run and HART pass-through.

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
CI810/ CI810A/ CI810B	Fieldbus Communication Interface (FCI) for Advant Fieldbus 100
CI820/CI820V1	Redundant Fieldbus Communication Interface (FCI) for Advant Fieldbus 100
CI830	Fieldbus Communication Interface (FCI) for PROFIBUS-DP
CI840/ CI840A	Fieldbus Communication Interface (FCI) for PROFIBUS-DPV1, redundant application, Hot Configuration In Run and HART pass-through.
DI801	16 DI channels (1x16), 24 V d.c., current sinking
DI802	8 DI channels (1x8), 120 V d.c., current sinking
DI803	8 DI channels (1x8), 230 V d.c., current sinking
DI810	16 DI channels (2x8), 24 V d.c., current sinking.
DI811	16 DI channels (2x8), 48 V d.c., current sinking
DI814	16 DI channels (2x8), 24 V d.c. current sourcing
DI818	32 DI channels (2x16), 24 V d.c. current sinking
DI820	8 galvanic isolated DI channels (8x1), 120 V a.c./d.c., current sinking.
DI821	8 galvanic isolated DI channels, (8x1) 230 V a.c./d.c., current sinking.
DI825	8 galvanic isolated DI channels, (8x1) 125 V d.c. with sequence of event (SOE) handling
DI828	16 DI channels (2x8), 120V a.c./d.c., current sinking
DI830	16 DI channels (2x8) 24 V d.c. with sequence of event (SOE) handling, current sinking

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
DI831	16 DI channels (2x8) 48 V d.c. with sequence of event (SOE) handling, current sinking
DI840	16 DI channels (2x8) 24 V d.c. with sequence of event (SOE) handling. Advanced diagnostics, for single or redundant applications.
DI880	16 High Integrity DI channels (1x16) 24 V d.c. with sequence of event (SOE) handling. For single and redundant applications.
DI885	8 DI channels, (1x8) 24/48 V d.c. with sequence of event (SOE) handling, current sinking
DI890	8 DI channels (8x1), I.S. interface
DO801	16 DO channels (1x16), 24 V d.c., 0.5 A, current sourcing
DO802	8 DO channels (1x8), 24-110 V d.c./250 V a.c., relay normally open
DO810	16 DO channels (2x8), 24 V d.c., 0.5 A, current sourcing.
DO814	16 DO channels (2x8), 24 V d.c., 0.5 A, current sinking
DO815	8 DO channels (2x4), 24 V d.c., 2A, current sourcing.
DO818	32 DO channels (2x16), 24 V d.c., 0.5 A, current sourcing
DO820	8 DO channels (8x1), Relay, 250 V, 3 A a.c. normally open.
DO821	8 DO channels (8x1), Relay, 250 V, 3 A a.c. normally closed
DO828	16 DO channels (16x1), Relay, 250V a.c./125V d.c. normally open.
DO840	16 DO channels (16x1), Relay, 24 V, 0.5 A a.c. with advanced diagnostics, for single or redundant applications.
DO880	16 High Integrity DO channels (1 x 16) 24 V d.c. For single and redundant applications.

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
DO890	4 channels (4x1), 11 V 40 mA, I.S. interface
DP820	2 channels, pulse count and frequency measurement, maximum 1.5 MHz. Interface for RS422, current, 5V, 12 V or 24 V.
DP840	8 channels, pulse count and frequency measurement, maximum 20 kHz. With advanced diagnostics, for single or redundant applications. Interface for NAMUR, 12 V and 24 V. The input can be read as digital input signals.
SD821	Power supply, 115/230 V a.c. to 24 V d.c. @ 2.5 A
SD822/SD822Z	Power supply, 115/230 V a.c. to 24 V d.c. @ 5.0 A.
SD823	Power supply, 115/230 V a.c. to 24 V d.c. @ 10 A
SD831	Power supply, 100-240 V a.c. or 110-300 V d.c. to 24 V d.c. @ 3 A.
SD832	Power supply, 100/120 V or 200/240 a.c. to 24 V d.c. @ 5 A.
SD833	Power supply, 100-120 V or 200-240 a.c. to 24 V d.c. @ 10 A.
SD834	Power supply, 100-240 V a.c. or 110-300 V d.c. to 24 V d.c. @ 20 A.
SS822/SS822Z	Voting Unit for redundant power supply, 24 V d.c. @ 20.0 A.
SS823	Power Voter with overvoltage protection, 24 V d.c., 20 A.
SS832	Voting unit for redundant power supply, 24 V d.c. @ 12.5 A.
TB805	Cable adaptor out module (electrical ModuleBus).
TB806	Cable adaptor in module (electrical ModuleBus).
TB807	Terminator module for electrical ModuleBus.

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
TB810	ModuleBus Optical Port Module 10 Mbit driver, fiber optic connection. Used together with CI810, CI820/CI820V1 and CI830.
TB811	ModuleBus Optical Port Module 5 Mbit driver, fiber optic connection. Used together with CI810, CI820/CI820V1 and CI830.
TB815	ModuleBus Interconnection Unit to redundant FCIs (CI820/CI820V1)
TB820/TB820V2	ModuleBus Modem, fiber optic ModuleBus interface of an I/O cluster. 10 Mbit driver.
TB825	ModuleBus Optical media converter, converts between plastic opto fiber or HCS fiber with Versatile link connectors and glass optical fiber with ST connectors.
TB826	Modulebus Optical media converter, converts plastic opto fiber or HCS fiber with Versatile link connectors to single mode glass opto fiber with SC connectors.
TB840/TB840A	ModuleBus Modem, fiber optic ModuleBus interface of an I/O cluster. 10 Mbit driver. Redundant application.
TB842	ModuleBus Optical Port Module 10 Mbit driver, fiber optic connection. Used together with CI840.
TB845	Cable adaptor out module (double electrical ModuleBus)
TB846	Cable adaptor in module (double electrical ModuleBus)
TC501V150	Cable terminator for AF 100 twisted pairs, 150 ohms
TC505	Connector: AF 100 Trunk Tap to FCI
TK801V003	Cable, ModuleBus Extension, 300 mm (11.8"),
TK801V006	Cable, ModuleBus Extension, 600 mm (23.6")
TK801V012	Cable, ModuleBus Extension, 1.2 m (47.25")

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
TK811V015	Cable, Optical ModuleBus Extension, 1.5 m (59"), duplex, plastic
TK811V050	Cable, Optical ModuleBus Extension, 5 m (16’), duplex, plastic
TK811V150	Cable, Optical ModuleBus Extension, 15 m (50’), duplex, plastic
TK812V015	Cable, Optical ModuleBus Extension, 1.5 m simplex, plastic
TK812V050	Cable, Optical ModuleBus Extension, 5 m simplex, plastic
TK812V150	Cable, Optical ModuleBus Extension, 15 m simplex, plastic
TU805	Terminal Unit 2 x18 terminals, 50 V. Used to enable 2- and 3-wire connections on DI801 and DO801. The Terminal Unit is mounted direct on DI801 or DO801.
TU807	Terminal Unit for single TB840A
TU810/TU810V1	Compact MTU, 3x8 + 2x3 terminals, 50 V.
TU811/TU811V1	Compact MTU, 2x8 terminals, 250 V.
TU812/TU812V1	Compact MTU, 25 pin D-sub Connector for field connection, 50 V
TU813	Compact MTU, Crimp Snap-in Connector for field connection, 250 V.
TU814/TU814V1	Compact MTU, Crimp Snap-in Connector for field connection 50 V.
TU818	Compact MTU, 40 pole screw terminal connector for field connection, 50 V
TU819	Compact MTU, Two D-sub 25 pin connector for field connection, 50V

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
TU830/TU830V1	Extended MTU, 3x16 + 2x4 terminals, 50 V
TU831/TU831V1	Extended MTU, 8x2 terminals, 250 V
TU833	Extended MTU, 3x16 + 2x4 spring-case terminals, 50 V.
TU834	Extended MTU, 2x16 + 2x4 terminals and individual shunt sticks, 50 V
TU835/TU835V1	Extended MTU, 4x2 groups + 2x4 power terminals, 50 V, individually fused per channel
TU836/TU836V1	Extended MTU, 2x4 groups + 2x6 power terminals, 250 V, individually fused per channel
TU837/TU837V1	Extended MTU, 2x4 groups + 2x6 power return terminals, 250 V, fused
TU838	Extended MTU, 2x4 groups + 2x4 power return terminals, 50 V, fused
TU839	Extended MTU, 3x2 groups + 2x3 power return terminals, 250 V, fused
TU840	MTU for redundant TB840, dual ModuleBus
TU841	MTU for redundant TB840, single ModuleBus
TU842	Redundant Horizontal MTU, 3x16 + 2x4 terminals, 50 V
TU843	Redundant Vertical MTU, 3x16 + 2x4 terminals, 50 V
TU844	Redundant Horizontal MTU, 2x16 + 2x4 terminals and individual shunt sticks, 50 V
TU845	Redundant Vertical MTU, 2x16 + 2x4 terminals and individual shunt sticks, 50 V
TU846	MTU for redundant CI840, dual ModuleBus
TU847	MTU for redundant CI840, single ModuleBus.

Table 3. I/O Station with S800 I/O Components (Continued)

Device Type Designator	Function
TU848	MTU for redundant TB840, dual ModuleBus and dual power supply connections
TU849	MTU for redundant TB840, single ModuleBus and dual power supply connections
TU850	Extended MTU, 2x8 current limited sensor power + 16 signal + 2x4 fused power connections terminals, 50 V.
TU851	Extended MTU, up to 16 isolated channels, 250 V.
TU852	Redundant Horizontal MTU, two 25 pin D-sub Connectors for field connection, 50V
TU854	Redundant Horizontal MTU, 25 pin D-sub Connector for field connection and individual shunt sticks, 50V
TU890	Compact MTU for I.S. interface Module, 50 V. For use in I.S. applications.
TU891	Compact MTU for I.S. interface Module, 50 V. Not for use in I.S. applications.
TY801	Shunt stick for current or voltage signals together with AI845 or AI880/AI880A and TU844 or TU845, 2 x 125 Ω.
TY804	Shunt stick for NAMUR signals together with DP840 and TU844 or TU845, 1 kΩ
TY820	Temperature sensor with 4-wire connection, and used together with AI835 and AI843.
Mounting Kit	Used for horizontal mounting of CI801, CI840 and TB840 on a vertical DIN-rail.
Mounting profile	Horizontal mounting profile with one DIN-rail and one cable duct
Mounting profile	Vertical mounting profile with 4 + 1 DIN-rails

Product Scope

The S800 I/O is a modular I/O system. The modular system allows for easy configuration of the I/O type and size.

An S800 I/O Station can consist of a base cluster and up to 7 additional I/O clusters. The base cluster consists of a single or redundant Fieldbus Communication Interface (FCI) module and up to 12 single I/O modules (on single MTUs) or 6 pairs of redundant I/O modules (on redundant MTUs). It is not allowed to mix single and redundant I/O modules on the base cluster.

I/O clusters 1 to 7 consist of a ModuleBus Modem and up to 12 single I/O modules. I/O clusters 1 to 7 are connected to the FCI through a fiber optic expansion of the ModuleBus. An S800 I/O Station can have up to 24 I/O modules. This means that an I/O Station can have a maximum of 384 digital channels or a maximum of 192 analog channels.

Each I/O cluster can be divided in groups using ModuleBus extension cables between the groups. The maximum length of the electrical ModuleBus of an I/O cluster is 2.5 meters (8.2 ft.) including extension cables. The factory made extension cables which plug into the cable adaptors are available in lengths of 0.3, 0.6 and 1.2 m (1, 2 and 4 ft.).

The maximum length of the optical ModuleBus expansion is dependent on the number of ModuleBus Modems. The maximum length between any two clusters is 15m (50ft) with plastic fiber, 200m (656ft) with HCS glass fiber, and 1000m (3281ft) using TB825 Optical Media Converter. Maximum fiber length between two modems is 15m (50ft) with plastic fiber, 200m (656ft) with HCS fiber and up to 5000m (20000m for S800 I/O HI) using TB826 Optical Media Converter. Factory made optical duplex or simplex cables (plastic fiber) are available in lengths of 1.5, 5 and 15 m (5, 16.7 or 50 ft.).

ModuleBus

Each S800 I/O module is installed on a Module Termination Unit (MTU). The first MTU with its I/O module or S800L module connects to the ModuleBus master or a cluster’s ModuleBus Modem and then each of the remaining MTUs or S800L modules connect to the previous MTU or S800L module.

A ModuleBus master communicates with its I/O modules over the ModuleBus. The ModuleBus can be divided into 8 clusters, one base cluster and up to 7 I/O clusters. The base cluster consists of the ModuleBus master (single or redundant) and I/O modules (single or redundant). Additional I/O clusters (1 to 7) consist of a ModuleBus Modem and I/O modules. The ModuleBus Modems are connected to an optional ModuleBus Optical Port module on the ModuleBus master, using optical cables.

Within a cluster, the ModuleBus is made up of increments that are integrated into each MTU or S800L module. The ModuleBus master and ModuleBus Modems have a ModuleBus outlet connector to connect to an MTU or a S800L module. An MTU and S800L module have a bus inlet and a bus outlet connector.

By adding, on the DIN rail, an MTU or a S800L module to a ModuleBus master or a ModuleBus Modem, the bus is automatically expanded up to a maximum of 12 single MTUs (this number includes the number of S800L modules) or 6 redundant MTUs. It is not allowed to mix single and redundant I/O modules within a cluster. In a "Hot Replacement" configuration, you can install up to 6 I/O modules on up to 6 redundant MTUs.

Unique position codes are automatically assigned to each MTU or S800L module as the bus is expanded. An inserted S800 module is assigned the unique position identity of its MTU. Through the incremental bus design, the physical size of an S800 I/O installation is directly proportional to the number of installed MTUs or S800L modules.

The S800 I/O modules can be inserted and removed from MTUs without disturbing system operation. The physical lock, which locks an I/O module to its MTU, allows I/O module removal only when the lock is in its unlock position. The locking mechanism also acts as a logic lock so that an I/O module is only operational when the lock is in the locked position. If the lock is in its unlocked position, output channels are de-energized and I/O modules can be inserted/removed without need to remove system or field power.

The MTUs are totally passive units with all active circuitry allocated to the I/O module. The ModuleBus requires a terminator to be installed after the last MTU or S800L module of a cluster.

Figure 3 shows a typical base cluster in an I/O station with single I/O modules and single FCI connected to PROFIBUS or Advant Fieldbus 100.

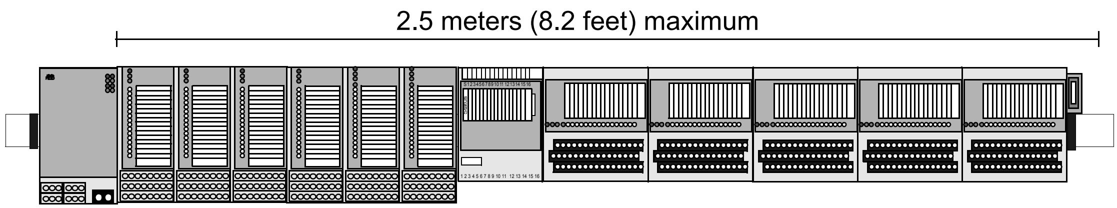


Figure 3. Typical I/O Station Base Cluster with S800 I/O, Single or Redundant FCI

Figure 4 shows a typical base cluster in an I/O station with single I/O modules and redundant FCI connected to Advant Fieldbus 100.

Redundant I/O modules and redundant FCI connected to PROFIBUS are shown in Figure 23.

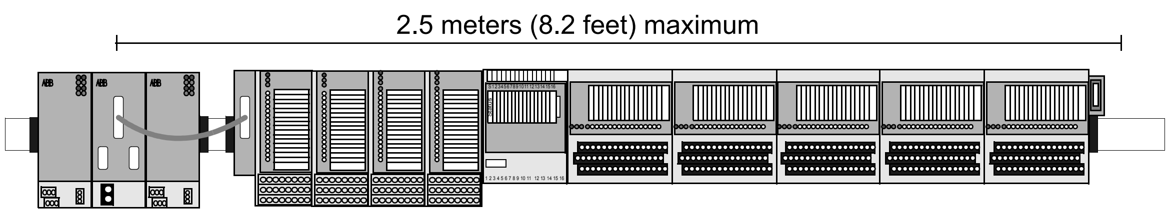


Figure 4. I/O Station Base Cluster with Redundant FCIs to S800 I/O for AF100

CI801 Fieldbus Communication Interface

The CI801 Fieldbus Communication Interface (FCI) module is a configurable communication interface that performs operations such as signal processing, gathering of various supervision information, OSP handling, Hot Configuration In Run, HART pass-through, and configuration of I/O modules. The FCI connects to the controller through of the PROFIBUS-DPV1 fieldbus.

Refer to specifications in *S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1 (3BSE020926*)* for more information.

CI810/CI810A/CI810B Fieldbus Communication Interface

The CI810/CI810A/CI810B Fieldbus Communication Interface (FCI) module is a configurable communication interface which performs operations such as signal processing, gathering of various supervision information, OSP handling and configuration of re-inserted I/O modules. The FCI connects to the controller through the Advant Fieldbus 100 (AF 100) twisted pair segment. The FCI supports redundant media configurations.

Refer to specifications in *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* for more information.

CI820/CI820V1 Fieldbus Communication Interface

The CI820/CI820V1 Fieldbus Communication Interface (FCI) module is a configurable communication interface which performs operations such as signal processing, gathering of various supervision information, OSP handling and configuration of
re-inserted I/O modules. The FCI connects to the controller by way of the Advant Fieldbus 100 (AF 100) twisted pair segment. The FCI supports redundant fieldbus communication interface.

Refer to specifications in *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* for more information.

TB815 Interconnection Unit

The TB815 Interconnection Unit is used with redundant CI820/CI820V1 FCIs to provide an interface to the ModuleBus (electrical and optical) and service port connections. All signals between the redundant FCIs such as AF 100 signals and control signals are routed through the TB815 and it also provides the termination of the electrical ModuleBus.

Refer to specifications in *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* for more information.

CI830 Fieldbus Communication Interface

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

Refer to specifications in *S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1 (3BSE020926*)* for more information.

CI840 Fieldbus Communication Interface

The CI840 Fieldbus Communication Interface (FCI) module is a configurable communication interface that performs operations such as signal processing, gathering of various supervision information, OSP handling, Hot Configuration In Run, HART pass-through and configuration of I/O modules. CI840 is designed for redundant applications. The FCI connects to the controller by way of the PROFIBUS-DPV1 fieldbus.

Refer to specifications in *S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1 (3BSE020926*)* for more information.

TB810/TB811 ModuleBus Optical Port

The TB810/TB811 Optical ModuleBus Port is used with the CI810 or CI830 FCI or the TB815 Interconnection Unit to provide an interface for the Optical ModuleBus expansion. The TB810/TB811 has connectors for fiber optic connections and a connection to the communication interface module.

TB810 is used with TB820/TB820V2 and ABB Drives equipment with 10 Mbit driver.

TB811 is used with ABB Drives equipment with 5 Mbit driver. Figure 5 shows the TB810/TB811 installed in the CI810 FCI.

TB842 ModuleBus Port

The TB842 optical port is used for optical extension of the ModuleBus. The TB842 Optical ModuleBus Port is used with the CI801 or the CI840 redundant FCI. The TB842 module can be connected to CI801 through TB806 or redundant CI840 through TB806 and TU847 (single I/O) or through TB846 and TU846 (redundant I/O), see Figure 6, Figure 7 and Figure 8. The TB842 has two connectors for fiber optic connections and a connection to the communication interface module.

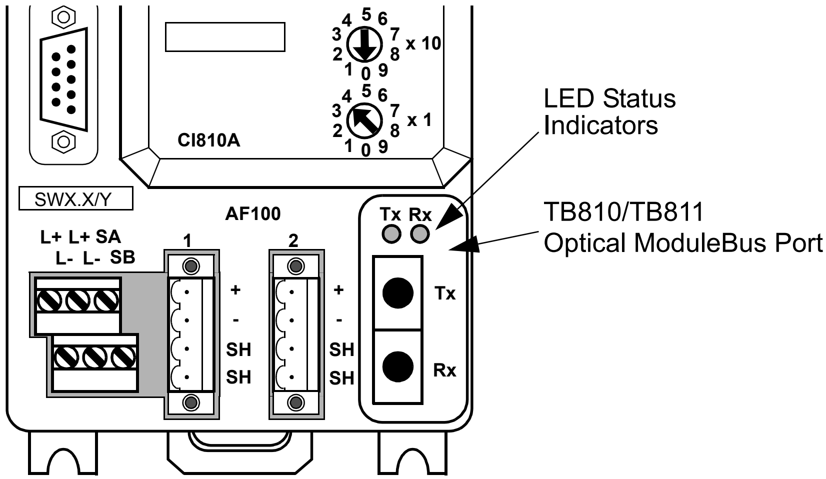


Figure 5. TB810/TB811 Optical ModuleBus Port installed in CI810A FCI

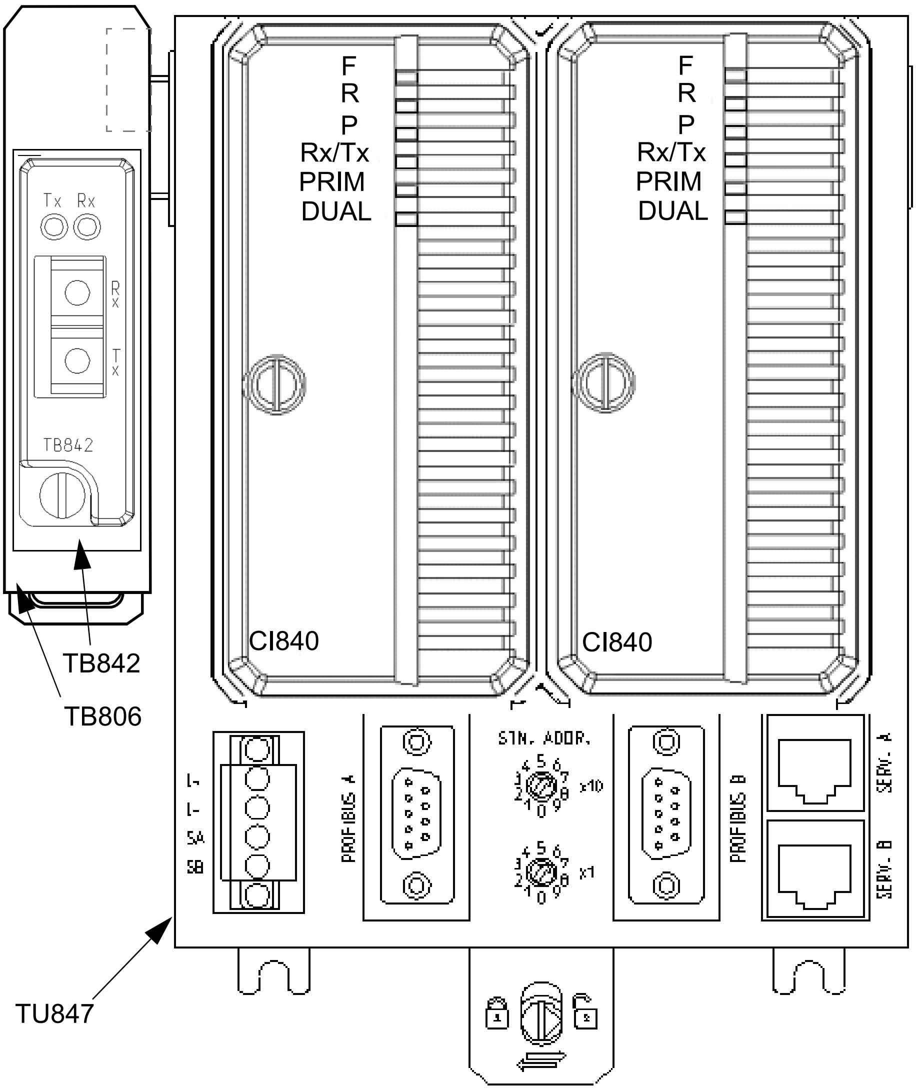


Figure 6. TB842 Optical ModuleBus Port mounted on TB806 module for connection to TU847

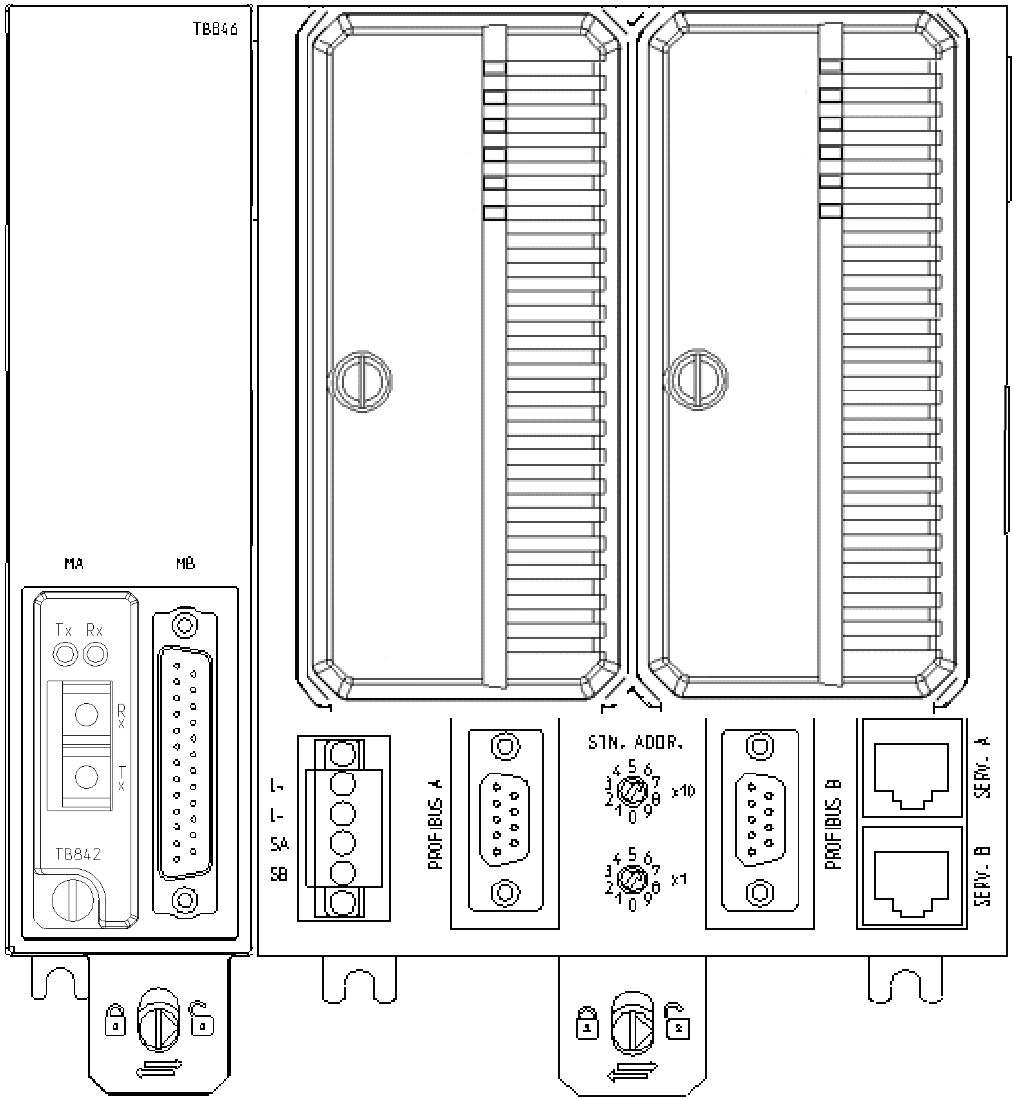


Figure 7. TB842 Optical ModuleBus Port mounted on TB846 for connection to TU846

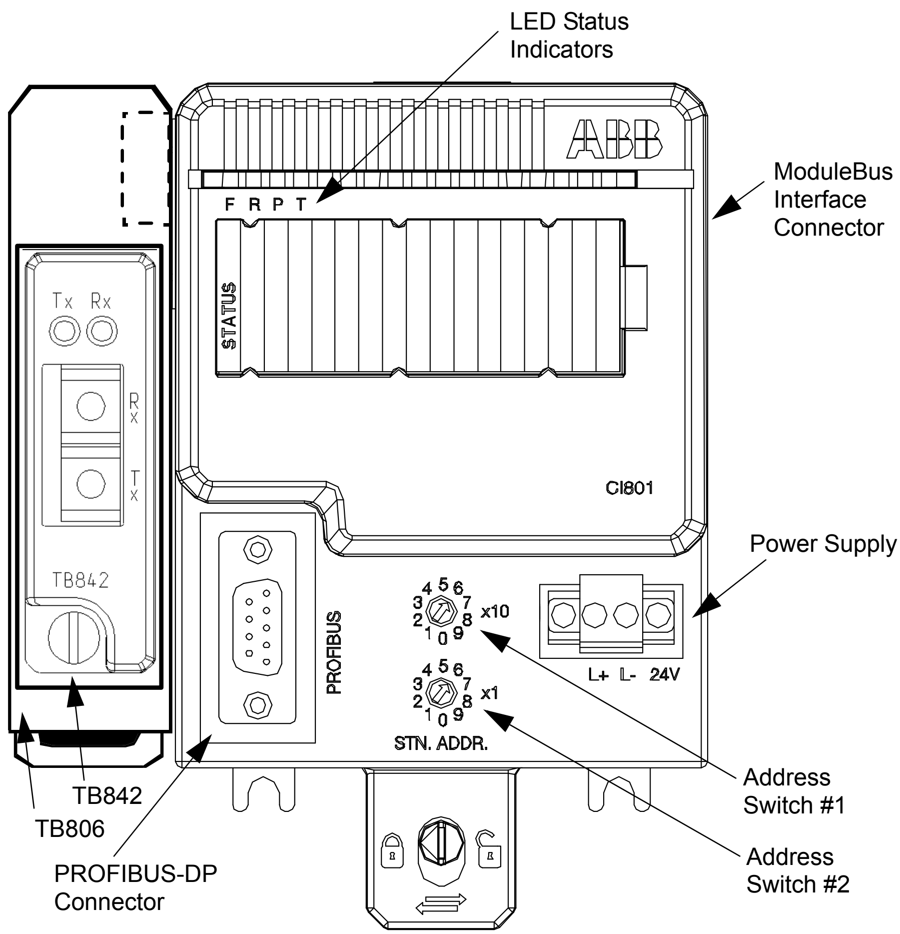


Figure 8. TB842 Optical ModuleBus Port mounted on TB806 module for connection to CI801

TB820/TB820V2 ModuleBus Modem

The TB820/TB820V2 ModuleBus Modem is a fiber optic interface to the ModuleBus. The ModuleBus Modem has an electrical and an optical interface which are logically the same bus. A maximum of 12 I/O modules can be connected to the electrical ModuleBus and up to seven clusters can be connected to the fiber optic ModuleBus. The fiber optic interface is intended for local distribution of I/O clusters and where more then 12 I/O modules are required in an I/O Station.

The TB820/TB820V2 ModuleBus Modem has a rotary switch that selects its cluster number, 1 to 7, on the optical ModuleBus. Figure 9 shows the layout of TB820/TB820V2.

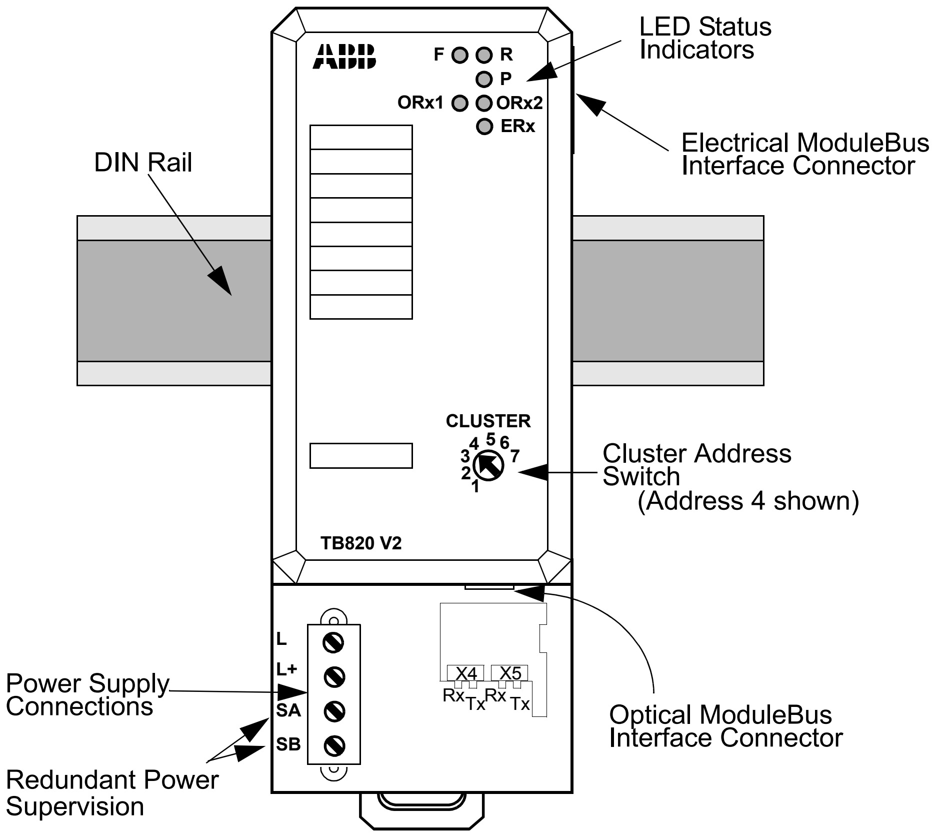


Figure 9. TB820/TB820V2 ModuleBus Modem

The ModuleBus Modem communicates with the FCI or Controller via the Optical ModuleBus.

The TB820/TB820V2 ModuleBus Modem provides 24 V d.c. current limited (from the source) and an isolated, current limited 5 V dc power to the cluster's I/O modules by way of the electrical ModuleBus connection. One power source (single or redundant 24 V d.c.) can be connected to the power terminals (L+ & L-). Redundant power supply can be supervised via inputs SA and SB.

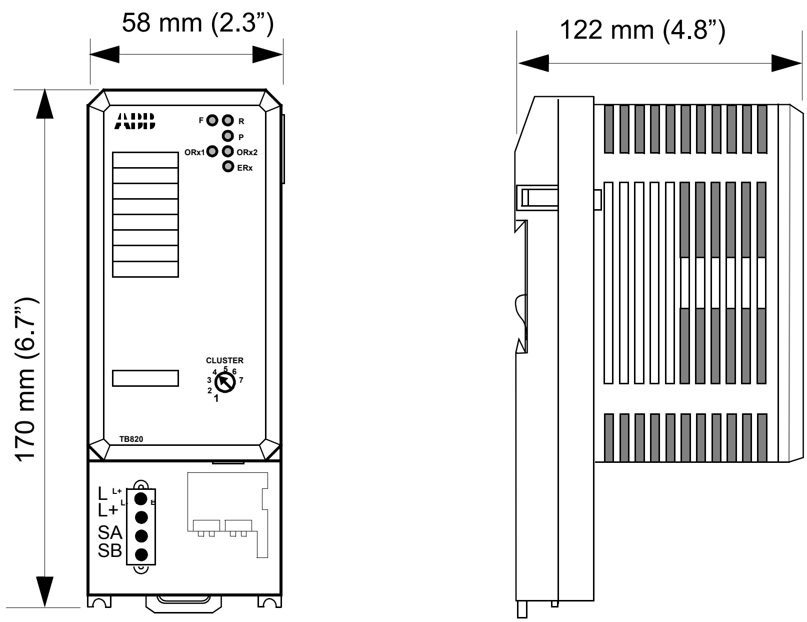


Figure 10. TB820/TB820V2 ModuleBus Modem Dimensions

Refer to specifications in Appendix B, Specifications for more information.

TB840/TB840A ModuleBus Modem and TU807/TU840/TU841/TU848/TU849 Module Termination Unit

The TB840/TB840A ModuleBus Modem is a fiber optic interface to the Optical ModuleBus. TB840/TB840A is used in redundancy configurations where each module is connected to different optical ModuleBus lines, but connected to the same electrical ModuleBus.

The ModuleBus Modem has an electrical and an optical ModuleBus interface which are logically the same bus. A maximum of 12 I/O modules can be connected to the electrical ModuleBus and up to seven clusters can be connected to the fiber optic ModuleBus. The fiber optic interface is intended for local distribution of I/O clusters and where more then 12 I/O modules are required in an I/O Station.

The cluster address sets by a rotary switch on the Termination Unit TU807/TU840/TU841/TU848/TU849 in range 1 to 7.

Figure 11 shows the layout of TB840.

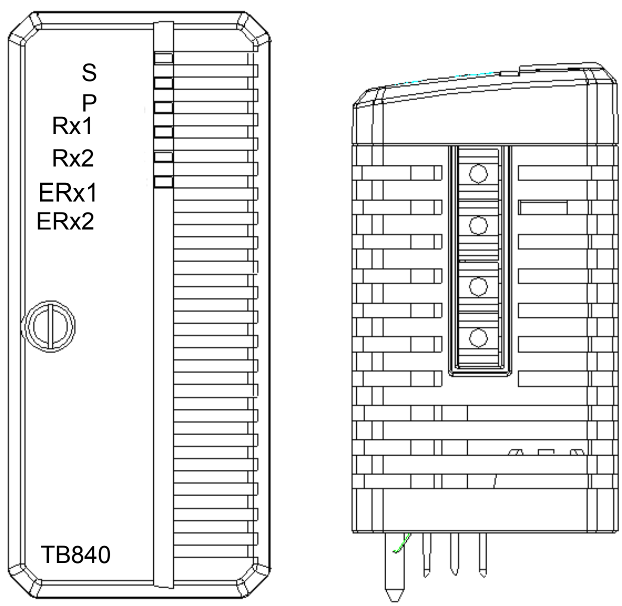


Figure 11. TB840 ModuleBus Modem

The TB840/TB840A ModuleBus Modem provides 24 V d.c. short circuit proof (from the source) and an isolated, short circuit proof 5 V dc power to the cluster's I/O modules by way of the electrical ModuleBus connection. One power source (single or redundant 24 V d.c.) can be connected to the power terminals (L+ & L-). Redundant power supply can be supervised via inputs SA and SB.

The rotary switch and the connector for power supply is located on the terminal unit.

Terminal unit TU807 is for single TB840/TB840A and single ModuleBus.
TU840/TU848 is for redundant TB840/TB840A and redundant ModuleBus.
TU841/TU849 is for redundant TB840/TB840A and single ModuleBus.

TU848 and TU849 have dual power supply connections.

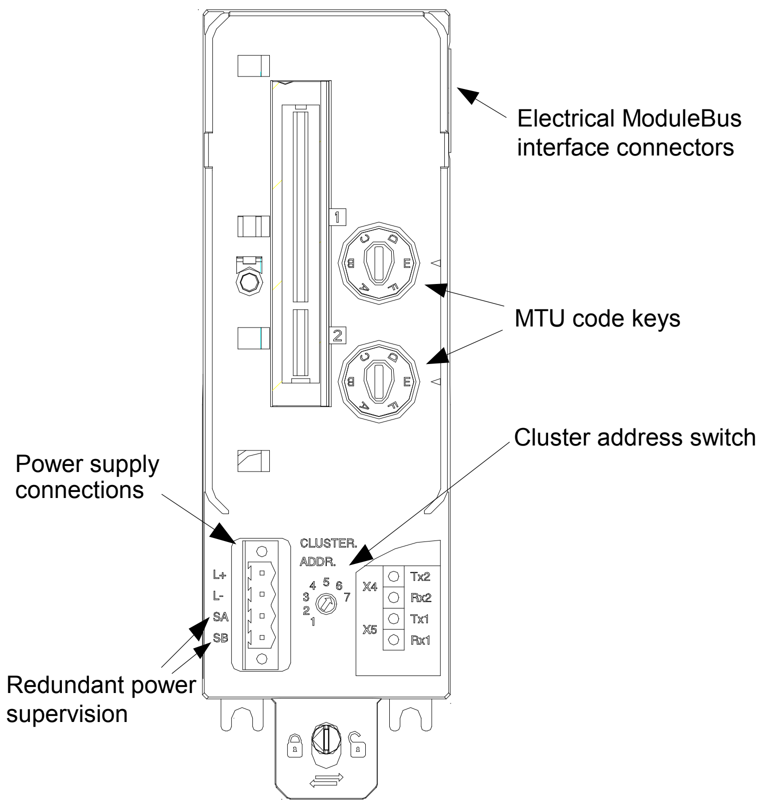


Figure 12. TU807 Module Termination Unit for TB840/TB840A

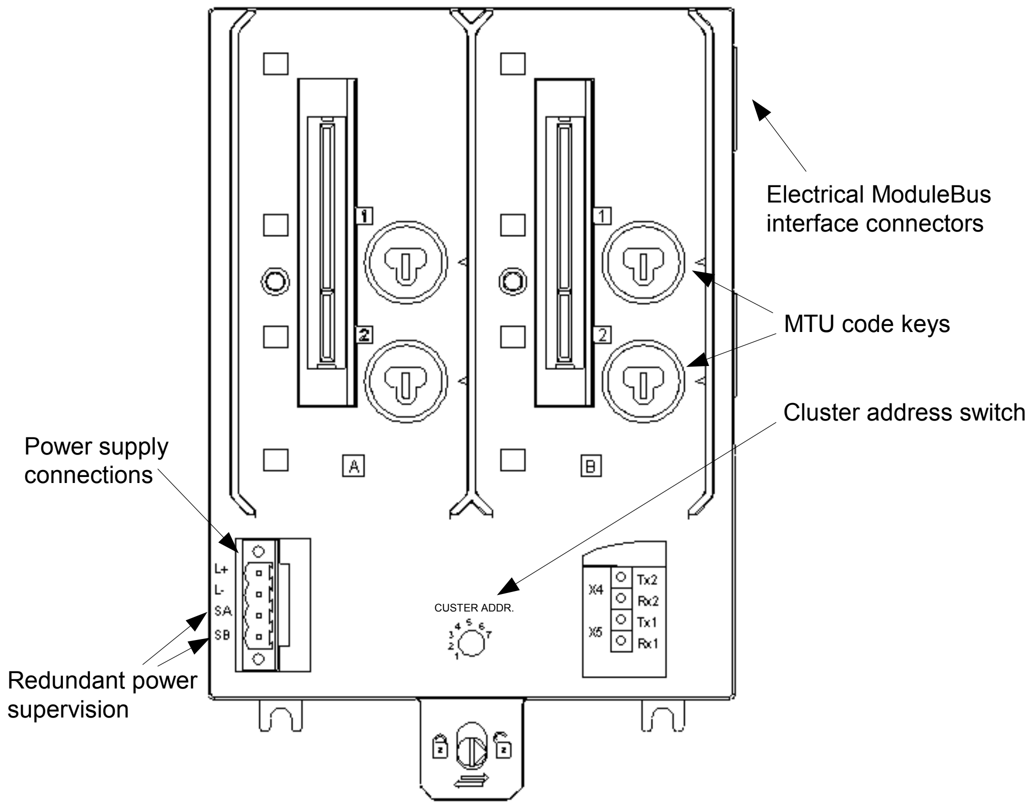


Figure 13. TU840/TU841 Module Termination Unit for TB840/TB840A

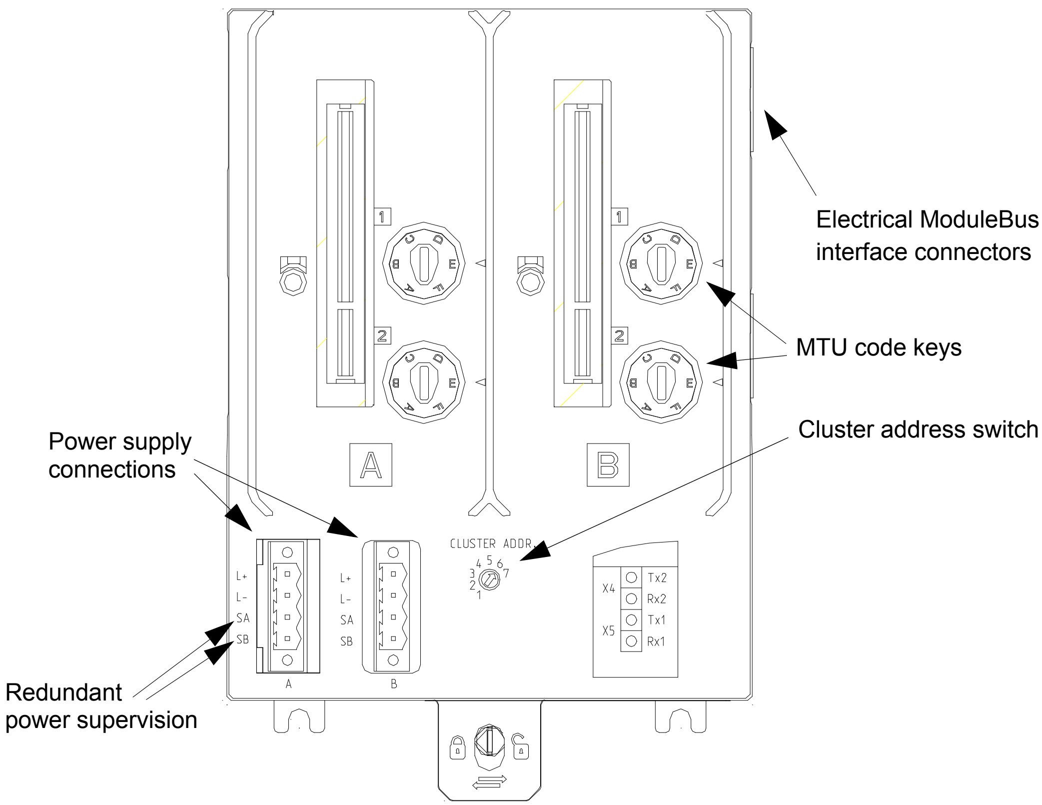


Figure 14. TU848/TU849 Module Termination Unit for TB840/TB840A

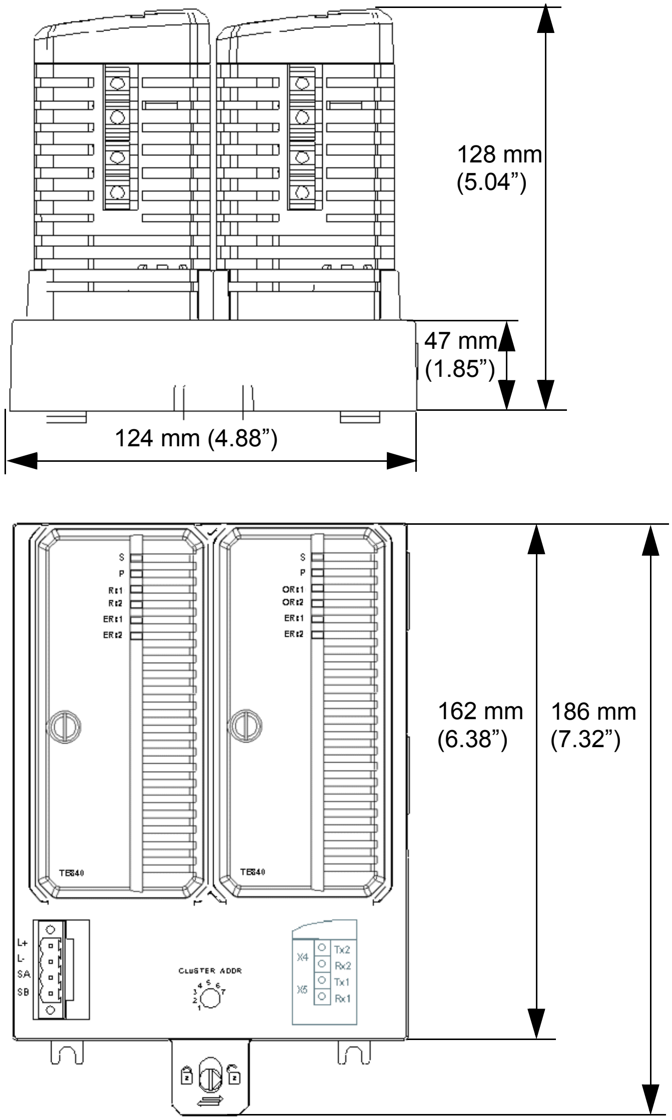


Figure 15. TB840/TB840A and TU841 Dimensions

Refer to specifications in Appendix B, Specifications for more information.

TB825 Optical Media Converter

ModuleBus Optical media converter, converts between plastic opto fiber or HCS fiber with Versatile link connectors and glass optical fiber with ST connectors.

The TB825 is built in S800L mechanics and DIN rail mounted.

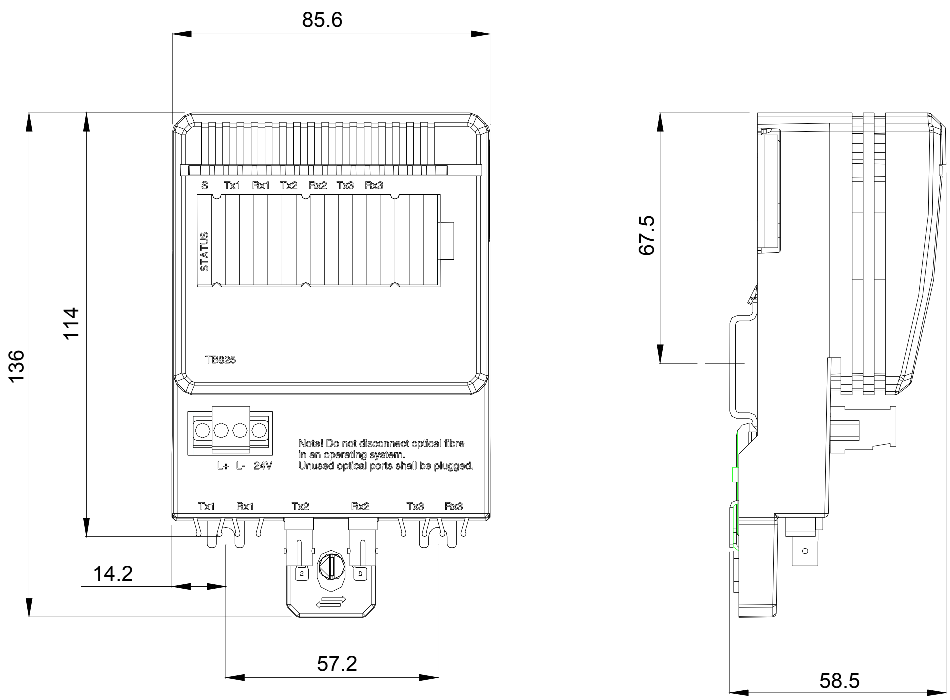


Figure 16. TB825 Optical Media Converter

TB826 Optical Media Converter

TB826 is a Long Range Optical Media Converter for the Modulebus. It is used to convert between plastic/opto fiber or HCS fiber with Versatile link connectors and single mode field fiber with SC connector.

The TB826 is built in S800L mechanics and DIN rail mounted.

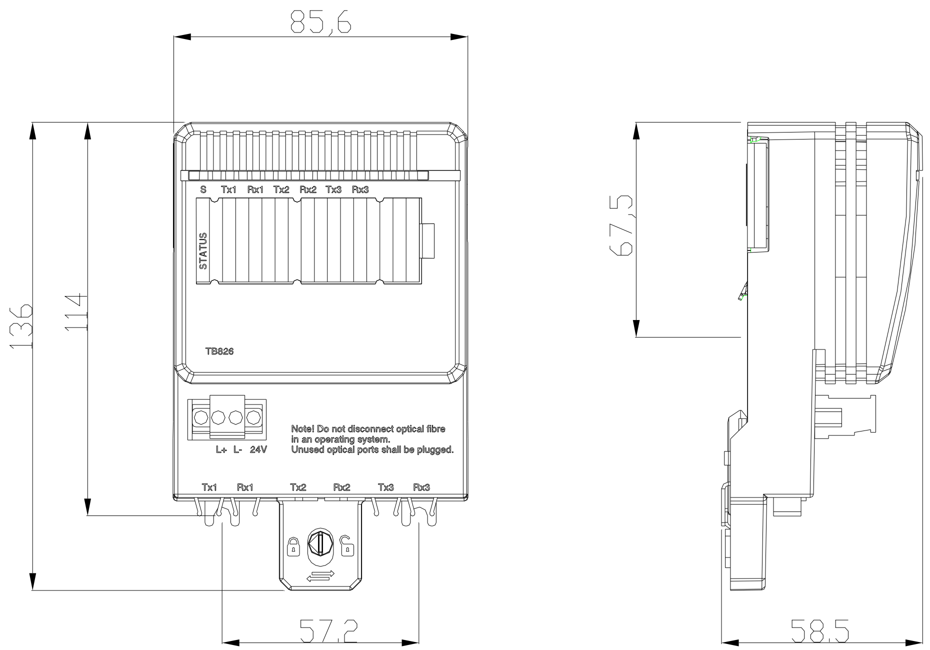


Figure 17. TB826Optical Media Converter

Module Termination Units

The Module Termination Units (MTU) are passive base units used to house the S800 I/O modules. They contain the process wiring terminals.

Refer to specifications in *S800 I/O Modules and Termination Units (3BSE020924*)* and *S800 I/O Modules and Termination Units with Intrinsic Safety Interface (3BSE020927*)* for more information.

I/O Modules

There are two different types of I/O modules; S800 modules and S800L modules.

S800 modules are designed to be put into a MTU.

S800L modules are designed to be put direct on a standard DIN rail and contain also process connections and part of the ModuleBus.

S800 I/O Modules

The I/O modules have open ventilated plastic enclosures. On the front of each I/O module there are three LEDs (FAULT, RUN and WARNING) indicating the module status and digital I/O modules have a status LED for each channel, some even two. One additional LED (OSP) is included on analog output and digital output modules.

I/O modules may be replaced in a fully operational I/O station. Mechanical keying on modules and MTUs protect I/O modules from being inserted in positions where they could be damaged by excessive voltage or current. An electronic type designation ID in each module keeps the I/O module from being taken into operation by the ModuleBus master, if a module’s ID does not match the configured module type definition in the data base.

S800L I/O Modules

The I/O modules have open vertical plastic enclosures and a bottom of sheet-metal. On the front of each I/O modules there is a LED (STATUS) indicating the module status (run or fault) and digital I/O modules have a status LED for each channel.

Refer to specifications in *S800 I/O Modules and Termination Units (3BSE020924*)* and *S800 I/O Modules and Termination Units with Intrinsic Safety Interface 3BSE020927*)* for more information.

Power Supply

The SD82x and SD83x are switch-mode power supply units which convert the mains voltage to 24 volts d.c. These power supplies can be utilized for non-redundant and redundant applications. Redundant applications require diode voting units SS822, SS823 or SS832.

Please refer to specifications in Appendix C Specifications SD82x Power Supply Modules, 24 V d.c.and Power Supply Units Types SD83x for more information.

The S800 I/O station/cluster can be powered by a single or redundant supply voltage of 24 V d.c., see Figure 18 and Figure 19. Power supplies with 100-240 V a.c. or 110-300 V d.c. inputs and 24 V d.c. outputs are available to supply the I/O station and its field circuits. It is recommended to feed the I/O station/cluster and the field circuits from different power supplies.

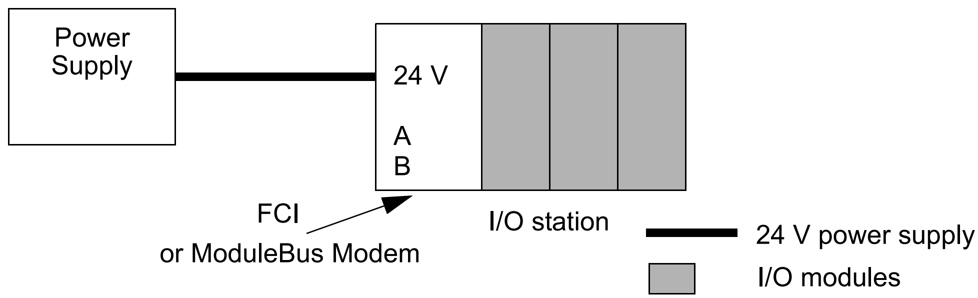


Figure 18. Installation Using Single Power Supply Unit

The ModuleBus master and ModuleBus Modem are able to supervise the redundant voltage supply. The supervision function is individually configurable for power supervision of each I/O station.

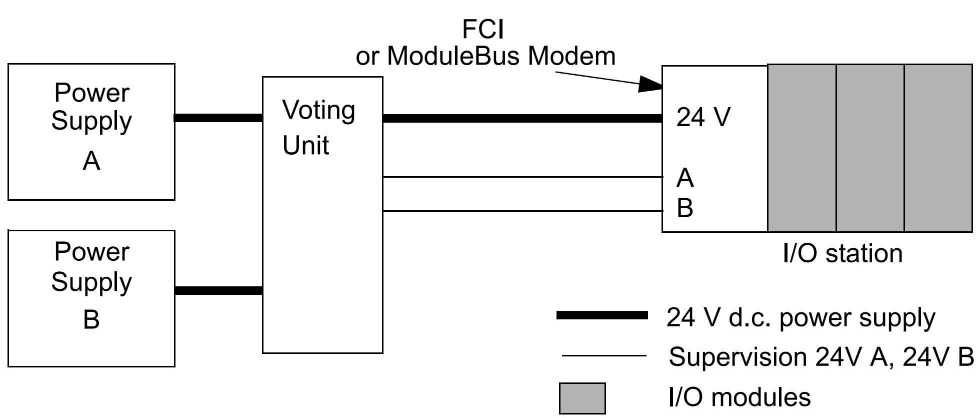


Figure 19. Installation Using Redundant Power Supply Units

G3 Compliant Modules

In general, all S800 units are G3 compliant (for exceptions, see Product Overview on page 24).

G3 is a severity level in the standard ISA-S71.04 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants, for further information about the environment turn to the standard ISA-S71.04.

During transport, storage and installation special caution must be taken:

- Dividable connectors/terminals must not be left unconnected/open in G3 environment if the are intended to be used later.
- Module must not be stored in G3 environment due to unprotected connectors/terminals, also valid for modules in packaging.

Example of Enclosure Configurations

In Figure 20 a layout example are shown for an I/O station in an RE820 cabinet which could house the I/O station with power supplies for the I/O system as well as for the field powering, and space for marshalling terminals.

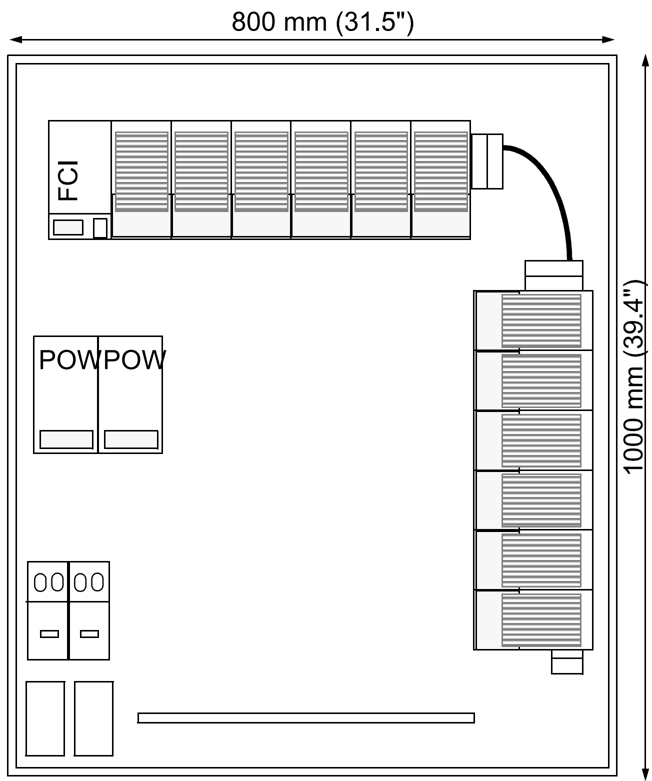


Figure 20. RE820 Cabinet with 12 I/O Modules and Redundant Station Power Supplies

Support for External Intrinsic Safety System

Beside S800 I/O modules with Intrinsic Safety Interfaces, Intrinsic Safety Systems can be connected to the S800 I/O.

Intrinsic Safety System from Pepperl+Fuchs Elcon (manufacturer outside ABB) is supported via S800 I/O module and a special MTU.

Supported Intrinsic Safety System is the HiD Series 2000.

The S800 I/O modules are connected via MTU TU812/TU812V1, a standard cable and a specific adapter board, one for each I/O module types.

For further information refer to Elcon Instruments Manuals.

The following I/O modules are supported:

AI810, AO810/AO810V2, DI810 and DO810.

See Figure 21 for an example of a connection between S800 I/O and Intrinsic Safety System.

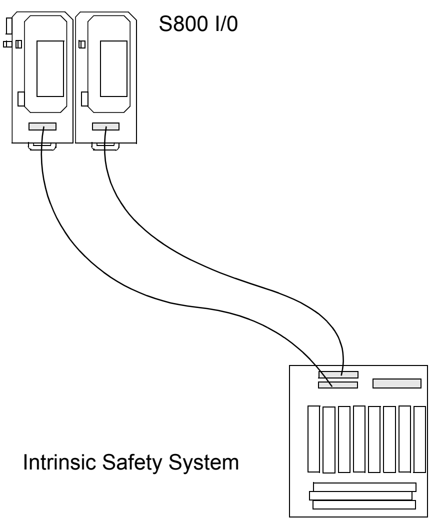


Figure 21. Example of Connection between S800 I/O and Intrinsic Safety System from Pepperl+Fuchs Elcon

Support for External HART Communication

Beside S800 I/O modules with HART interface, Pepperl+Fuchs Elcon provides a HART protocol connection to I/O modules integrated with the Intrinsic Safety System, see Figure 22.

For further information refer to Pepperl+Fuchs Elcon.

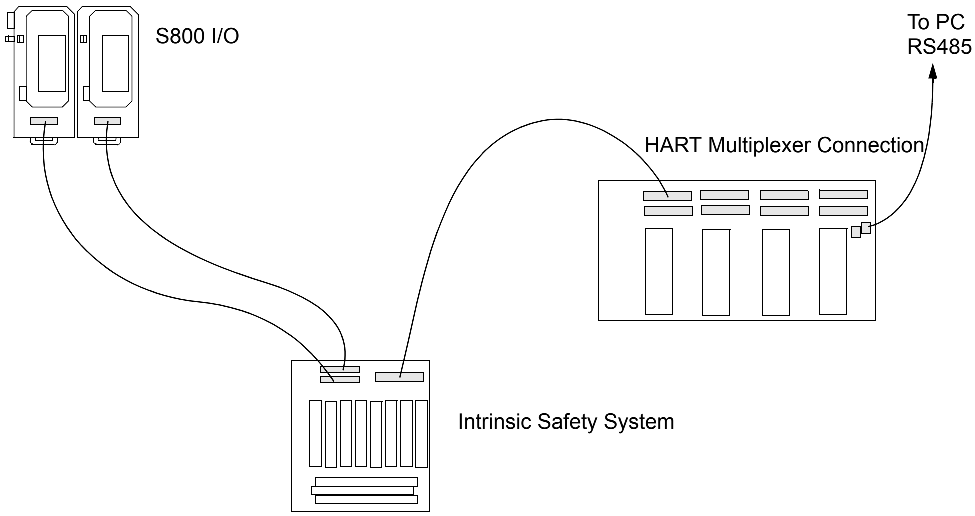


Figure 22. Example of Connection between S800 I/O and Intrinsic Safety System from Pepperl+Fuchs Elcon and HART Multiplexer Interface from HART

Redundancy

Figure 2 shows the basic construction of I/O Stations without any redundancy. To increase the up-time, a number of component can be set up with redundancy:

- Power Supply
- I/O Module
- Fieldbus Communication Interface (FCI)
- Fieldbus
- Electrical ModuleBus

An example of a system using redundancy for all these components is shown in Figure 23.

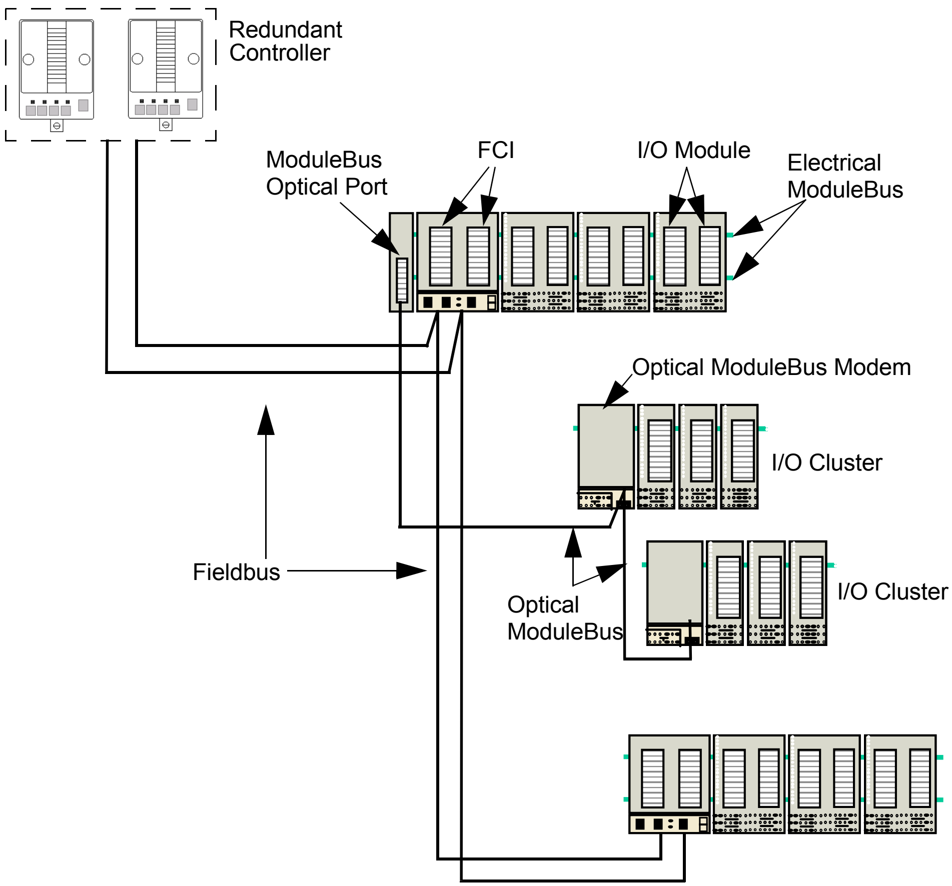


Figure 23. I/O Station Overview with Maximum Redundancy and Additional Single I/O Modules

It is not necessary to implement redundancy on all components, but there are some dependencies:

- Redundant power supply requires no other redundancy.
- Redundant Advant Fieldbus 100 requires no other redundancy.

- Redundant PROFIBUS requires redundant FCIs
- Redundant FCI requires:
  - redundant fieldbus
- Redundant I/O Module (only in base cluster and on PROFIBUS) requires:
  - double electrical ModuleBus
  - redundant FCI
  - redundant fieldbus

Redundancy Functionality

Fieldbus Communication Interface (FCI). When using redundant FCI, one is primary and one is secondary. The FCI will diagnose itself, and when the primary FCI fails it will hand over to the secondary FCI.

If using redundant FCI and redundant electrical ModuleBuses only on PROFIBUS, the primary FCI will control both electrical ModuleBuses. When the primary FCI fails, the secondary FCI will take control of both electrical ModuleBuses.

Input Modules. When using redundant input modules, all reading is done from the primary input module. The input module will diagnose itself, and when the primary input module fails the reading will be done from the secondary input module.

The secondary AI module is checked for error status at a lower cycle rate than the primary.

Analogue Output Modules. When using redundant AO modules, half the output current is generated from each AO module. The AO module will diagnose itself, and when one fails, it disconnects and a direct communication between the two redundant AO modules will ensure that the second AO module quickly doubles its output current.

Digital Output Module. When using redundant DO modules, they both work parallel to each other. They give the same output.

When one DO module fails it will give output signals set to low. The DO module that still work will override by setting active signals to high.

Section 2 Installation

This section contains guidelines for planning the installation of the S800 I/O equipment.

This section does not give the complete list of measures to be taken with respect to environment and other conditions on site. The equipment should be adapted to the actual application by thorough system definition and design.

Since each system is designed to meet a specific requirement, there is no standard configuration that describes every system. Therefore, certain areas of the following instructions are meant only as a guide for planning a specific installation. However, some of the information covers specific requirements for proper system and equipment operation, and is not subject to modification.

All information given in this section relates to standard equipment.

For installation of Advant Fieldbus 100 and Advant Fieldbus 100 modems, see *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* manual.

For installation of PROFIBUS, see *PROFIBUS DP Wiring and Installation (3BDS009029*)* manual.

For installations of S800 I/O modules with Intrinsic Safety Interface see *S800 I/O Modules and Termination Units with Intrinsic Safety Interface (3BSE020927*)* manual.

Site Planning

Site Selection and Preparation

When planning an S800 I/O installation, consider the following:

- Surrounding environment and atmosphere.
- The temperature in the room where the equipment is to be located.
  This should include an estimation of the resulting temperature rise with respect to the power dissipation from the planned equipment.
- Proximity of the equipment to the process.
- Size of the cabinets to accommodate all the required equipment.
- Minimum distances from a cabinet to walls and ceiling to obtain satisfactory results from different aspects.
- Ease of access for moving equipment in and out of area.
- Free space in front of cabinets. Also consider the need of space to fully open a cabinet door either left hand or right hand hinged.
- Spare area for future expansion of the system.
- Grounding by an effective connection to the grounding plane.
- Cable routing with respect to installation rules.
- Availability of power and other utilities.

The following sections examine some of these factors in detail and provide recommendations and requirements as necessary.

Environmental Considerations

General

S800 I/O equipment can be installed in a designated control room, or located in the process area when housed in a suitable enclosure. The S800 I/O is designed for a demanding industrial environment.

Temperature

I/O Module Factors. The maximum ambient air temperature around S800 modules is 55°C (131°F) for I/O modules mounted on Extended MTUs on vertical or horizontal orientated DIN-rails, or I/O modules mounted on compact MTUs on horizontal oriented DIN-rails. I/O modules mounted in Compact MTUs on a vertical DIN-rail allows operation at 40°C (104°F).

The maximum ambient air temperature around S800L modules is 55°C (131°F) for I/O modules mounted on horizontal orientated DIN-rails. It is 40°C (104°F) for I/O modules mounted on vertical oriented DIN-rails.

The ambient temperature de rating which applies for vertical DIN rail and Compact MTUs is due to the reduced air flow through an I/O module due to the orientation.

The different hardware modules in the S800 I/O have different outputs of heat. Accurate calculation of the heat produced by the system requires knowledge of the modules and the work cycle. Power supplies with regulated outputs are highly recommended to minimize heat in cabinets. Use of such devices will reduce the power loss of resistive loads and current outputs, for example, digital inputs and analog outputs. Refer to Power and Cooling on page 168 for more information.

Cabinets Factors. The temperature within cabinets and in the surrounding environment and atmosphere must be considered, especially when using sealed cabinets (IP65/IP54) or tropicalized cabinets (IP41) with considerable equipment and outside ambient temperatures at levels approaching 40°C (104°F). The frequency of faults is estimated to double for each 20°C (36°F) increase in temperature. Thus, it is important to maintain as low ambient temperature outside the cabinets (typical operating range 5 - 40°C (41 - 104°F)) as possible where the equipment is installed. Design considerations are given in Heat Dissipation Permitted in Cabinets on page 165.

Vibration

The cabinets are to be located on a stable floor, wall, deck or supporting structure, free from vibrations.

If the system equipment is installed in a control room adjacent to large machinery such as shakers or large presses, where frequent major vibrations occur, shock absorbers or an isolation pad may be required to protect the system equipment. Shock absorbers normally protect the equipment from sustained low level vibrations (vibrations that are perceptible, but not excessive). If vibrations or shock is a major problem, more extreme measures must be considered to alleviate the problem, such as fasten the MTUs with extra screws.

Electromagnetic Compatibility and CE Marking

Grounding, cable selection and cable routing must be considered for electromagnetic interference-free operation. Planning considerations are discussed in the following sections. Instructions for implementing these plans are provided in Installation Procedures on page 106.

The S800 I/O meets requirements specified in EMC Directive 2004/108/EC.

Layout of I/O Stations

I/O Station with S800 I/O

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 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, MTU or S800L, 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.

S800L module has screw locking device that attaches it to the mounting rail.

Mounting Procedure for S800L I/O

Use a screwdriver with a 1 mm (0.03 inch) tick flat blade that fits the locking screw. This is the only tool you need for the mounting. See Figure 24 and Figure 25.

1. Turn the locking device to **open** position (1) and hook the lip at the rear of the unit onto the DIN rail and snap the unit into position.
2. Turn the screw to the **slide** position (2). Now you can slide the unit along the rail to desired position and join it to another unit. Make sure that the connector pins and sockets are in line. Do not use excessive force!
3. Turn the screw clockwise to **locked** position (3). The unit is now locked and has good earth connection to the DIN rail.It is essential that the locking device is in locked position to avoid problems due to vibration and inadequate grounding.

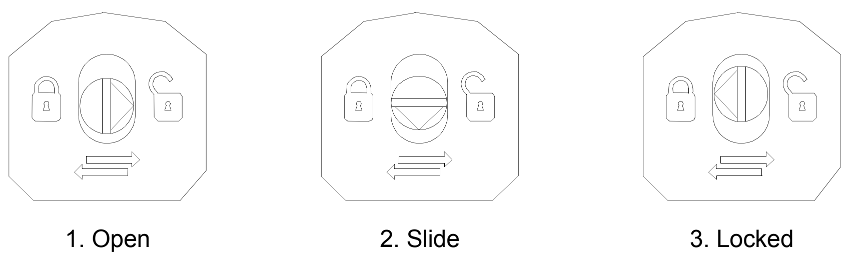


Figure 24. Mounting Procedure

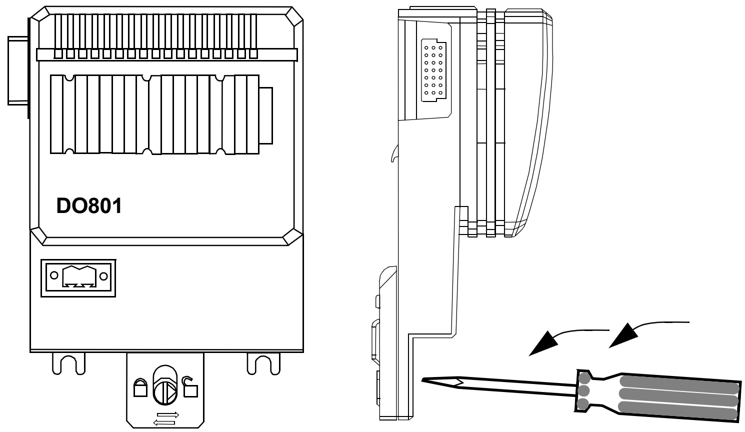


Figure 25. Unlocking the S800L I/O Module

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 26).

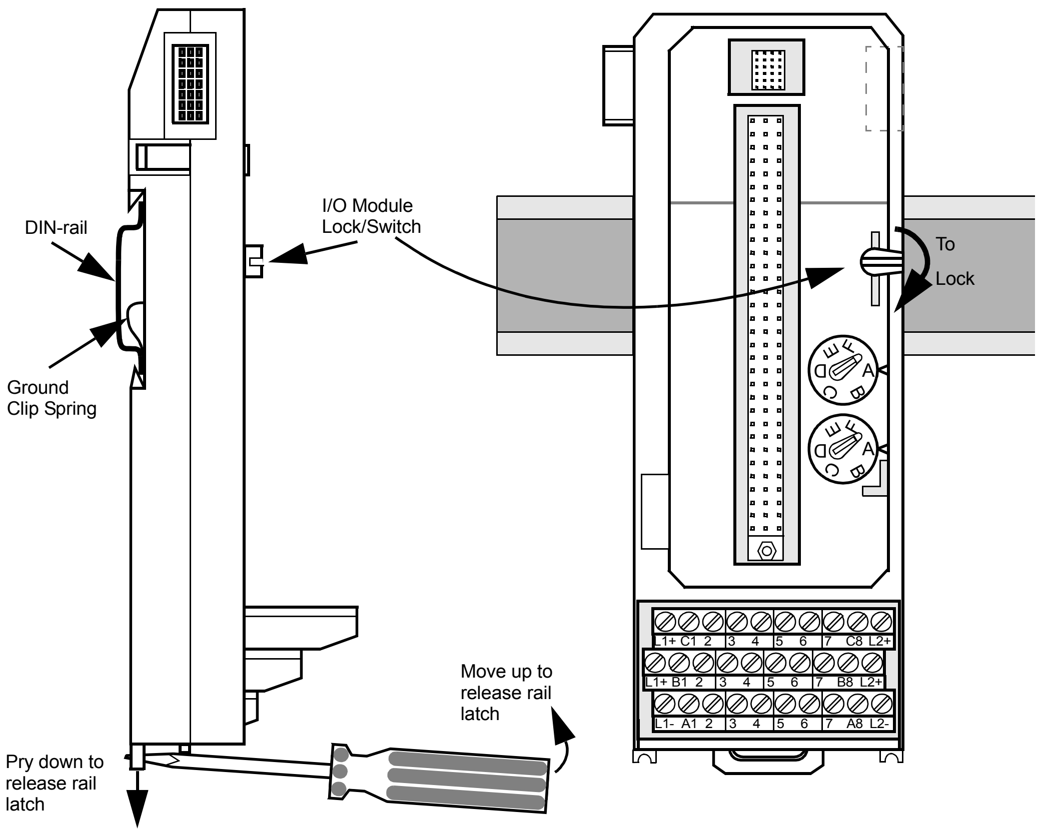


Figure 26. MTU Latching System

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 27).

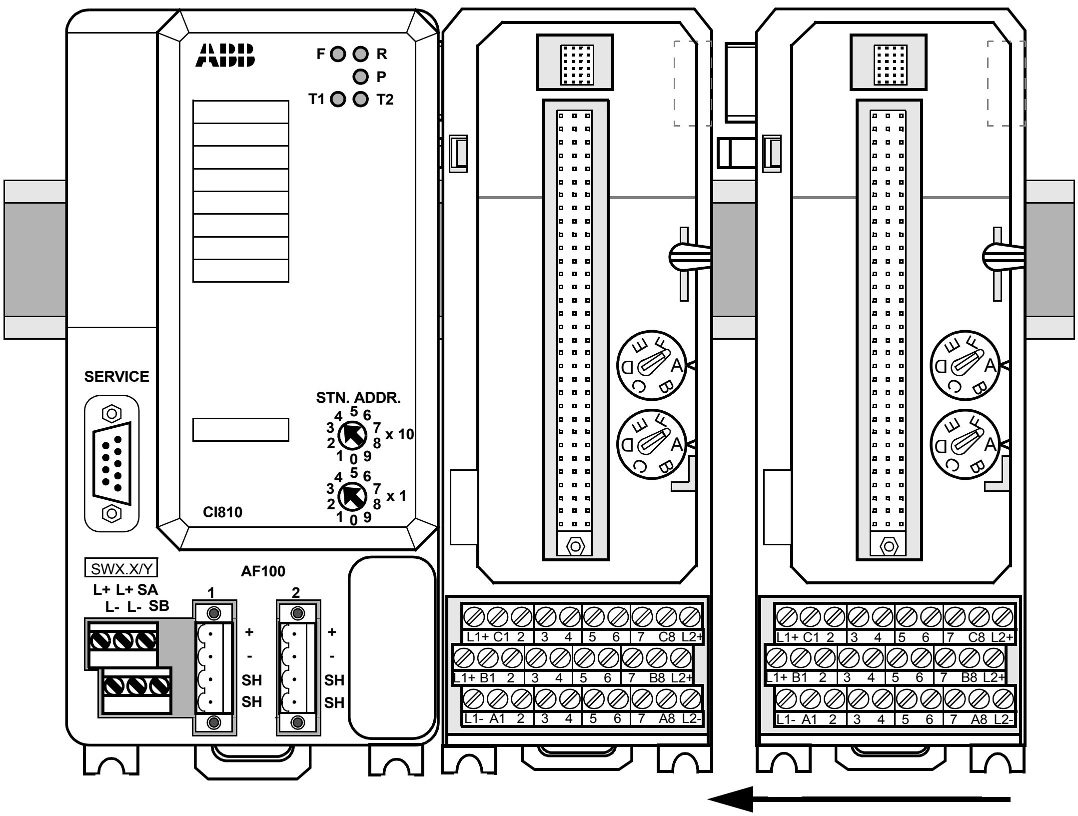


Figure 27. I/O Station Installation Diagram

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.

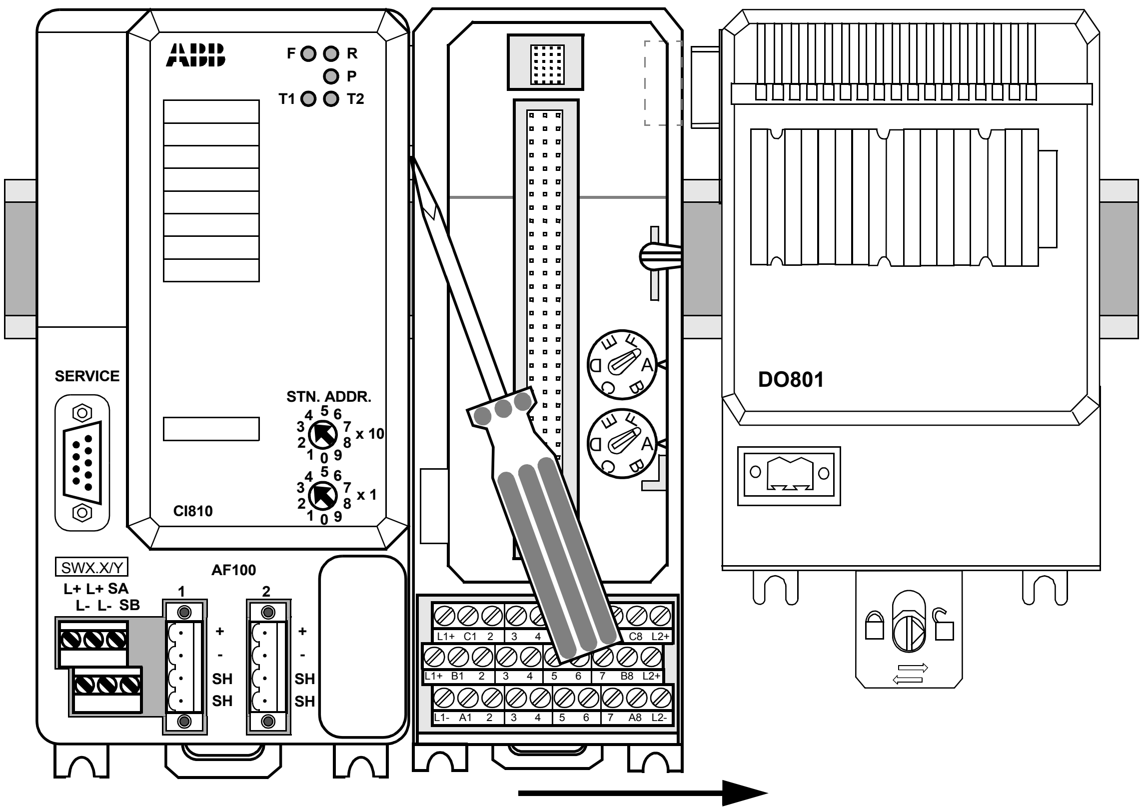


Figure 28. Module Release

Redundant FCI Installation AF100

Installation of an I/O Station with redundant FCIs requires two CI820/CI820V1 FCIs and a TB815 Interconnection Unit (Figure 29). They are connected to the I/O modules of the base cluster by an electrical ModuleBus extension cable. From the

TB815 ModuleBus connector, a TK801V0xx cable is connected to the first MTU via a TB806 Cable Adapter-in module.

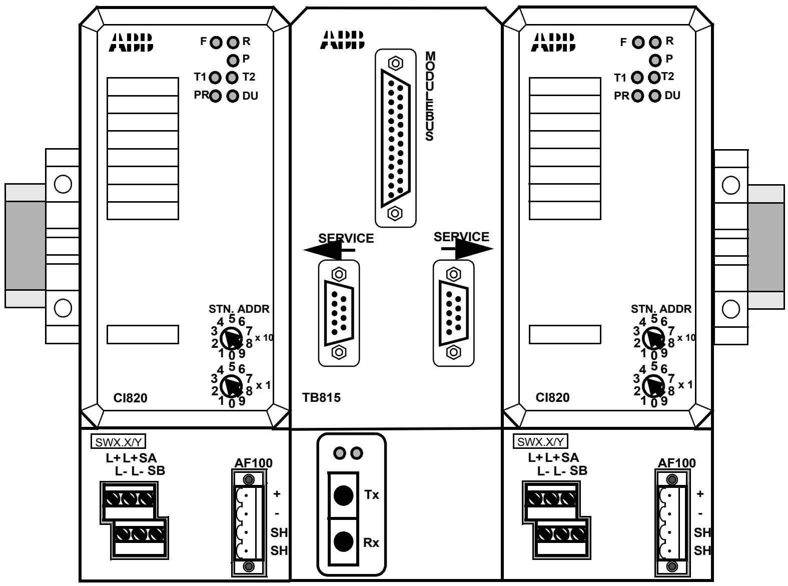


Figure 29. Redundant CI820 FCIs and TB815 Interconnection Unit Layout

The redundant FCIs can either be mounted on a separate DIN rail or the same one as the I/O modules. Room must be allowed to the left and right of the FCIs for disconnection from the TB815 for removal (Figure 30).

The total length of the ModuleBus extension, from the TB815, and ModuleBus segments of the I/O modules must not exceed 2.5 meters (8.2 feet).

Optical ModuleBus Extension can be connected to the TB815 via the TB810 ModuleBus Optical Port unit for connection of 1 to 7 additional I/O clusters.

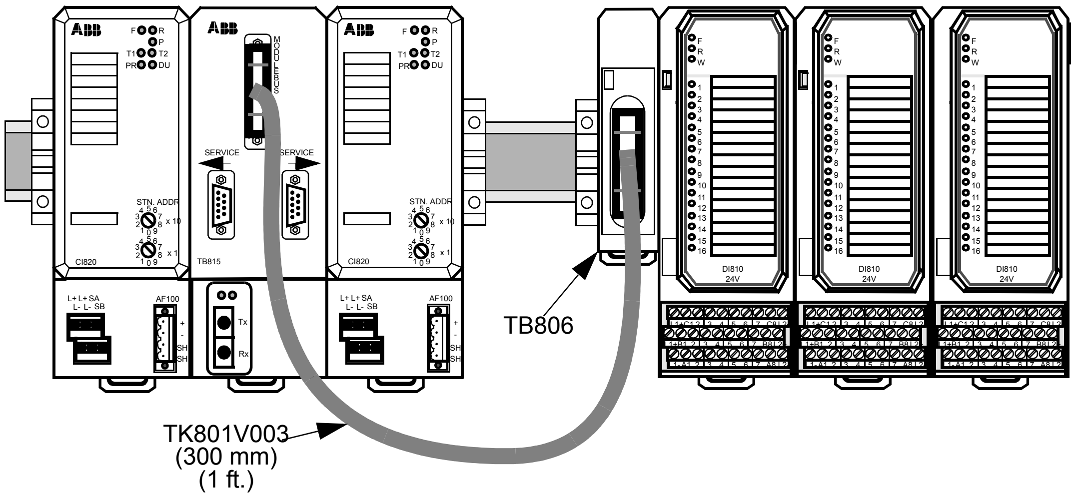


Figure 30. Connection of Redundant FCIs to I/O Modules

Redundant FCI Installation Profibus

Installation of an I/O Station with redundant FCIs requires two CI840 FCIs and one TU846 or TU847 (Figure 31). They are direct connected to the I/O modules of the base cluster.

TU846 are used with redundant I/O modules and TU847 with single I/O modules.

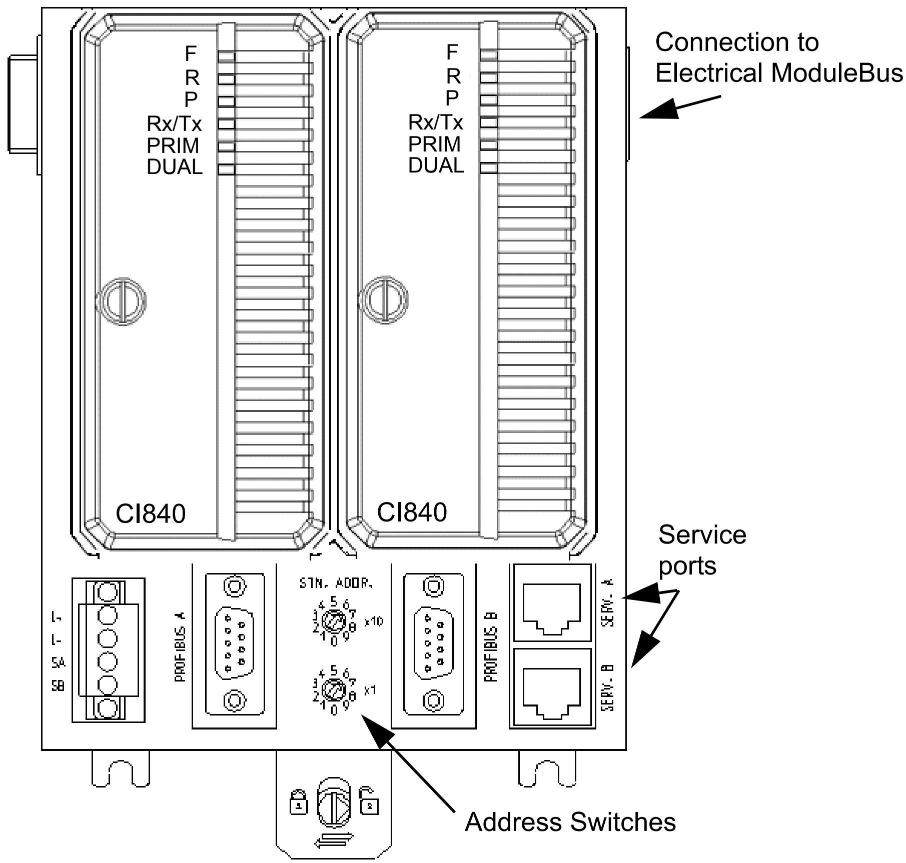


Figure 31. Redundant CI840 FCIs on TU847

The total length of the electrical ModuleBus, must not exceed 2.5 meters (8.2 feet).

ModuleBus Extension (Electrical)

When the next MTU or S800L module is located away from the previous MTU, S800L module, then a TK801V0xx ModuleBus Extension cable must be used. The previous MTU or S800L module will require a TB805 Cable Adapter-out to be plugged into the ModuleBus-out connector. The TK801V0xx cable is then connected to the TB805 adapter. The next MTU will have a TB806 Cable Adapter-in plugged into the ModuleBus-in connector and then connected to the other end of the ModuleBus Extension cable. See Figure 32.

In case of redundant I/O two TK801V0xx ModuleBus Extension cables, a Cable Adapter-out TB845 instead of TB805 and a Cable Adapter-in TB846 instead of TB806 are needed. See Figure 33.

The TB805/TB806 ModuleBus Cable Adapter-Out/In adapters mount on the DIN-rail. Each has a latch that locks it to the rail. There is also a grounding spring that connects it to the DIN-rail. The latch can be released with a screw driver and the adaptor moved toward or away (for removal) from the MTU or S800L module.

The ModuleBus Extension cable comes in three standard lengths:

- TK801V003 - 300 mm (1 ft.)
- TK801V006 - 600 mm (2 ft.)
- TK801V012 - 1.2 meters (4 ft.).

ModuleBus length must not exceed 2.5 meters (8.2 feet) from FCI, TB815 Interconnection Unit, or ModuleBus Modem to the last MTU or S800L module including extension cables.

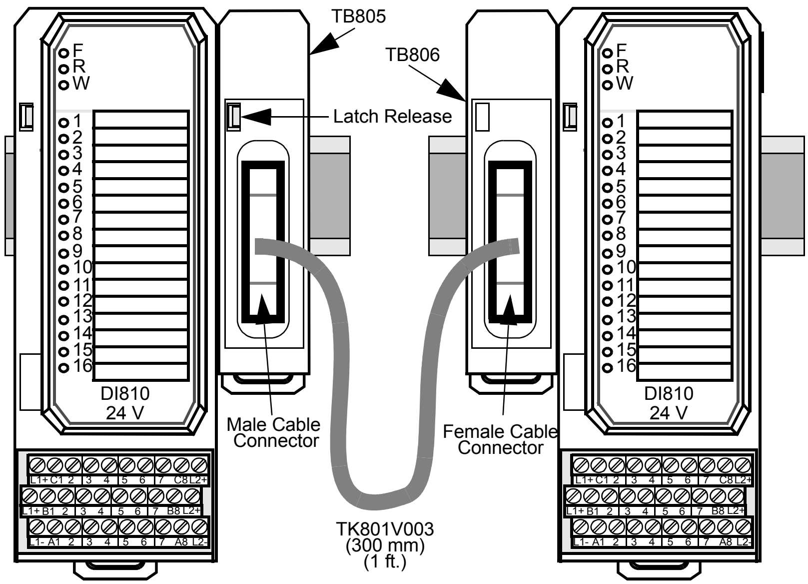


Figure 32. ModuleBus Extension Cable Connections, single I/O

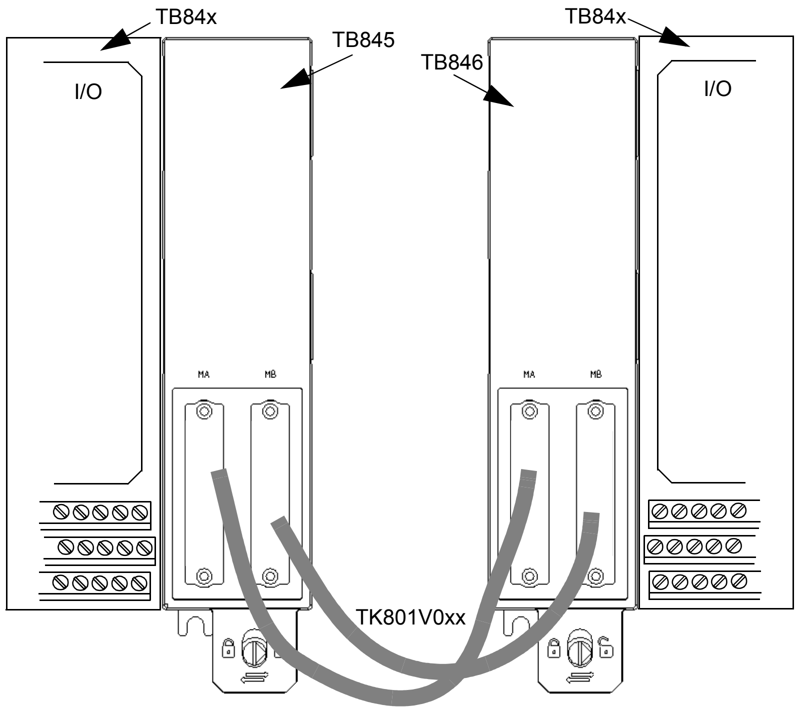


Figure 33. ModuleBus Extension Cable Connections, Redundant I/O

Optical ModuleBus Expansion Single Configuration

The FCI (Fieldbus Communication Interface) provides fiber optic expansion of the ModuleBus for up to 7 additional I/O clusters or to drive equipment. The TB810/TB811 ModuleBus Optical Port must be inserted in to the CI810 or CI830 FCI or TB815 Interconnect unit (redundant CI820/CI820V1) to provide optical ModuleBus expansion. See Figure 34 for location of the TB810/TB811 on the CI810/CI830 FCI and Figure 35 for location in the TB815 Interconnection Unit.

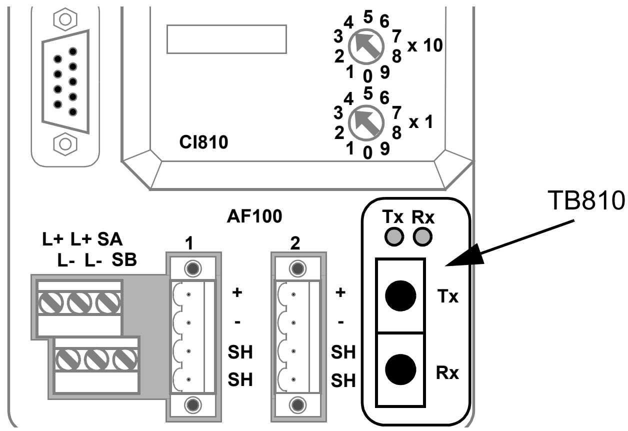


Figure 34. Location of TB810/TB811 ModuleBus Optical Port in CI810 FCI

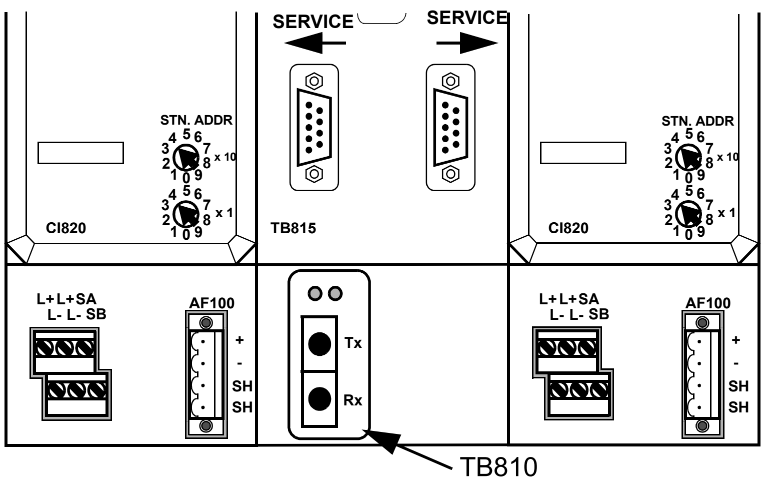


Figure 35. Location of TB810/TB811 ModuleBus Optical Port on the TB815

The TB842 ModuleBus Optical Port must be connected to CI840 via TB806 or TB846 and TU846 or TU847. TB806 and TU847 for single I/O, see Figure 36, and TB846 and TU846 for redundant I/O, see Figure 37.

TB810 and TB842 has 10 Mbit drivers and is used with the TB820/TB820V2 (S800 I/O) and ABB drives equipment. TB811 has 5 Mbit drivers and is used with ABB drives equipment. The TB811 can only use up to 10 meters (33 ft) plastic optic fiber. A ModuleBus must have the same type of drivers on each node

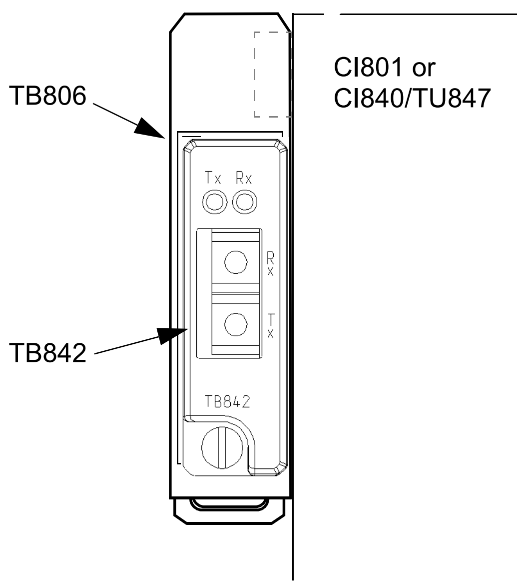


Figure 36. TB842 and TB806 Connected to CI801 or Redundant CI840 FCIs Through TU847

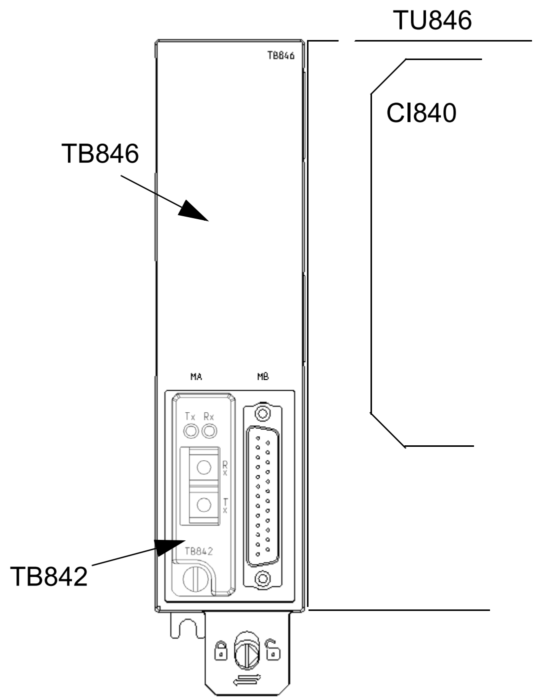


Figure 37. TB842 and TB846 Connected to Redundant CI840 FCIs Through TU846

After optical expansion of the Modulebus, only single I/O configurations can be used.

Each I/O cluster can have a maximum of 12 S800 I/O modules. The maximum number of S800 I/O modules or other units connected to one FCI is 24. The optical ring connection or duplex connection allows for a maximum distribution of 15m (49 ft.) (plastic fiber) or 200m (667 ft.) (HCS fiber) between each I/O cluster, see example in Figure 38.

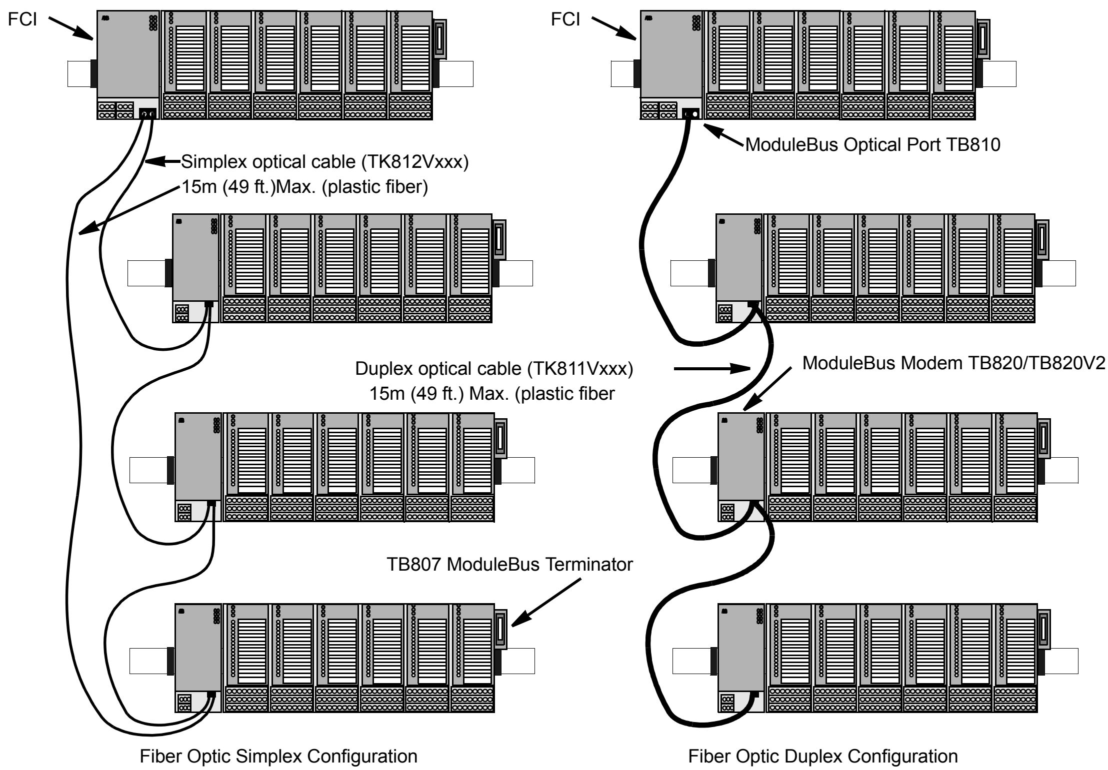


Figure 38. Optical ModuleBus Expansion, Simplex and Duplex Configurations

The TB820/TB820V2 can be used in both a simplex optical configuration as well as in a duplex optical configuration. In a simplex optical configuration, the optical ModuleBus nodes are connected in a ring. In a duplex optical configuration, the optical ModuleBus nodes are connected in a row.

The optical ModuleBus Extension fiber optic (plastic fiber) cable comes in three standard lengths:

- TK811V015 (duplex), TK812V015 (simplex) - 1.5 meters (5 ft.)
- TK811V050 (duplex), TK812V050 (simplex) - 5 meters (16 ft.)
- TK811V150 (duplex), TK812V150 (simplex) - 15 meters (49 ft.)

As with the FCI (base cluster), the electrical ModuleBus length must not exceed 2.5 meters from the ModuleBus Modem to the last MTU or S800L module of each cluster. Each cluster requires a TB807 ModuleBus Terminator plugged into the last MTU or S800L module.

Optical ModuleBus Expansion Redundant Configuration

Redundant Optical ModuleBus Expansion can only be used with redundant AC 800M Controller. Redundant Optical modem TB840/TB840A and TU840 for redundant I/O and TB840 and TU841 for single I/O. See Figure 39.

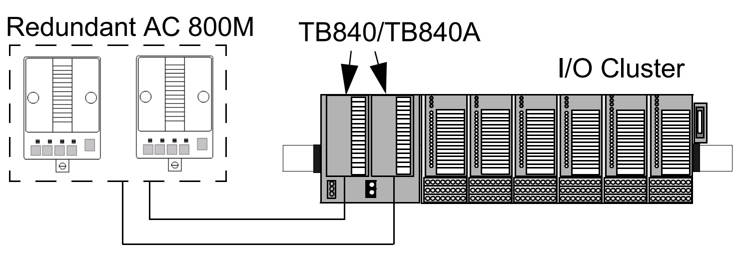


Figure 39. Optical Module Expansion Redundant Configuration

I/O Module Installation

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.

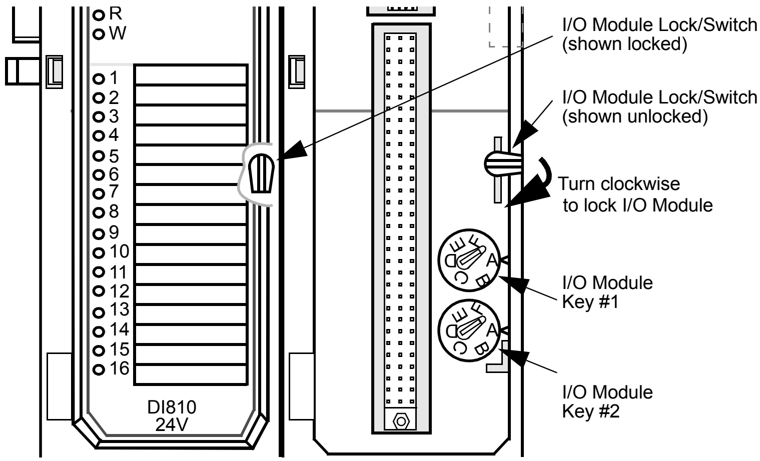


Figure 40. MTU Mechanical Keys for I/O Module and Module Lock

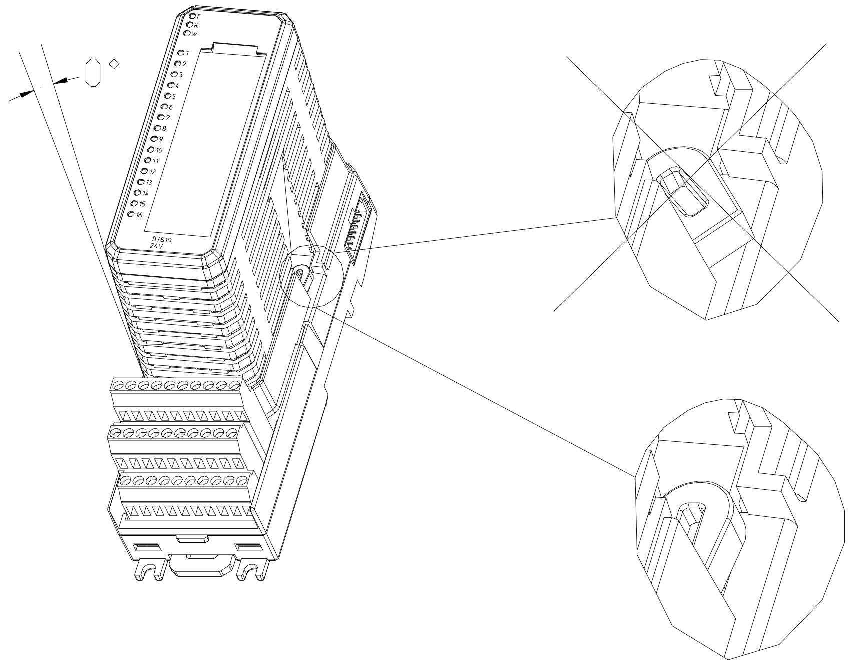


Figure 41. Mounting of I/O module on MTU

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.

After all the MTUs or S800L module are connected, the TB807 ModuleBus Terminator connects to the ModuleBus connector of the last MTU or S800L module of the I/O cluster. The TB807 has a snap latch (Figure 42) that holds it in place. To release the terminator, the latch has to be squeezed to allow removal.

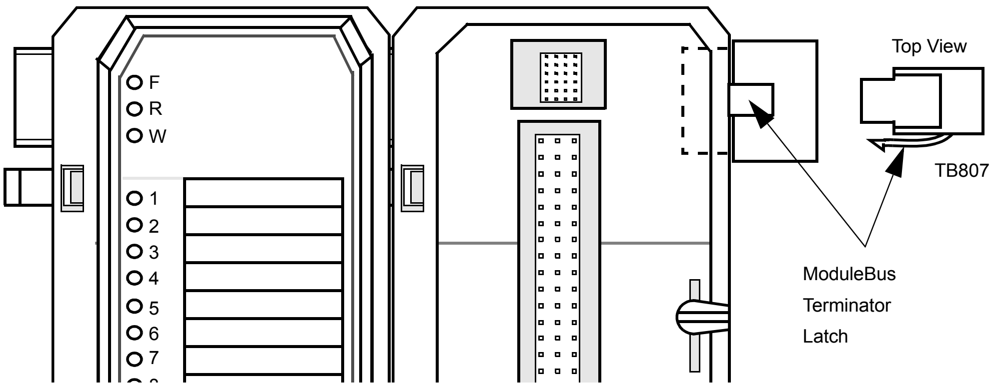


Figure 42. TB807 ModuleBus Terminator Installation

The I/O cluster configuration can be as shown in Figure 43 and/or as presented in *S800 I/O Modules and Termination Units* and Example of Enclosure Configurations on page 58.

The space between the I/O modules or FCIs are ca 0.8 mm (0.03”)

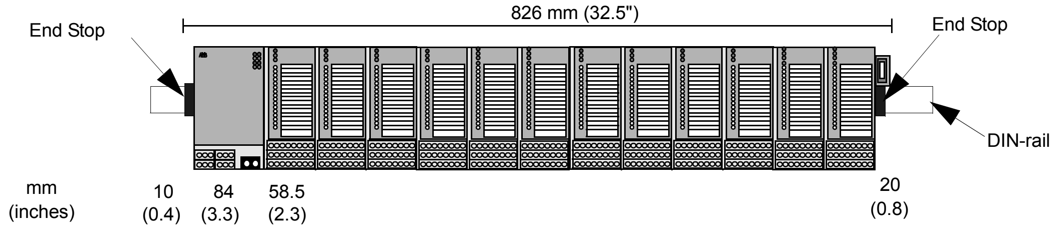


Figure 43. I/O Station Layout with FCI and S800 I/O Modules

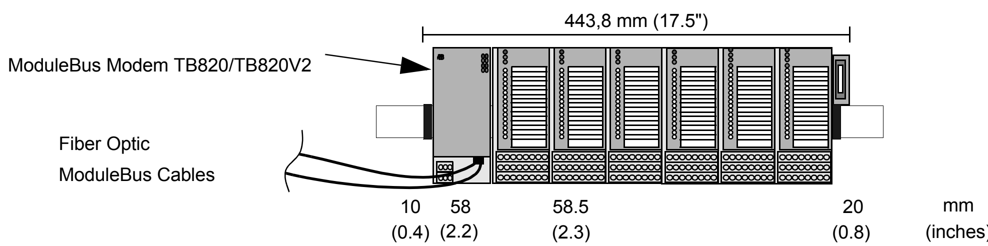


Figure 44. I/O Station Layout with ModuleBus Modem and S800 I/O Modules

In all installations, two end stops must be mounted on the DIN-rail, one at each end of the cluster, to prevent the modules from moving along the rail, see Figure 43.

The installation rules should be followed as much as possible. The flexibility of the system allows both horizontal and vertical mounting of the rail and mixing of MTU types as shown in Figure 45.

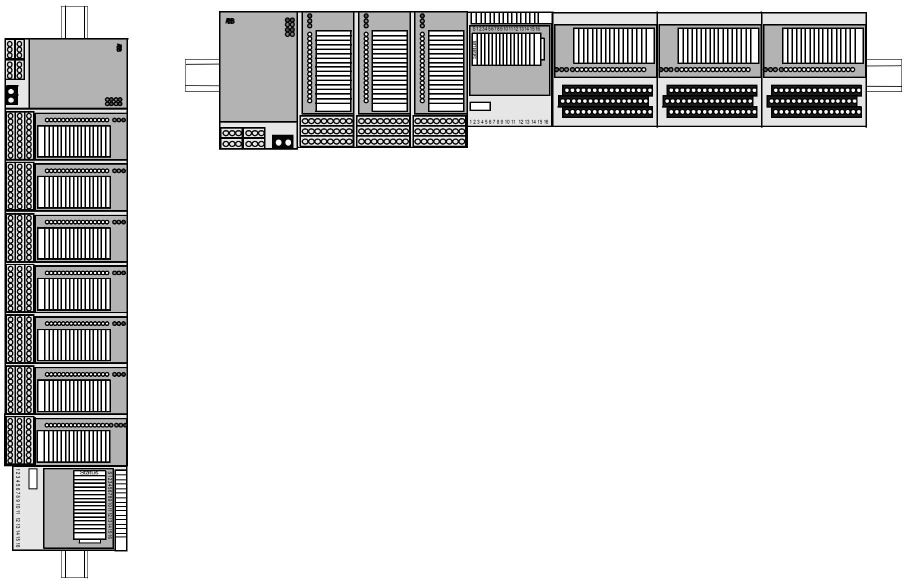


Figure 45. Compact, Extended MTU and S800L Modules showing Horizontal and Vertical Mounting

Mounting Kit for CI801/CI840/CI840A/TB840/TB840A

The Mounting Kit is used for horizontal mounting of CI801/CI840/CI840A and TB840/TB840A on a vertical DIN-rail.

The Mounting Kit is locked to the vertical DIN-rail by a DIN rail lock, which is screwed and tightened to the Mounting Kit by two M4 screws, see Figure 46.

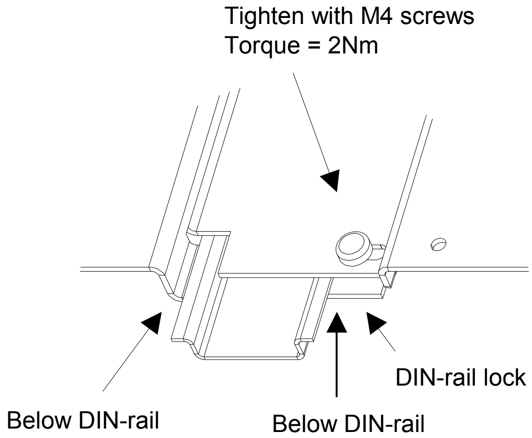


Figure 46. Locking of Mounting Kit to the vertical DIN-rail

The modules will be placed on the Mounting Kit, locked by the locking device, and screwed with M4 screws into the Mounting Kit, see Figure 47.

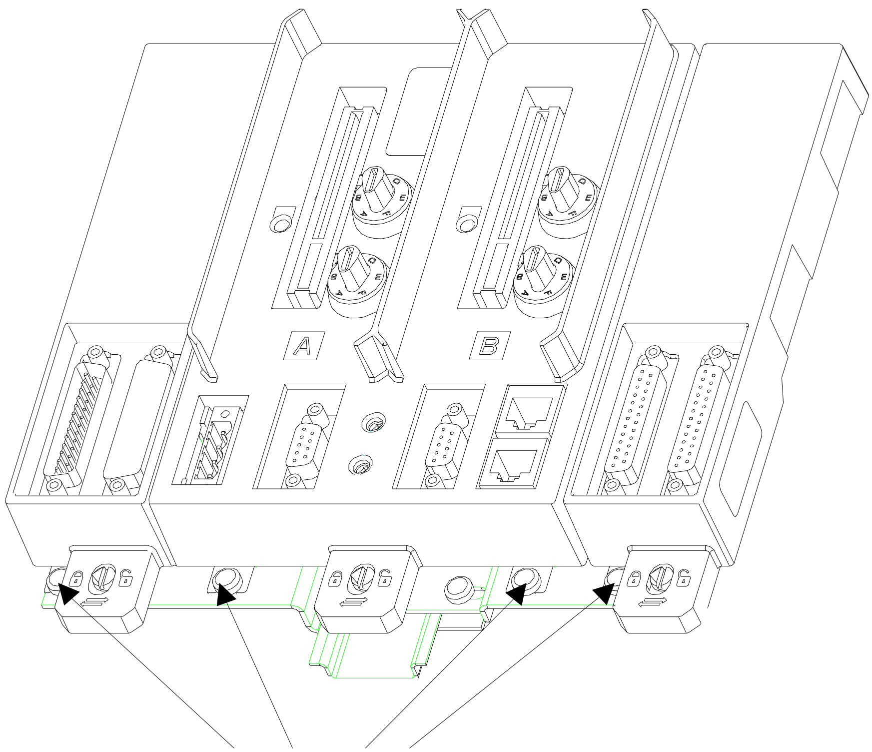


Figure 47. Mounting of modules on the Mounting Kit

Mechanical Installation

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

All cabinet structure components must be bonded together with good and permanent ground connections. The connections should preferably be made with self-tapping Taptite screws with cutting head. Where self-tapping Taptite screws cannot be used on painted components, the paint must be removed under the head of the screw and the nut and the surface must be smeared with conductive grease.

The metallic parts in the cabinet shall be properly connected to plant ground.

Prefabricated Aluminium 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 fastening screws.

The profile has grooves for self-tapping screws (ST 4.8×9.5) that can be used for fastening the modules in an environment with high vibrations.

The aluminum profiles have one DIN-rail and one cable duct and are available in different sizes, see Figure 48.

Horizontal mounting:

- 482 mm (19”) ordering number 3BSE022255R1
- 609 mm (24”) ordering number 3BSE022256R1
- 736 mm (29”) ordering number 3BSE022257R1

Vertical mounting:

- 1806 mm (71") ordering number 3BSE049768R1

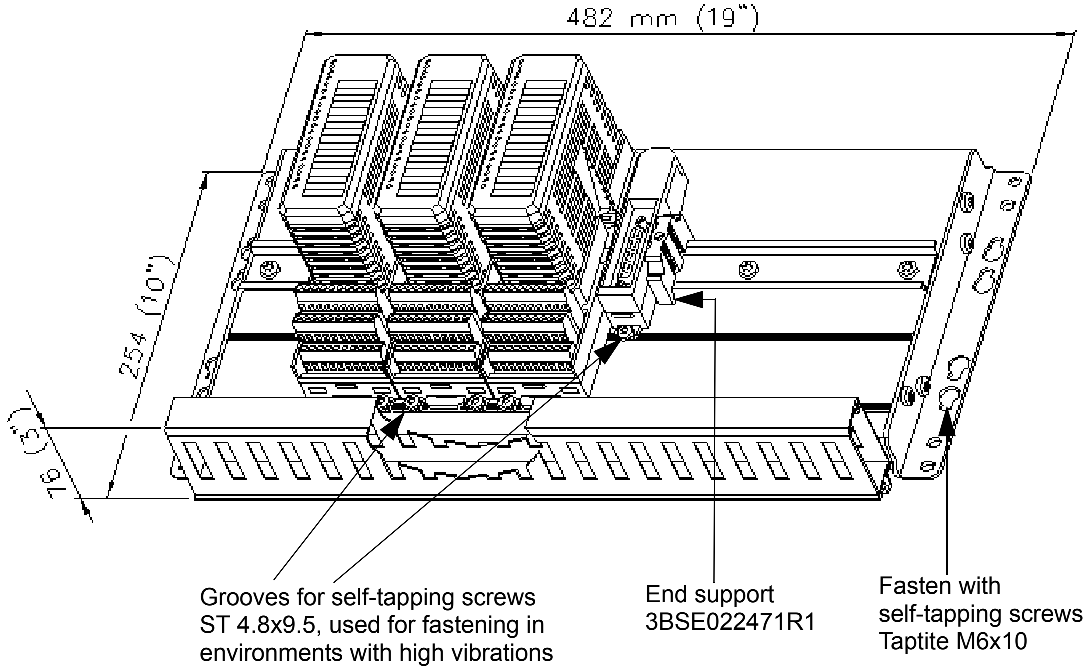


Figure 48. MTU mounted on aluminium profile

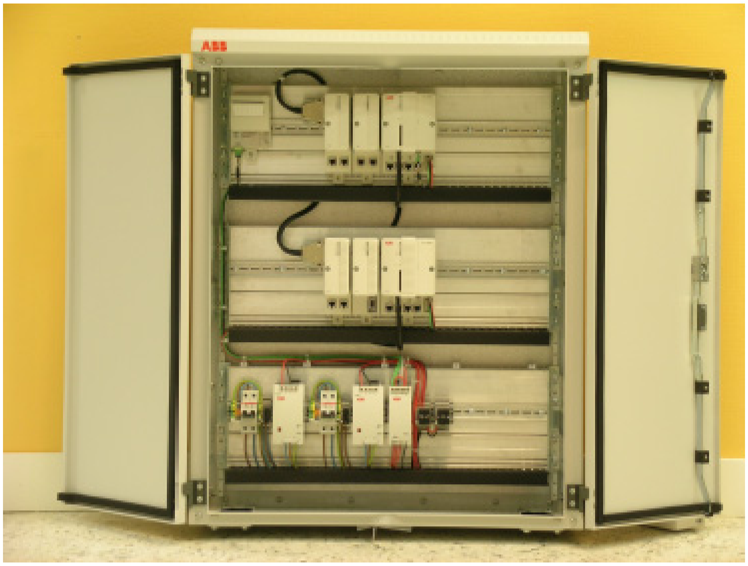


Figure 49. Cabinet with Controller on prefabricated aluminium profiles

Mounting on Metal Sheet

The DIN-rail shall be 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 50.

The metal sheet shall at least be 2.5 mm thick and at least 178 mm (4U) high, preferably with at least one long edge bent 90 degrees to increase the stability. The metal sheet shall be mechanically fastened at least every 500 mm to the cabinet or rack, nevertheless with a minimum of four screws. The fastening to the cabinet frame shall be performed with fastening 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.

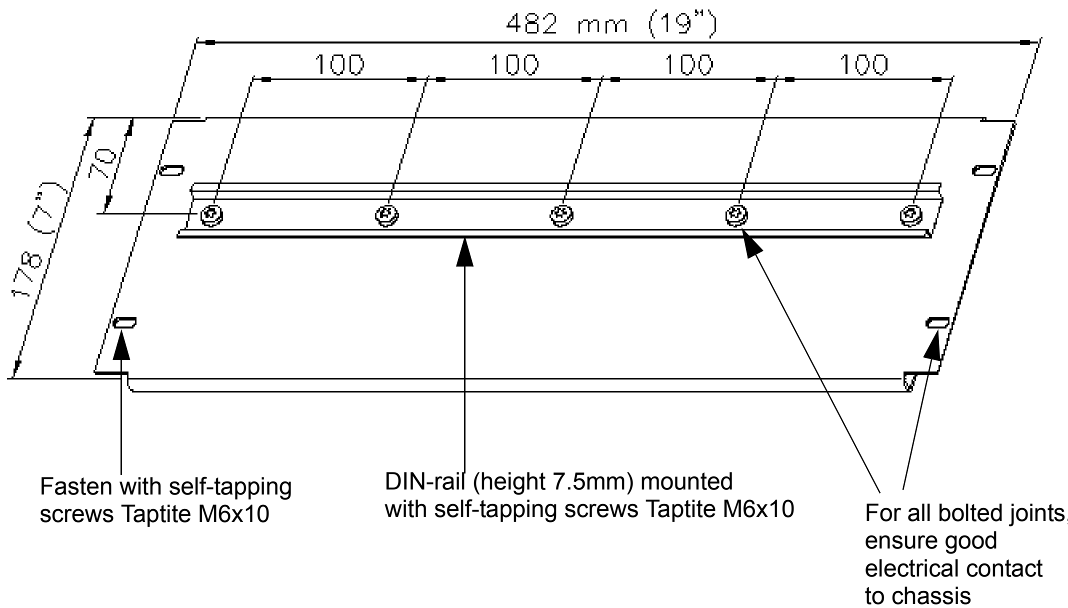


Figure 50. Mounting on unpainted metal sheet

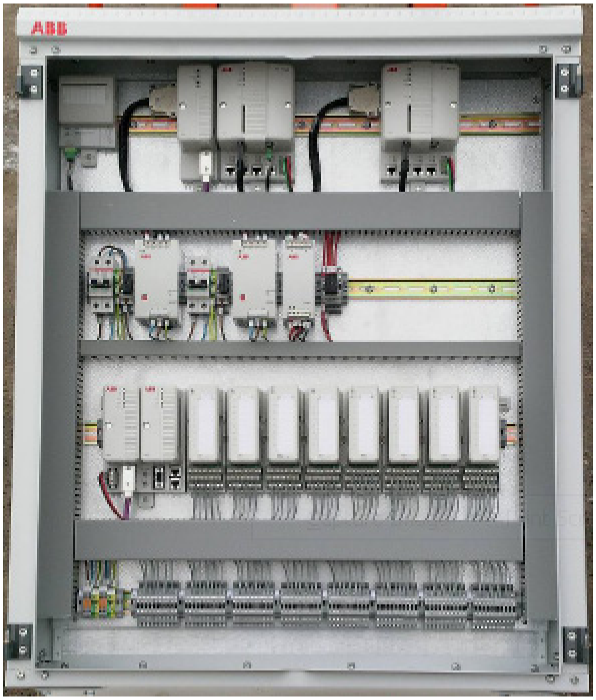


Figure 51. Cabinet with Controller and I/O on metal sheet

Grounding

General

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

For interference free operation, the S800 I/O system need to be connected properly to plant ground.

Each S800 I/O module's grounding spring connects to the metallic DIN-rail which serves as the module electronics ground conductor between the inter-connected devices. This is to ensure a good ground connection both for the internal logic and for the EMI immunity and RF emission of the modules.

The DIN mounting rail must therefore have a good bond to the cabinet structure which shall be connected to plant ground. How to get a good bond from DIN-rail to cabinet structure is described in the mechanical installation section.

The ground wire which joins the grounding systems and connects to the cabinet to plant ground should be ≥35 mm^2 (2 AWG) copper (Cu), see Figure 52. The ground wire should be fastened firmly to a unpainted surface of the cabinet structure.

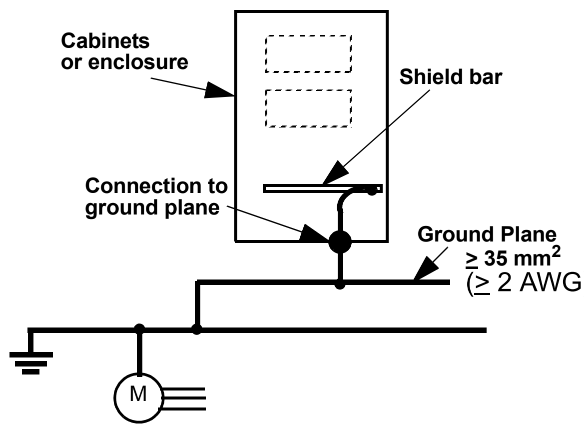


Figure 52. Grounding of Electronic Equipment

Protective Earth (PE)

Cabinets supplied with 120/230 V a.c. always must be connected to protective earth (PE) grounding.

Grounding of Signals and Voltage Supply

For minimum interference and maximum accuracy, it is normally most effective to ground supply voltages for transducers, sensing voltage for contacts, load supply voltage and so on at the same location. Since all I/O modules have galvanic isolation from ground, different groups of channels can be grounded in different locations.

All channels within a group shall have a common ground reference.

In the event that the above recommendations (because of measurement techniques or safety regulations) cannot be complied with, be sure to use these methods:

- Signal isolation for analog input signals.
- Digital inputs and outputs are divided into groups at the MTUs and I/O modules, with supply voltage distribution and grounding common for each single groups.

Local grounding of a signal at the transducer location may be a requirement in some cases. This normally hinders the use of MTUs for voltage distribution. A distribution bar with the terminal block and fuse equipment required by the application can be used in such cases.

If the transmitter/transducer has galvanic isolation of the supply, its signal zero can be grounded where most suitable for measurement accuracy.

Signal Cable Considerations

When planning for the cable routing in the plant and when selecting suitable cables to be used, the following should be considered:

- Routing of communication cables with regard to a.c. power wiring.
- Mixing of signals and signal types within cables.
- Need of shielded or un-shielded cables.

Recommendations for Signal and Process Cable

For use in a typical industrial environment according to the basic protection:

1. Unshielded lines are adequate for binary signals and high level (0...20 mA, ±10 V...) analog signals.

2. Shielded cables should be used for low level (RTDs, TC...) analog signals, HART[1] signals, pulse transducer signals and High Integrity I/O modules.
3. Minimize the loop area formed between the cable and earth (environment ground), for example by laying the cable on metallic trays that are earthed at several points. Closed cable conduits provide an additional attenuation of up to 30 dB.
4. Usage of binary and analog signals in a multi-core cable works fine, if the following conditions are fulfilled:
   - All binary signals are 24 V d.c. or slow varying analog signals.
   - Field power supply is earthed to S800 earth.
   - All multi-core cable signals are earthed to S800 earth (same earth as the field power supply).
   - Binary signals are suppressed. (S800 semiconductor binary outputs have built-in free-wheel diodes for smooth inductive load switching.)
   - If cable shield, it should be connected to S800 earth.
   - Three wire analog transducers with voltage outputs should have individual power return wires to avoid voltage drop caused by binary loads' return current.

   In other cases use separate cables for analog, binary and heavy current lines. Lay the cables separately sorted according to type.

   The signal cables and heavy current cables (power supply cables > 600V) should be in separate conduits or at least 30 cm apart from each other.
5. The return-conductor should be in the same cable as the signal.
6. The field cables must be wired according to the recommendations of Table 5.
7. Advant Fieldbus cable installed per S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*).
8. PROFIBUS-DP cable installed. Refer to *PROFIBUS DP Wiring and Installation* manual *(3BDS009029*)*.

1. Shielded twisted pair cables should be used for HART signals.

Power Requirements

General

Power supplied to ABB system's power supply units and for external supply to I/O can normally be obtained from the plant a.c. or d.c. supply sources.

A.C. Supply

A power source can be rated as Installation Category II or III with respect to level of disturbances, voltage variations and so on, according to IEC standards. Standard voltage range is 100 - 240 V a.c. Installation Category II denotes a higher quality than III mains. The S800 I/O power supplies SD82x and SD83x are rated for Overvoltage Category II on the secondary side and Overvoltage Category III on primary side.

D.C. Supply

Table 4. Requirements for d.c. Supply Sources

Device	Voltage Range
FCI/ModuleBus Modem	19.2 - 30
SD821/SD822	225-250
SD823	250
SD831/SD834	110-300

Hazardous Location – North American Approval (cULus)

If indicated on the label the unit is suitable for use in Class 1 Zone 2 and in Class 1 Division 2 Groups A, B, C or D hazardous locations (or in nonhazardous locations).

Units must be installed in an enclosure providing at least IP54, according to IEC 60529.

Provision shall be made to prevent transient disturbances of more than 40% of rated voltage at the power supply terminals.

Please notice that the following restrictions must be followed when equipment are installed in hazardous locations:

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

Explosion hazard!
Substitution of components may impair suitability for Class 1 Zone 2 and Class 1 Division 2.

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

Explosion hazard!
Do not remove fuses unless the area is known to be non-hazardous.

Marking: Class 1 Zone 2 AEx nC (or nA) IIC T4 and CL 1 DIV 2 GP A B C D T4

Hazardous Location – European Approval (ATEX)

If indicated on the label or by documentation the unit is suitable for use in potentially explosive atmospheres according to the EU directive 94/9/EC, the installation is allowed in Zone 2 or in safe area.

Marking: ATEX (Ex / EEx)

For S890-series, special conditions for safe use is found in User's Guide 3BSE020927-600.

For other S800 modules that are suitable for use in ATEX hazardous locations the following special conditions for safe use must be fulfilled:

- The modules must be mounted in an enclosure that fulfills minimum IP54.
- The modules must be used in an area of not more than pollution degree 2.
- It is not allowed to disconnect or operate any switch while circuit is alive unless area is known to be non hazardous.
- The input voltage from power supplies must not exceed 28.4V.

High Voltage Switch-gear Applications

The I/O modules are not designed for direct connection to high voltage switch-gear. Interposing relays are used for digital input and output signals as a connecting link. For analog signals, special transmitters/converters are used.

Lightning Strike Protection

Industrial installations and power plants are normally provided with well-integrated grounding networks installed together with the power distribution system.
In installations with such grounding systems, it is not necessary to install lightning strike protection unless overhead wiring or suspended cables are used outdoors.

Large plants (water supply installations, refineries and so on) can however have an inadequate grounding system and signal cables can be routed above ground. In such cases lightning strike protection must be used.

Cables outside the grounding system (even for short distances such as 10 m) always require lightning strike protection.

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.

Mounting Dimensions

When placing a control cabinet, specified minimum distances to walls and ceiling must be kept to ensure satisfactory performance.

Overhead Clearances

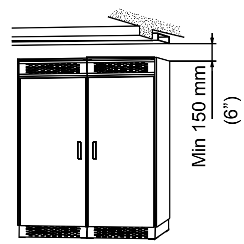


Figure 53. Minimum Distance to Cabinets

To ensure adequate ventilation, there should be a free space, 150 mm (6") high, between the top of the cabinet and the ceiling, the underside of any beam, duct or similar object over the cabinet. When cables enter the cabinet from above, the space available should be at least 1000 mm (40") high to provide working space, see Figure 53.

Rear and Side Clearance

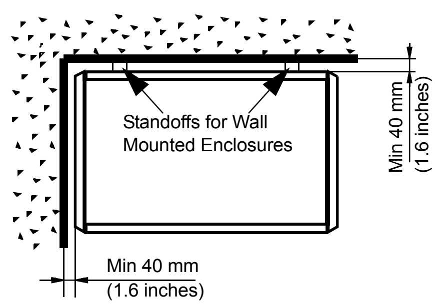


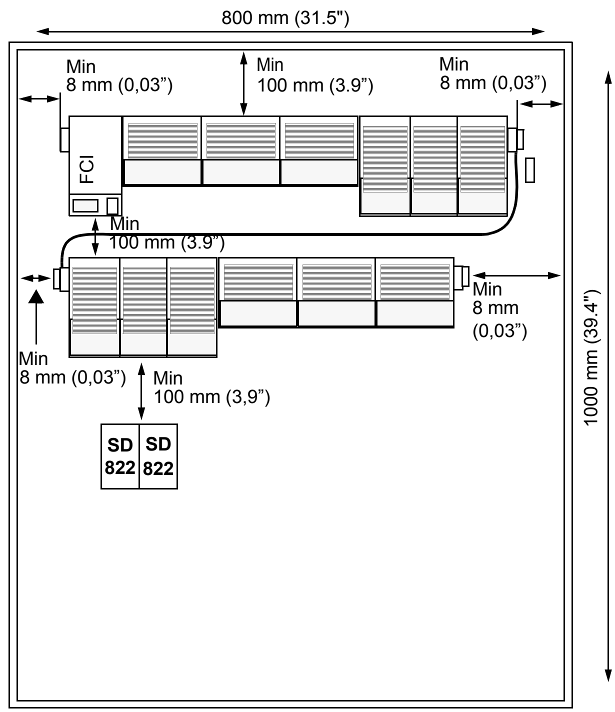
Figure 54. Minimum Distance from Rear and Side of Cabinet to a Wall

The distance between the rear and the sides of the cabinet and an adjacent wall should be no less than 40 mm (1.6 inches), see Figure 54. This will ensure good ventilation. The free space in front of the cabinet should be the width of the door plus aisle width.

Wall mounted enclosures should use standoffs equal to the clearance requirements.

Clearances within an Enclosure

Clearances within an enclosure with horizontally mounted I/O modules are described in Figure 55.



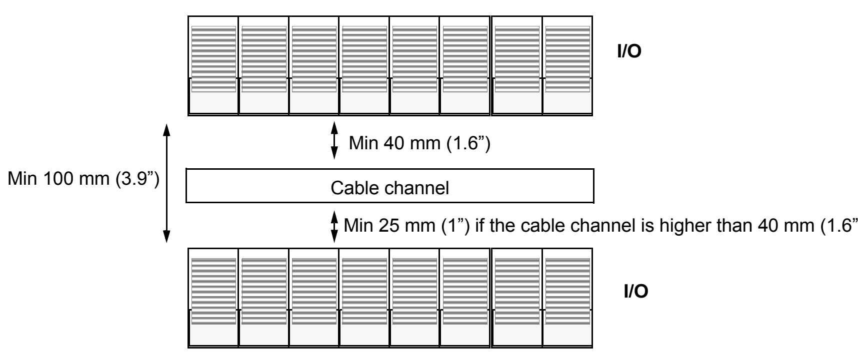


Figure 55. Enclosure with 12 Modules mounted horizontally and Redundant Station Power Supplies

Clearances within an enclosure with vertically mounted I/O modules are described in Figure 56.

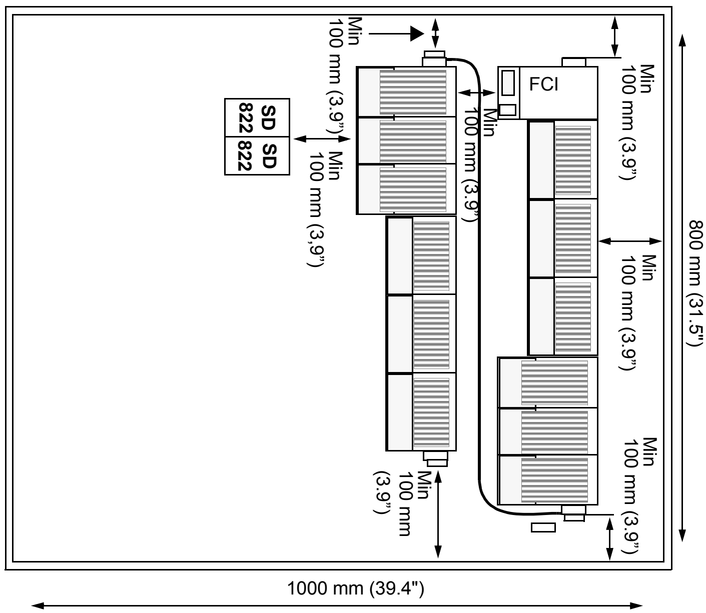


Figure 56. Enclosure with 12 I/O modules mounted vertically

Electrical Installation Overview

The electrical environment on a site is shown in Figure 57. In the figure, different Overvoltage categories are shown.

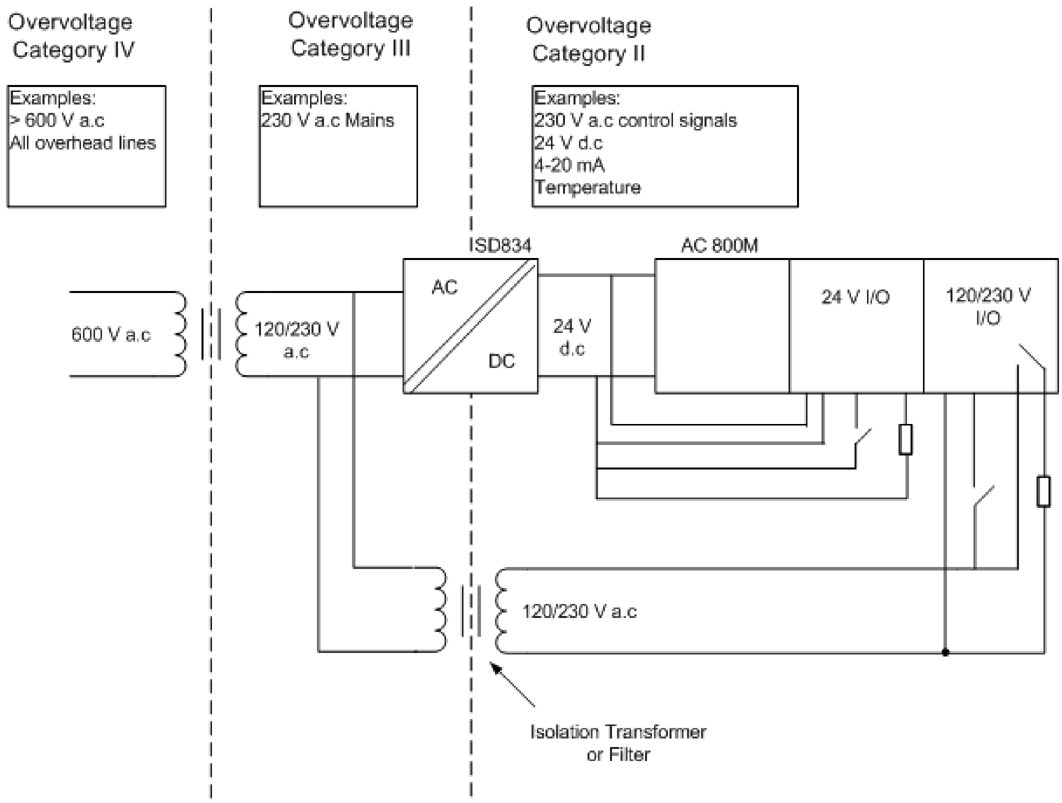


Figure 57. Electrical installation showing Overvoltage categories

Overvoltage Categories

Overvoltage categories are based on magnitude of surges caused by lightning strikes and overvoltage generated by circuit components, primary hard contacts breaking inductive load circuits. Spacings, creepage distances and clearances given by product standards are based on Overvoltage categories.

Overvoltage Category IV

Public mains, voltage >600 V a.c, and all over head lines.

Overvoltage Category III

Factory mains, isolated by transformer from the Public mains normal, 120/480 V a.c.

Overvoltage Category II

Local power distribution, I/O signals, no un-suppressed inductive loads are allowed. For example 120/230 V a.c., 24/48/110/220 V d.c., 4 to 20 mA, 0 to 10 V signals, and temperature signals.

All digital output modules in the S800 I/O family have integrated components to suppress inductive loads.

External components can be used to suppress inductive loads, if:

- S800 output circuit can be disconnected from the inductive load by other contacts.
- The inductive loads are not directly driven by a S800 I/O module (relay between load and S800 I/O output).
- The inductive loads are driven by other type of equipment without components to suppress inductive loads.

Installation Procedures

After some general information in the following section, you will find individual setup descriptions for different parts of the system.

Safety Regulations

The following instructions are to be followed when installing and operating an S800 I/O system to minimize the risks of injury to personnel and damage to the equipment. Local statutory regulations, to the degree that they are more strict than the following are to take precedence.

Personnel Safety

The following are to be observed:

- Voltage supply of a cabinet shall never be switched on during installation work.

Work with care when supply voltage is applied to the system. Voltages within the cabinet can cause serious injury or death.

- All who work on the installation must know the location of the main power supply switch to the equipment and how it is operated.
- When the subsections of the process are checked and a test run has been performed, interlocking links are to be checked by a responsible engineer. All assembly personnel must be informed about test runs to be performed.
- Process technicians are to be present when testing and operating the process device.

Equipment Safety

Observe the following safety rules:

- Avoid direct contact with the bus connector of the I/O modules.
- Always switch off the voltage before extracting a module which cannot to be exchanged with power applied, for example, processor units, extension cable adaptors and extension cables, see Section 5, Maintenance. Wait for a sufficient time for the capacitors to discharge before removing a power sensitive module.

Grounding in Enclosures

This section describes where and how grounding is to be done in a cabinet or small enclosures.

General

The plant ground potential must be stable and well defined, even in the event of a low ground fault caused by high voltage equipment or a lightning strike.

The interference suppression for external signals, are normally directly grounded to plant ground. For interference-free operation, the S800 I/O system need to be connected properly to plant ground.

Each S800 I/O module's grounding spring connects to the metallic DIN-rail, which serves as the module electronics ground conductor between the inter-connected devices.

This ensures a good ground connection both for the internal logic and for the EMI immunity and RF emission of the modules. The DIN mounting rail must therefore have a good bond to the cabinet structure which shall be connected to plant ground. For details on how to obtain a good bond from DIN-rail to cabinet structure, see Mechanical Installation on page 89.

Protective Earth

Cabinets supplied with 120/230 V a.c. always must be connected to protective earth (PE) grounding. The main power source distribution normally includes a protective ground wire. This shall be connected to the protected earth (PE) terminal block on the power supply. Use cable lug connectors when connecting on the ground screw.

Ground Line

The cabinet is to be grounded with a copper lead (≥35 mm^2, 2 AWG) to the plant ground line. Cabinets in a row shall be individually connected to the plant ground plane. To form an even stronger ground plane, cabinets placed next to each other should be connected together.

Grounding of Process Cable Shields

Process cable shields are, as applicable, attached directly to the cabinet ground. It is recommended to use a shield bar (or similar grounding termination) that is connected to the cabinet structure. This gives a firm connection to plant ground.

Grounding of Communication Cable Shields

The shields of communication cables are to be connected directly to the modem or FCI module in an I/O station. Please refer to S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*) and PROFIBUS DP Wiring and Installation (3BDS009029*) manual for more information.

Grounding of Process Signals

There are three applications of signal grounding directly to chassis. (High frequency grounding by capacitors is always provided and not discussed in this context).

- Signals can be commonly grounded by connecting the reference 0 V of the power supply for loads and sensing to plant ground.
- Individual grounding of a signal in the I/O cabinet is possible (if applicable with respect to I/O module type). The requirement for such an application, is when the signal is not grounded elsewhere, for example, not locally grounded at load/sensor or not grounded via a power supply grounding.

Do not ground the same circuit at different points in the plant.

Grounding of Additional Equipment

Additional power supply units of different types used by loads or sensor, and modems and so on, and are located in the controller or I/O cabinet, shall be connected to the installation protective earth terminal or directly to cabinet ground:

Cable Routing

There are some restrictions in mixing cables within a cabinet due to the risk of interference.To describe the simple rules applicable at site installation, cables are divided in categories. See Table 5 and the following rules for custom cabinet installations:

- Within a category cables can be arbitrary mixed.
- The distance between cables belonging to different categories shall be as described in Table 5.

Table 5. Separation between cables of category X and category Y

Cable category X [OVC = Overvoltage category]	Cable category Y [OVC = Overvoltage category]	Separation for standard installation	Separation for installation with shielded cables	Separation for installation in cable duct with grounded conducting barrier
OVC IV	OVC III	300 mm	No separation required	No separation required
OVC IV	OVC II	350 mm	No separation required	No separation required
OVC IV	Modulebus extension	350 mm	No separation required	No separation required
OVC III	OVC II	50 mm	No separation required	No separation required
OVC III	Modulebus extension	50 mm	No separation required	No separation required
OVC II	Modulebus extension	No separation required	No separation required	No separation required

I/O Station with S800 I/O

Assembly

Information regarding location of equipment may be found in the documentation delivered with the equipment. Some general I/O Station information is presented below.

- Install a DIN-rail sized to allow installation of the FCI, ModuleBus Modem, MTUs, and S800L modules, terminator and power supplies. Some extra DIN-rail should be allowed for expansion or the moving of the FCI, ModuleBus Modem, MTUs or S800L modules during maintenance.

- Install the FCI, ModuleBus Modem on the left end of the DIN-rail leaving some room to the left to allow removable from the first MTU or S800L modules. If vertical mounting is used, leave room to the top of the FCI for removal.
- Install the first MTU or S800L modules to the right (below) of the FCI or ModuleBus Modem and all other MTUs or S800L modules to the right (below) of the preceding MTU or S800L module.
- The last MTU or S800L module (12 max.) connected to the FCI or ModuleBus Modem will have the TB807 Terminator installed in the ModuleBus connector.
- Set each MTU mechanical keys to the correct setting for the I/O module that will be located there.
- The power supply modules may be located on the same DIN-rail as the FCI or ModuleBus Modem and the I/O modules, but should be always located on a horizontal DIN-rail.
- Install an end stop before the first module and after the last one on the DIN-rail.
- Then proceed with the electrical connections as necessary.

Electric Installation

Advant Fieldbus 100 Fieldbus Connection

The AF100 Fieldbus is connected to the terminals of a CI810 or a CI820/CI820V1. The incoming fieldbus twisted pair cable is connected to a plug connector with four terminals, two for the signal wires and two for the shield. The incoming and out going fieldbus signal + conductors are terminated in the + terminal.
The - conductors are both terminated in the - terminal. The cable shield drain wires are terminated in the two SH terminals and they must be bridged to ensure a continuous shield connection in case the fieldbus plug is removed from the FCI. Keep the drain wires as short as possible (≤ 50mm). If the unit is at the end of the bus, a terminator (TK501Vxxx) must be connected. Please refer to the *Advant Fieldbus 100 User's Guide* for complete details.

PROFIBUS Fieldbus Connection

The PROFIBUS fieldbus is connected to the terminals of a CI830/CI840. The incoming fieldbus cable is connected to a 9 pin D-sub connector. If the unit is at the end of the bus, a connector with termination must be used. Please refer to relevant PROFIBUS documentation.

I/O Clusters (1-7)

The TB820/TB820V2/TB840/TB840A ModuleBus Modem of an I/O cluster is connected to the CI810/CI830/CI840/CI801 FCI or TB815 Interconnection Unit by Optical Expansion cables. The optical ModuleBus can be a simplex, duplex or mixed design, CI840 only duplex.

Optical cable length between each cluster must not exceed 15 meters with plastic fiber cable and 200 meters with HCS glass fiber cable.

Refer to TB820/TB820V2 and TB840/TB840A ModuleBus Modem on page 141 for optical ModuleBus configurations.

Distributed MTUs and S800L Modules

An MTU or a S800L module can be extended to another MTU or S800L module by using a ModuleBus extension cable. The following instructions apply:

Cable length and ModuleBus length must not exceed 2.5 meters.

Cable routing in cabinets, see Cable Routing on page 109.

Process Signals

Process signals are connected to the MTUs or S800L modules according to site installation drawings.

The following instructions also should apply:

- Cable routing in cabinets, see Cable Routing on page 109.
- Grounding of cable shields and Process signals, see Grounding in Enclosures on page 107.

A carefully done electrical installation is the basis for future interference-free operation.

Address Setting

All S800 I/O modules are automatically set to the correct addresses by the ModuleBus interconnection scheme.

The FCI module station address should be set to the assigned PROFIBUS address or Advant Fieldbus 100 station set by the station address switches. Refer to *S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1 (3BSE020926*)* or *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* as to location of address switches.

The ModuleBus Modem cluster address should be set to the assigned cluster number by the cluster address switch. Refer to TB820/TB820V2 ModuleBus Modem on page 44.

Check of the External Wiring

The level of workmanship must be judged case by case, and the results will determine the need for a check of all connections before the system is powered up. It is possible to check, with a buzzer, that the external wiring to the process equipment is correct and that all conductors are intact. The check of the field wiring should be done before the I/O modules are installed. It is also possible, without activating the control equipment, to check that transmitters, transducers and actuators (including all process wiring) to see if they function correctly. This makes it necessary to connect voltage to these units and develop suitable checking methods.

An alternative method, is to make an integrated check of the process equipment, wiring and the corresponding controller functions. This should be done on a point by point basis. Preferably the controller should be loaded with the application data base. The data base is then used as one check-point. Status / values can be read and control signals to process devices can be simulated.

Be aware of the risk of “accidents”. Short-circuit and over-voltage can damage the equipment, for example, a process I/O board or field element.

Checklists

The following checklists, Table 6 to Table 12, are a summary of important information that should be checked for the installation.

Grounding Philosophy, Ground Plane System

Table 6. Grounding Philosophy, Grounding System

Item	Concerning	Check
Grounding philosophy	Ground system	Grounding to PE network only. Only one ground system. No exceptions.

Process Cabling, Shielding, Grounding, Max. Length

Table 7. Process Cabling, Shielding, Grounding, Max. Length

Item	Concerning	Check
Cables	Prescribed type	Communication cables Pulse transducer cables Shielded for low level AI (RTD, thermocouple, and so on). Signal wire and return wire in same cable
Shielding: Single shield	Grounding	Should be grounded directly as it comes into the cabinet
	Grounding: Communications	For AF 100, see *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* manual. For PROFIBUS, see *PROFIBUS DP Wiring and Installation (3BDS009029*)* manual.
Multi-core signal cable	Grounding	All signals in a multi-core cable shall refer to a common ground
A.C. digital inputs 120 V and 230 V	Max. cable length	Approximately 200 m (656 ft.)

Power Supply

Table 8. Power Supply

Item	Concerning	Check
A.C. Power Mains	Connection in cabinet	Protective ground is connected. **Note:** There must be no breaks in the protective ground conductor to the PE terminal.
	No unsuppressed load	No unsuppressed load on same finale circuit from distribution box
	Internal distribution	Incoming power supply (120, 230 V) must be separated from other cables. See Table 5.
D.C. (floating supply)	Grounding, supply	Floating supply is permitted if supply voltage to S800 ground is not >50 V (Voltage between 24V minus and DIN rail must be < 50V). If >50V, use an isolating d.c./d.c. converter.
D.C. (grounded supply)	Connection	The D.C. supply shall be grounded to the same ground plane as S800.

Lightning Protection

Table 9. Lightning Protection

Item	Concerning	Check
Lightning protection		Protections are compulsory for all circuits in: Overhead lines Cables that leave the general ground line network

MTU, I/O Module

Table 10. MTU, I/O Module

Item	Concerning	Check
Mounting rail (for MTUs)	Ground connection to cabinet via DIN rail mounting screws	See Mechanical Installation on page 89.
MTU	Ground connection	DIN rail type with height 7.5 mm shall be used. See Mechanical Installation on page 89.

Cabinet, Internal Cables

Table 11. Cabinets, Internal Cables

Item	Concerning	Check
Row of cabinets	Electrical connection (grounding)	Through 35 mm^2 (2 AWG) copper conductors in each cabinet.
Cabinet parts (plates)	All parts electrically connected to each other and to the PE bar	Bonded together.
Grounding in cabinet	Design	Only one grounding system. The only exception is if non-isolated IS barriers are used in the same cabinet.
Temperature in cabinet	Max. permitted temperature for continued operation	Max. permitted temperature for continued operation in cabinet is 0 to +55°C (32 to 131°F)(1). Measured just below the I/O module. Modules on compact MTUs or S800L modules on a vertical DIN rail allow 0 to +40°C (32 to 104°F)(1) ambient temperature. See Table 24.

Table 11. Cabinets, Internal Cables (Continued)

Item	Concerning	Check
Radio emission	Emission	S800 equipment does not require radio proof enclosures.
Shielded cable	Design	Communication, pulse transducers, S800 I/O High Integrity and analog circuits for Low Level (RTD, thermocouples) must be shielded. Please refer to module documentation for details.
Internal cables	Routing	See Cable Routing on page 109. Check that there is no tension in the wiring.

(1) Non-condensing

Environmental Data

See Appendix A, General Specifications.

Airborne Contaminants

See Appendix A, General Specifications.

Miscellaneous

Table 12. Miscellaneous

Item	Concerning	Action
Non suppressed inductive loads	Cable routing	Cabling to non-suppressed inductive loads in cabinets must be kept more than 100 mm (4") away from internal cables
Non suppressed inductive loads	Power supply	Use separate power supply
Thermocouples	Position of AI835 “CJC” RTD Cold Junction Compensation)	CJC RTD should be placed where the TC’s compensation cable is terminated
Analog inputs	External grounded transmitters	Use analog input modules with differential or isolated channels.
Analog outputs	External grounded receivers	Use analog output modules with isolated channels.

External Cables

When selecting cables that are to be used in the plant environment, you should know that there are some restrictions and rules to follow:

- Routing of communication cables.
- Mixing of signals and signal types within cables.
- Need of shielded cables.

Final Procedure Before Start-up

Remove all debris from the work performed and clean off all grease and dirt. Check that no tools or assembly material are left in the cabinets. Vacuum clean the cabinets.

Start-up and Shut-down Procedures

Start-up Procedures

This section includes power up for the very first definition/configuration of the system resources. A visible result of the start-up procedures, are that all red LED on module fronts are turned off and all green LED are turned on.

Safety Regulations

The instructions given in Safety Regulations on page 106 are applicable in all situations when working with S800 I/O and associated equipment. Please read the instructions carefully.

Work with care when supply voltage is applied in the system. The voltage in the cabinet can cause serious injury or death.

Controller and I/O

When the set-up activities are finished and after using Checklists on page 114, the equipment will be ready for start-up, but first read the following security guidelines before proceeding.

Security Guidelines

During the power up of S800 I/O there is always a risk of spurious output signals to the process due to a faulty hardware module.

Critical process devices should always be identified and isolated in some way if the process is energized. Examples of different methods are:

- Disconnected output power supply.
- Disconnect the process cables from outputs.
- Remove output S800 I/O modules.

Succeeding operations after power up, including necessary tests, must be performed carefully.

Shut-down Procedures

Before power is switched on, and start-up of the equipment, it is important to know how to shut-down in different situations. This is described below.

Safety Regulations

The instructions given in Safety Regulations on page 106 are applicable in all situations when working with a Controller and associated equipment. Please read the instructions carefully.

Work with care when supply voltage is applied in the system. The voltage in the cabinet can cause serious injury or death.

Emergency Shut Down

An emergency stop should always be available. It shall be controlled by local regulations. This is a responsibility of the plant design and construction. The controller system does not supply this special function.

Check the Location of the Emergency Stop and use it in an Emergency Situation

From the electrical and functional point of view, an emergency stop will have the same consequences to the controller and associated equipment as a safety shut down.

Safety Shut Down

The controller and its S800 I/O may be mounted in a row of joined cabinets and are connected as a single unit to the mains power source. The I/O Station with S800 I/O may also be located remotely in the process area and have its own power source. Safety shut down, by disconnecting the controller or remote enclosure from the mains, can be carried out in two ways:

- As prescribed in the site planning Power Requirements on page 98, there should be a common safety switch installed within 3 m (10 feet) of the cabinets.
- Check the Location of the Safety Switch and use it when working with the equipment.

The safety switch should be arranged to shut down the power of not only the electronics system but also transmitters, transducers and other process devices. In other words, a total power shut down for the plant section controlled.

Since the safety switch is a plant component this document can not stipulate and describe the design exactly. Please check the plant documentation in this respect carefully. Instructions, as to the extent of the power shut down, should preferably be attached to the safety switch.

Regardless of the way, the results and consequences of a shut down will be:

- Zero output to the process devices (S800 I/O).
- De-energized output relays (S800 I/O). Not for normally closed contacts.
- The system is ready for a restart. Restart can be performed when the reason for the shut down is cleared away.

Manual Stop

Beyond the most drastic way of shut down, by disconnecting power, there is an other way to “stop” the S800 I/O:

- Stop program execution in the controller
- Disconnect the I/O station from the fieldbus.

The results of the manual stop method:

- Output modules goes to the OSP state.
- The system is ready for a restart. Restart can be performed by starting the execution in the controller or connecting the fieldbus.

After necessary measures, a restart can take place.

Product Verification

As the test requirements vary considerably between different installations, the system engineer is responsible for determining the functional requirements which apply.

Equipment Required

The following equipment is a minimum requirement:

- Necessary parts of the documentation listed in Related Documentation on page 21.
- Specific documentation enclosed with the equipment.

In more complex installations which include closed loop control some additional test equipment can be necessary/practical at tuning:

- Access to an operator station for loop tuning.

General

A general description of how to set the controller in operation and start the execution of application program is presented in the controller manuals. Once the system is started and ready for operation the I/O can be checked.

General information for some functional tests, which can be made to verify the S800 I/O are presented in the following sections.

Check of Process Input/Output Systems

With the application program running in the controller, the inputs and outputs can be checked. This should be done by using a signal by signal procedure.

It may be necessary to simulate digital and analog input signals which are normally generated by the process. Suitable methods are:

- Digital inputs: Activate the input by connecting a voltage which corresponds to the nominal value of the input. The “1” and “0” status is simulated by opening and closing the terminal connections. Activate the input as close to the process transducer as possible to test the process wiring as far as possible. Manual operation of transducers, for example, limit switches can also give the required change for the input signals.
- Analog input signals: Use a signal generator for analog signals. A simple test coupling can be used as a voltage source. This can consist of a potentiometer across a suitable voltage source which gives +/- voltage. A current source, which can give sufficient current, for example, 20 mA, is required for current

signals. Analog input test signals should be entered as close to the transmitter/transducer as possible to test the process wiring.

Digital and analog output signals are obtained by setting the required values from the overlaying controller.

Input Signals

Figure 58 shows where an input signal can be checked in an S800 I/O application.

DI modules provide a field input connector and DI channel LED's, and AI modules provide a field input connector.

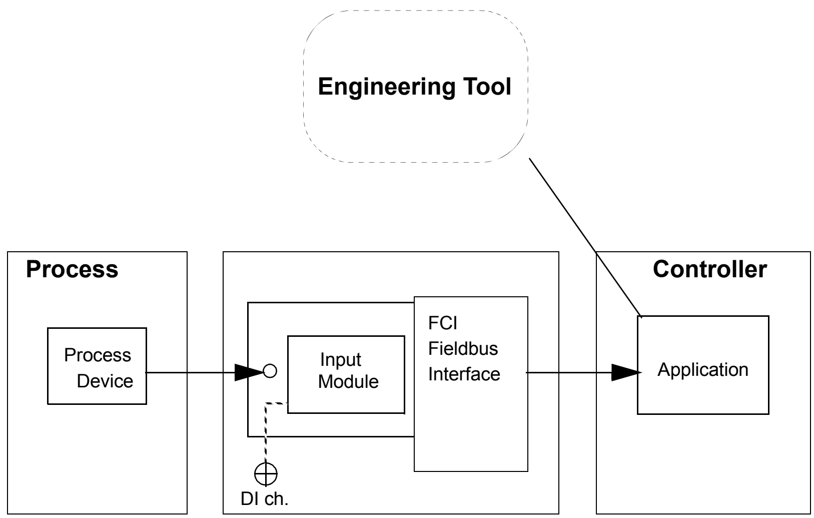


Figure 58. Block Diagram of S800 I/O Input Channel, Test Points

- Digital Input Signals

  A digital input signal can be checked as shown in Figure 58. Use the following procedure as a guide:

  – Simulate the digital input signal as close to the process transducer as possible or activate the transducer itself.

- Check that the corresponding yellow LED on the input module concerned illuminates and that the change is shown accordingly in the overlaying controller
- Change the input signal to a low level. Check that the yellow LED on the input board extinguishes and that the display value has changed.

- Analog Input Signals

  Figure 58 shows where an analog input signal of an input channel can be checked. Proceed as follows to check an analog input channel:

  - Simulate the analog input signal as close to the process transmitter/transducer as possible.
  - Check that the simulated signal is available at the screw terminal of the corresponding connection.
  - Check that the value shown on the display screen corresponds to the simulated value set in the field. Check the complete signal range.

Output Signals

Figure 59 shows where an output signal can be checked in an S800 I/O application.

DO Modules provide a field output connector and DO channel LED’s.

AO Modules provide a field output connector.

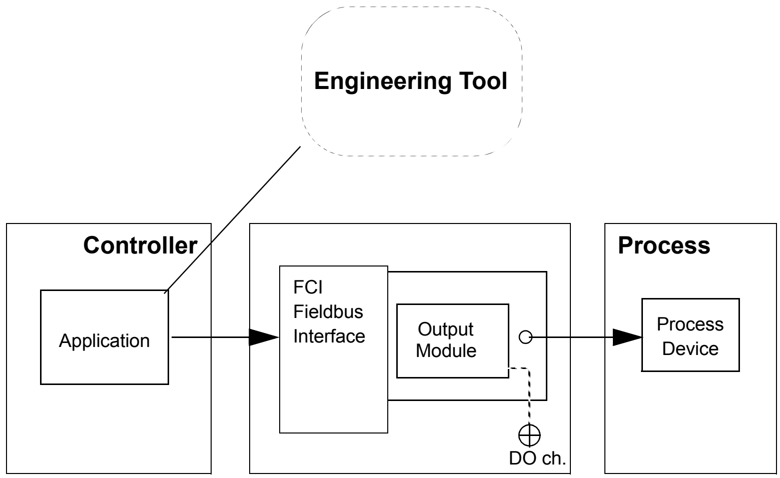


Figure 59. Block Diagram of S800 I/O Output Channel, Test Points

- Digital Output Signals

  Typical digital output channels and where the signals can be tested are shown in Figure 59. Digital output signals in a specific plant are shown in the terminal diagrams for the plant.

  Proceed as follows to check digital channels:

  - Check that the corresponding output shows that it is set to on.
  - Check that the corresponding yellow LED on the digital output module illuminates.
  - Check the value on the screw terminal block, and if practical also at the process device.

- Analog Output Signals

When checking analog output signals, use a multimeter to test for an output signal over the complete signal range.

Typical analog output channels and where the signals can be tested are shown in Figure 59. Analog output signals in a specific plant are shown in the connection diagrams for the plant.

Proceed as follows to check analog channels:

– Set the output value, and check that the corresponding output shows this value.

– Measure the value on the screw terminal block, and if practical also at the process.

– When checking analog output signals use a multimeter to test that an output signal is obtained over the complete signal range.

Final Check

When the test of the control system is complete, and the plant functions satisfactorily, the following actions should be taken:

- Check that all S800 I/O modules are properly inserted in the MTUs.
- Check that the I/O module lock/switch is in its locked position.
- Check that all terminal screws on MTUs and S800L modules are properly tightened and that all grounds are good.
- Check that all cable connectors are properly mated.
- Check that all cable coverings or tie wraps are installed properly to avoid cable wear.
- Check that no tools or debris from installation remain in the cubicle. Clean the cabinet.

Section 3 Configuration

Design Considerations

This section provides guidelines and other information that you need to know before designing and configuring the S800 I/O. This information includes an overview of the hardware and database configuration guidelines.

I/O Station Layout Hardware Configuration Guidelines

The S800 I/O is DIN rail mounted. The rail can be any practical length to fit the needs of that particular I/O Station. A S800 I/O cluster can have a maximum length of the ModuleBus from the ModuleBus master, TB815 Interconnection Unit, or ModuleBus Modem to the ModuleBus terminator of 2,5 meters (8.2 feet). See Figure 60 for maximum layout of station using Compact MTUs.

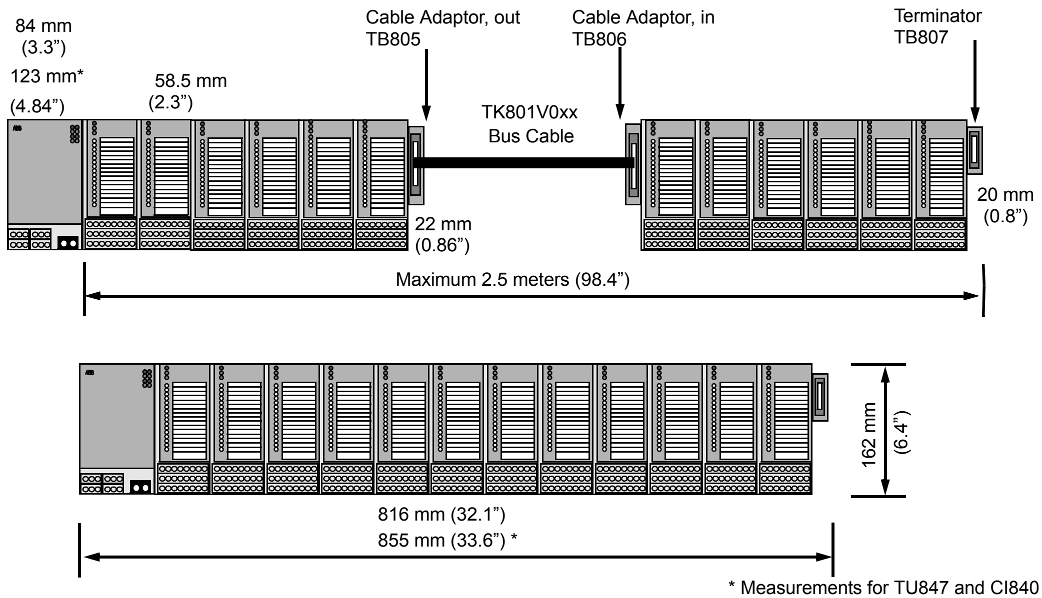


Figure 60. Maximum Layout of I/O Cluster with Compact MTUs

See Figure 61 for maximum layout of I/O cluster using Extended MTUs.

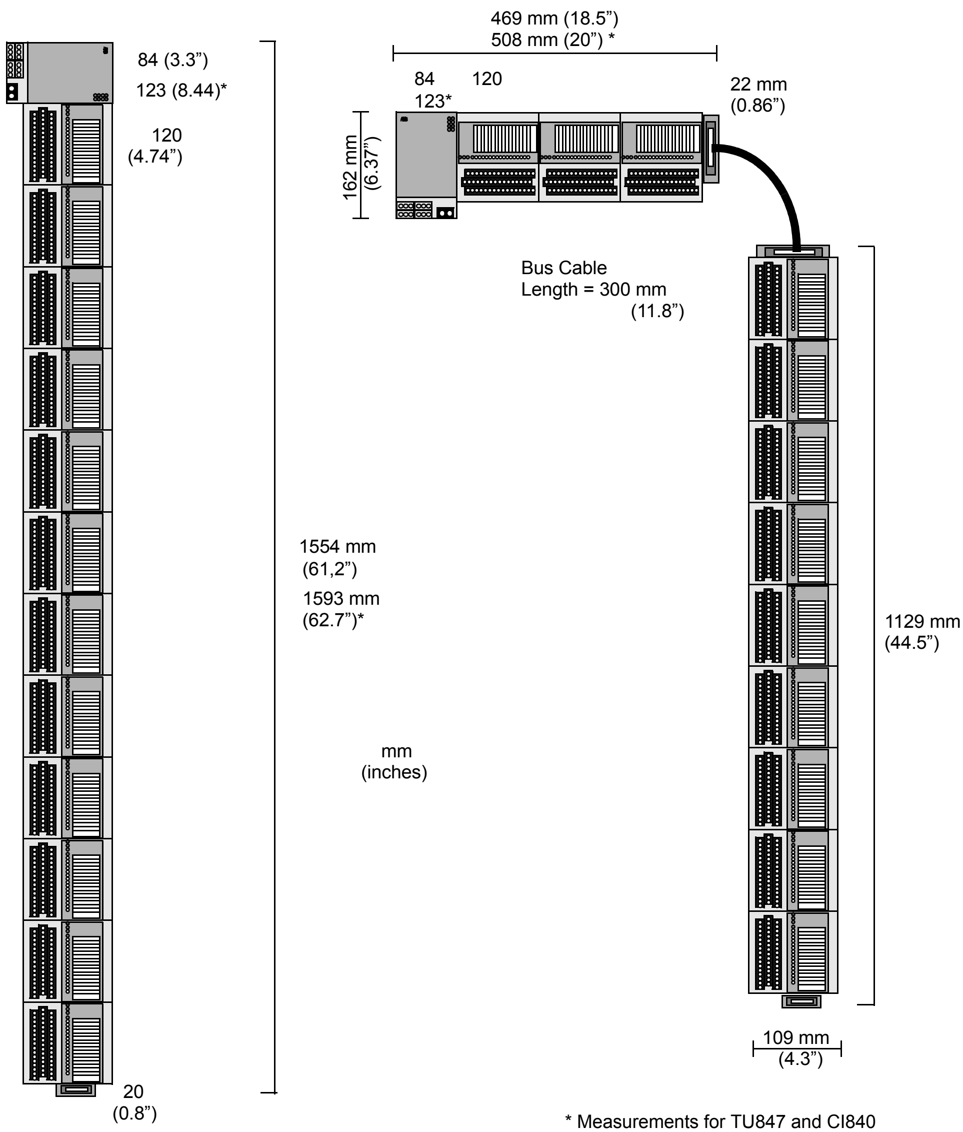


Figure 61. Maximum Layout of I/O Cluster with Extended MTUs

See Figure 62 for maximum layout of I/O cluster using S800L.

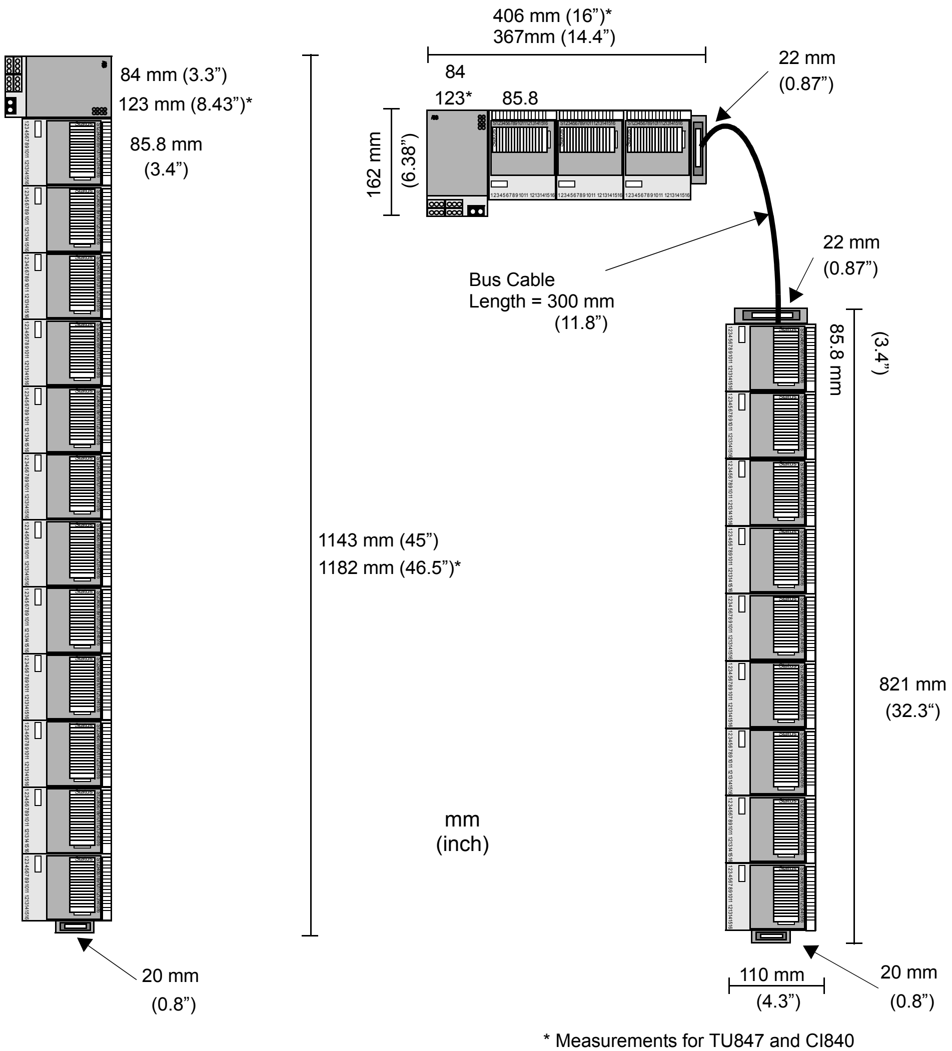


Figure 62. Maximum Layout of I/O Cluster with S800L

An I/O cluster may be divided into smaller parts to fit a particular requirement, but the 2.5 meter (8.2 feet) maximum must be observed at all times. The cluster may be distributed because of space limitations or to keep signal types together.
See Figure 63 for a example of an I/O cluster divided up into four groups.

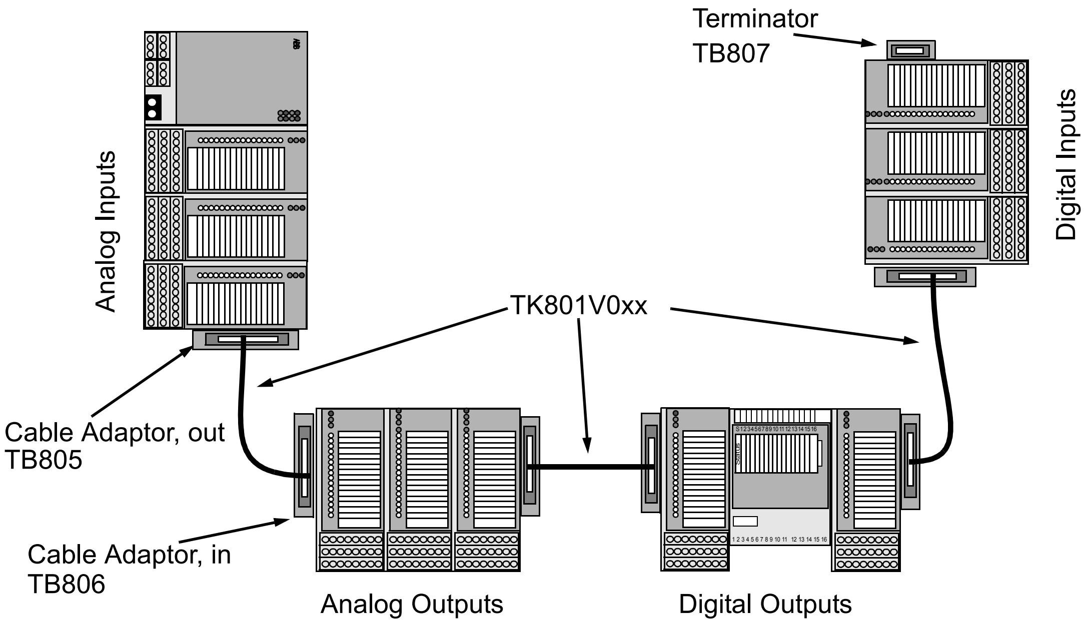


Figure 63. I/O Cluster in Small Groups

The first unit of the I/O Station is the Fieldbus Communications Interface (FCI). It connects to the fieldbus and is the communications interface to the I/O modules. The FCI controls the ModuleBus and provides power to the logic-side of the I/O modules. The FCI is a station on the fieldbus and must be set to the correct address. Refer to respective FCI manual for more information.

The FCI connects to the first MTU or S800L module. Additional MTUs or S800L modules connect to each other or through the ModuleBus Extension cable, up to a maximum of 12. The ModuleBus is terminated by the TB807 Bus Terminator module. The I/O Modules are installed onto the MTUs and connected to the process in the field.

Redundant FCIs for Advant Fieldbus 100

An I/O Station with redundant CI820/CI820V1 FCIs requires that the ModuleBus Extension cable be connected to the TB815 Interconnection Unit and then to the first I/O Module. The maximum ModuleBus length from the TB815 to the ModuleBus terminator is 2.5 meters. See Figure 64 for layout of a station.

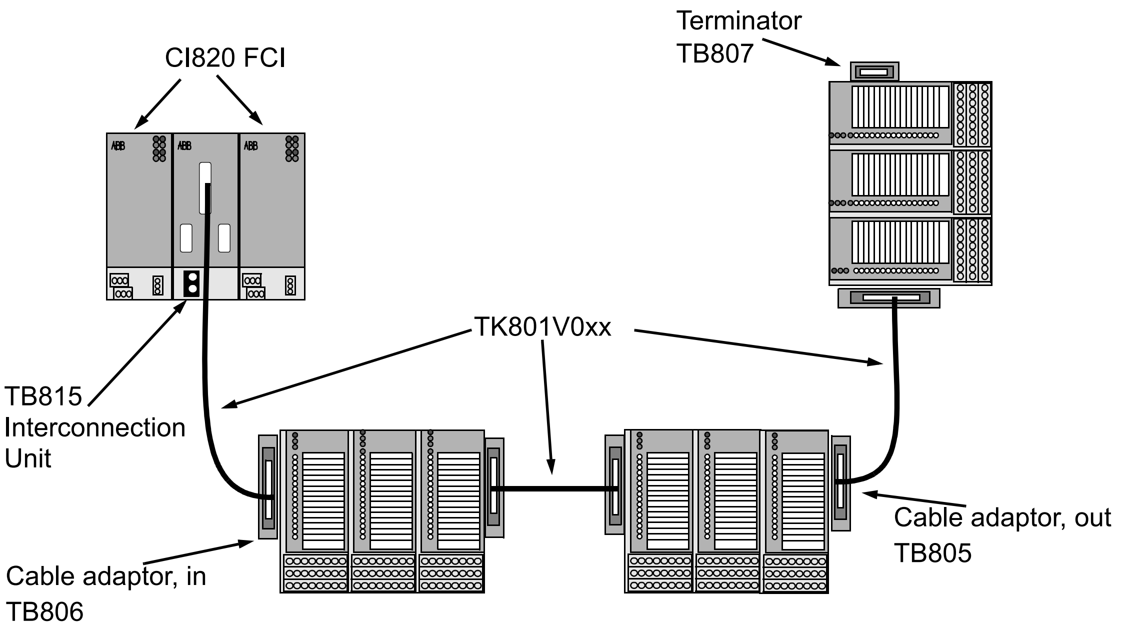


Figure 64. I/O Station with Redundant CI820 FCIs

Redundant FCIs and I/O Modules for PROFIBUS

An I/O Station with redundant CI840 FCIs can have the first I/O module connected direct to the MTU TU846. ModuleBus Extension cables can be connected via a ModuleBus Cable Adaptor-Out TB845 and a ModuleBus Cable Adaptor-In TB846.

The maximum ModuleBus length from the TU846 to the ModuleBus terminator is 2.5 meters. See Figure 65 for layout of a station.

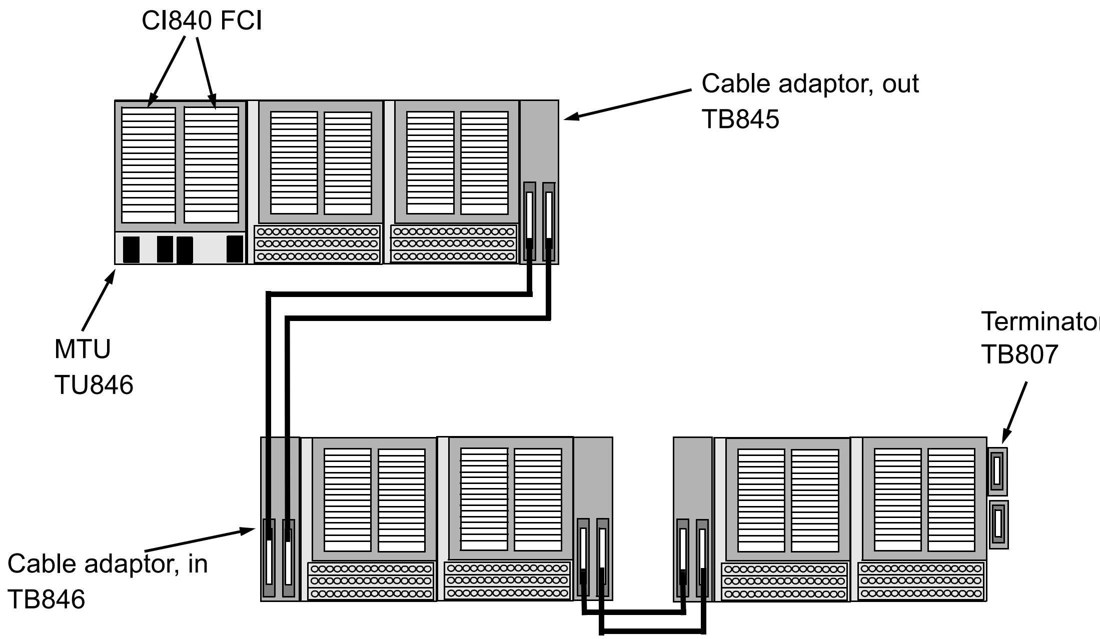


Figure 65. I/O Station with Redundant CI840 FCIs and Redundant I/O Modules

I/O Clusters

I/O clusters 1-7 connect to the Optical ModuleBus port on the FCI or TB815 Interconnection Unit by Optical Expansion cables. Each I/O station can have up to 24 I/O modules and each I/O cluster can have up to 12 I/O modules.

The 24 V power supply has to be connected to each cluster. See Figure 66 to Figure 70 for an example of optical ModuleBus Expansion cabling.

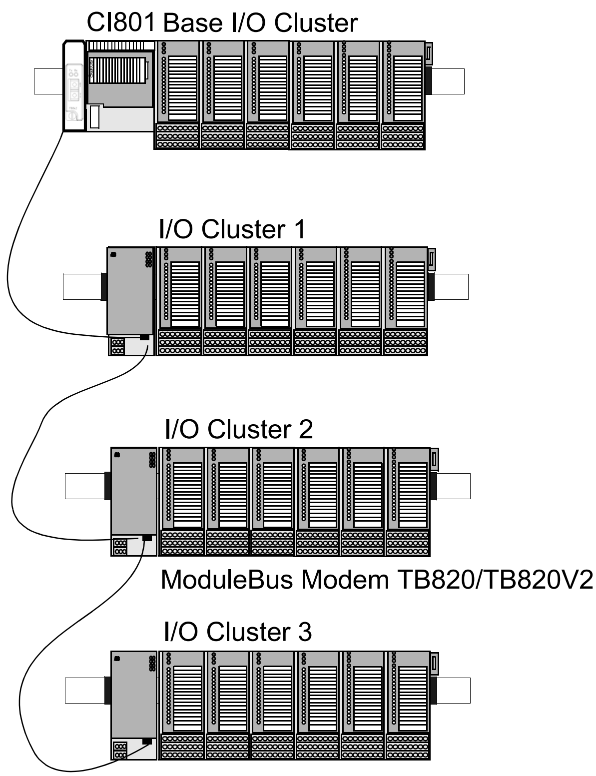


Figure 66. Optical ModuleBus Extension non-redundant, CI801

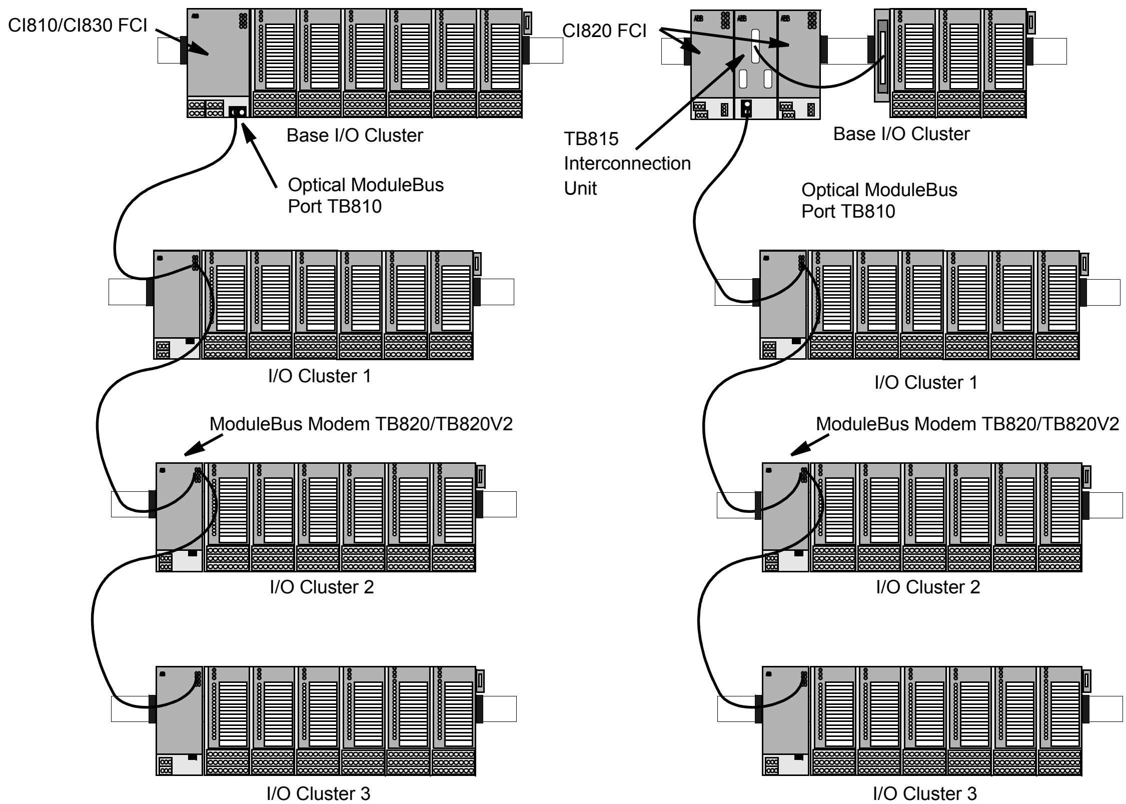


Figure 67. Optical ModuleBus Extension non-redundant, CI810, CI820, CI830

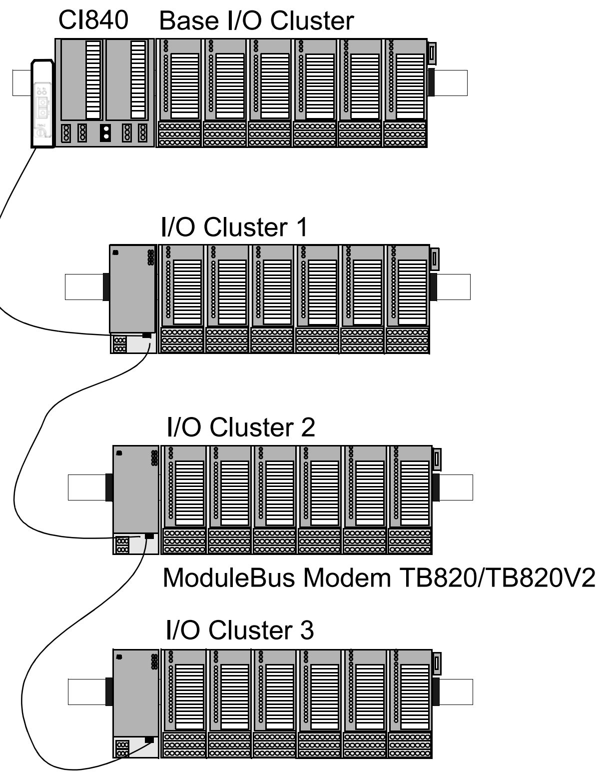


Figure 68. Optical ModuleBus Extension non-redundant, CI840 with single I/O

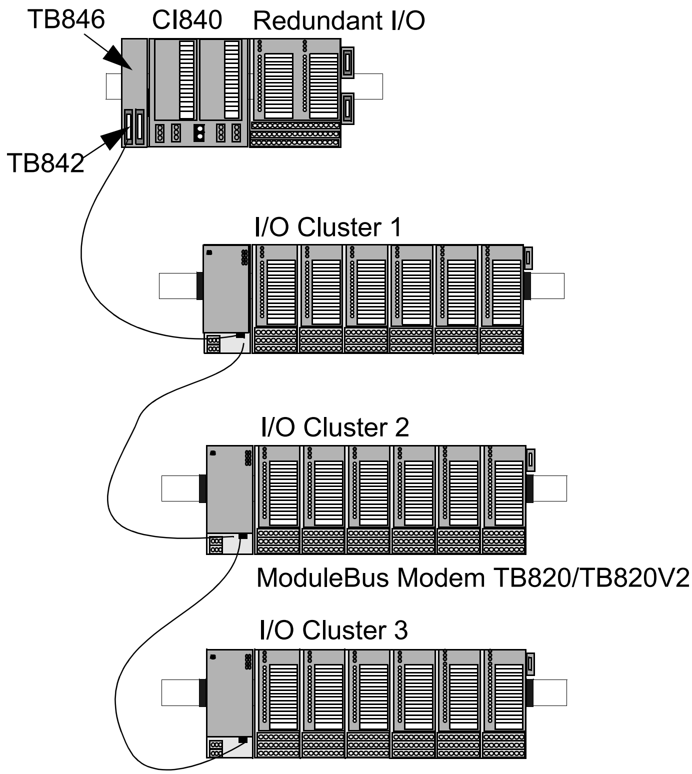


Figure 69. Optical ModuleBus Extension non-redundant, CI840 with redundant I/O

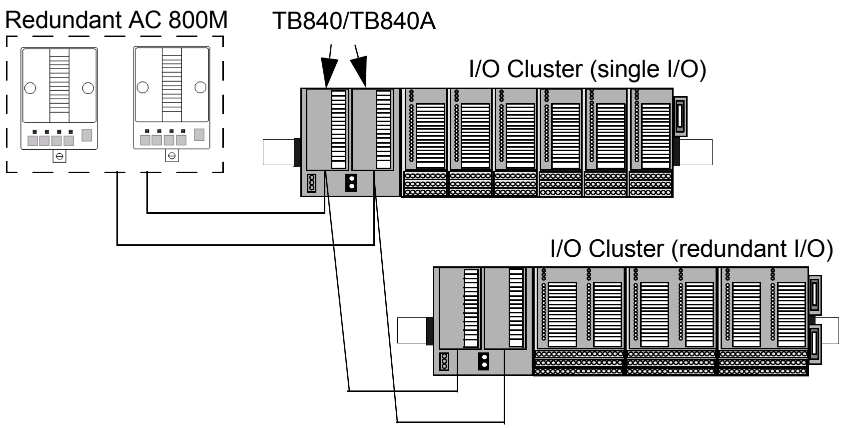


Figure 70. Redundant Optical ModuleBus Extension with Redundant TB840/TB840A

CI801/CI810/CI820/CI820V1/CI830/CI840 FCI

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

TB820/TB820V2 and TB840/TB840A ModuleBus Modem

The TB820/TB820V2 ModuleBus Modem needs to be connected to the Optical ModuleBus, and have an I/O cluster address selected. It is also connected to a 24 V d.c. power source to provide power to the I/O modules of the cluster.

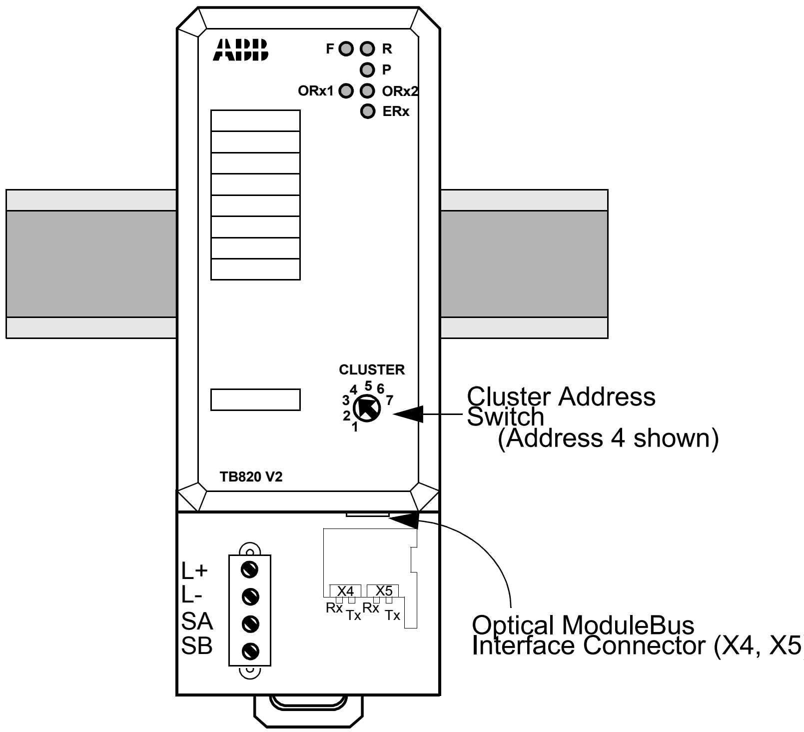


Figure 71. Front Panel of the TB820/TB820V2 ModuleBus Modem

The TB840/TB840A ModuleBus Modem must be mounted on a TU841 Module Termination Unit and needs to be connected to the Optical ModuleBus, and have an I/O cluster address selected. It is also connected to a 24 V d.c. power source to provide power to the I/O modules of the cluster.

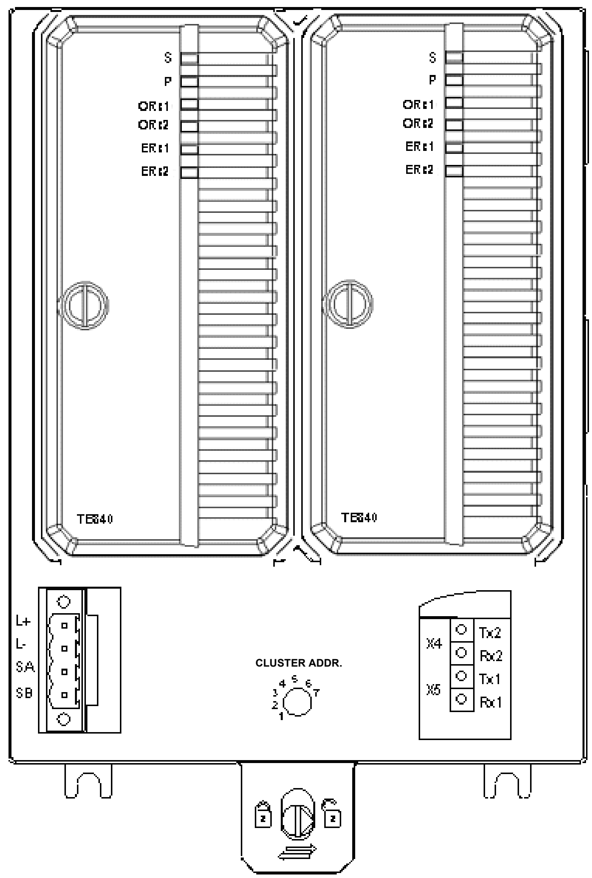


Figure 72. TB840/TB840A ModuleBus Modem mounted on TU841

Cluster Address Switch

The TB820/TB820V2 is equipped with a rotary switch used as the I/O cluster address selector for the I/O cluster. The address switch for TB840/TB840A is placed on TU841. The I/O cluster address is in the range of 1 to 7. The FCI is base cluster address 0 (zero). Figure 71 shows the front panel of the TB820/TB820V2 and Figure 72 the front panel of the TB840/TB840A.

Care must be taken that no I/O clusters have the same address setting. This could result in output modules in the same ModuleBus position but in different I/O clusters putting out the same value.

On TB820/TB820V2, a new cluster address should not be set during operation. If the address changes are done during operation, the cluster is disconnected from the ModuleBus, and no communications is possible with the I/O modules on that cluster address.

The new address is set at reset or power up. If the address changes are done on TB840 during operation, the cluster will get a warning signal and the new address will not be set until reset or power up.

TB820/TB820V2 can not handle High Integrity I/O modules (AI880/AI880A, DI880 and DO880).

Optical ModuleBus Connections

The TB820/TB820V2/TB840/TB840A has a connection to the optical ModuleBus by the optical ports on its side. The fiber optic cable(s) connect to the X4 (Tx and Rx ports) and X5 (Tx and Rx ports) connectors of the TB820/TB820V2/TB840/TB840A.

The optical ModuleBuses can be connected to duplex or simplex fiber optic cables. See Figure 73 for connection details.

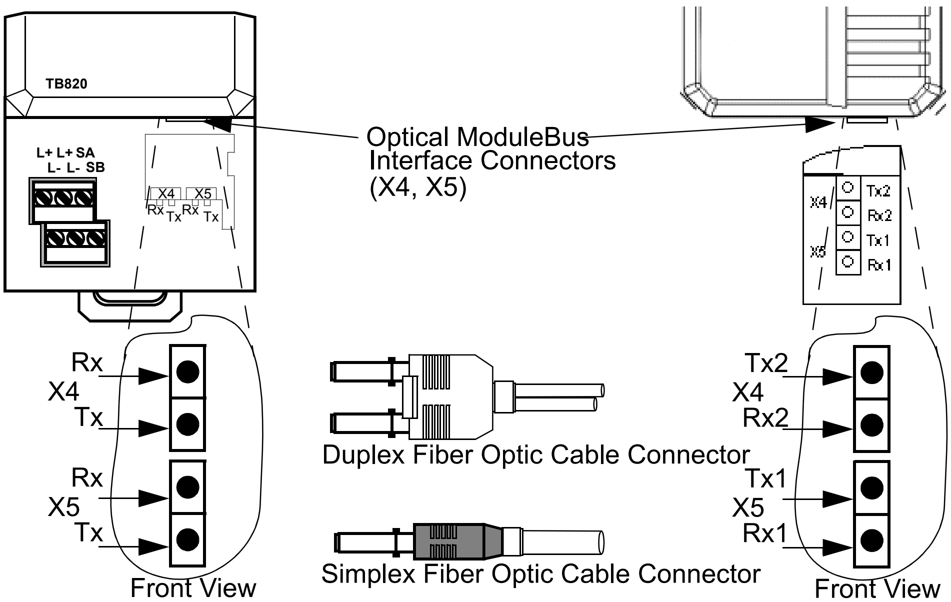


Figure 73. TB820/TB820V2 and TB840 Optical ModuleBus Connections

The connector style, either simplex or duplex, all provide snap-in action when mated to the X4/X5 ports. Simplex connectors are color coded to facilitate identification of transmitter (Tx) or receiver (Rx) connections. Duplex connectors are keyed so that proper orientation is ensured during insertion.

Figure 74 shows a duplex, simplex and mixed configuration of the optical ModuleBus. Duplex (two-way) is normally the best communication design, but may not apply to all requirements. Duplex design allows additional TB820/TB820V2’s or TB840/TB840As to be added down-stream on-line.

Simplex (one-way) connections provide a ring configuration from the FCI to the first TB820/TB820V2/TB840/TB840A, then to the next and so on and then back to the FCI. Simplex designs will require that the “home-run” cable from the last TB820/TB820V2/TB840/TB840A back to the FCI, or another TB820/TB820V2/TB840/TB840A, is limited to the 15 meter (49 ft.) plastic fiber or 200 meter (667 ft.) HCS fiber cable length. The 15 meter (49 ft.) cable length or 200 meter (667 ft.) maximum applies from FCI to TB820/TB820V2/TB840/TB840A, to the next TB820/TB820V2/TB840/TB840A, etc. and back to the FCI.

Also, duplex and simplex configurations can be mixed in the same optical ModuleBus if required.

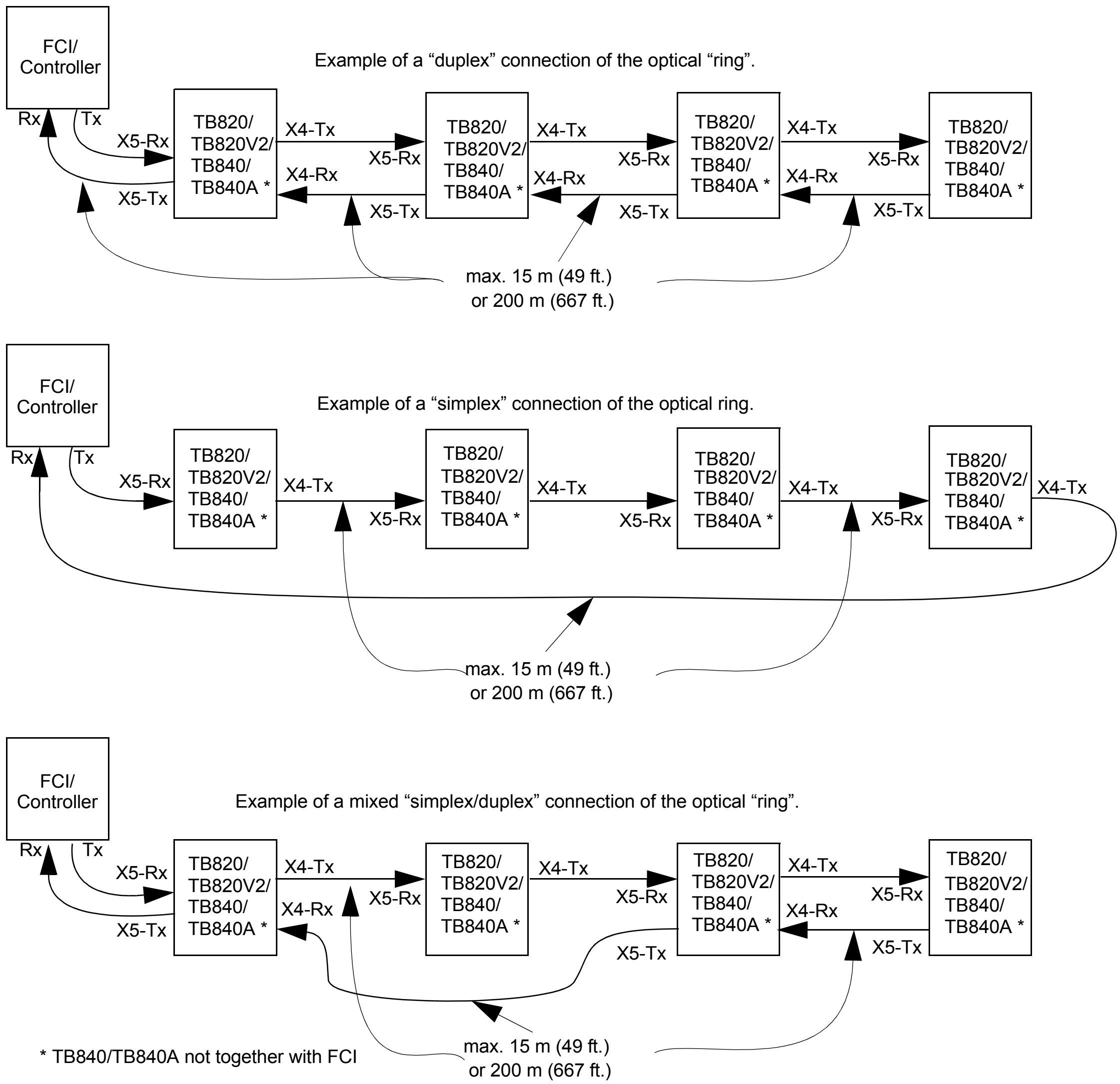


Figure 74. Typical Optical ModuleBus Designs

In a “duplex connection” a cable break or loss of a TB820/TB820V2, TB840 or TB840A will only affect the clusters down-stream of the break. In a “simplex connection” a cable break or loss of a TB820/TB820V2, TB840 or TB840A will affect all I/O expansion clusters on the ModuleBus.

Power Supply Connections

The TB820/TB820V2/TB840/TB840A requires 24 V d.c. (19.2 - 30 V) with a maximum current requirement of 1,7 Ampere. The module can be powered by either a single or redundant power supply. If a redundant power supply is used, the TB820/TB820V2/TB840/TB840A can monitor the status of each supply and send the status back to the FCI of the I/O Station.

See Figure 75 for the latest layout of power supply connections and Figure 76 for the previous layout.

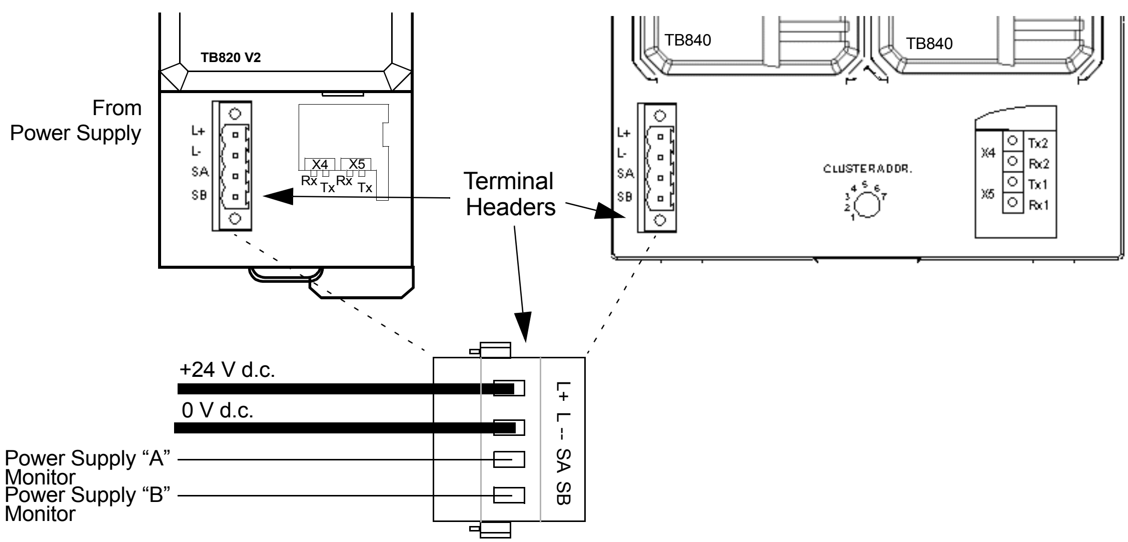


Figure 75. TB820/TB820V2/TB840/TB840A Power Supply Connections Latest Layout

Table 13. TB820/TB820V2 Power Connection Terminal valid for Figure 75.

Pin	Designation	Description
L+	L+	+ 24 V d.c. Supply
L-	L-	0 V d.c. Supply
SA	SA	Redundant Power Supply Monitoring Input
SB	SB	Redundant Power Supply Monitoring Input

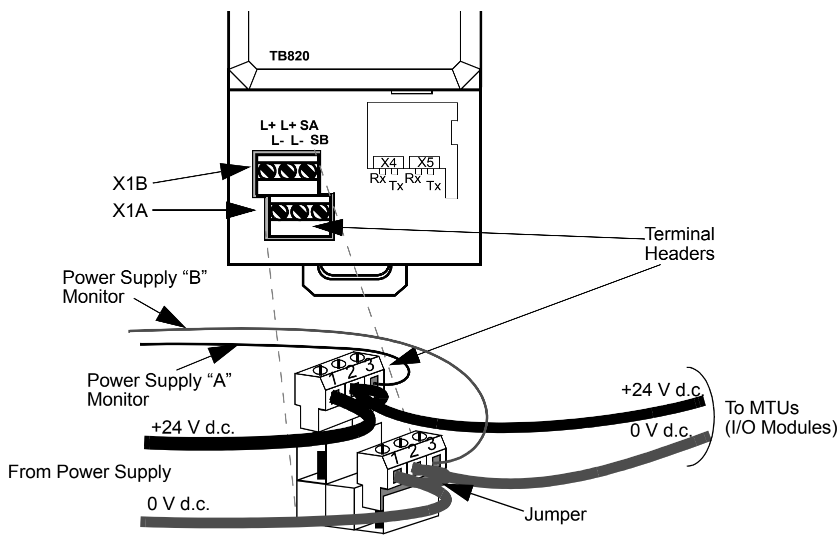


Figure 76. TB820/TB820V2 Power Supply Connections Previous Layout

Power connections can accept up to 0.2 - 2.5 mm^2 (24 - 14 AWG) wire size.

Table 14. TB820/TB820V2/TB840/TB840A Power Connection Terminal valid for Figure 76.

Pin	Designation	Description
X1A1	L-	0 V d.c. Supply (can be jumpered to pin 2)
X1A2	L-	0 V d.c. Supply
X1A3	SB	Redundant Power Supply Monitoring Input
X1B1	L+	+24 V d.c. Supply (can be jumpered to pin 2)
X1B2	L+	+24 V d.c. Supply
X1B3	SA	Redundant Power Supply Monitoring Input

TB825 Optical Media Converter

Optical ModuleBus Connections

TB825 can be used for star connections or where long distance optical fiber is required, see Figure 78. Signal routing is done according to Table 15 and in Figure 77.

The modem is powered by 24 V d.c.

Table 15. TB825 Signal Routing

Receiving Port	Regeneration Port
Rx1	Tx2, Tx3
Rx2	Tx1
Rx3	Tx1

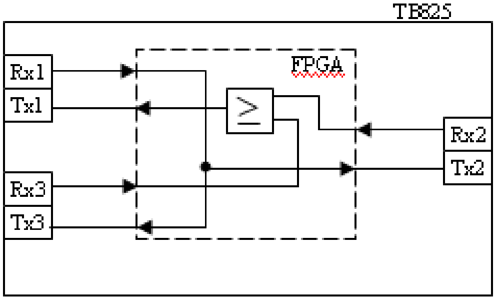


Figure 77. TB825 Signal Routing

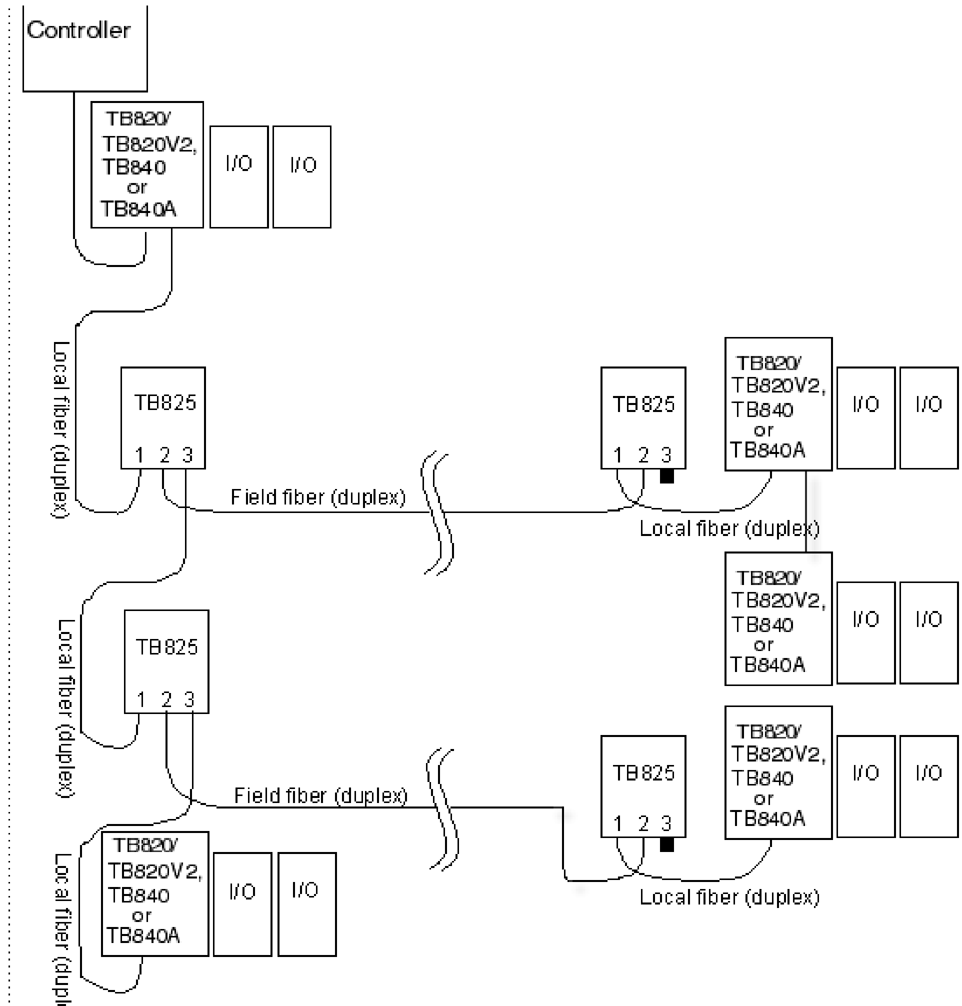


Figure 78. ModuleBus configuration with Optical Media Converter TB825

Power Supply Connections

The TB825 requires 24 V d.c. (19.2 - 30 V) with a maximum current requirement of 0.1 Ampere.

Table 16. TB825 Power Connection Terminal

Pin	Designation	Description
L+	L+	+ 24 V d.c. Supply
L-	L-	0 V d.c. Supply

Optical Fiber Connection

Table 17. TB825 Optical Port Description

Connection	Description
Tx1	Transmitting port local fiber 1
Rx1	Receiving port local fiber 1
Tx2	Transmitting port field fiber
Rx2	Receiving port field fiber
Tx3	Transmitting port local fiber 2
Rx3	Receiving port local fiber 2

Calculation of Maximum Optical ModuleBus Configuration

The maximum signal delay should be calculated in a configuration using Optical Media Converter. This is calculated using the signal path from the controller to the point in the configuration that has the longest delay. The maximum delay in a optical ModuleBus configuration must be ≤ 100µs (less than 250µs for S800 I/O HI).

The delay values in Table 18 can be used to calculate the maximum delay in an optical ModuleBus configuration.

Table 18. Delay Values Optical ModuleBus Components

Opto-to-opto delay in TB825(1)	2.4 µs
Opto-to-opto delay in TB820/TB820V2(1)	4.0 µs
Opto-to-electrical delay in TB820/TB820V2(1)	6.5 µs
Opto-to-opto delay in TB840/TB840A(1)	2.0 µs
Opto-to-electrical delay in TB840/TB840A(1)	5.5 µs
Delay in optical fiber(1)(2)	(0.01 x length) µs

(1) Notice that the delays in the table is the sum of the communication delay in both directions, i.e. (delay of master frame) + (delay of slave frame).
(2) Total fiber length = total local fiber length + field fiber length

Maximum fiber length between two modems is 15 m for plastic fiber, 200 m for HCS fiber and 1000 m for glass fiber.

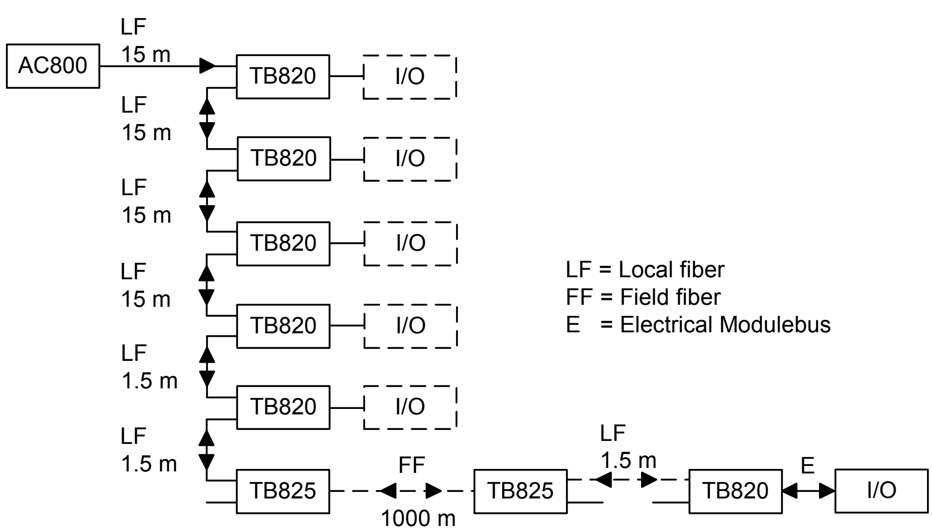


Figure 79. Example of worst case delay configuration

Calculation of the ModuleBus delay for the configuration in Figure 79:

ModuleBus delay = (total delay in optical fiber) + 5 x (opto-to-opto delay in TB820/TB820V2) + 2 x (delay in TB825) + (opto-to electrical delay in TB820/TB820V2) = (4 x 15 + 3 x 1.5 + 1000) x 0.01 + 5 x 4 + 2 x 2.4 + 6.5 = 42 µs.

TB826 Optical Media Converter

Optical ModuleBus Connections

TB826 can be used for duplex fiber configurations. Also, it is possible to connect TB826 in a mixed duplex/simple configuration. TB826 is always connected with duplex fibers, see Figure 81. Signal routing is done according to Table 19 and in Figure 80.

The modem is powered by 24 V d.c.

Table 19. TB826 Signal Routing

Receiving Port	Regeneration Port
Rx1	Tx2, Tx3
Rx2	Tx1
Rx3	Tx1

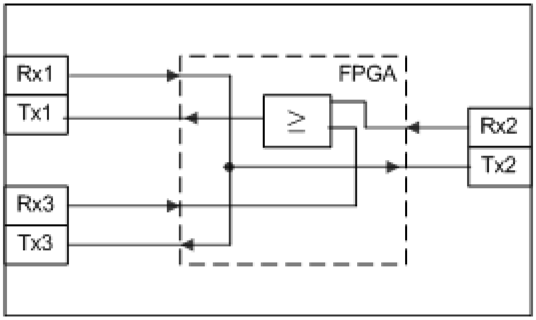


Figure 80. TB826 Signal Routing

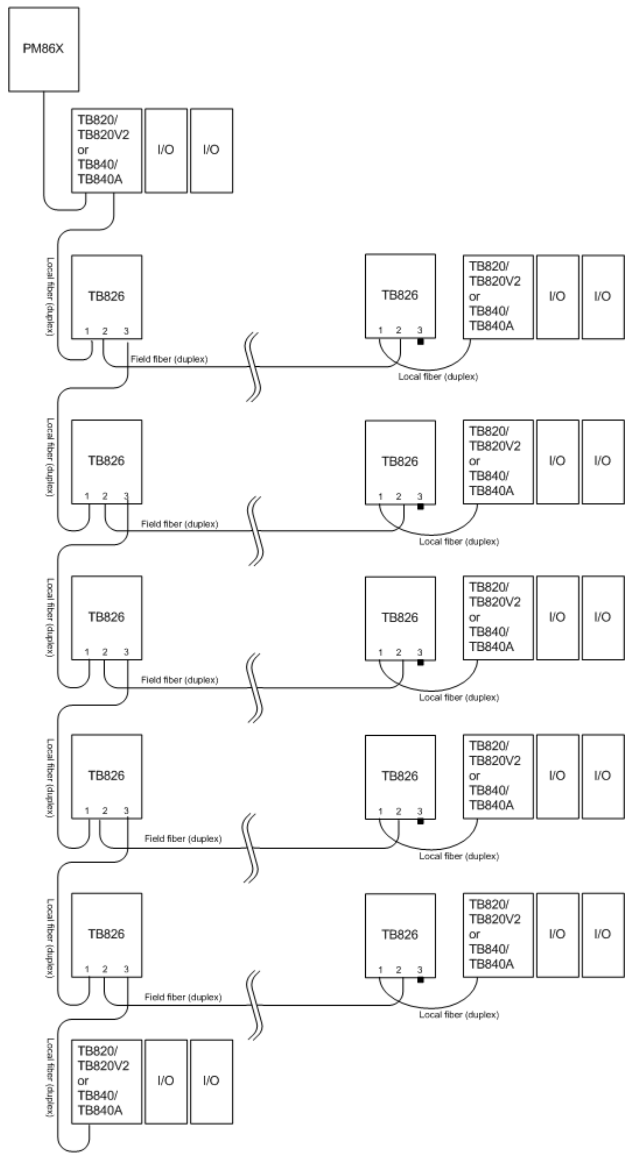


Figure 81. ModuleBus configuration with Optical Media Converter TB826

Power Supply Connections

The TB826 requires 24 V d.c. (19.2 - 30 V) with a maximum current requirement of 0.1 Ampere.

Table 20. TB826 Power Connection Terminal

Pin	Designation	Description
L+	L+	+24 V d.c. Supply
L-	L-	0 V d.c. Supply

Optical Fiber Connection

Table 21. TB826 Optical Port Description

Connection	Description
Tx1	Transmitting port local fiber 1
Rx1	Receiving port local fiber 1
Tx2	Transmitting port field fiber
Rx2	Receiving port field fiber
Tx3	Transmitting port local fiber 2
Rx3	Receiving port local fiber 2

Calculation of Maximum Optical ModuleBus Configuration

Calculation of Maximum Fiber length

The maximum signal delay in a configuration is calculated using Optical Media Converter. This is calculated using the signal path from the controller to the point in the configuration that has the longest delay. The maximum delay in a optical ModuleBus configuration must be ≤ 100μs (less than 250μs for S800 I/O HI).

The delay values in Table 22 can be used to calculate the maximum delay in an optical ModuleBus configuration.

Table 22. Delay Values Optical ModuleBus Components

Opto-to-opto delay in TB826[1]	2.0 µs
Opto-to-opto delay in TB820[1]	4.0 µs
Opto-to-electrical delay in TB820[1]	6.5 µs
Opto-to-opto delay in TB840[1]	2.0 µs
Opto-to-electrical delay in TB840[1]	5.5 µs
Delay in optical fiber[1][2]	(0.01 x length) µs

(1) Notice that the delays in the table is the sum of the communication delay in both directions, i.e. (delay of master frame) + (delay of slave frame).

(2) Total fiber length = total local fiber length + field fiber length

Maximum fiber length between two modems is 15m for plastic fiber, 200m for HCS fiber and up to 5000m (20000m for S800 I/O HI) for Glass Optical Fiber.

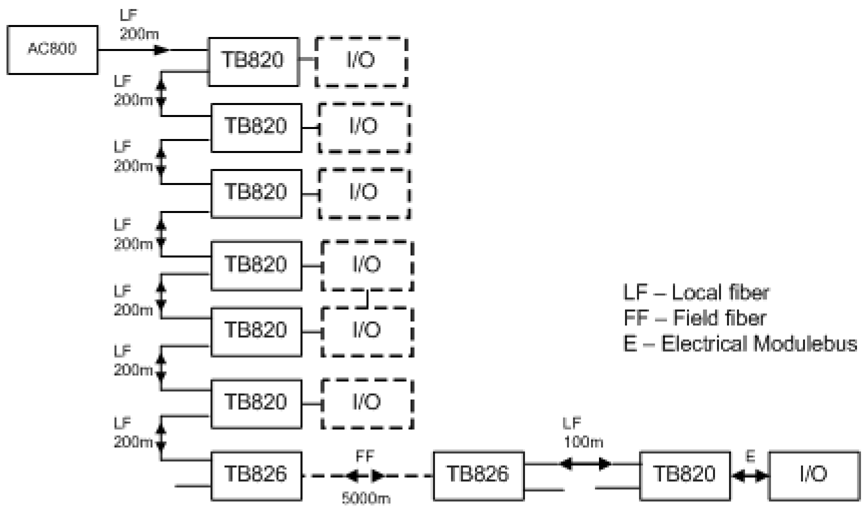


Figure 82. Example of worst case delay configuration TB826

Calculation of the Communication link delay

For the configuration in Figure 82 the Communication link delay is calculated as:

(Total delay in FF) + (Total delay in LF) + 6*(Opto-to-opto delay in TB820/TB820V2) + 2*(Delay in TB826) + (Opto-to-electrical delay in TB820)

= 5000*0.01 + ((7 * 200)+100)*0.01 + 6*4 + 2*2.0 + 6.5
= 50 + 1500*0.01 + 24 + 4 + 6.5
= 99.5 µs

Power Supply System

The power supply system for an S800 I/O system is very straightforward.

With the Type SD8xx series power supply modules, there is no requirement for the installation of a mains filter. Should other types of non-ABB power supply units be used, it may be necessary to install mains filters. For confirmation, refer to the relevant manufacturers documentation.

Powering S800 I/O System

Figure 83 shows a series of simple circuit diagrams to indicate the various possibilities for connecting the incoming mains power supply, via the mains breaker, the power supply modules and the SS822, SS823 or SS832 voting devices, to the 24 V d.c. distribution terminals of the S800 I/O System.

Powering Field Equipment

Interference

Powering field equipment from a power supply located close to the S800 I/O system often requires the use of long 24 V d.c. cables which can easily pick up local interference and direct it straight back to the power supply modules.

Short-circuit at the output

The SD8xx series power supply has only a little extra energy reservoir at their outputs. In case of a short-circuit the output voltage of the power supply will fall rapidly.

Short-circuits, (even if fuses are installed in the 24 V d.c. distribution system), can produce unwanted voltage dips in the power supply. To avoid any influences on the S800 I/O system from any of the field equipment, it is strongly recommended that independent power supply modules for both the S800 I/O system and the field equipment are installed.

Sectioning the field equipment

If the field equipment connected to an S800 I/O system are to be sectioned into groups so that a power fail in one group is not allowed to influence the power to other groups then it is recommended to use one power supply for each group of field equipment.

It is not safe to use fuses for sectioning in the 24 V d.c. distribution system. If a short-circuit occurs in one group the power supply voltage will most likely drop before any fuse is blown and consequently all groups will have a voltage drop in their supply. To work fairly the power supply must have a spare capacity of at least 3-4 times the rated current value of the largest fuse connected to the power supply. The resistance of long cables can lead to problems.

Cable protection

Fuses in the 24 V d.c. distribution system for cable protection only can be used.

Connection alternatives

It is recommended to power the S800 I/O system and field equipment from different power supplies; however, the power supply for field equipment can be connected in the same manner as that used for connecting and powering the S800 I/O system, see Figure 83.

It should be pointed out however, that the same Mains Breaker Unit can be used to control and isolate both power supplies or, alternatively, independent Mains Breakers can be used on each spur, see the examples shown in Figure 84.

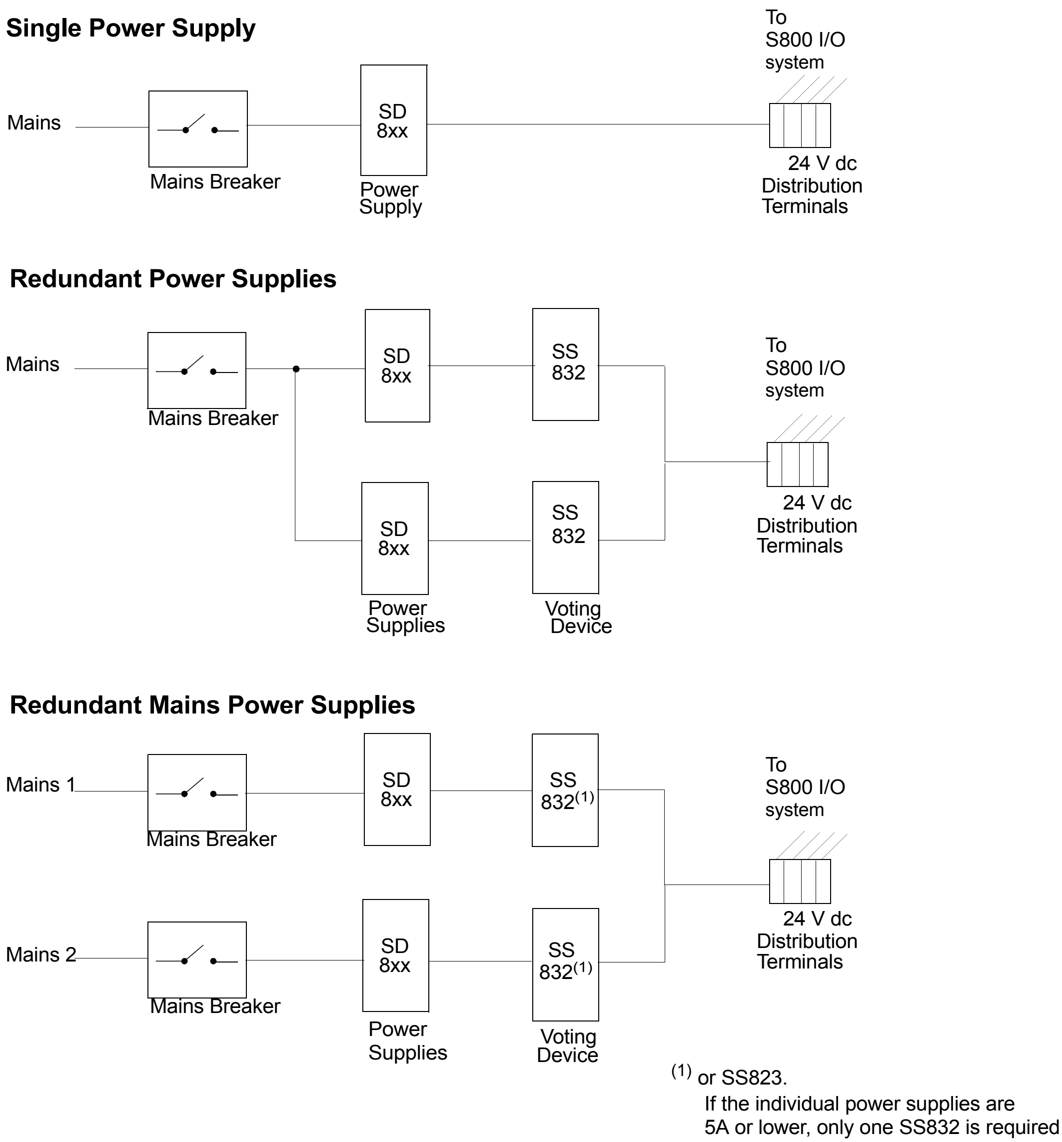


Figure 83. Power Supply Options for S800 I/O System

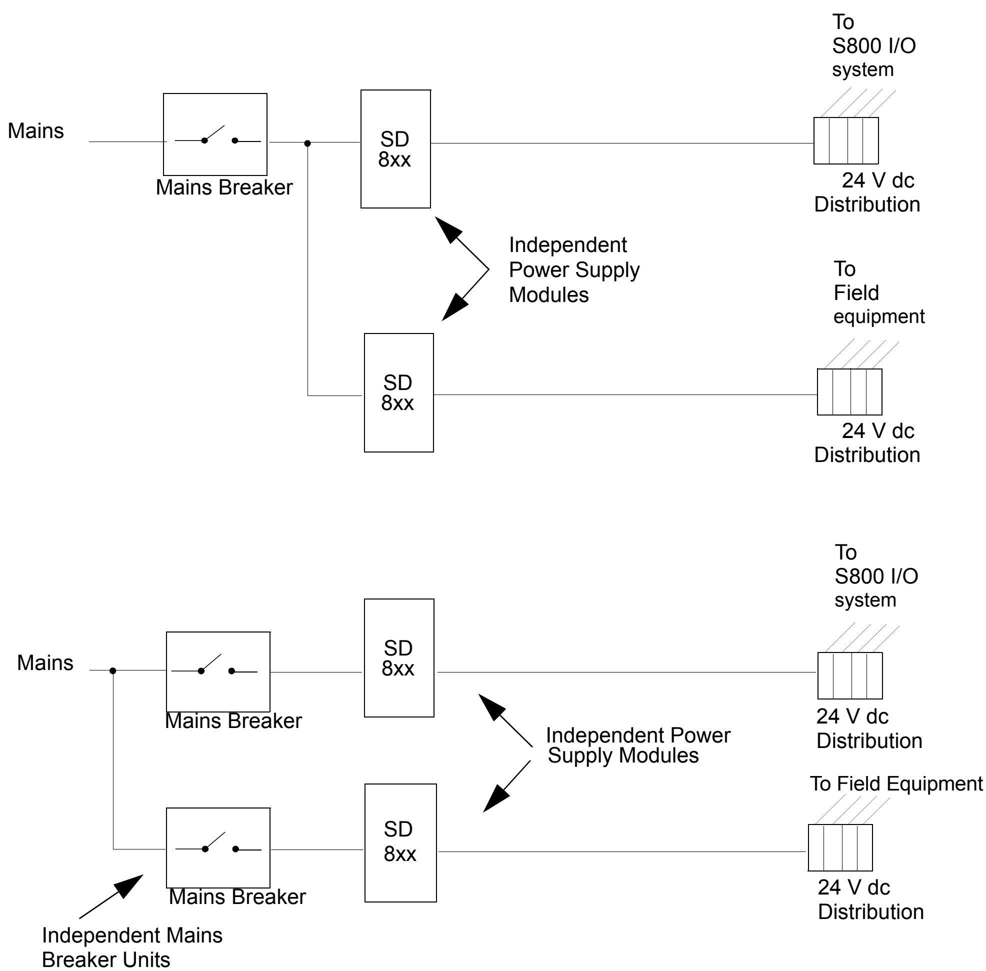


Figure 84. Powering Field Equipments

Power Supply Load Calculation

Appropriate Hardware

Different power supply systems are available for the S800 I/O Station. The number of power supply units is calculated with respect to actual number of S800 I/O modules supported by the Station, see Power Supply Requirements on page 167 for details.

Normally you don’t have to deal with current consumption calculations, however there are occasions with special requirements, or designs when detailed information regarding current consumption is valuable. Please find a description of special power supply usage under the guidelines below.

Guidelines

- A summary of the main requirements of the plant supply, from a planning point of view, is found in Section 2, Installation.
- Auxiliary equipment in the controlled system is normally powered separately from the S800 I/O power supplies.
- If field devices are grounded, be sure to use galvanic isolation.
- Heavy current on/off loads are **always** powered separately
- It is possible to use the system power supply for transmitters/transducers:
  - There is idle capacity in the available power supply units.
  - The transducer is grounded directly in the control system chassis.

Heat Dissipation

Cabinet Ventilation

To avoid overheating, when ambient temperatures are high, the heat dissipated in the electronics cabinet must be taken into consideration. This is particularly the case with sealed cabinets (IP54) or tropicalized cabinets (IP41).

The frequency of faults is estimated to be doubled for each 20°C increase in temperature. It is therefore important to maintain a low temperature where the equipment is installed.

The different hardware modules in the controller and the I/O system have different outputs of heat. Accurate calculation of the heat produced by the system requires knowledge of the modules and the work cycle.

Heat Dissipation Permitted in Cabinets

The maximum permitted temperature below the I/O station in the cabinet is 55 °C. The permissible amount of heat generated depends on the type of cabinet and its location.

In critical applications with an I/O station fully equipped and cabinets arranged in groups, it may be necessary to make a calculation of the actual power dissipation and an estimation of the temperature rise within the cabinet. It is recommended that you re-calculate when you expand the system as well.

Calculation of Heat Generated in a Cabinet

When calculating the heat generated in a cabinet, the heat generated by the different I/O modules must be summed, and then added to the heat generated by the power supply units and other equipment such as an extra modem, extra unit for supply of power to transmitters etc.

Power and Cooling on page 168 gives the power dissipated as heat by hardware modules in the S800 I/O system.

The total power dissipated in the cabinet can thus be written:

P_{FCI} = Power of the FCI Module
P_{IO} = Power of each S800 I/O Module

$$P_{Total} = (\sum P_{FCI}) + (\sum P_{IO}) + (\sum P_{Voltagesupplyunit}) + (\sum P_{Sundry})$$

$P_{Voltagesupplyunit}$ = Power loss of the power supply unit(s)
P_{Sundry} = Miscellaneous power using equipment installed in the cabinet.

Maintenance and Repair

From the maintenance point of view, use as few module types as possible in the hardware disposition of a control system. This is most relevant with the process I/O design. Standardization of I/O signal types and other electrical qualities is important to minimize the spare part stock.

Your solutions must make sense to the maintenance people in the event of disturbances and following trouble-shooting.

Expansion Considerations

A new S800 I/O station can be connected to an existing fieldbus without affecting other stations and controllers. The new I/O is automatically incorporated in the communication system. Spare connections must be pre-installed as to not disturb the existing bus.

The system fieldbus can be expanded in the following ways:

- Process I/O or MTU unit

New I/O modules can be added on line. It is recommended to have approximately 10 - 20% of total capacity as spare channels, and spare space.

Spare MTUs need to be pre-mounted to add I/O modules on-line.

Power Supply Requirements

A quick guide for power consumption to be used in a preliminary phase of a project work or whenever you need estimated figures is provided in Table 23.

Table 23. Estimated System Power Consumption

I/O Station	24 V d.c. Power Consumption
Base Cluster (single FCI) and 6 I/O Modules	0.5 A
Base Cluster (single FCI) and 12 I/O Modules	1.0 A
Redundant FCIs (2) and 6 I/O Modules	1.0 A
Redundant FCIs (2) and 12 I/O Modules	1.5 A
Additional I/O Clusters and 6 I/O Modules	0.5 A
Additional I/O Clusters and 12 I/O Modules	1.0 A

The above estimates are based on an I/O Station with a mixed configuration of AI/AO and DI/DO. Only power consumption on the 24 V d.c. distributed via the ModuleBus are included. External 24 V connected directly to the I/O modules, for external loads and transmitters, are not included. When using large quantities of AO820s, DI885s, DO815s and/or DO820/DO821s, these load figures may be exceeded.

Power Supply for DO880

To ensure bumpless performance of the I/O system including DO880, the power supply for the I/O field power should be able to support at least short circuit on one DO880 channel in addition to the total nominal load. Short circuit current for DO880 see technical data in S800 I/O Modules and Termination Units.

The following rules must be considered if ABB power supply units are being used together with DO880.

- Single DO880 and SD833: The basic load must not exceed 10 A, with voting unit 8 A.

- Single DO880 and SD834: The basic load must not exceed 20 A, with voting unit 20 A.
- Redundant DO880 and SD833: The basic load must not exceed 4 A, with voting unit 4 A, if the power supply voltage >26 V
- Redundant DO880 and SD834: The basic load must not exceed 20 A, with voting unit 20 A.
- Single DO880 and voting unit SS823: The basic load must not exceed 20 A.
- Redundant DO880 and voting unit SS823: The basic load must not exceed 16A.

Power and Cooling

Table 24 shows the typical power and cooling values that can be used when designing the S800 I/O.

Table 24. I/O Station Power and Cooling (Typical) Values

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
AI801	70 mA	-	30 mA	1.1	3.7	55/40°C (131/104°F)(2)
AI810	70 mA	40 mA	-	1.5	5.1	55/40°C (131/104°F)(2)
AI815	100 mA	50 mA	22 mA + (sensor current *1.32)	3.5	12	55/40°C (131/104°F)(2)
AI820	80 mA	70 mA	-	1.7	5.8	55/40°C (131/104°F)(2)
AI825	100 mA	110 mA	-	3.2	11	55/40°C (131/104°F)(2)

Table 24. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
AI830/ AI830A	70 mA	50 mA	-	1.6	5.4	55/40°C (131/104°F)(2)
AI835/ AI835A	75 mA	50 mA	-	1.6	5.4	55/40°C (131/104°F)(2)
AI843	60 mA	50 mA	-	1.5	5.1	55/40°C (131/104°F)(2)
AI845	100 mA	50 mA	22 mA + (sensor current *1.32)	3.5	12	55/40°C (131/104°F)(2)
AI880/ AI880A	45 mA	50 mA	4 mA + sensor current	2.4	8.2	55/40°C (131/104°F)(2)
AI890	150 mA	-	300 mA including sensor current	3.3	11	55/40°C (131/104°F)(2)
AI893	125 mA	-	-	0.6	2.0	55/40°C (131/104°F)(2)
AI895	130 mA	-	370 mA including sensor current	4.75	16	55/40°C (131/104°F)(2)
AO801	70 mA	-	200 mA including load current	3.8	13	55/40°C (131/104°F)(2)

Table 24. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load [(1)] (BTU/H Typical)	Maximum Ambient Temperature
AO810	70 mA	-	200 mA including load current	3.0	10	55/40°C (131/104°F)[(2)]
AO810V2[(3)]	70 mA	-	245 mA including load current	2.3	7.8	55/40°C (131/104°F)[(2)]
AO815	125 mA	-	165 mA including load current	3.5	12	55/40°C (131/104°F)[(2)]
AO820	100 mA	260 mA	-	6.0	20	55/40°C (131/104°F)[(2)]
AO845/ AO845A	125 mA	-	165 mA including load current	3.5	12	55/40°C (131/104°F)[(2)]
AO890	150 mA	-	300 mA including load current	3.5	12	55/40°C (131/104°F)[(2)]
AO895	130 mA	-	330 mA including output current	4.25	14.5	55/40°C (131/104°F)[(2)]
CI801	-	-	140 mA	5.4 W[(4)]	19	55/40°C (131/104°F)[(2)]

Table 24. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
CI810	-	-	110 mA	2.6	8.9	55°C/(131°F)
CI820/ CI820V1	-	-	250 mA (5)	6.0	20	55°C/(131°F)
CI830	-	-	110 mA	2.6	8.9	55°C/(131°F)
CI840/ CI840A	-	-	190 mA(5)	7.7	26	55/40°C (131/104°F)(2)
DI801	70 mA	-	-	2.2	7.5	55/40°C (131/104°F)(2)
DI802	50 mA	-	-	2.8	9.6	55/40°C (131/104°F)(2)
DI803	50 mA	-	-	2.8	9.6	55/40°C (131/104°F)(2)
DI810	50 mA	-	-	1.8	6.1	55/40°C (131/104°F)(2)
DI811	50 mA	-	-	2.7	9.2	55/40°C (131/104°F)(2)
DI814	50 mA	-	-	1.8	6.1	55/40°C (131/104°F)(2)
DI818	70mA	-	25mA	3.1		55/40°C (131/104°F)(2)
DI820	50 mA	-	-	2.8	9.6	55/40°C (131/104°F)(2)
DI821	50 mA	-	-	2.8	9.6	55/40°C (131/104°F)(2)

Table 24. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
DI825	90 mA	-	-	4.9	15	55/40°C (131/104°F)(2)
DI828	45 mA			3.5		55/40°C (131/104°F)(2)
DI830	120 mA	-	-	2.3	7.8	55/40°C (131/104°F)(2)
DI831	120 mA	-	-	3.2	11	55/40°C (131/104°F)(2)
DI840	100 mA	-	15 mA + sensor current	2.7	9.0	55/40°C (131/104°F)(2)
DI880	125 mA	-	15 mA + sensor current	2.4	8.2	55/40°C (131/104°F)(2)
DI885	160 mA	91 mA(6)	91 mA(6)	3.0	10	55/40°C (131/104°F)(2)
DI890	150 mA	-	70 mA including sensor current	1.6	5.4	55/40°C (131/104°F)(2)
DO801	80 mA	-	(7)	2.1	7.2	55/40°C (131/104°F)(2)
DO802	70 mA	80 mA	-	2.2	7.5	55/40°C (131/104°F)(2)
DO810	80 mA	-	(7)	2.1	7.2	55/40°C (131/104°F)(2)

Table 24. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
DO814	80 mA	-	(7)	2.1	7.2	55/40°C (131/104°F)(2)
DO815	120 mA	-	(8)	4.0	14	55/40°C (131/104°F)(2)
DO818	70mA	-	40mA	2.8		55/40°C (131/104°F)(2)
DO820	60 mA	140 mA	-	2.9	9.9	55/40°C (131/104°F)(2)
DO821	60 mA	140 mA	-	2.9	9.9	55/40°C (131/104°F)(2)
DO828	45 mA	80 mA		3.5		55/40°C (131/104°F)(2)
DO840	130 mA	-	200 mA (7) + channel load	4.3	14	55/40°C (131/104°F)(2)
DO880	45 mA	55 mA	10 mA (7) + channel load	5.6(9)	19	55/40°C (131/104°F)(2)
DO890	150 mA	-	360 mA @ 300 ohms load/ channel	4.4	15	55/40°C (131/104°F)(2)
DP820	120 mA	-	(7)	2.5	8.5	55/40°C (131/104°F)(2)
DP840	115 mA	-	(10)	4.0	14	55/40°C (131/104°F)(2)

Table 24. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
TB810	100 mA	20 mA	-	0.5	1.7	55°C/(131°F)
TB811	100 mA	20 mA	-	0.5	1.7	55°C/(131°F)
TB820/ TB820V 2	-	-	100 mA	6.0	20	55°C/(131°F)
TB825	-	-	96 mA	2.3	7.8	55°C/(131°F)
TB826			92 mA	2.2	7.8	55°C/(131°F)
TB840/ TB840A	-	-	120 mA(5)	6.0	20	55/40°C (131/104°F)(11)
TB842	100 mA	20 mA	-	0.5	1.7	55°C/(131°F)
SD821	-	-	-	8.6	29	55°C/(131°F)(12)
SD822	-	-	-	13.3	45	55°C/(131°F)(12)
SD823	-	-	-	26.7	90	55°C/(131°F)(12)
SD831	-	-	-	10/8(13)	34/27	55°C/(131°F)(12)
SD832	-	-	-	14/13(13)	47/44	55°C/(131°F)(12)
SD833	-	-	-	24/22(13)	81/75	55°C/(131°F)(12)
SD834	-	-	-	40/31(13)	136/105	55°C/(131°F)(12)
SS822	-	-	-	2.5(14)	8.5	55°C/(131°F)(12)
SS823	-	-	-	24	82	55°C/(131°F)(12)
SS832	-	-	-	7,9	27	55°C/(131°F)(12)

(1) Cooling load is the heat (BTU/H) produced by the equipment that may be required to meet room or enclosure cooling specifications.
(2) 40°C (104°F) applies to Compact MTUs with I/O modules, S800L, CI801 or CI840 mounted on a vertical DIN rail.
(3) AO810V2 replaces AO810

(4) With maximum load at ModuleBus 24 V and 5V
(5) In redundant configuration twice
(6) 24 V from ModuleBus (91 mA) or 24 V external (91 mA) or 48 V external (22 mA).
(7) 500 mA per channel with maximum load per channel.
(8) 2 A per channel with maximum load per channel.
(9) With maximum channel load
(10) Sensor power
NAMUR: 56 + 0.5 x external load [mA]
12 V: 89 + 0.7 x external load [mA]
24 V: 97 + external load [mA]
(11) 40°C (104°F) mounter on a vertical DIN rail.
(12) Horizontal mounting only.
(13) a.c. 120/230V.
(14) 2,5 W at 5A, for calculation use W=0,5 V x Output current.

Calculation of 24 V d.c. Power Consumption

Total 24 V d.c. power consumption = Σ 24 V load ModuleBus + Σ 5 V load ModuleBus*0.3 + Σ 24 V external load.

The calculated 24 V ModuleBus load should not exceed 1.4 A.

If too many of the modules: AO820, DO820 and DO821 are used, the maximum 24 V ModuleBus load could be exceeded. See Table 24 for exact data.

The calculated 5 V ModuleBus load should not exceed 1.5 A.

If too many of the modules: AI890, AI895, AO890, AO895, DI830, DI831, DI885, DI890, DO815, DO890 or DP820 are used, the maximum 5 v load could be exceeded. See table Table 24 for exact data.

Section 4 Operation

Operating Overview

An I/O station is an autonomous station, which is normally not handled by an operator. Of course, it is started and sometimes stopped manually. This is done in specific situations, for example during installation work and maintenance.

Consequently, operating instructions are spread out in this manual and will be discussed in the appropriate section.

For specific instructions, see Section 2, Installation and Section 5, Maintenance.

For more information regarding operation, refer to the controller manual or the *S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1 (3BSE020926*)* or the *S800 I/O Fieldbus Communication Interface for Advant Fieldbus 100 (3BSE020925*)* manuals.

Section 5 Maintenance

Preventive Maintenance

This section describes routine maintenance, replacement and installation procedures necessary to maintain the operation of the S800 I/O equipment. The S800 I/O modules do not need special adjustments such as zero and span of analog I/O modules.

Analog I/O modules are factory calibrated and have calibration parameters for all ranges stored in memory on the module. The ModuleBus master uses those calibration parameters for calculations of the correct input and output signals.

Thermocouple and RTD modules use internal references for calibrations of the measured values.

Hardware Indicators

Various visual indications (LEDs) are used in the I/O-system for showing module status and for digital I/O modules also channel status.

These indications serve the purpose of informing the user about status or fault in the system or in the process. They are intended to be a simple and easy to use help. They should allow to spot faults in the station easily.

Color

A fixed meaning is assigned to the colors red, yellow and green:

RED	Danger or alarmWarning of potential danger or a situation which requires immediate action	
YELLOW	Caution	Change or impending change of condition, warning

GREEN	Safety	Indication of a normal situation or authorization to proceed, clear way.

For digital I/O on-states a definite meaning can not be assigned. For them the color yellow is chosen. The Table 25 shows the meaning and colors of LED's.

Table 25. Meaning and Colors of LED's

Meaning/Purpose	Color	Examples
Fault; Error	Red	"FAULT"
Warning, I/O State Indications and OSP (Outputs Set as Predetermined)	Yellow	OSP, Process error, Digital I/O on-state, Process voltage low, Traffic.
Normal Operation	Green	"RUN", Normal operation, Power OK.

Location

For the location of LEDs the following rules are applied:

S800 I/O Modules (except S800L)

- Indications having the same meaning on every I/O module (for example, FAULT, RUN, WARNING, OSP) are at the same position.
- The standard indications FAULT, RUN, WARNING and OSP (only output modules), are always on the topmost position on every device (top: FAULT, RUN, then WARNING, OSP).

S800L I/O Modules

- Have one LED **S** for module status showing FAULT (Red) or RUN (Green).

FCI

- On the FCI: FAULT, RUN, POWER OK, TRAFFIC and for redundant FCI also PRIMARY and DUAL.

Optical ModuleBus Modem

- On TB820/TB820V2: FAULT, RUN, POWER OK, ORx1, ORx2 and ERx.

- On TB840: STATUS, POWER OK, Rx1, Rx2, ERx1 and ERx2.

Identification

LED's shall be identified by an appropriate symbol or abbreviation of an English term. For the standard indications the abbreviation is as follows:

- Fault in the moduleFAULT or F
- Device is in operationRUN or R
- External fault or minor fault in the moduleWARNING or W
- Output Set as Predetermined, OSP or O
- Digital I/O on-state1, 2,... (channel number)
- Digital I/O channel FAULT or F
- Power supply ok internal and/or external okPOWER OK or P
- Module status (S800L modules and Optical ModuleBus Modem TB840)STATUS or S
- Traffic on FieldbusTRAFFIC, T1, T2 or Rx/Tx
- Primary in redundant FCI configurationPRIMARY, PR or PRIM
- Both FCI in a redundant pair are in operationDUAL or DU
- Traffic on the Optical ModuleBusORx1, ORx2, Rx1 or Rx2
- Traffic on the electrical ModuleBus.ERx, ERx1 or ERx2

Error Messages

Not applicable.

Fault Finding and User Repair

Introduction

Diagnostics are available in different forms for rapid localization of the source of the equipment malfunction. Hardware error is usually corrected by replacing the faulty module which is returned to ABB Service for repairs. The smallest replaceable unit is normally a module or an apparatus like a power supply unit.

Disturbances and system halt caused by software error is commonly solved by a manual system restart.

External faults in process wiring and transducers can also affect the function of the S800 I/O system. However, this type of fault is not discussed in this manual.

Diagnostics and Fault Indications

Hardware and software in a S800 I/O system is provided with supervision against system faults.

LED indicators on modules:

- Green LED, RUN, indicates normal function.
- Yellow LED indicates an active signal, for example, status of digital input (DI) or digital output (DO), OSP and Warning.
- Red LED, FAULT, indicates malfunction.
- Red/Green LED indicates module status (S800L modules)
  Red = FAULT, Green = RUN normal function.

List of General Fault Finding Procedures and Hints

Location of Malfunction

Sometimes, you lack the information from the controller diagnostics, that tells you where the fault is located. Suspicion about a fault is raised by the process behavior.

Experience indicates that approximately 85% of all faults occur in the process, 10% in the control program and 5% in the control system hardware.

It is always advisable to localize the malfunction with these figures in mind to minimize the down-time.

External Factors

In an electronics system which has given satisfactory service, most malfunctions have external causes. It is therefore important, when tracing a fault, to determine if any external factor such as incorrect handling of the equipment, short circuits, welding work, lightning strike and/or power failure has caused the malfunction.

Safety at Start/Stop

Voltage failure, component fault or manual restart usually affect the control system function. I/O system failure affects the process in different ways:

- In a system which is monitoring the process only, changes in the process status are not registered but there is no immediate danger to the process operation.
- In a system which is controlling a continuous processes (rolling mills and paper manufacture) demands a high degree of continuity of the control system functions.

A restart of the I/O system or controller can have very serious consequences. It is important to be aware of the local requirements for safety when starting and stopping the I/O system or controller.

Check of Non-redundant Power Supply

The CI801/CI810/CI820/CI820V1/CI830/CI840 Fieldbus Communications Interface (FCI), or TB820/TB820V2/TB840/TB840A status LED - P is illuminated when 24 V d.c. is supplied to the FCI or TB820/TB820V2/TB840/TB840A, and 5 V (from the FCI or TB820/TB820V2/TB840/TB840A) is supplied to the rest of the I/O Station.

The supply system consists at least of one power supply.

Power can be checked at the FCI or TB820/TB820V2/TB840/TB840A on terminals L+ and L- with a voltmeter. The value should be 24 V d.c. (19.2 to 30). Power can also be checked at the power supply or on the distribution strip.

Check of Redundant Power Supply

The CI801/CI810/CI820/CI820V1/CI830/CI840 Fieldbus Communications Interface (FCI), or TB820/TB820V2/TB840/TB840A status LED - P is illuminated when 24 V d.c. is supplied to the FCI/TB820/TB820V2/TB840/TB840A, and 5 V (from the FCI/TB820/TB820V2/TB840/TB840A) is supplied to the rest of the I/O Station.

The supply system consists of at least two power supplies.

Power can be checked at the FCI or TB820/TB820V2/TB840/TB840A on terminals L+ and L- with a voltmeter. The value should be 24 V d.c. (19.2 to 30). Power can also be checked at the power supplies, diode unit or on the distribution strip.

To do a complete check each power supply has to be run as single.

User Repair

I/O Module Replacement

All S800 I/O modules, except for the S800L modules or relay output modules with normally closed contacts, can be exchanged on-line with the process power supply connected. This is possible because the module deactivates when the I/O module lock switch is turned to unlock.

Switch off the process voltage before removal of the module, if the plastic cover for the I/O modules DI802, DI803, DI820, DI821, DO802, DO820 or DO821 is damaged, and there is risk for contact with live parts.

It is important to understand the consequences of a module exchange on-line and how it affects the process. Replacement of an S800 I/O module affects all channels on the module. It also sometimes indirectly affects the outputs via some application function, on another module.

To exchange a S800L module or MTU the power supply must be switched off.

The system software in the ModuleBus master checks automatically that all I/O modules function correctly. In the event of module fault, and module exchange, the module and associated signals are marked as faulty.

The system software checks that the module is inserted and correct. If this is the case, the Fault-indicator (LED) extinguishes (after 10 seconds).

At exchange of faulty I/O modules, it is important to check that the new modules start up correctly. If the module does not start up correctly within about one minute the module is faulty or of wrong type and should be taken out from the system and changed to a correct module.

Power Supply Module Replacement

In single or parallel operation of power supplies, there will always be a disturbance of the function when a power supply must be replaced; the station will not have power.

In a redundant power supply configuration, it is possible to replace a power supply module without disturbance of the function. To achieve that installation, see Figure 83 and Figure 84 and the correct replacement procedure that follows.

Practical Execution. Replace faulty or suspect power supply module in the following way:
For single or parallel operation do steps 1, 2 and 4 to13.
For redundant configuration do steps 1 to 14.

1. Read Section 2, Installation.
2. Check that the new module can replace the old.
3. Switch off the output from the module (only redundant configuration).
4. Switch off input power to the module.
5. Disconnect the wires.
6. Dismount the module by loosening the module locking.
7. Mount the new module.
8. Connect the input wires.
9. Switch on input power to the module.
10. Perform a function test on the new module.
11. Switch off input power to the module.
12. Connect the output wires.

13. Switch on input power to the module.
14. Switch on the output from the module (only redundant configuration).

Communication Module Replacement

Normally communications modules cannot be exchanged on-line, the only exception are the CI820/CI820V1/CI840/TB840/TB840A in a redundant configuration.

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

- Replacement of a communication module type CI801/CI810/CI820/CI820V1/CI830 or a CI840 in a single configuration affects all channels on all the modules in an I/O station. The station will loose power.
- Replacement of a single communication module type CI820/CI820V1/CI840 in a redundant configuration has no affects on channels in an I/O station.
- Replacement of a communication module type TB810/TB811/TB842 affects all channels on all the modules in all clusters except cluster 0. The communication will be broken to all clusters except for cluster 0.

If TB842 should be replaced in a running system the carrier (TB806 or TB846) of TB842 have to be disconnected from the FCI first.

- Replacement of a communication module type TB815 affects all channels on all the modules in an I/O station. The station will loose power.
- Replacement of a communication module type TB820/TB820V2, TB840 or TB840A in a single configuration, connected via a simplex optical cable, affects all channels on all the modules in all clusters except cluster 0. The communication will be broken to all clusters except for cluster 0. The cluster where the TB820/TB820V2/TB840/TB840A should be replaced will be power less.
- Replacement of a communication module type TB820/TB820V2, TB840 or TB840A in a single configuration, connected via a duplex optical cable, affects all channels on all the modules in all clusters after and including the cluster where the replaced TB820/TB820V2/TB840/TB840A is located.

The communication will be broken to all clusters after where the replaced TB820/TB820V2/TB840/TB840A is located. The cluster where TB820/TB820V2/TB840/TB840A should be replaced will be power less.

- Replacement of a communication module type TB840/TB840A in a redundant configuration has no affects on channels in an I/O station.

After replacing a TB840/TB840A module used with a redundant AC 800M Controller, the failed controller must be manually restarted by pressing "INIT" or toggling the power to it

Table 26. Replacement Aspects of S800 I/O Modules

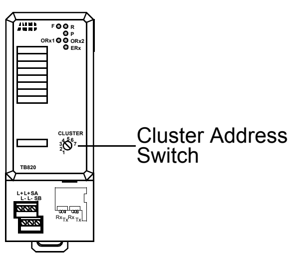
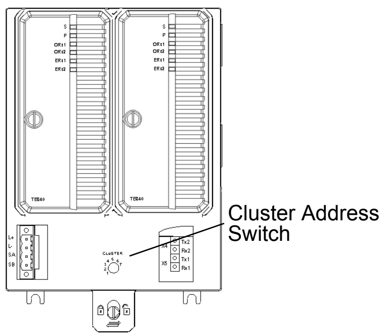
Module Type - Settings		Comments
TB810/811	No settings	Optical ModuleBus cable can be removed by pulling the connector(s) out of the unit. **Can not** be replaced with power applied.
TB820/ TB820V2 Module- Bus Modem	Switch setting for I/O Cluster address 	**Can not** be replaced with power applied. Needs room to the left of an MTU in order to be removed. In normal operation mode, before a TB820/TB820V2 is replaced, the supply to the S800 I/O is to be switched off. Power connections can be removed by pulling the header terminals out of the unit. Optical ModuleBus connections can be removed by pulling the connector(s) out of the unit.

Table 26. Replacement Aspects of S800 I/O Modules (Continued)

Module Type - Settings		Comments
TB840/ TB840A and TU841		TB840/TB840A: Can be replaced with power applied. In redundancy applications, one TB840/TB840A can be replaced, without any affects on channels in an I/O station. TU841:Needs room to the left of an MTU in order to be removed. **Can not** be replaced with power applied.
TB842	No settings	Optical ModuleBus cable can be removed by pulling the connector(s) out of the unit. Can be replaced with power applied. If TB842 should be replaced in a running system the carrier (TB806 or TB846) of TB842 have to be disconnected from the FCI first.
TU841	See TB840	

Appendix A General Specifications

Directives

EMC Directive

All products, mentioned in this document, that bares the CE marking, meet the requirement of the EMC Directive EMCD 2004/108/EC. The following standards have been applied:

- EN 61000-6-4 (2007) EMC, Emission
- EN 61000-6-2 (2005) EMC, Immunity

Low Voltage Directive

All products, mentioned in this document, that bares the CE marking, meet the requirement of the Low Voltage Directive LVD 2006/95/EC. The following standard has been applied:

- EN 61131-2 (2007) Clause 11, 12, 13 and 14.

ATEX directive

All products, mentioned in this document, that bares the Ex symbol, meet the requirement of the ATEX Directive ATEX 94/9/EC. For more information, see Certifications on page 197.

Standards and Approvals

Check how the approvals are applicable for each module.

Electrical Safety

Table 27. Electrical Safety

EN 50178	Electronic Equipment for Use in Power Installations
EN 61131-2 (Clause 11, 12, 13 and 14)	Programmable Controllers Part 2: Equipment Requirements and Tests
UL 508	Industrial Control Equipment.

Hazardous Classified Locations

Table 28. Hazardous Locations

UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres - Part 15: Electrical Apparatus with Type of Protection "n".
EN 60079-15	Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection “n” electrical apparatus.
EN 50020	Electrical apparatus for potentially explosive atmospheres - Intrinsic safety "i"

See Certifications on page 197 for each module type certification details.

CE-marking

S800 products fulfill the requirements of EU-directives 2004/108/EC "Electromagnetic Compatibility" (EMC Directive) and 2006/95/EC "Electrical Equipment Designed for Use between Certain Voltage Limits" (Low Voltage Directive). Declarations of conformity are available on request.
See Certifications on page 197 for each module type certification details.

G3 Compliant

G3 compliant modules fulfills the severity level in the standard ISA-S71.04 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants.

G3 compliant modules shall not be stored in more severe environment than G2 if the contacts are unconnected.

Transport and Storage Conditions

S800 modules should be transported and stored in their original packaging.

Table 29. S800 Storage Conditions

Condition	Range	Standard
Temperature	-40 to +70°C	IEC/EN 61131-2
Humidity	RH = 5 to 95%, no condensation	
Altitude	-500 to +3000 m	
Pollution degree	Degree 2	IEC 60664-1
Corrosive atmosphere	< 1000 Angstrom copper corrosion over 28 days	ISA-71.04 Severity level G2
Fall in package	< 10 kg: 300 mm 10 - 40 kg: 300 mm > 40 kg: 250 mm Free-fall drop height in original product package.	IEC/EN 61131-2
Shock	150 m/s^2, 11 ms	

Climatic operating conditions

Table 30. Climatic Operating Conditions

Condition	Operative range	Standard
Temperature(1)	0 to +55°C non-condensing 0 to +40°C compact MTUs or S800L modules on vertical DIN-rail, see Table 24, non-condensing	IEC/EN 61131-2
Temperature change	3 °C/min	
Humidity	RH = 5 to 95%, no condensation	
Altitude	2000 m	
Pollution degree	Degree 2	IEC 60664-1
Corrosive atmosphere	<1000 Angstrom copper corrosion over 28 days <2000 Angstrom copper corrosion over 28 days	ISA-71.04 Severity level G2 ISA-71.04 Severity level G3

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

Mechanical operating conditions

Table 31. Mechanical Operating Conditions

	Operative range	Standard
Vibration Test **Sinusoidal** **Operational**	5–9 Hz, amplitude 3,5 mm 9-150 Hz, acceleration 1,0g 1 octave/min	IEC/EN 61131-2
Shock	150 m/s^2, 11 ms	IEC/EN 61131-2
Emitted noise	<55 dB (A)	

EMC

Table 32. Radiated Radio Frequency Emission IEC/EN 61000-6-4 (Class A), IEC/EN 61131-2

Radiated Radio Frequency Emission IEC/EN 61000-6-4 (Class A), IEC/EN 61131-2		
Test	**Limits**	**Generic standards**
30 MHz -230 MHz	40 dB (μV/m) quasi peak measured at 10m	EN/IEC 61000-6-4, EN/IEC 61131-2
230 MHz - 1000 MHz	47 dB (μV/m) quasi peak measured at 10m	

Table 33. Conducted Radio Frequency Emission, AC mains port IEC 61000-6-4 (Class A), IEC/EN 61131-2

Conducted Radio Frequency Emission, AC mains port IEC 61000-6-4 (Class A), IEC/EN 61131-2		
Test	**Limits**	**Generic standards**
0,15 MHz -0,50 MHz	79 dB (μV/m) quasi peak 66 dB (μV/m) average	EN/IEC 61000-6-4, EN/IEC 61131-2
0,50 MHz - 30 MHz	73 dB (μV) quasi peak 60 dB (μV/m) average	

Table 34. Immunity IEC/EN 61000-6-2, IEC/EN 61131-2

Immunity IEC/EN 61000-6-2, IEC/EN 61131-2 Continuous...		
Test	**Severity**	**Generic standards**
Radiated RF field	80MHz – 1.0GHz, 10 V/m 1.4GHz – 2.0GHz, 3 V/m 2.0GHz – 2.7GHz, 1 V/m	EN/IEC 61000-6-2, EN/IEC 61131-2
Conducted RF field	0.15MHz-80MHz, 10V	EN/IEC 61000-6-2, EN/IEC 61131-2

Table 35. Transients Immunity

Transients immunity		
Electrostatic discharge	4 kV contact discharge 8 kV air discharge	IEC 61000-6-2, IEC 61131-2
Electrical fast transient/Burst	2 kV, AC/DC, process I/O AC 1 kV, Process I/O DC, analog I/O and com	IEC 61000-6-2, IEC 61131-2
Surge	2 kV common mode, AC/DC power ports, process I/O AC 1 kV differential mode, Process I/O DC, analog I/O and com	IEC 61000-6-2, IEC 61131-2

Overvoltage Categories

Table 36. Overvoltage

Installation type	Category	Standards
Equipment permanently connected to low voltage mains	Overvoltage categories III	IEC/EN 60664-1
Equipment not energized directly from the low voltage mains	Overvoltage categories II	

AC mains power supplies are compliant with Overvoltage Category III networks (industrial mains). All I/O signals are overvoltage II compliant.

Equipment Class and Insulation Voltages

Equipment Class

S800 equipment class is Class 1 according to IEC 60536. Class 1 means protection of electric shock by protective earth connection (PE). In this case this means a PE-connection must be made to the DIN rail.

Insulation Voltage

All accessible ports on S800 modules are galvanically isolated from ground and system. For actual module isolation configuration, please consult module data sheets.

Insulation Test Voltage

Type test, insulation test voltage

500 V a.c. or 700 V d.c. 1 minute for RIV 50V[1] modules

2000 V a.c. 1 minute for RIV 250V modules

Routine Test, insulation test voltage

850 V d.c. 1 second for RIV 50V modules

2000 V a.c. 1 second for RIV 250V modules

1. Modules with a working voltage of less than 50 V have RIV 50 V. RIV 250 V applies to all modules having a working voltage greater than 50 V. It should be noted that insulation test voltage specifications, according to electrical safety standards, do not imply that permanent connection to circuits with voltages greater than the specified Rated Insulation Voltage is allowed. Connection to voltages higher than specified RIV violates electrical safety codes and may expose users to electric shock.

Certifications

The S800 I/O system is continuously enhanced with additional certificates. Table 37 describes the current certifications.

Table 37. Current Certifications for S800 Modules

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
Analog Input Modules						
AI801	X	X	X			
AI810	X	X	X			
AI815	X	X	X			
AI820	X	X	X			
AI825	X	X				
AI830	X	X	X			
AI830A	X	X	X			
AI835	X	X	X			
AI835A	X	X	X			
AI843	X	X	X			
AI845	X	X	X			
AI880/ AI880A	X	X	X	X		X
AI890	X				X	
AI893	X				X	

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
AI895	X				X	
Analog Output Modules						
AO801	X	X	X			
AO810	X	X	X			
AO810V2	X	X	X			
AO815	X	X	X			
AO820	X	X	X			
AO845	X	X	X			
AO845A	X	X	X			
AO890	X				X	
AO895	X				X	
Field Communication Interface						
CI801	X	X	X			
CI810B	X	X	X			
CI820V1	X	X	X			
CI830	X	X	X			
CI840	X	X	X			

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
CI840A	X	X	X			
TB815	X	X	X			
Advant Fieldbus 100						
TC501V150	X					
TC506	X					
TC513V1	X					
TC514V2	X					
TC515V2	X					
Digital Input Modules						
DI801	X	X	X			
DI802	X	X				
DI803	X	X				
DI810	X	X	X			
DI811	X	X	X			
DI814	X	X	X			
DI818	X					
DI820	X	X				

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
DI821	X	X				
DI825	X	X				
DI828	X					
DI830	X	X	X			
DI840	X	X	X			
DI880	X	X	X	X		X
DI885	X	X	X			
DI890	X				X	
Digital Output Modules						
DO801	X	X	X			
DO802	X	X				
DO810	X	X	X			
DO814	X	X	X			
DO815	X	X	X			
DO818	X					
DO820	X	X				
DO821	X	X				
DO828	X					

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
DO840	X	X	X			
DO880	X	X	X	X		X
DO890	X				X	
Power supply and voter						
SD821(4)	X	X				
SD822(4)	X	X				
SD823(4)	X	X				
SS822(4)	X	X				
SD832	X	X				
SD833	X	X				
SD834	X	X	X			
SS823	X	X	X			X
SS832	X	X				
Pulse Counting Modules						
DP820	X	X	X			
DP840	X	X	X			

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
Module Termination Units						
TU807	X	X	X			
TU810V1	X	X	X			
TU811V1	X	X				
TU812V1	X	X	X			
TU813	X	X				
TU814V1	X	X	X			
TU818	X					
TU819	X					
TU830V1	X	X	X			
TU831V1	X	X				
TU833	X	X	X			
TU834	X	X	X			
TU835V1	X	X	X			
TU836V1	X	X				
TU837V1	X	X				
TU838	X	X	X			
TU839	X	X				
TU840	X	X	X	X		

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
TU841	X	X	X	X		
TU842	X	X	X	X		
TU843	X	X	X	X		
TU844	X	X	X	X		
TU845	X	X	X	X		
TU846	X	X	X			
TU847	X	X	X			
TU848	X	X	X			
TU849	X	X	X			
TU850	X	X	X			
TU851	X					
TU852	X					
TU854	X					
TU890	X				X	
TU891	X					
TY801	X	X	X	X		
TY804	X					
ModuleBus Communication Parts						
TB805	X	X	X			

Table 37. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
TB806	X	X	X			
TK801V003	X					
TK801V006	X					
TK801V0012	X					
TB807	X	X	X			
TB810	X	X	X			
TB811	X	X	X			
TB820V2	X	X	X			
TB825	X	X	X			
TB826	X	X	X			
TB840/ TB840A	X	X	X	X		
TB842	X	X	X			
TB845	X	X	X			
TB846	X	X	X			

(1) Marking for mounting and interface: Class 1 Zone 2 AEx nA IIC T4 Gc X
(2) Marking for mounting and interface: Ex II 3G Ex nA IIC T5 Gc
(3) Marking for mounting: Ex II 3G Ex nA II T4
Marking for interface: Ex II (1)G [EEx ia] IIC
(4) cULus; UL508, UL1950, CSA 22.2 No 950

Appendix B Specifications

SD82x Power Supply Modules, 24 V d.c.

Key Features

- Simple DIN-rail mounting
- Input a.c. or d.c.
- Class I Equipment, (when connected to Protective Earth, (PE))
- Over-voltage Category III for connection to primary main TN network of Installation Category III
- Protective separation of secondary circuit from primary circuit.
- Secondary outputs;
  - SD823 = 24 Volts d.c. regulated @ 10 A
  - SD822 = 24 Volts d.c. regulated @ 5 A
  - SD821 = 24 Volts d.c. regulated @ 2.5 A
- Accepted for SELV and PELV applications

Equipment Class

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

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

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

For PELV applications; in accordance with EN 50178.

Ingress Protection

IP20 according to EN 60529, IEC 60529

Protective Class I according to EN 50718; 3.56

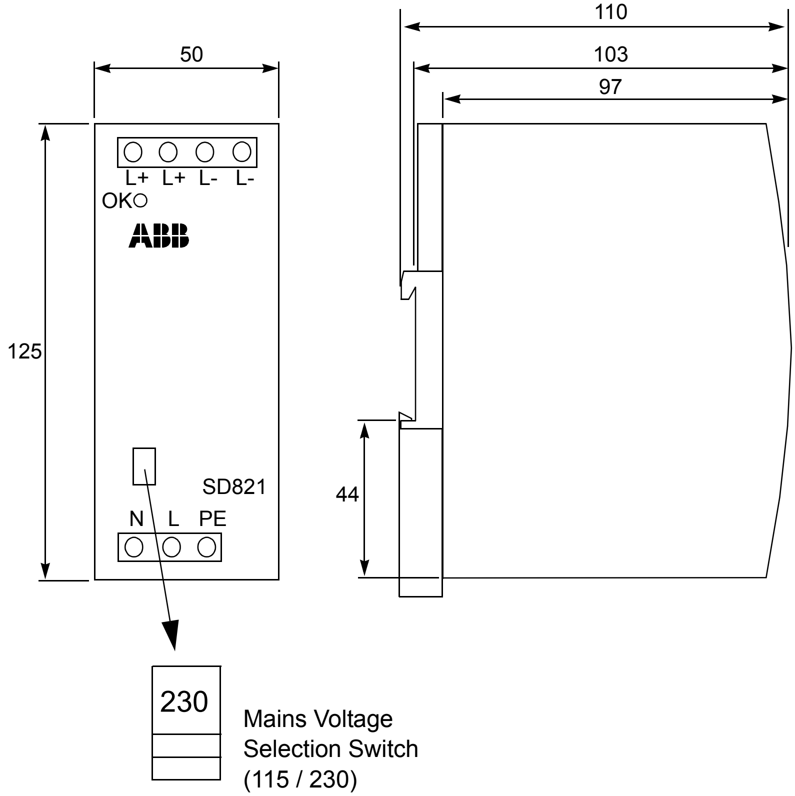


Figure 85. SD821 Connections for 2.5 A Power Supply

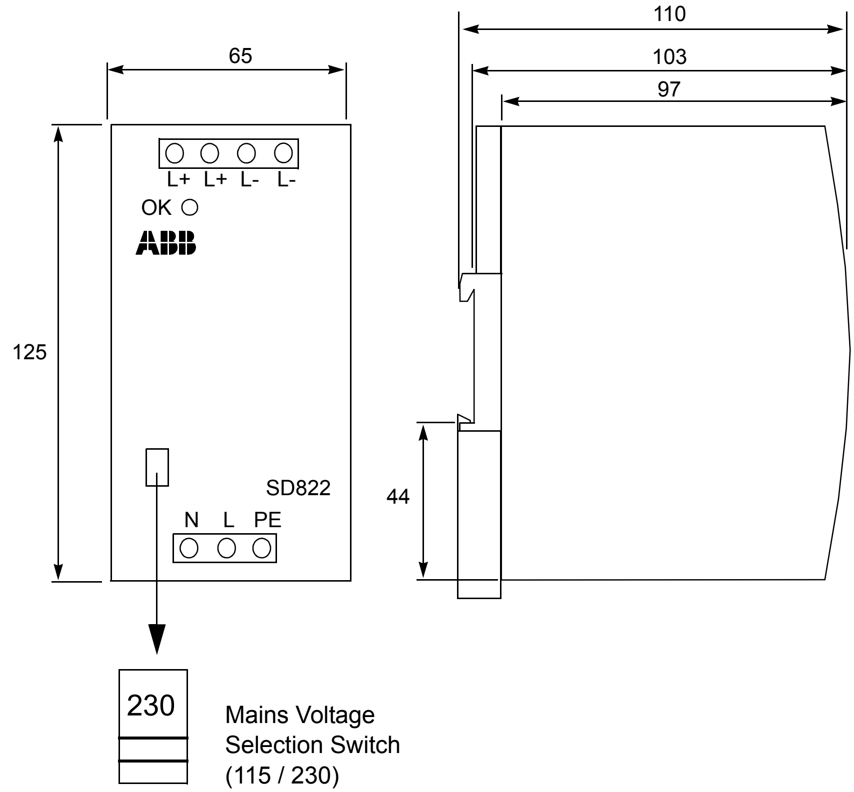


Figure 86. SD822 Connections for 5 A Power Supply

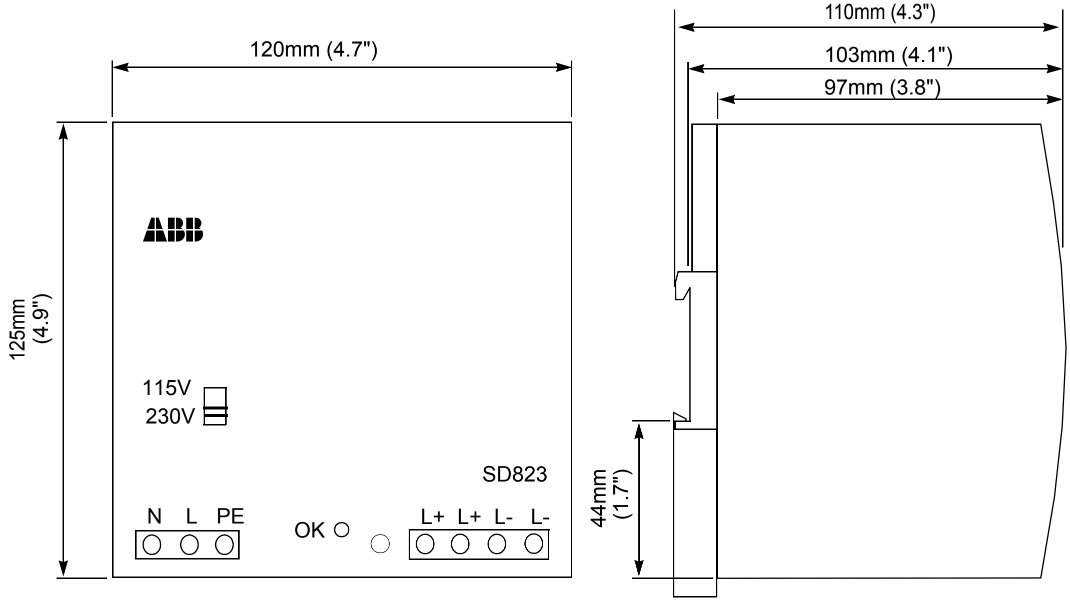


Figure 87. SD823 Connections for 10 A Power Supply

Power Supply Units Types SD821 / 822 / 823 - Description

ABB recommend the use of these robust and reliable power supply units, (PSUs), for providing power to the S800I/O system, when connected to an industrial mains network of installation category III. PSUs can be used for both non-redundant and redundant applications.

The three PSUs were designed as switch mode power converters, that is, converting a.c. mains supply voltage to a regulated 24 V d.c. output. The three converters have rated output capacities as follows:

- SD823 = 24 Volts d.c. regulated @ 10 A
- SD822 = 24 Volts d.c. regulated @ 5 A
- SD821 = 24 Volts d.c. regulated @ 2.5 A

The mains input voltage is set to either 115 V or 230 V by means of a switch mounted on the front face of the module. The factory default for this switch is in the 230 V position.

The output voltage of all three PSUs is, as stated, a regulated, low noise, 24 V d.c. A green LED, mounted on the PSU front panel, indicates that the output circuit is providing the correct output voltage level. The double connectors, provided on the 24 V d.c. output terminals, allow for the connection of more than one equipment.

A surge current limiter within the PSU circuit, provides a soft-start feature. The controlled power-on of a PSU therefore, will not trip fuses or earth-fault circuit breakers. In addition, the normal disturbances that occur within an industrial main network will not cause any transient fault conditions or trips to occur.

This means that the surge current limiter will effectively reduce the peak inrush current, caused by a power disruption, to a level that the PSU can tolerate.

This soft-start, surge current limiter facility provides ease of design for the system power distribution circuits.

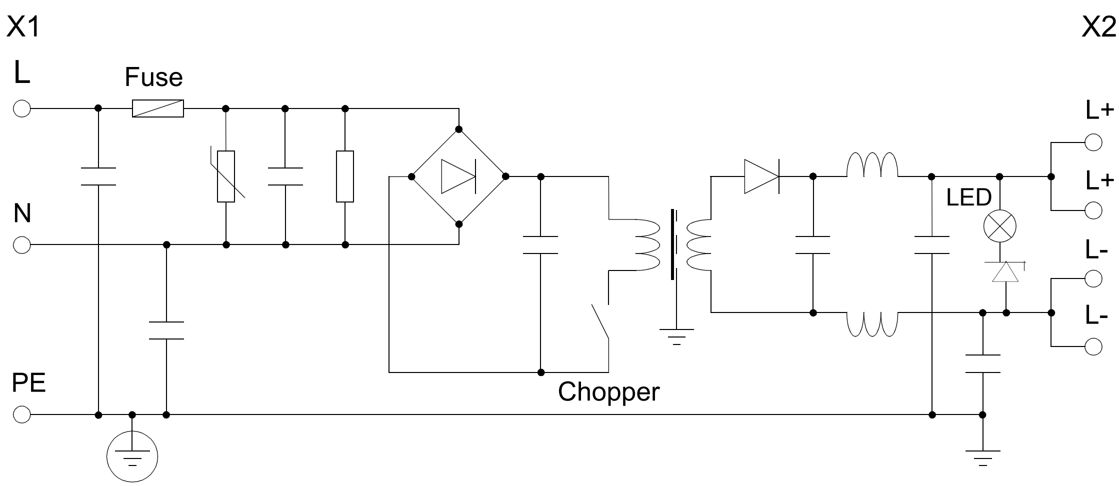


Figure 88. PSUs SD821, 822 and 823 - Block Diagram

Insulation of Power Supply Units (PSU)

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

Rated insulation voltage Primary to Secondary 300 V a.c.

Dielectric test voltage 3000 V a.c. (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 primary main network; TN network, 1 (one) fuse. Recommended primary external fuse:

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

Table 38. Power Supply Units - Fuses and Protective Devices

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

(1) Microcircuit Breaker (MCB), Characteristic B

Technical Data

Table 39. PSUs SD821, 822 and 823 - Technical Data

Parameter	SD821 Converter	SD822[1] 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 a.c. 225-250 V d.c.	115/230 V a.c. 225-250 V d.c.	115/230 V a.c. 250 V d.c.
Mains voltage variation allowed	85 - 110%	85 - 110%	85 - 110%
Mains/input voltage, max. (a.c.= 45-65 Hz)	138/275 V a.c. 375 V d.c.[2]	138/275 V a.c. 375 V d.c.[2]	138/275 V a.c.375 V d.c.[2]
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 39. PSUs SD821, 822 and 823 - Technical Data (Continued)

Parameter	SD821 Converter	SD822[1] Converter	SD823 Converter
Maximum ambient temperature	55°C[3]	55°C[3]	55°C[3]
Acceptable wire sizes: Solid Stranded Recommended Torque	 0.5 - 0.6 mm^2 0.5 - 4mm^2 22 - 14 AWG 0.8 Nm	 0.5 - 0.6 mm^2 0.5 - 4mm^2 22 - 14 AWG 0.8 Nm	 0.5 - 0.6 mm^2 0.5 - 4mm^2 22 - 14 AWG 0.8 Nm

(1) SD822Z is G3 compliant version according to ISA-S71.04.
(2) At d.c. input, always leave the mains voltage switch in position 230 V. Connect d.c. + to terminal L and d.c. - to terminal N
(3) Mounting on a horizontal DIN rail

Table 40. PSUs 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 (1.97”)	65 mm (2.56”)	120 mm (4.72”)
Mounting spacing W mm	10 mm (0.39”)	15 mm (0.59”)	15 mm (0.59”)
Mounting spacing H mm	25 mm (0.98”)	25 mm (0.98”)	25 mm (0.98”)
Weight (lbs.)	460 g (1.0 lbs.)	620 g (1.4 lbs.)	980 g (2.2 lbs.)

SD83x Power Supply Modules, 24 V d.c.

Key Features

- Simple DIN-rail mounting.
- Class I Equipment, (when connected to Protective Earth, (PE)).
- Over-voltage Category III for connection to primary main TN network of Installation Category III.
- Protective separation of secondary circuit from primary circuit.
- Accepted for SELV and PELV applications.
- The output of the units is protected against over current (current limit) and over voltage (OVP).
- SD834 can be connected in parallel to increase output power.
- Both a.c. and d.c. input at SD831 and SD834.
- Floating DC-OK relay contact at SD834.

Equipment Class

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

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

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

For PELV applications; in accordance with EN 50178.

UL 508, listed E 198865.

Ingress Protection

IP20 according to EN 60529, IEC 60529

Protective Class I according to EN 50718; 3.56

Dimensions and Connections

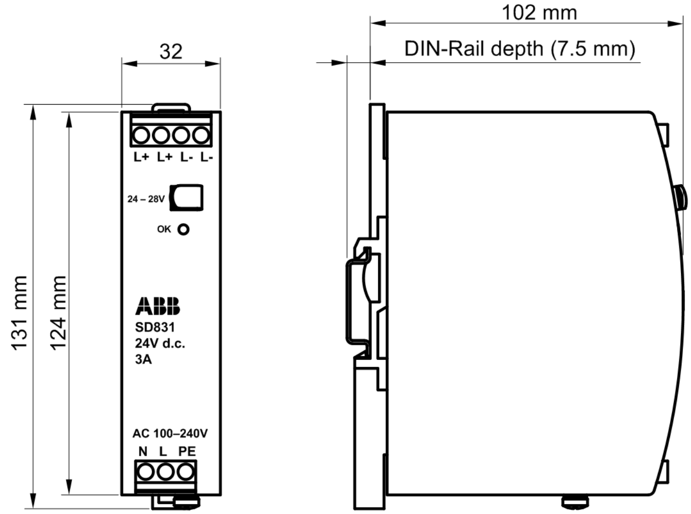


Figure 89. SD831 Dimension and Connections for 3 A Power Supply

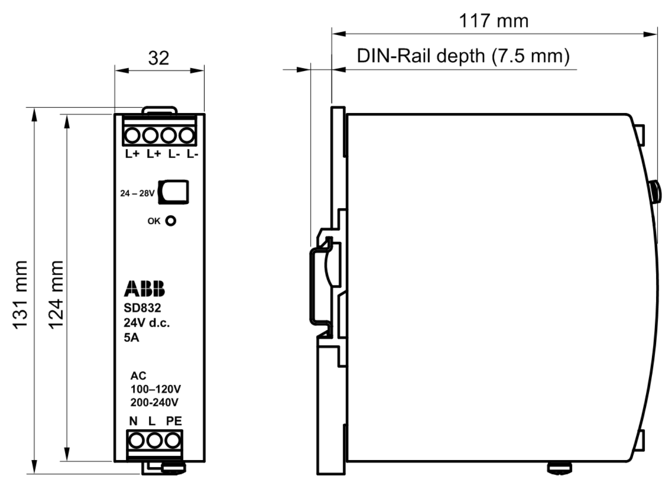


Figure 90. SD832 Dimensions and Connections for 5 A Power Supply

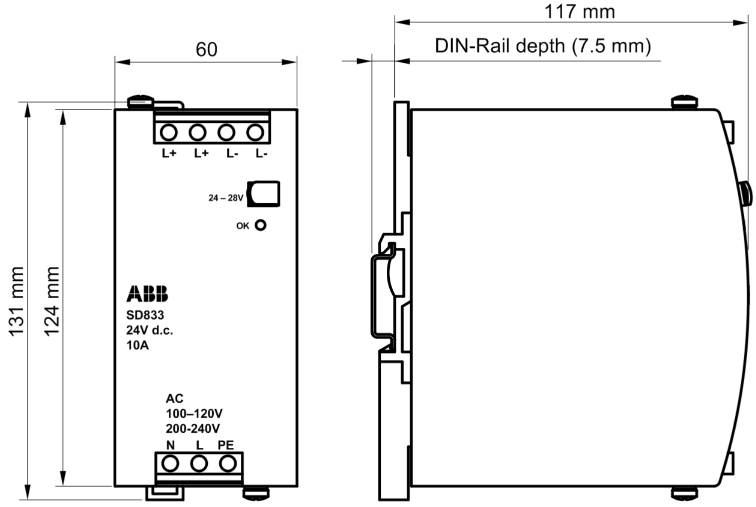


Figure 91. SD833 Connections for 10 A Power Supply

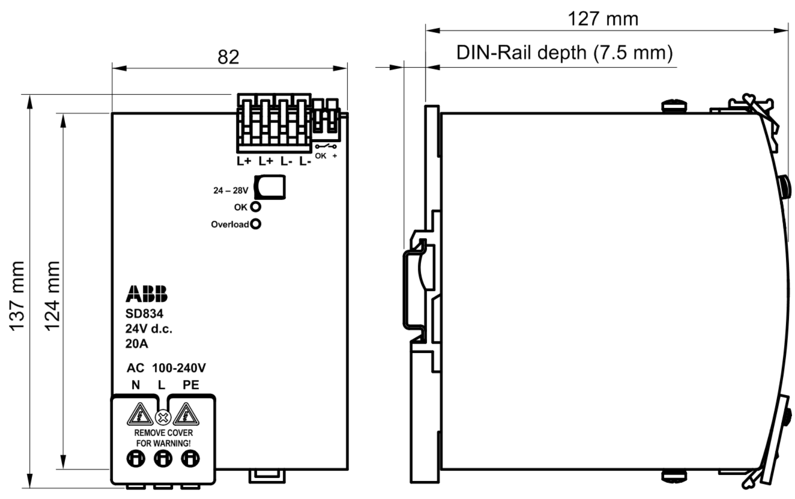


Figure 92. SD834 Connections for 20 A Power Supply

Power Supply Units Types SD831 / 832 / 833 / 834- Description

ABB recommend the use of robust and reliable power supply units, (PSUs), for providing power to the AC800 and S800I/O system, when connected to an industrial mains network of installation category III. PSUs can be used for both non-redundant and redundant applications.

The four PSUs are designed as switch mode power converters. They converting a.c. or d.c. mains supply voltage to a regulated d.c. 24 V output. The four PSUs have data as follows:

– SD831 = Input a.c. 100-240 V or d.c. 110-300 V.

  Output d.c. 24 Volts regulated @ 3 A.

– SD832 = Input a.c. 100-120 or 200-240 V.

  Output d.c. 24 Volts regulated @ 5 A

– SD833 = Input a.c. 100-120 or 200-240 V.

  Output d.c. 24 Volts regulated @ 10 A

– SD834 = Input a.c. 100-240 V or d.c. 110-300 V.

  Output d.c. 24 Volts regulated @ 20 A

The output voltage of the four PSUs is, as stated, a regulated, low noise, d.c. 24 V. A LED, mounted on the PSU front panel indicates that the output voltage is within range.

The PCS´s provide a soft start feature. The controlled power-on of a PSU therefore, will not trip fuses or earth-fault circuit breakers. In addition, the normal disturbances that occur within an industrial main network will not cause any transient fault conditions or trips to occur.

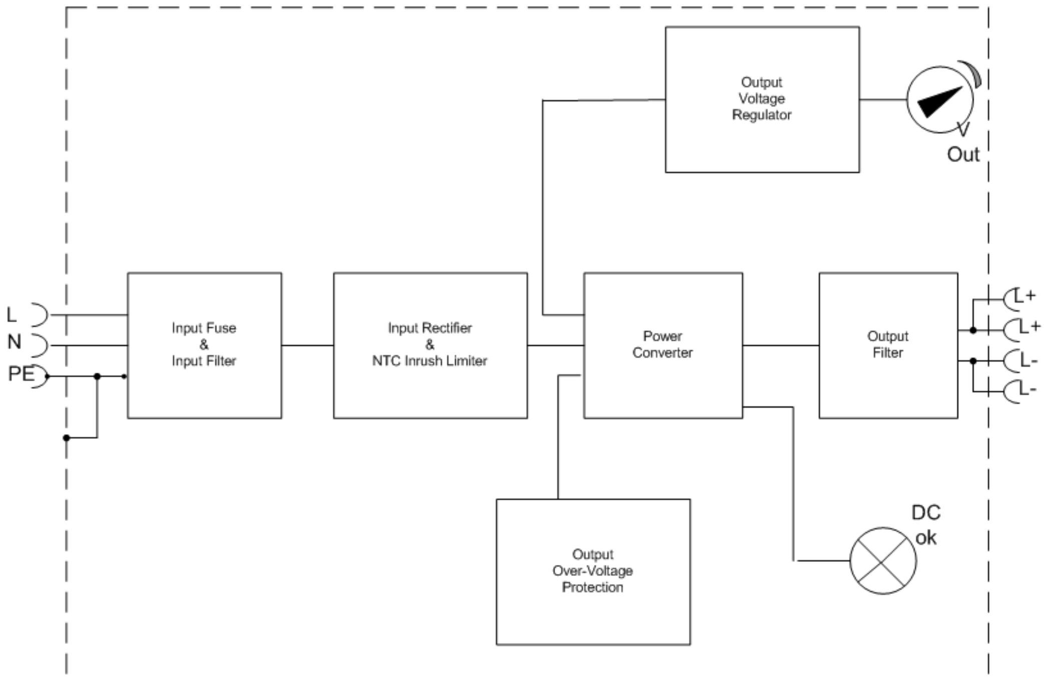


Figure 93. Functional Diagram SD831 for a 3 A Power Supply

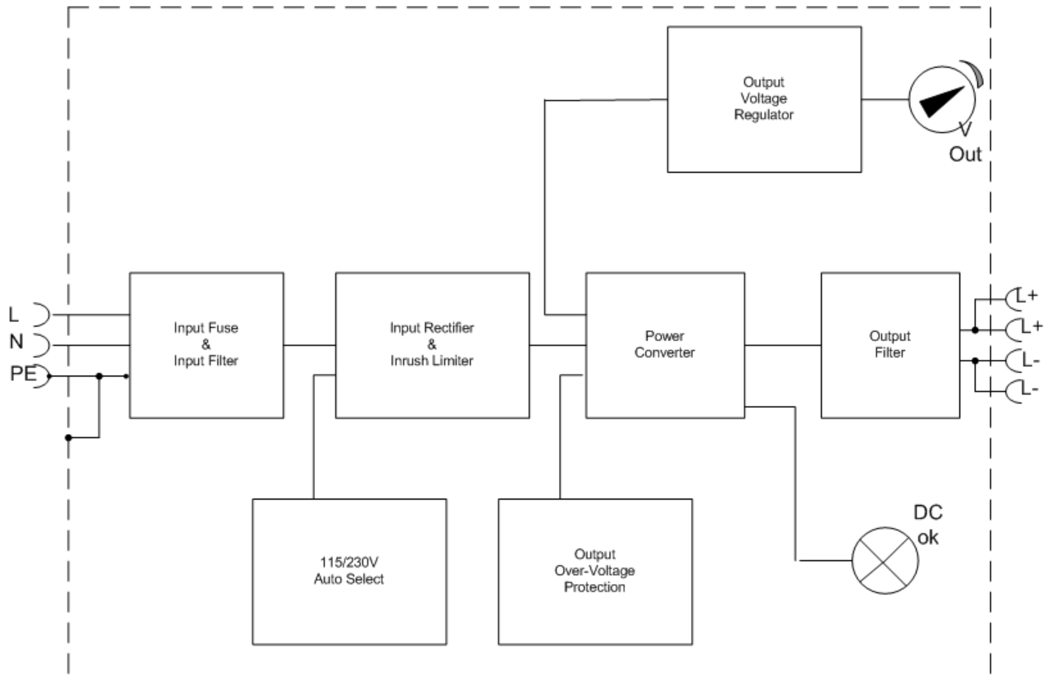


Figure 94. Functional Diagram SD832/SD833 for a 5 A/ 10 A Power Supply

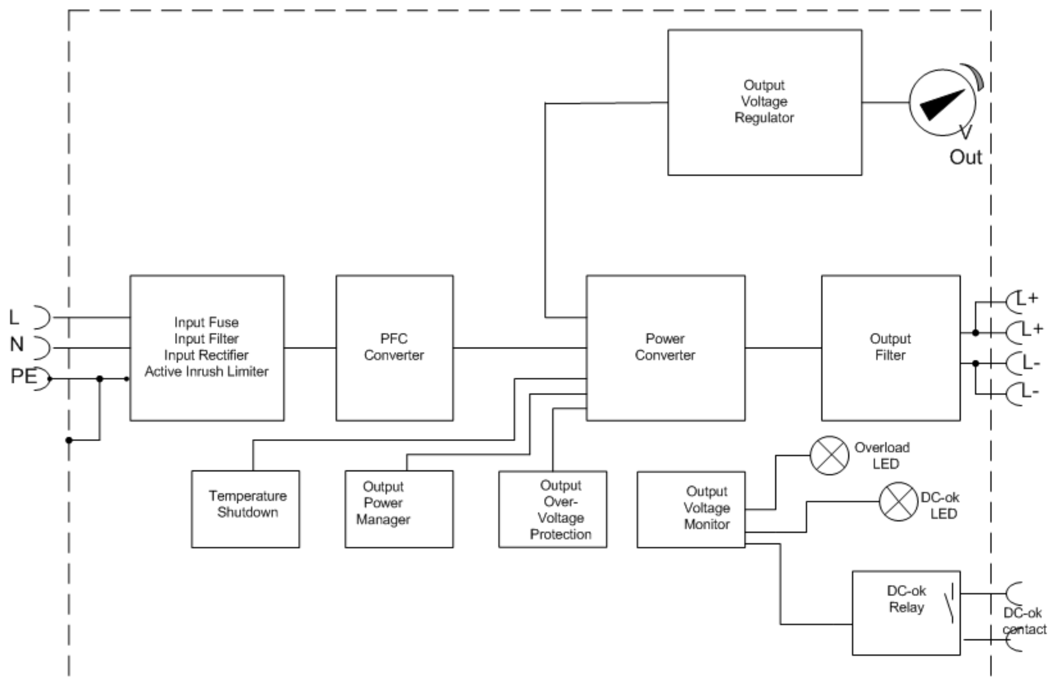
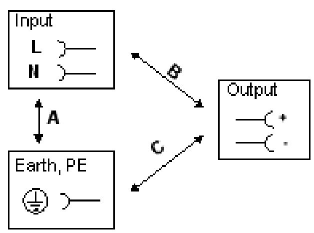


Figure 95. Functional Diagram SD834 for a 20 A Power Supply

Dielectric strength

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

Table 41. Dielectric Strength

		A	B	C
	Dielectric test voltage	a.c. 2500V	a.c. 3000V	a.c. 500V
	Field test	a.c. 2000V	a.c. 2000V	a.c. 500V
	Rules for Field test: Use appropriate test equipment which applies the voltage with a slow ramp. Connect L and N together as well as all output poles.			

DC-OK relay contact (SD834 only)

This feature monitors the output voltage, which is produced by the power supply itself. It is independent of a back fed voltage from a unit that is connected in parallel to the power supply output.

Short dips will be extended to a signal length of 250ms. Dips shorter than 1ms will be ignored.

Contact closes: for output voltage > 90% of the adjusted output voltage.

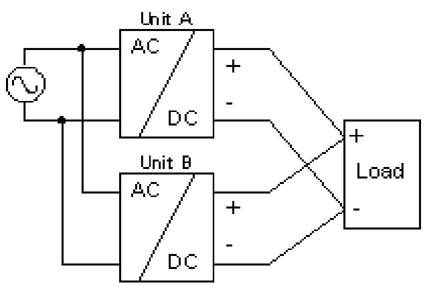
Contact opens: for output voltage dips > 10% below the adjusted output voltage.

Contact ratings: max 60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A resistive load
Min. >1mA, >5 V over open contact.

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

SD834 in parallel to increase output power

Table 42. SD834 Schematic and Instructions for parallel use.

Schematic for parallel operation	Instructions for parallel use
	a) Only SD834 can be used in parallel connection. b) Adjust the output voltages of all power supplies to approximately the same value (±500mV). Otherwise, the DC-OK signal might not work properly. c) A fuse (or diode) on the output is only required if more than three units are connected in parallel. d) Do not continuously load the terminals with more than 25A. Keep an installation clearance of 15mm (left/right) between two power supplies and avoid installing the power supplies on top of each other.

Installation, Fuses and Protective Devices

The PSU's should be mounted horizontally at a DIN rail. The PSU's have to be used in non-hazardous locations only.

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

Table 43. Power Supply Units - Fuses and Protective Devices Power Supply Units Types SD83x

Fuse	SD831	SD832	SD833	SD834
Primary: Recommended external fuse (1) min/max	6 - 20A	6 - 20A	6 - 20A	10 - 20A
Secondary: Short circuit	<8 A	<14 A	<18 A	<40 A
Secondary: Over-Voltage protection	<39 V	<39 V	<39 V	<37 V

(1) Microcircuit Breaker (MCB), Characteristic C or a delayed action fuse.

Table 44. PSU's SD831, 832, 833, 834 - Mounting space and weight.

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

(1) Do not place temperature sensitive units above the PSU.
(2) Do not place units with high power dissipation below the PSU.

Technical Data

Table 45. Technical Data PSU's SD831, 832, 833 and 834

Parameter	SD831 Converter	SD832 Converter	SD833 Converter	SD834 Converter
Rated output current (A)	3 A	5 A	10 A	20 A
Rated power output	72 W	120 W	240 W	480 W
Rated output voltage	d.c. 24 V	d.c. 24 V	d.c. 24 V	d.c. 24 V
Rated input power a.c. 120/230 V	134/143 VA 82/80 W	240/283 VA 134/133 W	447/514 VA 264/262 W	547/568 VA 519/511 W
Mains/input voltage, nominal. a.c. 47-63Hz	a.c. 100-240 V d.c. 110-300 V	a.c. 100-120 V a.c. 200-240 V Auto-select input	a.c. 100-120 V a.c. 200-240 V Auto-select input	a.c. 100-240 V d.c. 110-300 V
Mains voltage variation allowed	a.c. 90-264 V d.c. 88-375 V	a.c. 90-132 V a.c. 180-264 V	a.c. 90-132 V a.c. 180-264 V	a.c. 85-276 V d.c. 88-375 V
Max input voltage <0.5s	a.c. 264-300 V	a.c. 264-300 V	a.c. 264-300 V	a.c. 276-300 V
Primary peak current at power on at a.c.120/230V	<28/<54 A	<10 A	<10 A	<13 A

Table 45. Technical Data PSU's SD831, 832, 833 and 834 (Continued)

Parameter	SD831 Converter	SD832 Converter	SD833 Converter	SD834 Converter
Power Factor (at rated output power) a.c. 120/230V typ	0.61/0.56	0.56/0.47	0.59/0.51	0.95/0.90
Heat dissipation a.c. 120/230 V	10/8 W	14/13 W	24/22 W	39.6/31.4 W
Efficiency factor a.c. 120/230 V typ	88/89.8%	89.4/90.2%	91/91.6%	92.4/93.9%
Line/load regulation	< 50 mV /< 100 mV	< 70 mV /< 100 mV	< 70 mV /< 100 mV	< 10mV /< 100mV
Ripple (peak to peak)	< 50 mV	< 50 mV	< 50 mV	< 100mV
Holdup time at mains blackout a.c. 120/230 V typ	29/120 ms	80/78 ms	46/47 ms	32/51 ms
Maximum output current	3.3 A	6 A At ambient temp < 45 ^{o}C	12 A At ambient temp < 45 ^{o}C	30 A < 4 s
Maximum ambient temperature(1)	55 ^{o}C	55 ^{o}C	55 ^{o}C	55 ^{o}C
Acceptable wire sizes Power connection terminals	Solid: 0.5 – 6 mm^2 Stranded wire: 0.5 – 4 mm^2, 20 – 10 AWG Recommended torque: 0.8 Nm			
Acceptable wire sizes DC-OK-signal terminals				Solid: 0.3 - 4 mm^2 Stranded wire: 0.3 - 2.5 mm^2, 26 - 12 AWG

(1) Mounting on a horizontal DIN rail.

Voting Unit - (for Redundant Power Supply)

The Voting Unit has been specifically designed to be employed as a control unit within a redundant power supply configuration. The output connections from two Power Supply Units, (PSUs), are connected to the Voting Unit.

The Voting Unit separates the redundant PSUs, supervises the voltage supplied, and generates supervision signals to be connected to the computer system. Green LED's, mounted on the front panel of the voting unit, provide a visual indication that the correct output voltage is being delivered. Simultaneously with the green LED illuminating, a voltage free contact closes the path to the corresponding "OK connector". Voting Unit trip level's, are factory preset. Three different types of voting units are available:

SS822 up to 20 A.
SS823 up to 20 A, with over voltage protections and enlarge diagnostics.
SS832 up to 10A.
See Table 46 for the selection of voting unit based on the type of power supply.

Table 46. Selection of Voting Unit

	SS822	SS832	SS823
SD831	(x1)	x1	x2
SD832	(x1)	x1	x2
SD833	(x1)	x2	x2
SD834	(x2)	x2	x2

(x#) not preferred solution, x2 it needs two in parallel.

SS822

For SS822 Block diagram and Dimensions see Figure 96 and Figure 97.Table 47 and Table 48 shows the supervision data and the technical data respectively. For connection of SS822 in a redundant configuration see Figure 98.

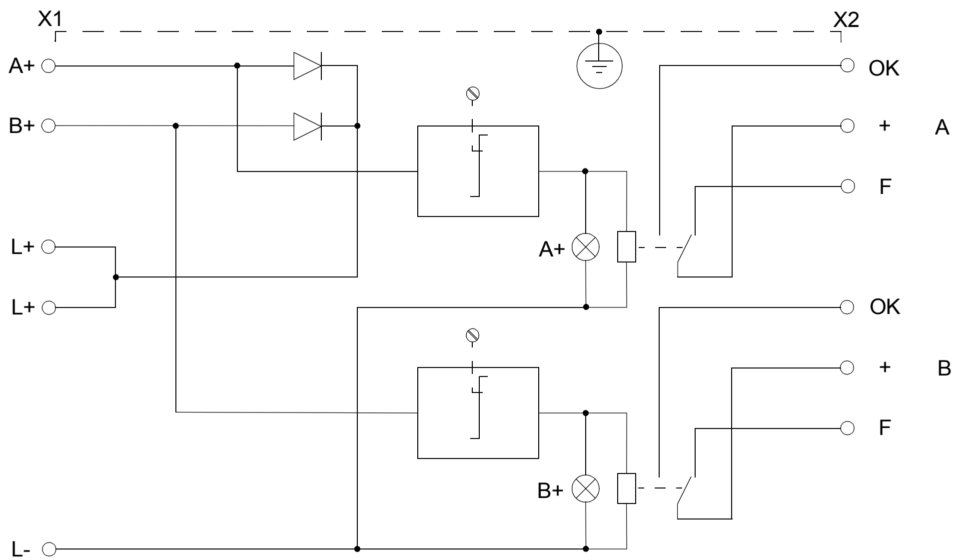


Figure 96. SS822 Block Diagram

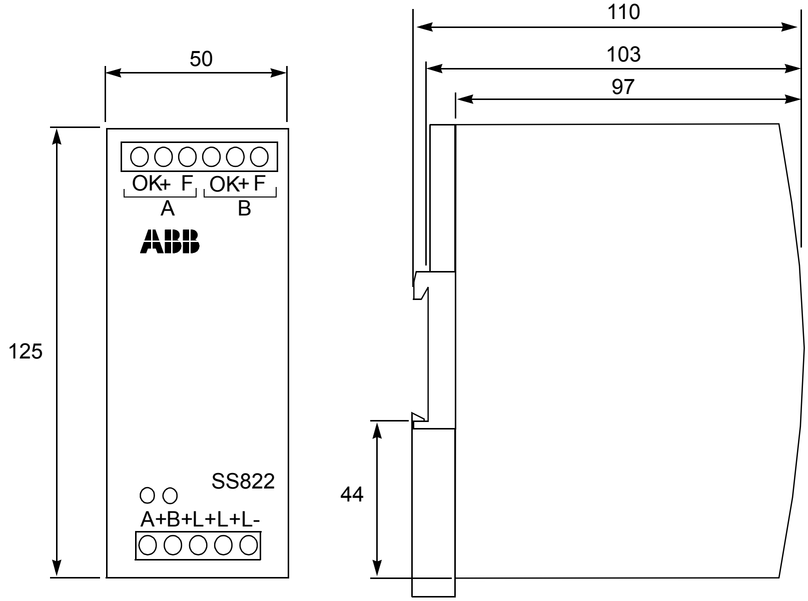


Figure 97. SS822 Voting Unit Connections

Table 47. SS822 Voting Unit - Supervision Data

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

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

Table 48. SS822 - Technical Data and Mounting Dimensions

Parameter	SS822 Voter
Rated output current (A)	20 A
Rated output voltage	35 V
Rated input power	500 W
Mains/input voltage, nominal	2 x 24 V d.c.
Rated/input voltage	35 V d.c.
Heat dissipation	10 W at 20 A and 2,5 W at 5 A
Output voltage regulation at max. current	0,5 V lower than input
Maximum output current	35 A (Overload)
Ingress Protection	IP20 according to EN60529, IEC 60529.
Max ambient temperature	55^{o}C(1)
Acceptable wire sizes Input/output terminals	Solid: 0.5 - 6 mm^2 Stranded: 0.5 - 4mm^2, 20 - 10 AWG Recommended torque: 0.8 Nm
Acceptable wire sizes Supervision output terminals	Solid: 0.2 - 1.5 mm^2 Stranded: 0.2 - 1.5 mm^2, 22 - 14 AWG Recommended torque: 0.8 Nm
Dimensions, Width HxD = 125 x 110 mm (4.9 x 4.3 inches)	50 mm (1.97”)
Mounting spacing W mm	10 mm (0.39”)
Mounting spacing H mm	25 mm (0.98”)
Weight (lbs.)	630 g (1.4 lbs.)

(1) Mounting on a horizontal DIN rail

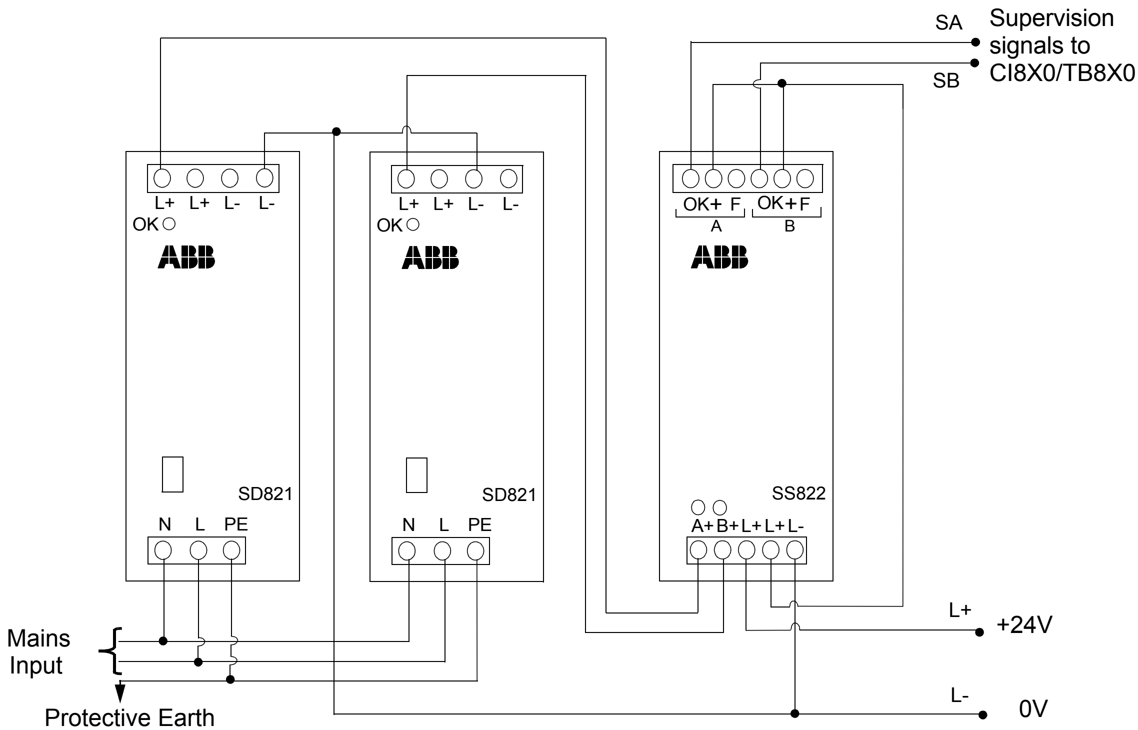


Figure 98. SS822 - Used in Redundant SD821 Configuration

SS823

The SS823 Voting Unit has double overvoltage protection circuit on both inputs. It is also able to detect both short and open circuit in the voting element. For details see Table 50.

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

Block diagram and dimensions for SS823 see Figure 99 and Figure 100. Table 49 and Table 50 shows supervision data and technical data for SS823. For connection of SS823 in a redundant configuration see Figure 101.

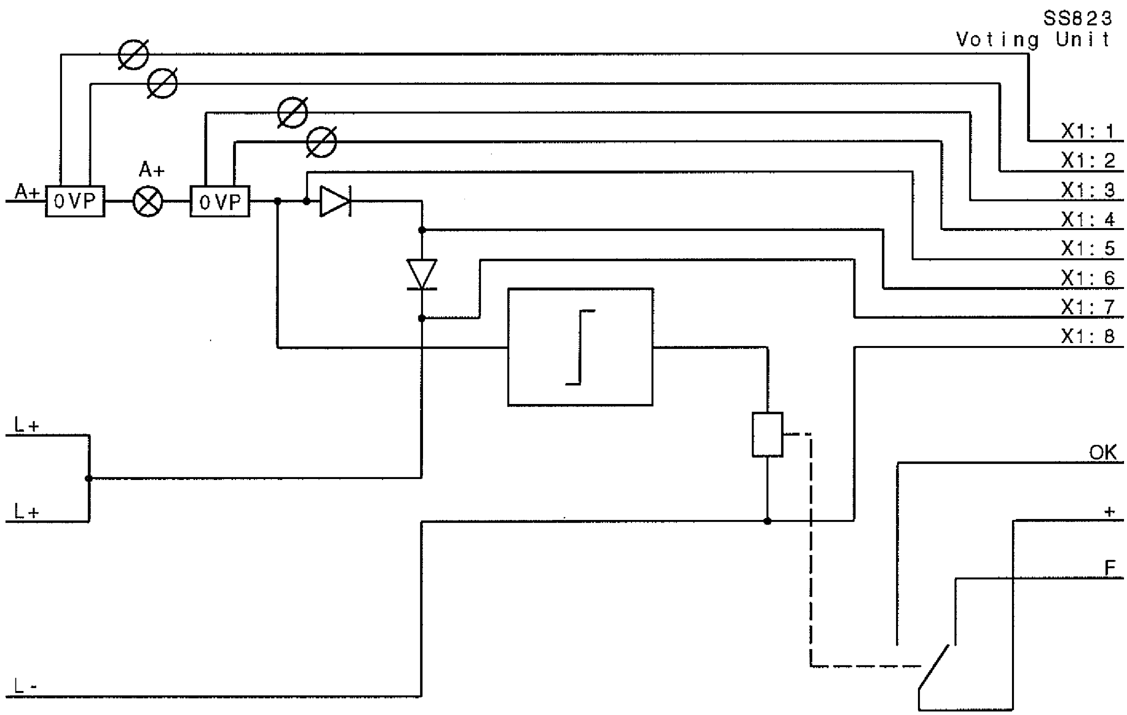


Figure 99. SS823 Block Diagram

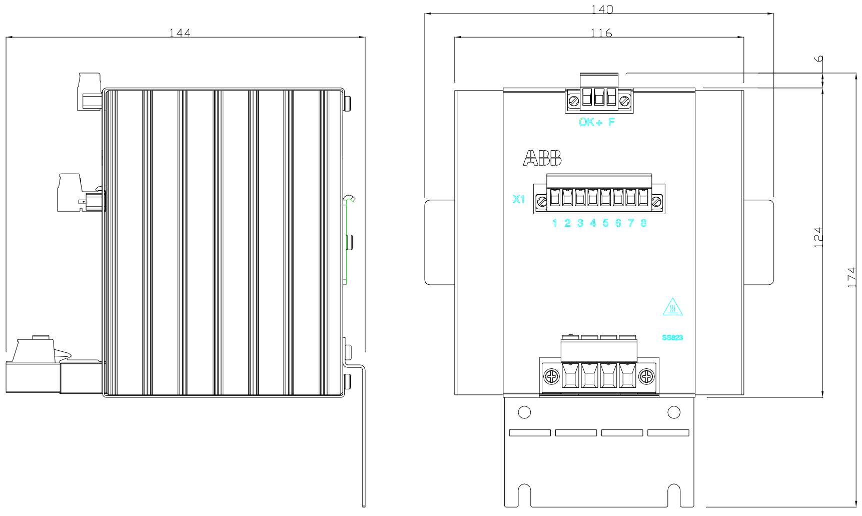


Figure 100. SS823 Power Voter Unit Connections

Table 49. SS823 Power Voter Unit - Supervision Data

Supervision Data	SS823
Voltage, high trip level for rising voltage	30 V
High trip hysteresis	0.7 V
Contact rating a.c.	Max. 120 V and max. 0.5 A
Contact rating d.c.	Max. 28 V and max. 1 A; min. 1 mA, recommended min. 5 mA

Table 50. SS823 - Technical Data and Mounting Dimensions

Parameter	SS823 Voter
Rated output current (A)	20 A
Rated output voltage	24 V
Rated input power	500 W
Mains/input voltage, nominal	24 V d.c.
Mains/input voltage, max	30 V d.c.(1)
Dual level OVP (Overvoltage protection)	Trip 32.0 V nominal Return 31.5 V nominal
Heat dissipation	24 W max
Output voltage regulation at max. current	1.2 V lower than input
Maximum output current	Static 35 A typical, dynamic 150 A for 100 µs typical
Ingress Protection	IP20 according to EN60529, IEC 60529.
Max ambient temperature	55°C(2)
Acceptable wire sizes Connector X1 and OK+F	0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm
Acceptable wire sizes Connector A+, L+, L-	0.2 - 6 mm^2, 24 - 10 AWG Recommended torque: 0.7 - 0.8 Nm
Mounting spacing W mm	15 mm (0.59”)
Mounting spacing H mm	25 mm (0.98”)
Width	140 mm (5.51”)
Depth	144 mm (5.67”
Height	174 mm (6.85”)
Weight	800 g (1.8 lbs.)

(1) Electronically limited by OVP, voltage between 32 V and 60 V will result in 0 V output
(2) Mounting on a horizontal DIN rail

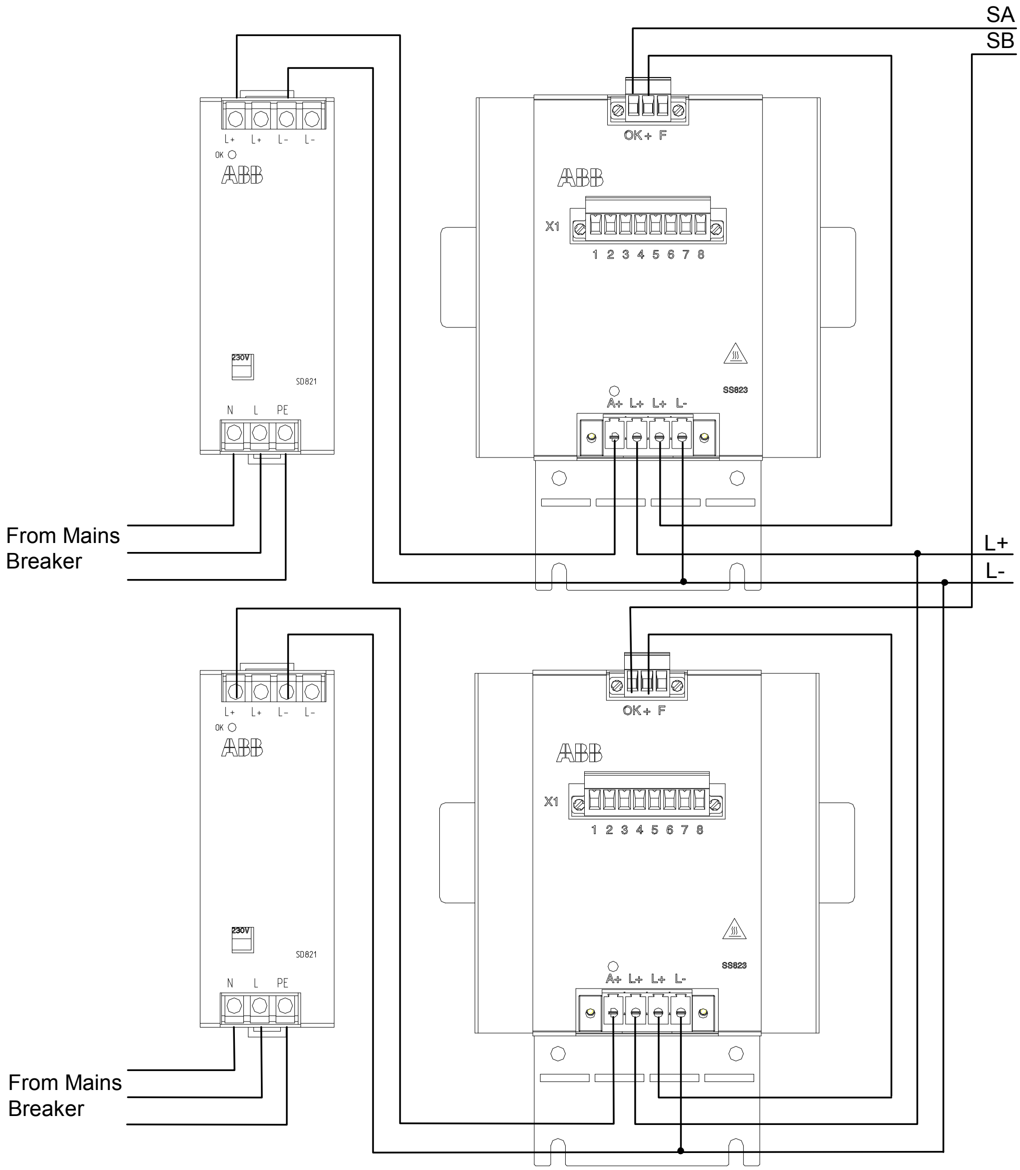


Figure 101. SS823 - Used in Redundant SD821 Configuration

SS832

SS832 is can be used directly for load up to 10 A and for loads up to 20 A two SS832 modules must be used. See Figure 103 and Figure 104.

For Block diagram and connections of SS832 see Figure 102 and Figure 105. Table 51 and Table 52 shows supervision data and technical data respectively. Figure 106 shows connection of SS832 in redundant configuration with maximum 10 A load, see Figure 107 for load up to 20 A.

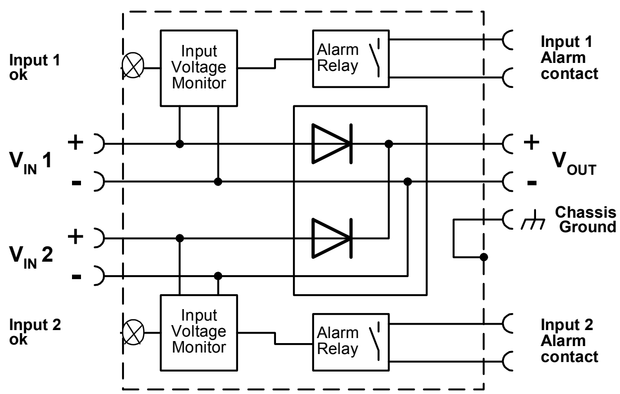


Figure 102. SS832 Block Diagram

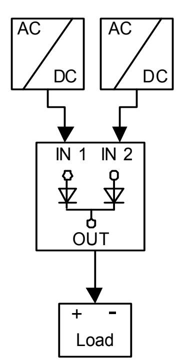


Figure 103. SS832 up to 10 A

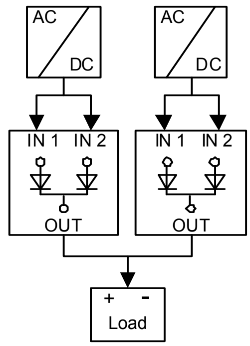


Figure 104. SS832 up to 20 A

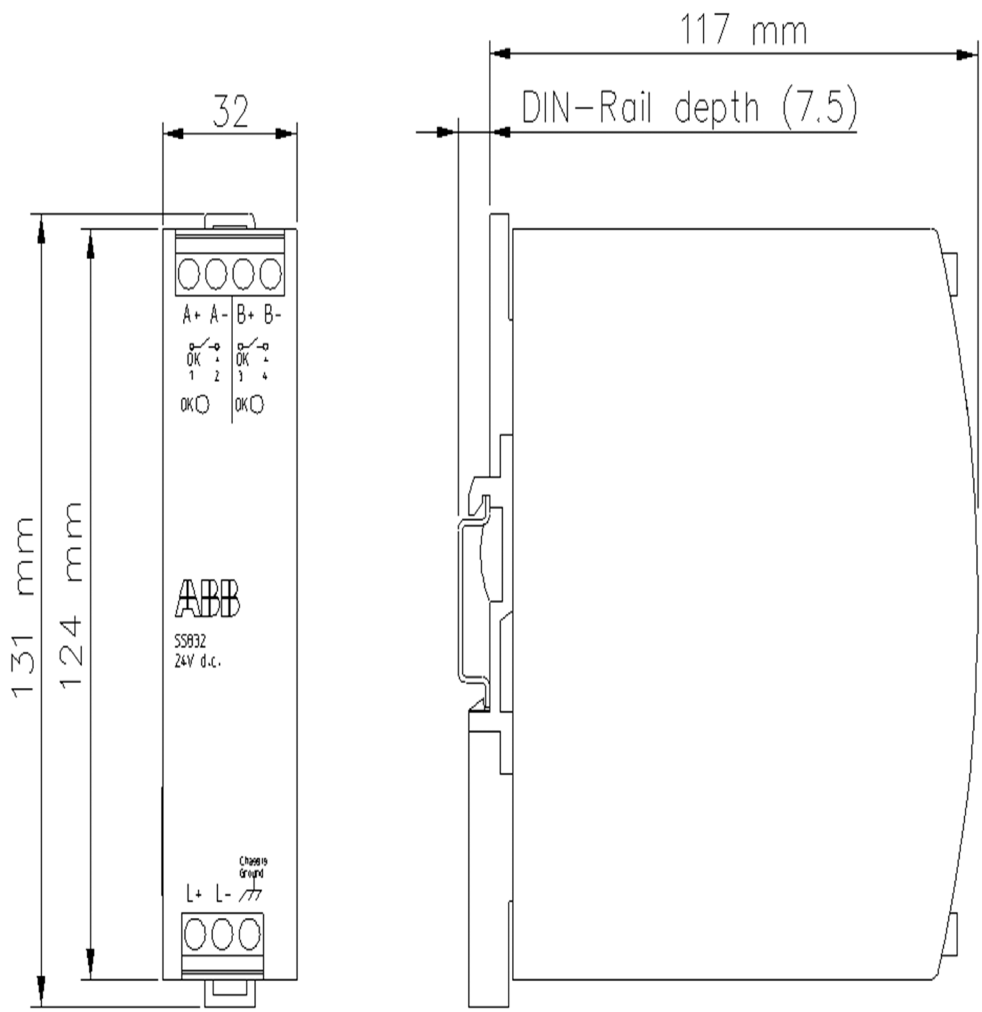


Figure 105. SS832 Voting Unit Dimensions and Connections

Table 51. SS832 Voting Unit - Supervision Data

Supervision Data	SS832
Voltage, low trip level (for decreasing voltage)	21.5 +- 0.5V
Voltage, low trip hysteresis	0.7 V
High trip hysteresis	0.7 V
Contact rating a.c.	Max. 30 V and max. 0.5 A, resistive load
Contact rating d.c.	Max. 60 V and max 0.3 A, 30 V max 0.5 A resistive load min. 1 mA at 5 V d.c.
Acceptable wire sizes	0.2 -1.5 mm^2, 22 - 14 AWG Recommended torque: 0.4 Nm

Table 52. Technical Data and Mounting Dimensions

Parameter	SS832 Voter
Input current	10A per input
Rated output current	20 A
Mains/input voltage, nominal	2 x 24 V d.c.
Rated/input voltage	60 V d.c.
Heat dissipation	8.9 W at 10 A and 4.6 W at 5 A
Input to output voltage drop at max. current	0,85 V
Maximum output current	25 A (Overload)
Ingress Protection	IP20 according to EN60529, IEC 60529.
Max ambient temperature	55^{o}C(1)

Table 52. Technical Data and Mounting Dimensions (Continued)

Parameter	SS832 Voter
Acceptable wire sizes	Solid: 0.5 - 6 mm^2, 20 - 10 AWG Stranded: 0.5 - 4 mm^2, 20 - 10 AWG Recommended torque: 0.8 Nm
Dimensions Width Depth Height	 32 mm (1.26”) 117 mm (4.6") 124 mm (4.9")
Mounting spacing W	5 mm (0.2"), In case the adjacent device is a heat source 15 mm (0.59")
Mounting spacing H	40 mm (1.57") on the top, 20 mm (0.79") on the bottom
Weight	350 g (0.77 lbs.)

(1) Mounting on a horizontal DIN rail

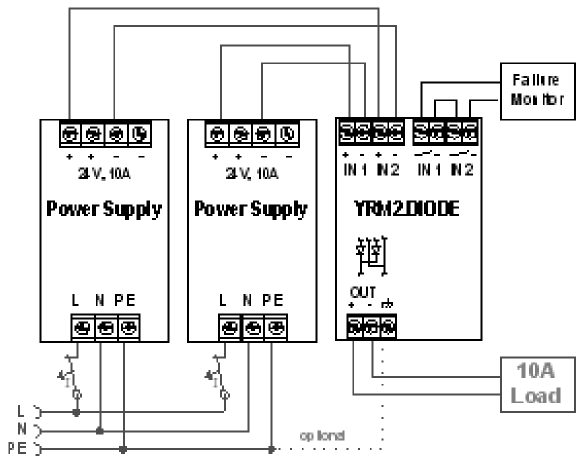


Figure 106. SS832 Redundant Configuration up to 10 A

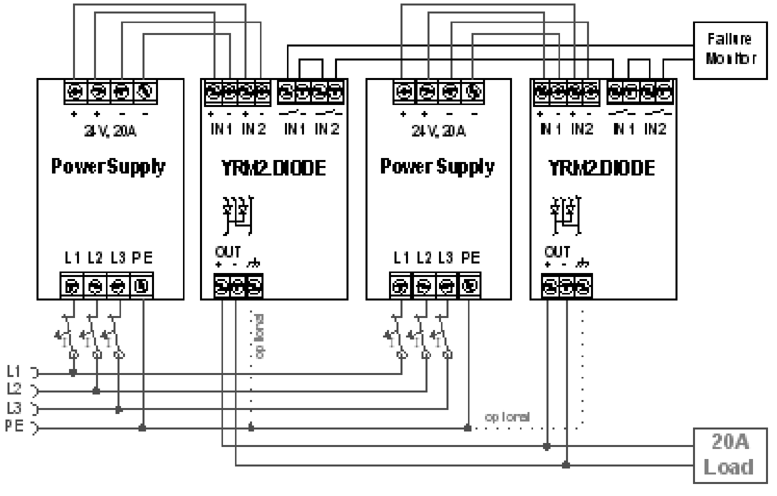


Figure 107. SS832 Redundant Configuration up to 20 A

TB805/TB806 ModuleBus Cable Adapter-Out/In

Features

- Passive unit used for connection and extension of the ModuleBus.
- DIN rail mounting.

Description

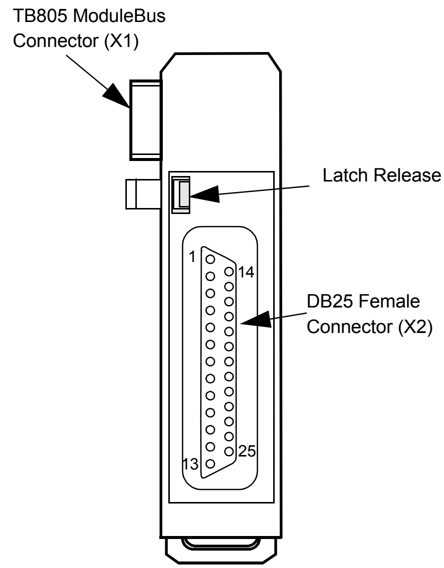
The TB805 ModuleBus Cable Adaptor-Out and TB806 ModuleBus Cable Adaptor-In with the ModuleBus Extension Cables, TK801V0xx, are used to extend the ModuleBus.

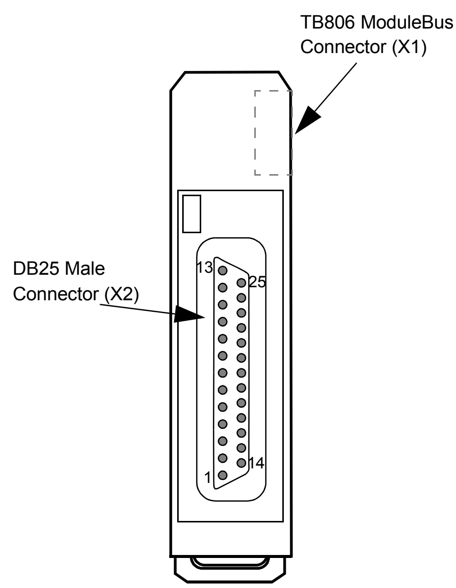
Using the TB805 and TB806, I/O modules on the same electrical ModuleBus of an I/O cluster, can be mounted on different DIN rails. This makes the installation of I/O Modules more flexible when laying out an enclosure design. Please refer to Section 2, Installation for details on layouts.

The ModuleBus extension cables used with the TB805/TB806 come in 3 standard lengths:

- TK801V003 - 300 mm
- TK801V006 - 600 mm
- TK801V012 - 1.2 meters.

Overall ModuleBus length must not exceed 2.5 meters including all cables and MTUs.





TB806 is also used for connection of the optical port TB842 to CI801 or TU847 (CI840).

The TB805/TB806 mounts on the standard DIN rail. It has a mechanical latch that locks it to the rail. It is grounded to the DIN-rail through a metallic spring connector. The latch can be released with a screwdriver.

Technical Data

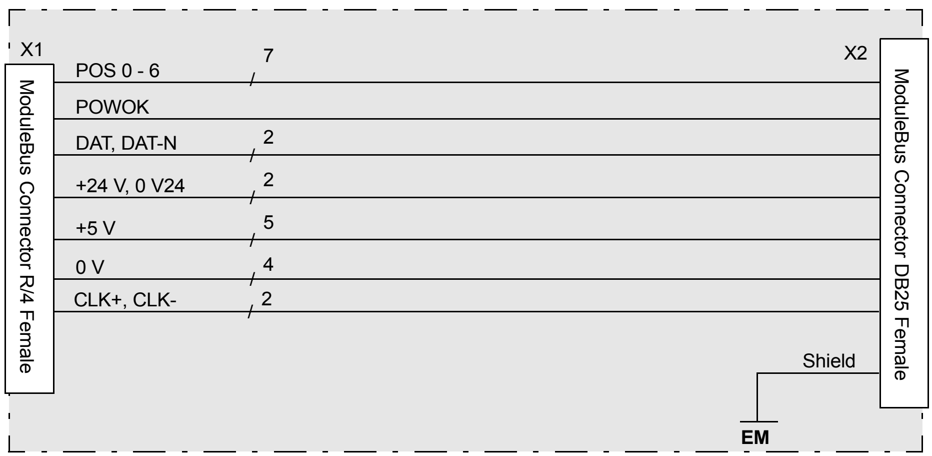
Table 53. TB805/TB806 ModuleBus Cable Adaptor Specifications

Item	TB805	TB806
Direction	Out	In
Connections	2 DIN41612 Type R/4 (X1) DB25 Female (X2)	2 DIN41612 Type R/4 (X1) DB25 Male (X2)
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A	1.5 A 1.5 A
Module catch	Locks module to previous device	Locks module to previous device
Module DIN rail lock	Locks module and provide ground connection	Locks module and provide ground connection
Equipment Class	Class I according to IEC 60536; (earth protected)	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529	IP20 according to IEC 60529
Rated Insulation Voltage	50 V	50 V
Dielectric test voltage	500 V a.c.	500 V a.c.
Width	22 mm (0.87”)	22 mm (0.87”)

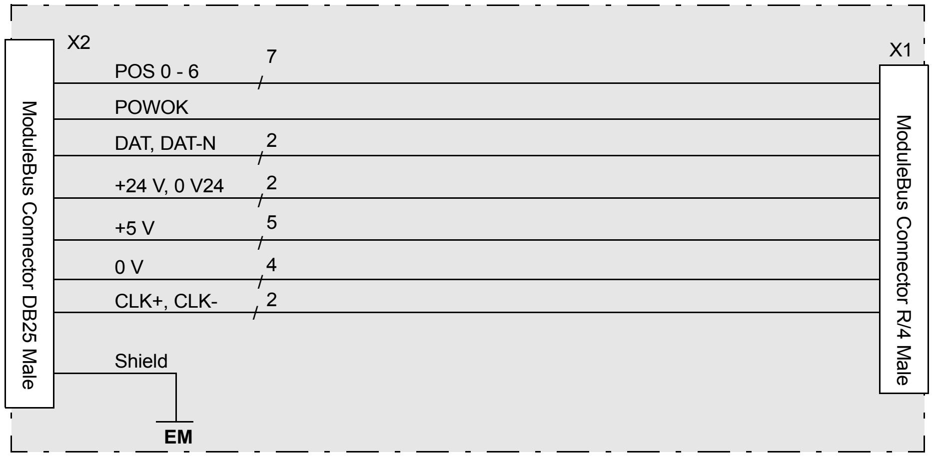
Table 53. TB805/TB806 ModuleBus Cable Adaptor Specifications (Continued)

Item	TB805	TB806
Depth	25 mm (0.98")	25 mm (0.98")
Height	109 mm (4.29")	109 mm (4.29")
Weight	46 g (0.10 lbs.)	46 g (0.10 lbs.)

Block Diagram TB805



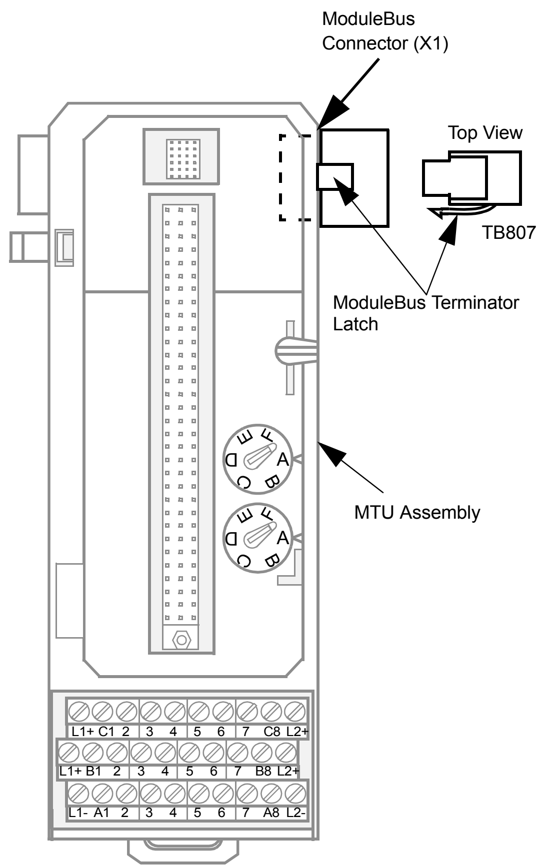
Block Diagram TB806



TB807 ModuleBus Terminator

Features

- Passive unit used for termination of the electrical ModuleBus.



Description

The TB807 ModuleBus Terminator is used to terminate the electrical ModuleBus.

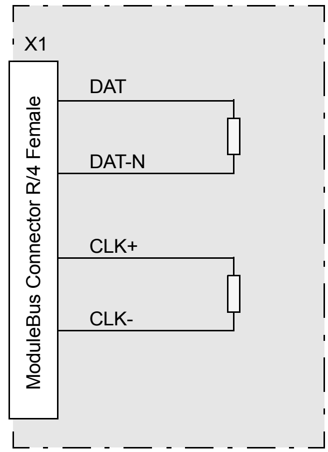
Use the TB807 to terminate the electrical ModuleBus of an I/O cluster. The ModuleBus terminator connects to the outlet ModuleBus connector of the last MTU.

Technical Data

Table 54. TB807 ModuleBus Terminator Specifications

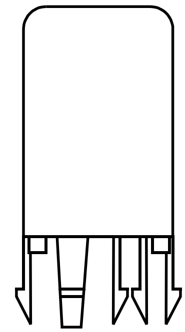
Item	Value
Connections	1 DIN41612 Type R/4 (X1)
Module catch	Attaches module MTU
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Rated Insulation Voltage	50 V
Dielectric test voltage	500 V a.c.
Width	13 mm (0.51”)
Depth	19 mm (0.75”)
Height	24 mm (0.94”) module projects 17 mm (0.67”)
Weight	10 g (0.022 lbs.)

Block Diagram TB807



TB810/TB811 ModuleBus Optical Port

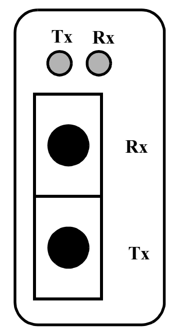
Features



- 1 fiber optic port for the Optical ModuleBus expansion.
- Connection to the CI810/CI830, FCI and TB815 (CI820/CI820V1).

Description TB810

The TB810 ModuleBus Optical Port is a communication interface between the CI810 FCI electrical ModuleBus and the TB820/TB820V2 ModuleBus Modem of an I/O cluster or ABB drives units via the Optical ModuleBus.



The TB810 can be used in both a simplex optical configuration as well as in a duplex optical configuration. In a simplex configuration, the optical ModuleBus nodes are connected in a ring. In a duplex configuration, the optical ModuleBus nodes are connected in a row.

The TB810 has two connectors for fiber optic connections and a connection to the communication interface module. The module is equipped with Transmitter/Receiver for up to 10 Mbit/s. Both plastic and HCS (Hard Clad Silica) optic fiber with connectors (Agilent’s, former Hewlett-Packard, Versatile Link) can be used with the TB810.

Description TB811

The TB811 ModuleBus Optical Port is a communication interface between the FCI electrical ModuleBus and the ABB drives units via the Optical ModuleBus.

The TB811 can be used in a simplex optical ring configuration.

The TB811 has two connectors for fiber optic connections and a connection to the communication interface module. The module is equipped with Transmitter/Receiver for up to 5 Mbit/s. Plastic and optic fiber with connectors (Agilent’s, former Hewlett-Packard, Versatile Link) can be used with the TB811.

Technical Data

Table 55. TB810 ModuleBus Optical Port Specifications

Item	TB810	TB811
Application	S800 I/O clusters and ABB variable drives	ABB variable drives
Configuration	Simplex and duplex	Simplex
Fibers	Plastic and HCS (Hard Clad Silica)	Plastic
Connector	Agilent’s, former Hewlett-Packard, Versatile Link	Agilent’s, former Hewlett-Packard, Versatile Link
Optical ModuleBus	Fiber optic interface, one transmit and one receive connection for max. 10 Mbit/s. Wavelength 650 nm	Fiber optic interface, one transmit and one receive connection for max. 5 Mbit/s. Wavelength 650 nm
Indicators	Tx LED: Yellow indicates transmitting of data on the optical ModuleBus Rx LED: Yellow indicates receiving of data on the optical ModuleBus	Tx LED: Yellow indicates transmitting of data on the optical ModuleBus Rx LED: Yellow indicates receiving of data on the optical ModuleBus
Current consumption +5 V	100 mA	100 mA
Current consumption +24 V	20 mA	20 mA
Power dissipation	0.5 W	0.5 W
Equipment Class	Class I according to IEC 60536; (earth protected)	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529	IP20 according to IEC 60529
Rated insulation voltage	50 V	50 V
Dielectric test voltage	500 V a.c.	500 V a.c.
Width	20 mm (0.79”)	20 mm (0.79”)

Table 55. TB810 ModuleBus Optical Port Specifications (Continued)

Item	TB810	TB811
Depth	39.6 mm (1.56”)	39.6 mm (1.56”)
Height	39.6 mm (1.56”)	39.6 mm (1.56”)
Weight	19 g (0.042 lbs.)	19 g (0.042 lbs.)

Connections

Table 56. Optical ModuleBus Connections (X2)

Port	Duplex Signals	Simplex Signals
Tx	Transmit data to down-stream device	Transmit data to next device
Rx	Receive data from up-stream device	Receive data from last device

Opto Cable for TB810 according to HP

Plastic Optical Fiber (POF) (TK811V... or TK812V...) up to 15 meters.

- Extra low loss attenuation.
- Simplex or duplex cable.
- Latching simplex or duplex connector.
- Cable attenuation maximum 4 dB.

Hard Clad Silica (HCS) fiber up to 200 meters.

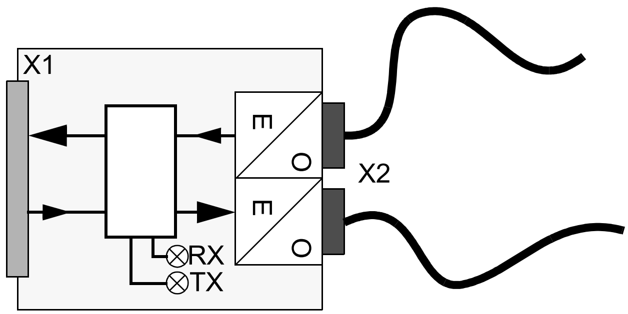
- Riser or plenum.
- Simplex or duplex cable.
- Latching simplex or duplex connector.
- Cable attenuation maximum 2 dB.

Opto Cable for TB811 according to HP

Plastic Optical Fiber (POF) (TK811V... or TK812V...) up to 10 meters.

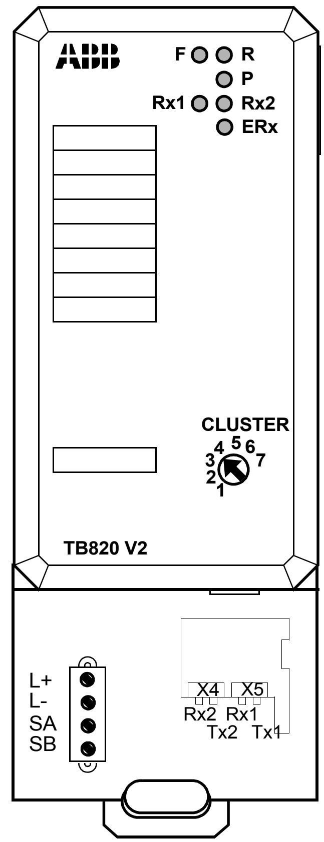
- Extra low loss attenuation
- Simplex cable
- Latching simplex connector.

Block Diagram TB810/TB811



TB820/TB820V2 ModuleBus Modem

Features



- 2 fiber optic ports to optical ModuleBus.
- ModuleBus (electrical) to the I/O Modules.
- Supervisory functions of I/O ModuleBus and power supply.
- Isolated power supply to I/O modules.
- DIN rail mounting.

Description

The TB820/TB820V2 ModuleBus Modem is a communication interface for connection of S800 I/O modules via the optical and electrical ModuleBus.

The module can not handle High Integrity I/O modules (AI880/AI880A, DI880 and DO880).

The TB820/TB820V2 can be used in both a simplex optical configuration as well as in a duplex optical configuration. In a simplex configuration, the optical ModuleBus nodes are connected in a ring. In a duplex configuration, the optical ModuleBus nodes are connected in a row.

TB820/TB820V2 has two basic parts: Module termination board and the power supply/communications board (see block diagram).

The termination board is a unit where most of the connections to the outside takes place. It is grounded to the DIN rail through a metallic spring connector. The board carries screw terminals for power supply and redundant power supply monitoring, connector for the electrical ModuleBus, a current limit “fuse” for the +24 V supply of the I/O modules and the electrical ModuleBus.

The power supply board has an isolated power converter that generates a short circuit proof +5 V supply for the TB820/TB820V2 and connected I/O modules. This board also contains the ModuleBus interfaces, LED indicators and one screwdriver maneuvered rotary switch for the ModuleBus I/O cluster address. The ModuleBus I/O cluster address (1-7) is set by a rotary decimal code switch, any other value than 1-7 is not allowed and will turn the Run LED off.

The ModuleBus has an electrical and an optical interface which are logically the same bus. A maximum of twelve I/O modules can be connected to the electrical ModuleBus and up to seven clusters can be connected to the fiber optic ModuleBus expansion. The fiber-optical interface is intended for local distribution of I/O clusters and where more than 12 I/O modules per station are required. Any distribution of I/O modules across the base cluster and the remote cluster(s) is allowed, however not more than 24 I/O modules per station can be used.

The module is equipped with optical Transmitter/Receiver for up to 10 Mbit/s. Both plastic and HCS (Hard Clad Silica) optic fiber with connectors (Agilent’s, former Hewlett-Packard, Versatile Link) can be used with TB820/TB820V2.

Technical Data

Table 57. TB820/TB820V2 ModuleBus Modem Specifications

Item	Value
Power input	24 V d.c. (19.2 - 30)
Power consumption at 24V d.c.	100 mA
Power dissipation	6.0 W
Power supply monitoring inputs	Max. input voltage: 30V Min. input voltage for high level: 15 V Max. input voltage for low level: 8 V
Power output (ModuleBus)	24 V max. = 1.4 A 5 V max. = 1.5 A
Electrical ModuleBus	Maximum of 12 I/O modules
Optical ModuleBus Fiber optic interface, two transmitters and two receivers for	Maximum of 7 I/O clusters Max. 10 Mbit/s Wavelength 650 nm
Maximum ambient temperature	55°C/(131°F)

Table 57. TB820/TB820V2 ModuleBus Modem Specifications (Continued)

Item	Value
Indicators	R(un) LED: Green indicates that the TB820/TB820V2 is operational F(ault) LED: Red indicates a fault condition; Reset and communications errors on the electrical ModuleBus turns the LED on. P(owok) LED: Green indicates that the d.c./d.c. converter generates a valid +5 V d.c. ORx1 and ORx2 traffic LEDs: Yellow (blinking) indicates that the TB820/TB820V2 is receiving data on the two optical ModuleBus channels respectively. ERx traffic LED: Yellow (blinking) indicates the TB820/TB820V2 is receiving data on the electrical ModuleBus.
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Width	58 mm (2.28”)
Depth	122 mm (4.80”)
Height	170 mm (6.69”) including latch
Weight	0.3 kg (0.66 lbs.)

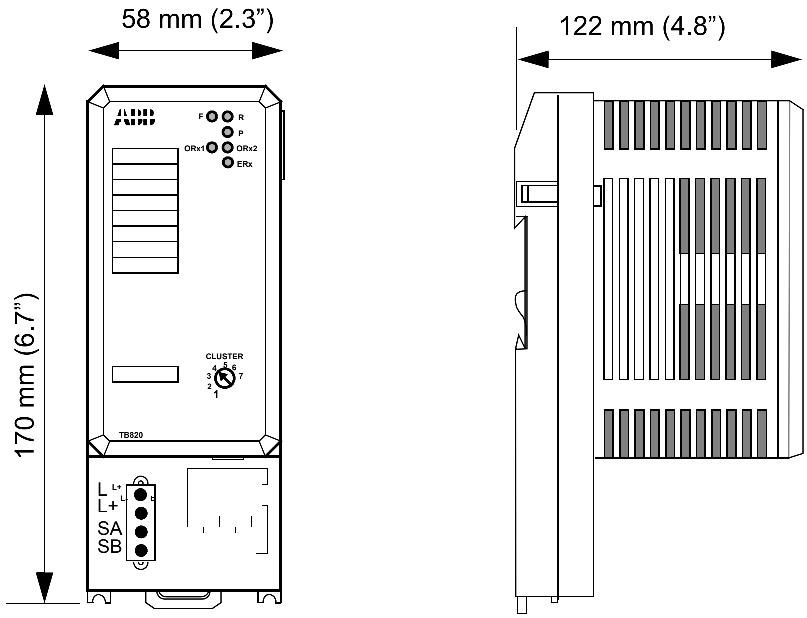


Figure 108. TB820/TB820V2 Module

Connections

Table 58. Power Supply Connections TB820/TB820V2/TB820V1

Designation	Description
L+	+24 V d.c. Supply In
L+	+24 V d.c. Supply Out
SA	Redundant Power Supply “A” Monitoring Input
L-	0 V d.c. Supply In

Table 58. Power Supply Connections TB820/TB820V2/TB820V1 (Continued)

Designation	Description
L-	0 V d.c. Supply Out
SB	Redundant Power Supply “B” Monitoring Input

Table 59. Power Supply Connections TB820V2

Designation	Description
L+	+24 V d.c. Supply
L-	0 V d.c. Supply
SA	Redundant Power Supply “A” Monitoring Input
SB	Redundant Power Supply “B” Monitoring Input

Table 60. Optical ModuleBus Connections (X4, X5)

Port	Duplex Signals	Simplex Signals
X4 - Tx	Transmit data to down-stream device	Transmit data to next device
X4 - Rx	Receive data from down-stream device	Not used
X5 - Tx	Transmit data to up-stream device	Not used
X5 - Rx	Receive data from up-stream device	Receive data from last device

Opto connectors type Agilent's, former Hewlett-Packard, Versatile Link can handle both plastic and HCS optic fiber.

Opto Cable according to HP

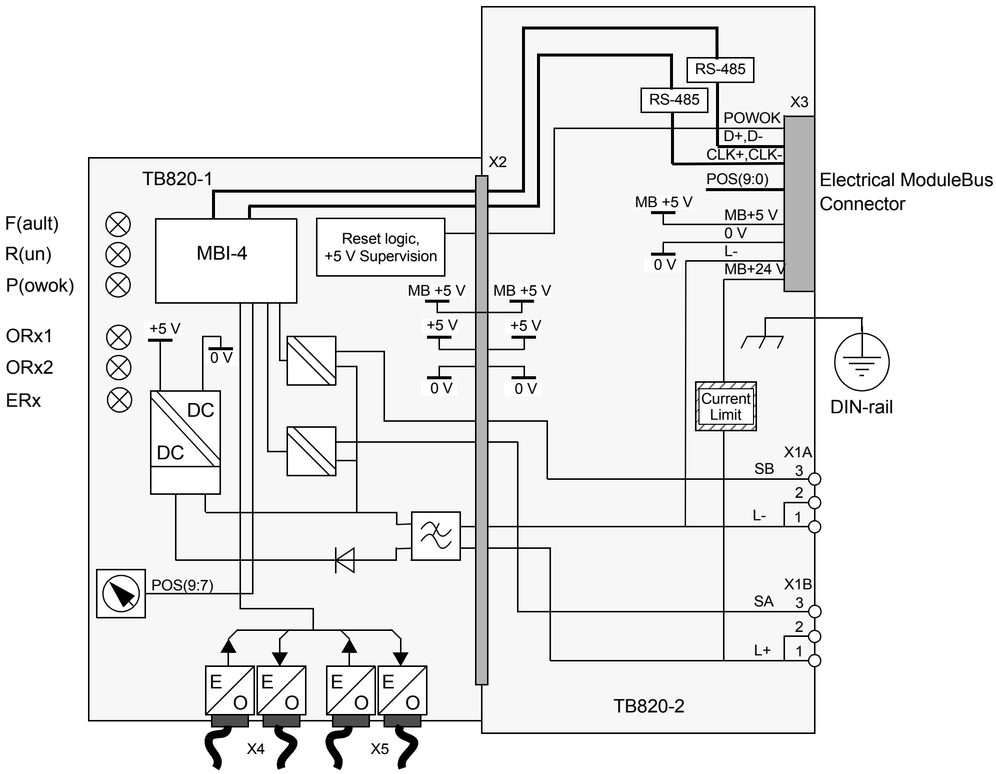
Plastic Optical Fiber (POF) up to 15 meters.

- Extra low loss attenuation.
- Simplex or duplex cable.
- Latching simplex or duplex connector.
- Cable attenuation maximum 4 dB.

Hard Clad Silica (HCS) fiber up to 200 meters.

- Riser or plenum.
- Simplex or duplex cable.
- Latching simplex or duplex connector.
- Cable attenuation maximum 2 dB.

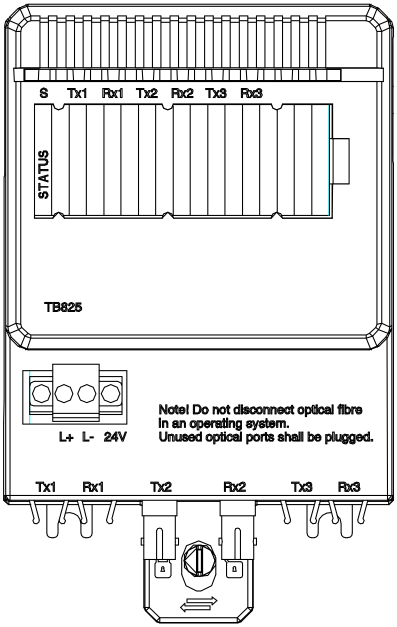
Block Diagram TB820/TB820V2



TB825 Optical Media Converter

Features

- Converts between plastic or HCS opto fiber and glass optical fiber.
- DIN rail mounted.
- S800L mechanics.



Description

ModuleBus Optical media converter, converts between plastic opto fiber or HCS fiber with Versatile link connectors and glass optical fiber with ST connectors.
Signal routing between Tx1/Rx1 and Tx2/Rx2 and between Tx1/Rx1 and Tx3/Rx3.

Technical Data

Table 61. TB825 Optical Media Converter Specifications

Item	Value
Power input	24 V (19.2 - 30)
Power consumption at 24V d.c.	96 mA
Power input fuse	2 A
Power dissipation	2.3 W
Optical ModuleBus Fiber optic interface, three transmitters and three receivers for	Local Optical ModuleBus 1, 2 and Field Optical ModuleBus

Table 61. TB825 Optical Media Converter Specifications (Continued)

Item	Value
Indicators	(S) Status LED: Red indicates module fault. Green indicates Module OK (FPGA configuration). Rx1 LED: Yellow indicates data received on opto port 1. Tx1 LED: Yellow indicates data transmitted on opto port 1. Rx2 LED: Yellow indicates data received on opto port 2. Tx2 LED: Yellow indicates data transmitted on opto port 2. Rx3 LED: Yellow indicates data received on opto port 3. Tx3 LED: Yellow indicates data transmitted on opto port 3.
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	85.6 mm (3.37”)
Depth	58.5 mm (2.30”)
Height	136 mm (5.35”) including latch
Weight	0.21 kg (0.46 lbs.)

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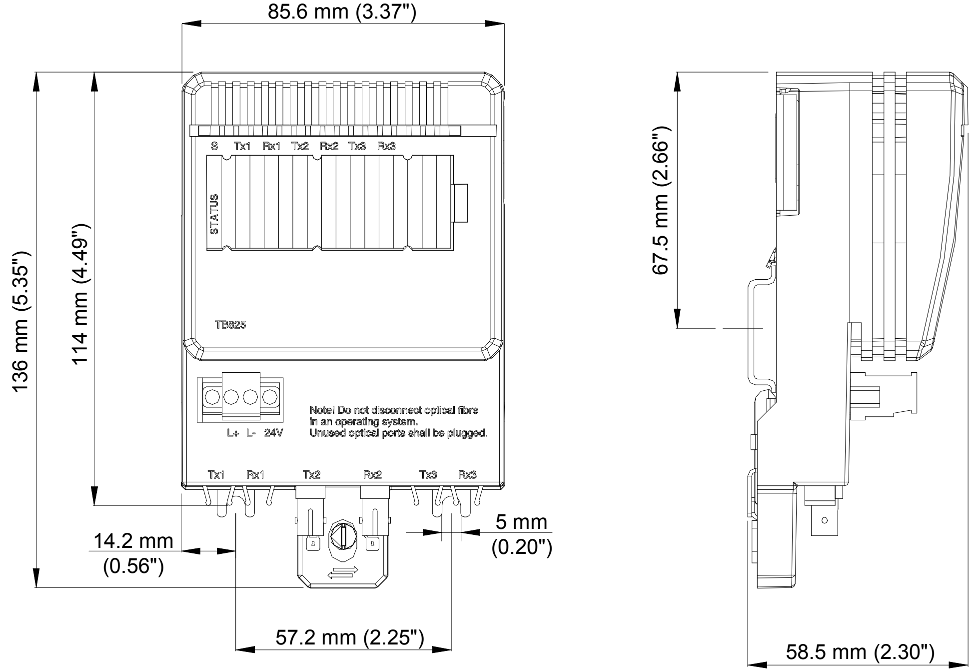


Figure 109. TB825 Optical Media Converter

Opto Connection

Local Optical Cable

Opto connectors type Agilent’s, former Hewlett-Packard, Versatile Link can handle both plastic and HCS optic fibre.

Plastic Optical Fiber (POF) (TK811V... or TK812V...) up to 15 meters

- Extra low loss attenuation
- Simplex or duplex cable
- Latching simplex or duplex connector.

- Cable attenuation maximum 4 dB

Hard Clad Silica (HCS) fiber up to 200 meters.

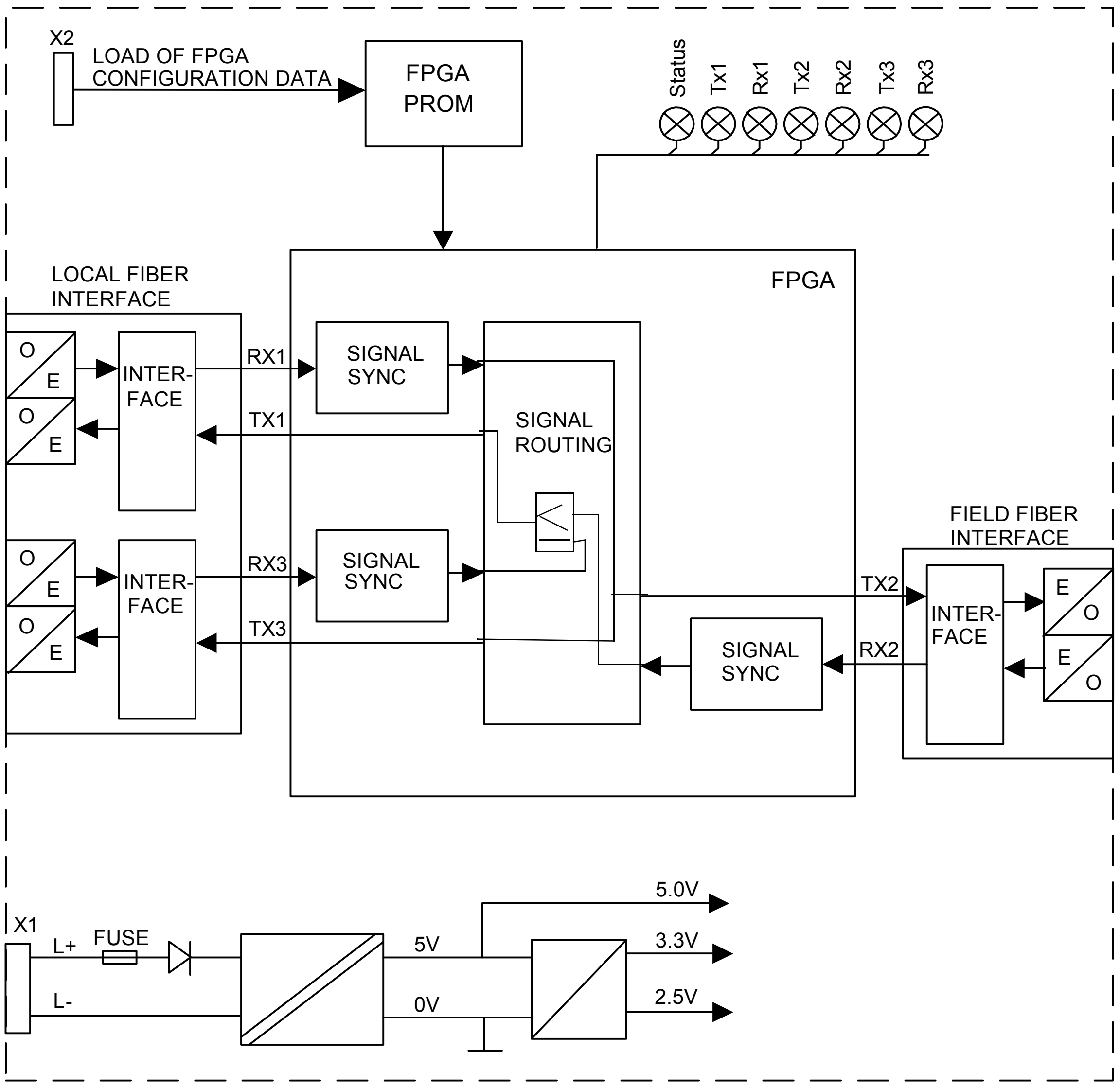
- Riser or plenum
- Simplex or duplex cable
- Latching simplex or duplex connector
- Cable attenuation maximum 2 dB

Field Optical Cable

Glass Optical Fiber, multimode up to 1000 m

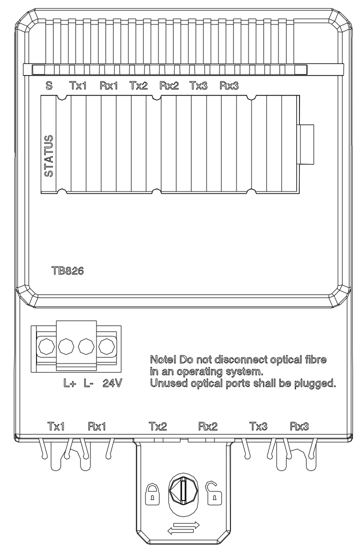
- Fiber dimensions: 62.5/125 µm
- Connector type: ST, bayonet
- Wave length: 820 nm
- Max cable attenuation: 3.5 dB (1000 m of unspliced cable)

Block Diagram TB825



TB826 Optical Media Converter

Features



- Converts between plastic or HCS opto fiber and glass optical fiber.
- DIN rail mounted.
- S800L mechanics.

Description

ModuleBus Optical media converter, converts between plastic opto fiber or HCS fiber with Versatile link connectors and glass optical fiber with SC connectors.

Technical Data

Table 62. TB826 Optical Media Converter Specifications

Item	Value
Power input	24 V (19.2 - 30)
Power consumption at 24V d.c.	92 mA
Power input fuse	2 A
Power dissipation	2.2 W
Optical ModuleBus Fiber optic interface, three transmitters and three receivers for	Local Optical ModuleBus 1, 2 and Field Optical ModuleBus

Table 62. TB826 Optical Media Converter Specifications (Continued)

Item	Value
Indicators	(S) Status LED: Red indicates module fault. Green indicates Module OK (FPGA configuration). Rx1 LED: Yellow indicates data received on opto port 1. Tx1 LED: Yellow indicates data transmitted on opto port 1. Rx2 LED: Yellow indicates data received on opto port 2. Tx2 LED: Yellow indicates data transmitted on opto port 2. Rx3 LED: Yellow indicates data received on opto port 3. Tx3 LED: Yellow indicates data transmitted on opto port 3.
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	85.6 mm (3.37”)
Depth	58.5 mm (2.30”)
Height	136 mm (5.35”) including latch
Weight	0.21 kg (0.46 lbs.)

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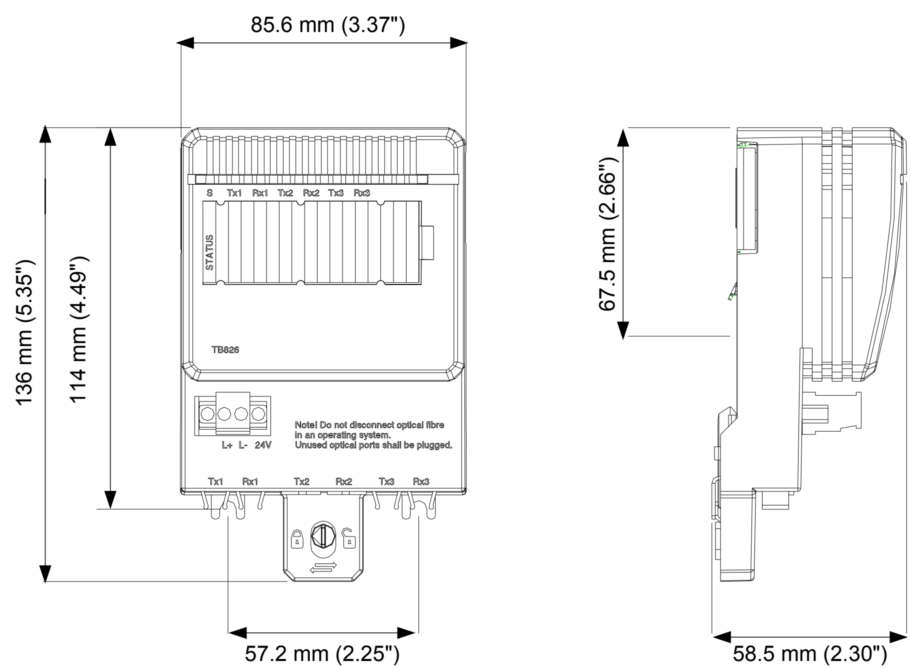


Figure 110. TB826Optical Media Converter

Opto Connection

Local Optical Cable

Opto connectors type Agilent’s, former Hewlett-Packard, Versatile Link can handle both plastic and HCS optic fibre.

Plastic Optical Fiber (POF) (TK811V... or TK812V...) up to 15 meters

- Extra low loss attenuation
- Simplex or duplex cable
- Latching simplex or duplex connector.

- Cable attenuation maximum 4 dB

Hard Clad Silica (HCS) fiber up to 200 meters.

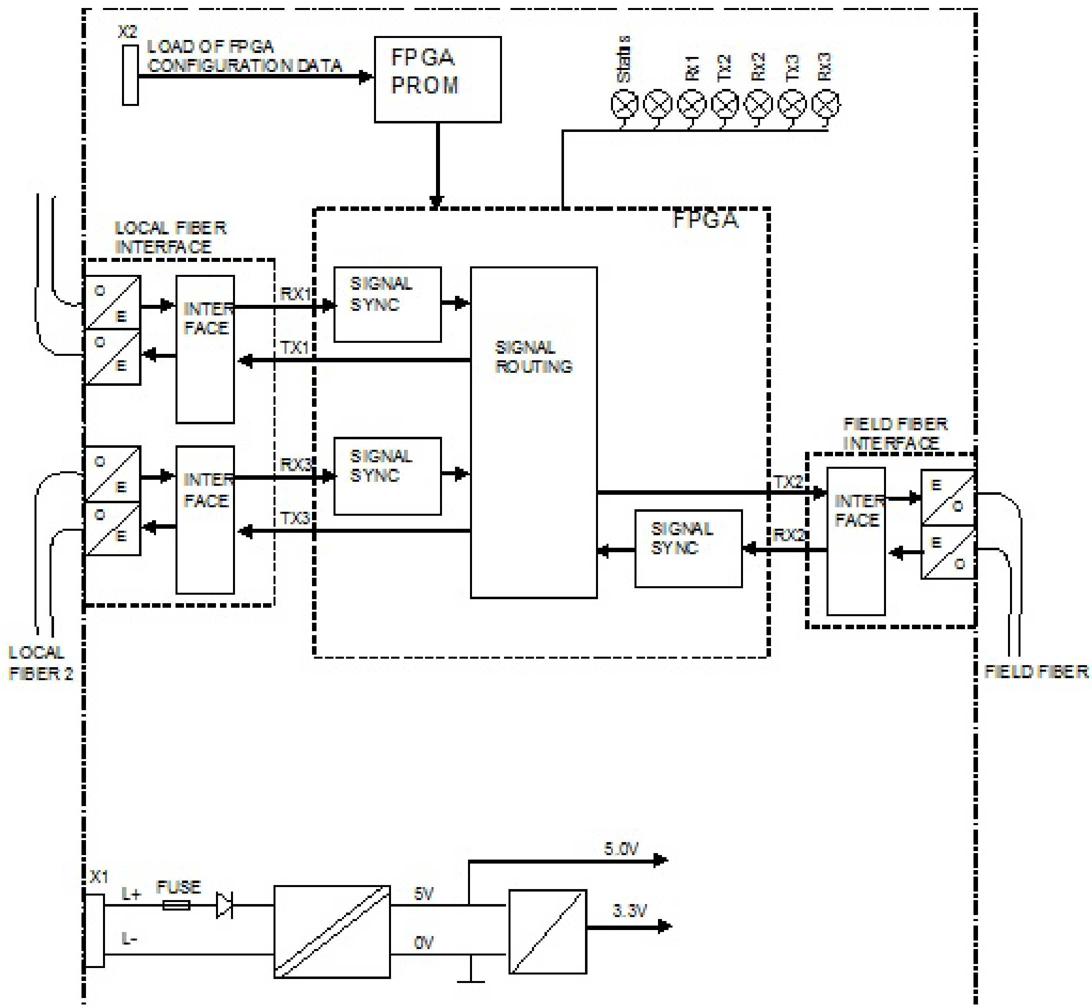
- Riser or plenum
- Simplex or duplex cable
- Latching simplex or duplex connector
- Cable attenuation maximum 2 dB

Field Optical Cable

Glass Optical Fiber, single mode up to 5000m (20000m for S800 I/O HI)

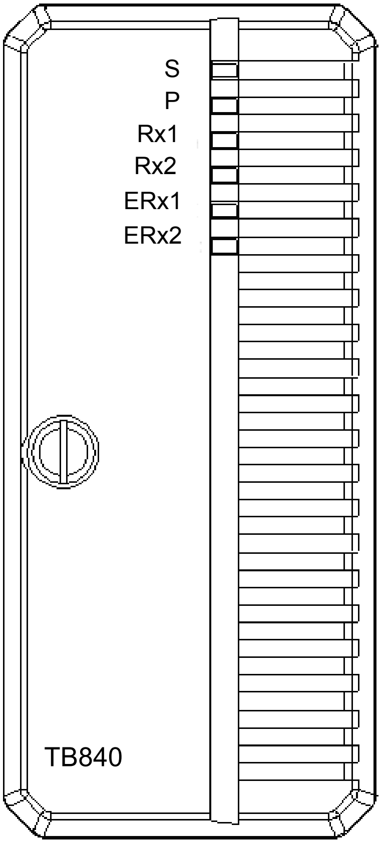
- Fiber dimensions: 9/125 µm
- Connector type: SC
- Wave length: 1310 nm
- Max cable attenuation: 20 dB

Block Diagram TB826



TB840/TB840A ModuleBus Modem

Features



- 2 fiber optic ports to optical ModuleBus
- ModuleBus (electrical) to the I/O Modules
- Supervisory functions of I/O ModuleBus and power supply
- Isolated power supply to I/O modules
- Input power fused

Description

The TB840/TB840A ModuleBus Modem is a communication interface for connection of S800 I/O modules via the optical and electrical ModuleBus.

TB840/TB840A is designed to be used in 1+1 redundant applications.

TB840/TB840A can be used in both a simplex optical configuration as well as in a duplex optical configuration. In a simplex configuration, the optical ModuleBus nodes are connected in a ring. In a duplex configuration, the optical ModuleBus nodes are connected in a daisy-chain.

TB840/TB840A must be mounted on a Module Termination Unit TU807, TU840, TU841, TU848 or TU849.

The Module Termination Unit carries screw terminals for power supply and power supply monitoring, connector for the electrical ModuleBus and a rotary switch for setting of the cluster address.

TB840/TB840A has isolated power converters that generates internal power for TB840/TB840A and short circuit proof +5 V supply for two electrical ModuleBuses. It also contains two ModuleBus interfaces and LED indicators. The ModuleBus I/O cluster address (1-7) is set by a rotary decimal code switch, on the Module Terminal Unit TU841.

TB840/TB840A has two electrical and one Optical ModuleBus Interface which are logically the same bus. Only one electrical ModuleBus is connected if TB840/TB840A is mounted on TU841, TU849 or TU807. A maximum of twelve I/O modules can be connected to the electrical ModuleBus and up to seven clusters can be connected to the fiber optic ModuleBus expansion. The fiber-optical interface is intended for local distribution of I/O clusters and where more than 12 I/O modules per station are required. Any distribution of I/O modules across the base cluster and the remote cluster(s) is allowed, however not more than 24 I/O modules per I/O station can be used.

Both plastic and HCS (Hard Clad Silica) optic fiber with connectors (Agilent’s, former Hewlett-Packard, Versatile Link) can be used with TB840/TB840A.

Technical Data

Table 63. TB840/TB840A ModuleBus Modem Specifications

Item	Value
Power input	24 V d.c. (19.2 - 30)
Power consumption at 24V d.c.	120 mA
Power input fuse	2 AF
Power dissipation	6 W
Power supply monitoring inputs	Max. input voltage: 30V Min. input voltage for high level: 15 V Max. input voltage for low level: 8 V
Power output (ModuleBus)	24 V max. = 1.4 A 5 V max. = 1.5 A
Electrical ModuleBus	Maximum of 12 I/O modules
Optical ModuleBus Fiber optic interface, two transmitters and two receivers for	Maximum of 7 I/O clusters Max. 10 Mbit/s Wavelength 650 nm

Table 63. TB840/TB840A ModuleBus Modem Specifications (Continued)

Item	Value
Indicators	S(tatus) LED: Green indicates that the TB840 is operational. Red indicates a fault condition; Reset and communications errors on the electrical ModuleBus turns the LED on. P(owok) LED: Green indicates that the d.c./d.c. converter generates valid internal power and +5 V d.c. on the electrical ModuleBus. Rx1 and Rx2 traffic LEDs: Yellow (blinking) indicates that the TB840 is receiving data on the two optical ModuleBus channels respectively. ERx1 traffic LED: Yellow (blinking) indicates the TB840 is receiving data on the electrical ModuleBus A. ERx2 traffic LED: Yellow blinking, indicates that the TB840 is receiving data on the electrical ModuleBus B.
MTU Keying code	AB
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	54 mm (2.13”)
Depth	96 mm (3.78”)
Height	119 mm (4.69”) including latch
Weight	0.2 kg (0.44 lbs.)

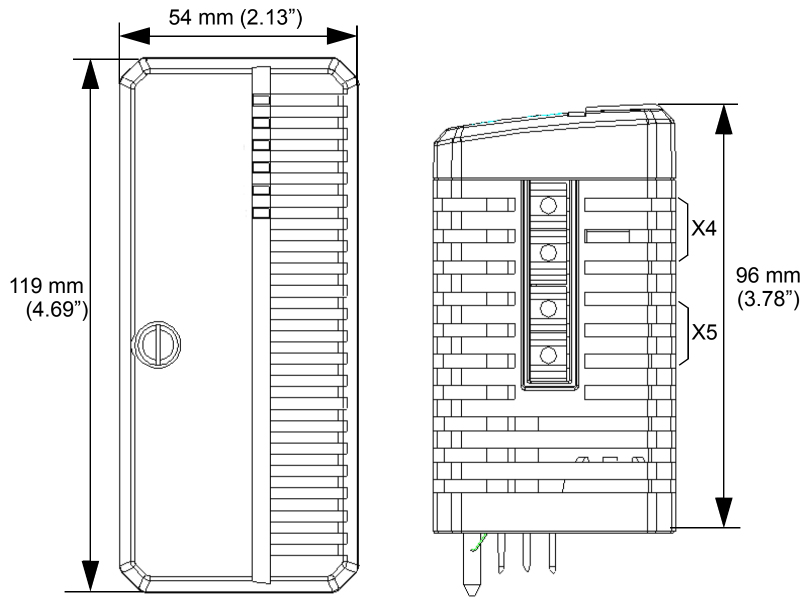


Figure 111. TB840/TB840A Module

Connections

Opto connectors type Agilent’s, former Hewlett-Packard, Versatile Link can handle both plastic and HCS optic fiber.

Opto Cable according to HP

Plastic Optical Fiber (POF) (TK811V... or TK812V...) up to 15 meters.

- Extra low loss attenuation.
- Simplex or duplex cable.
- Latching simplex or duplex connector.
- Cable attenuation maximum 4 dB.

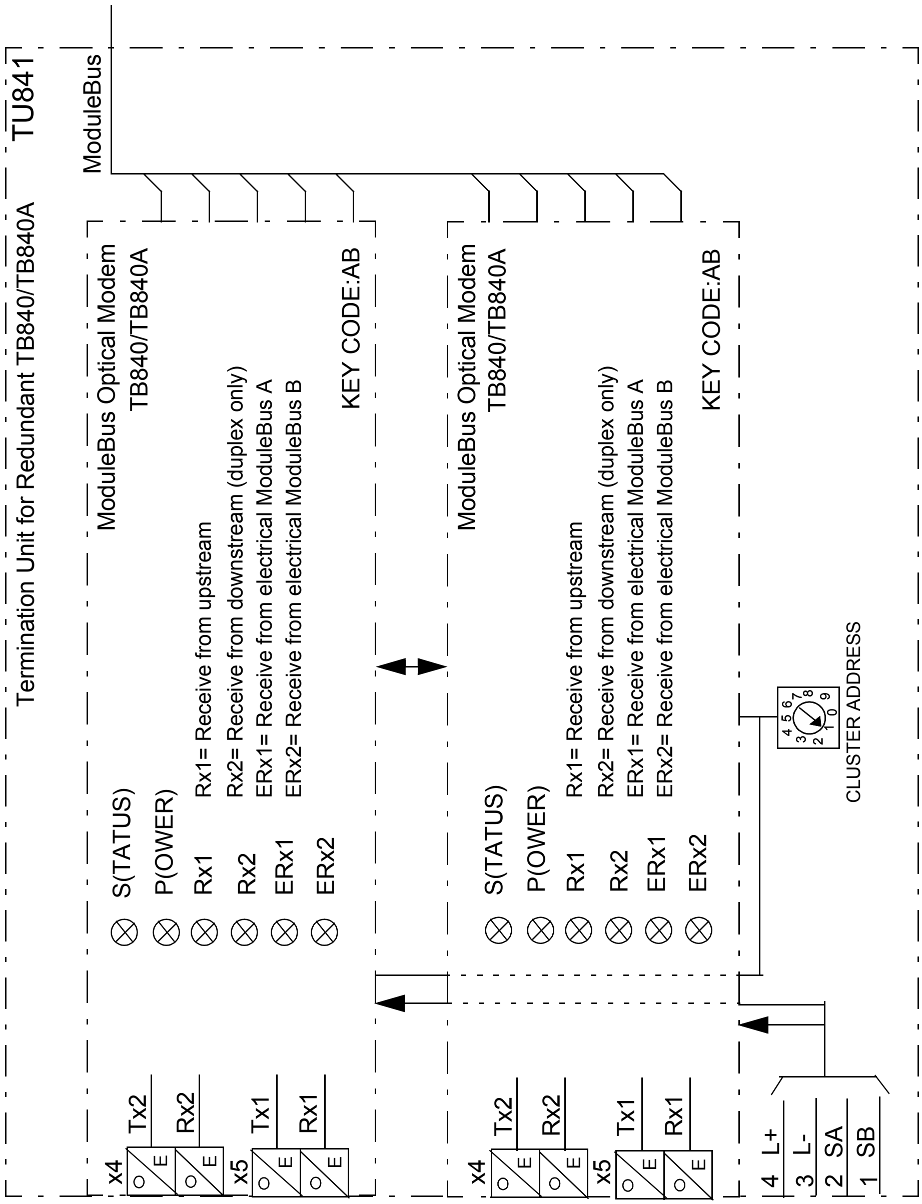
Hard Clad Silica (HCS) fiber up to 200 meters.

- Riser or plenum.
- Simplex or duplex cable.
- Latching simplex or duplex connector.
- Cable attenuation maximum 2 dB .

Table 64. Optical ModuleBus Connections (X4, X5)

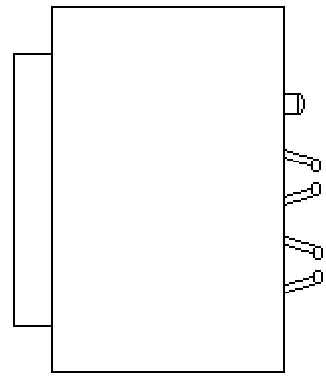
Port	Duplex Signals	Simplex Signals
X4 - Tx	Transmit data to down-stream device	Transmit data to next device
X4 - Rx	Receive data from down-stream device	Not used
X5 - Tx	Transmit data to up-stream device	Not used
X5 - Rx	Receive data from up-stream device	Receive data from last device

Connection Diagram TB840/TB840A



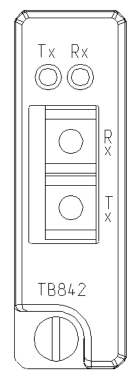
TB842 ModuleBus Optical Port

Features



- 1 fiber optic port for the Optical ModuleBus expansion
- Connection to CI801 and CI840

Description TB842



TB842 ModuleBus Optical Port is a communication interface between the CI801 or CI840 FCI and the TB820/TB820V2 ModuleBus Modem of an I/O cluster or ABB drives units via the Optical ModuleBus.

TB842 connects to CI801 via TB806 or CI840 via TU847 and TB806.

TB842 can be used in both a simplex optical configuration as well as in a duplex optical configuration. In a simplex configuration, the optical ModuleBus nodes are connected in a ring. In a duplex configuration, the optical ModuleBus nodes are connected in a row.

TB842 has two connectors for fiber optic connections and a connection to the communication interface module. The module is equipped with Transmitter/Receiver for up to 10 Mbit/s. Both plastic and HCS (Hard Clad Silica) optic fiber with connectors (Agilent's, former Hewlett-Packard, Versatile Link) can be used with the TB842.

Technical Data

Table 65. Technical Data TB824

Item	TB842
Application	S800 I/O clusters and ABB variable drives
Configuration	Simplex and duplex optical fiber
Fibers	Plastic and HCS (Hard Clad Silica)
Connector	Agilent’s, former Hewlett-Packard, Versatile Link
Optical ModuleBus	Fiber optic interface, one transmit and one receive connection for max. 10 Mbit/s. Wavelength 650 nm
Indicators	Tx LED: Yellow indicates transmitting of data on the optical ModuleBus Rx LED: Yellow indicates receiving of data on the optical ModuleBus
Current consumption +5 V	100 mA
Current consumption +24 V	20 mA
Power dissipation	0.5 W
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Width	17.6 mm (0.69”)
Depth	42.3 mm (1.67”)
Height	56.7 mm (2.23”)
Weight	40 g (0.088 lbs.)

Connections

Table 66. Optical ModuleBus Connections (X2)

Port	Duplex Signals	Simplex Signals
Tx	Transmit data to down-stream device	Transmit data to first device
Rx	Receive data from up-stream device	Receive data from last device

Opto Cable for TB842 according to HP

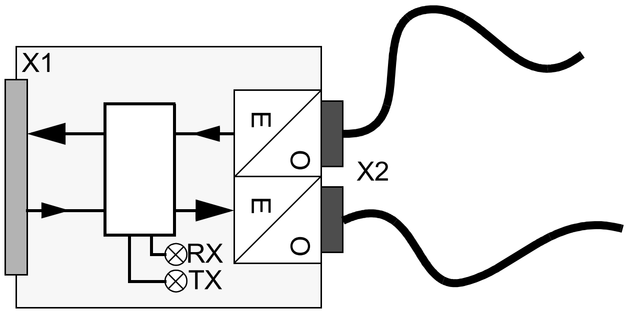
Plastic Optical Fiber (POF) (TK811V... or TK812V...) up to 15 meters.

- Extra low loss attenuation
- Simplex or duplex cable
- Latching simplex or duplex connector.
- Cable attenuation maximum 4 dB

Hard Clad Silica (HCS) fiber up to 200 meters.

- Riser or plenum
- Simplex or duplex cable
- Latching simplex or duplex connector
- Cable attenuation maximum 2 dB

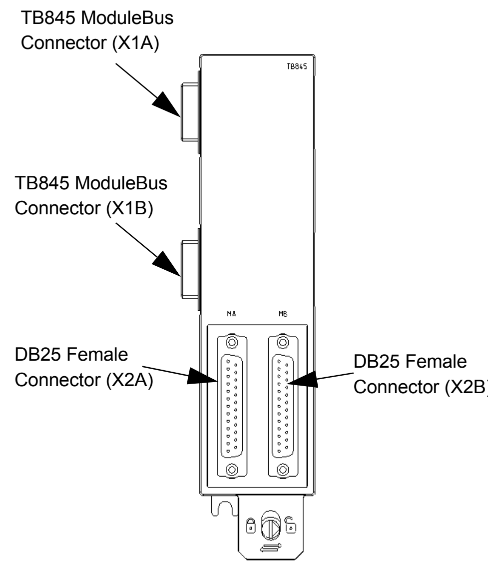
Block Diagram TB842



TB845/TB846 ModuleBus Cable Adapter-Out/In

Features

- Passive unit used for connection and extension of the ModuleBus
- DIN rail mounting.



Description

The TB845 ModuleBus Cable Adaptor-Out and TB846 ModuleBus Cable Adaptor-In with the ModuleBus Extension Cables, TK801V0xx, are used to extend the ModuleBus.

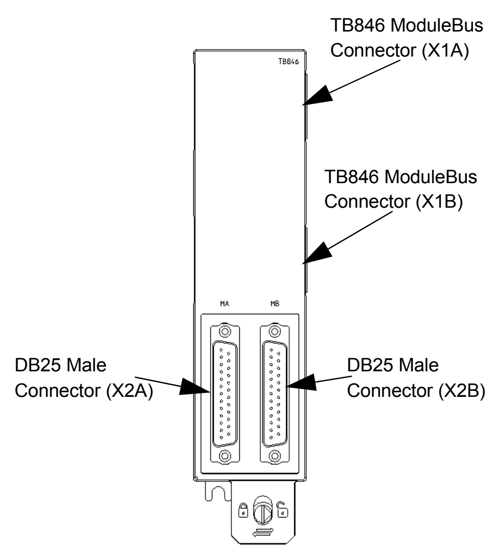
Using the TB845 and TB846, I/O modules on the same electrical ModuleBus of an I/O cluster, can be mounted on different DIN rails. This makes the installation of I/O Modules more flexible when laying out an enclosure design. Please refer to Section 2, Installation for details on layouts.

The ModuleBus extension cables used with the TB845/TB846 comes in 3 standard lengths:

- VTK801V003 - 300 mm
- TK801V006 - 600 mm
- TK801V012 - 1.2 meters.

Overall ModuleBus length must not exceed 2.5 meters including all cables and MTUs.

TB846 is also used for connection of the optical port TB842 to TU846 (CI840).



The TB845/TB846 mounts on the standard DIN rail. It has a mechanical latch that locks it to the rail. It is grounded to the DIN-rail through a metallic spring connector. The latch can be released with a screwdriver.

Technical Data

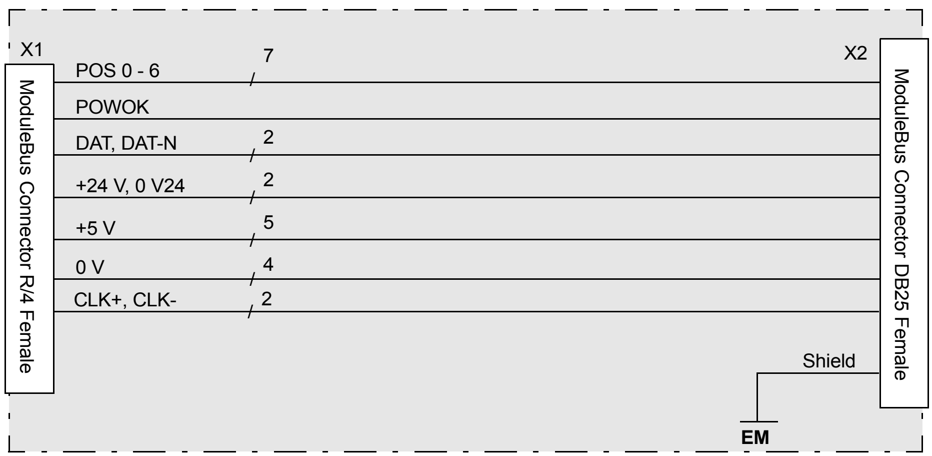
Table 67. TB845/TB846 ModuleBus Cable Adaptor Specifications

Item	TB845	TB846
Direction	Out	In
Connections	4 2 DIN41612 Type R/4 (X1) 2 DB25 Female (X2)	4 2 DIN41612 Type R/4 (X1) 2 DB25 Male (X2)
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	 1.5 A 1.5 A	 1.5 A 1.5 A
Module catch	Locks module to previous device	Locks module to previous device
Module DIN rail lock	Locks module and provide ground connection	Locks module and provide ground connection
Equipment Class	Class I according to IEC 60536; (earth protected)	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529	IP20 according to IEC 60529
Rated Insulation Voltage	50 V	50 V
Dielectric test voltage	500 V a.c.	500 V a.c.
Width	49.8 mm (1.96”) incl. connectors	43 mm (1.69”)
Depth	31.5 mm (1.24”)	31.5 mm (1.24”)

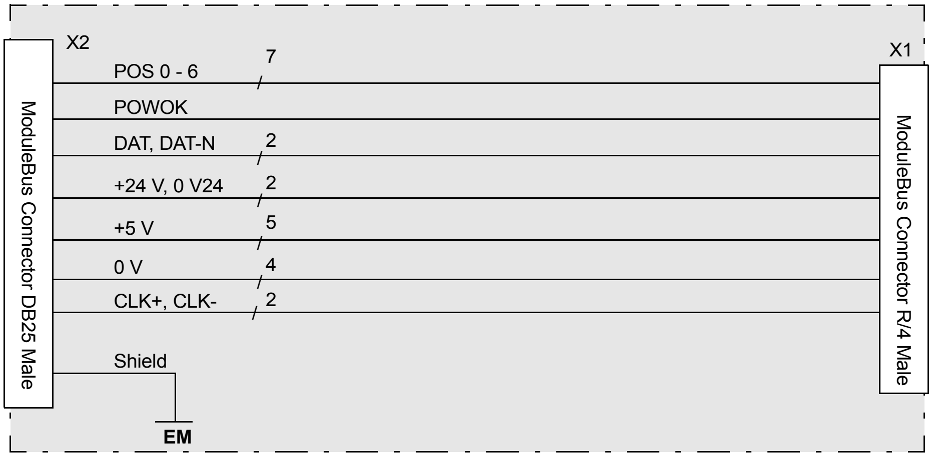
Table 67. TB845/TB846 ModuleBus Cable Adaptor Specifications (Continued)

Item	TB845	TB846
Height	186 mm (7.32”) incl. latch	186 mm (7.32”) incl. latch
Weight	180 g (0.4 lbs.)	180 g (0.4 lbs.)

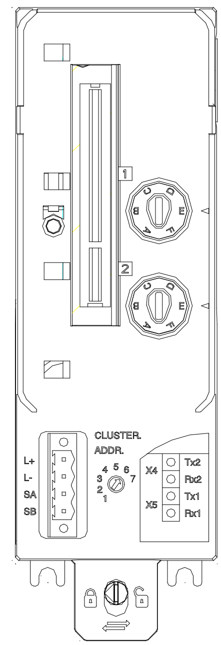
Block Diagram TB845



Block Diagram TB846



TU807, MTU for TB840/TB840A



Features

- A rotary switch for cluster address setting
- Mechanical keying prevents insertion of wrong module type
- Single ModuleBus connection
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

Description

The TU807 is a module termination unit (MTU) for single configuration of Optical ModuleBus Modem TB840/TB840A.

The MTU is a passive unit having connections for power supply, a single electrical ModuleBus, one TB840/TB840A and a rotary switch for cluster address (1 to 7) setting.

Two mechanical keys are used to configured the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

The MTU has a BLOCK signal that keeps the module in its INIT state until it is locked in its position.

Technical Data

Table 68. TU807 Single MTU for TB840/TB840A

Item	Value
Power input	24 V d.c. (19.2 - 30 V)
ModuleBus current distribution Maximum 5 V 24 V	 1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Power Dissipation	2.0 W
Width	59 mm (1.57”)
Depth	47 mm (1.85”)
Height	186.5 mm (7.34”) including latch
Weight	0.45 kg (0.99 lbs.)

Dimensions

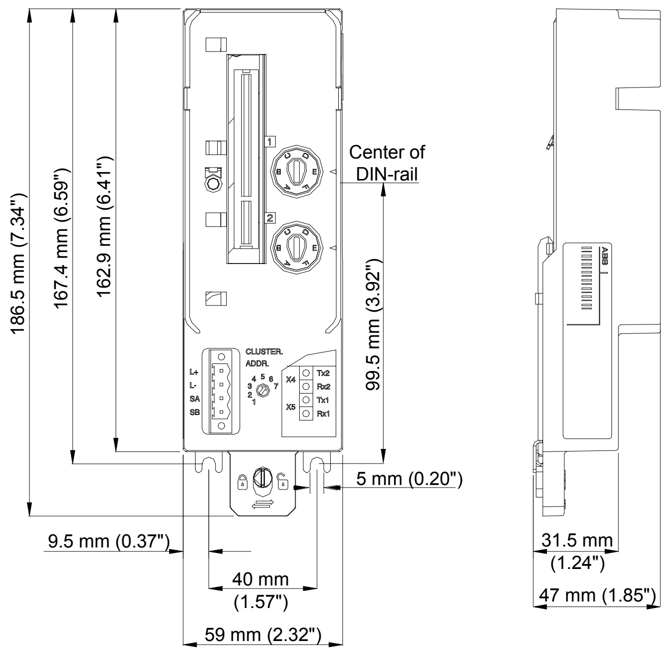


Figure 112. Dimensions TU807

Connections

Table 69. TU807 Power Supply Connections

Designation	Description
L+	+24 V d.c. Supply In
L-	0 V d.c. Supply In
SA	Redundant Power Supply “A” Monitoring Input
SB	Redundant Power Supply “B” Monitoring Input

Block Diagram TU807

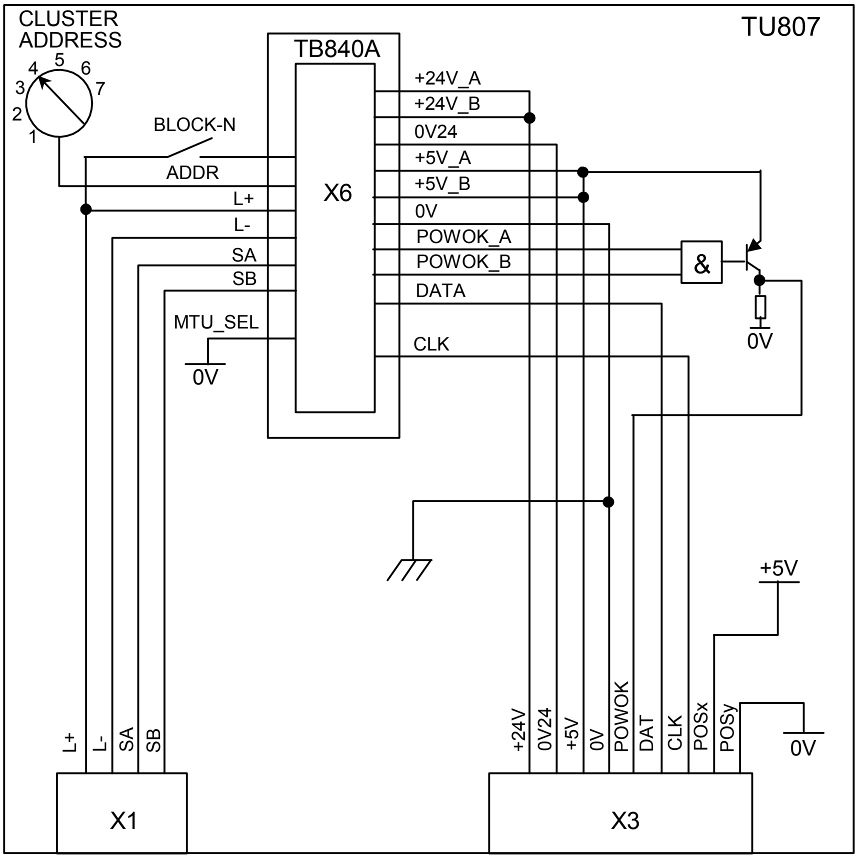
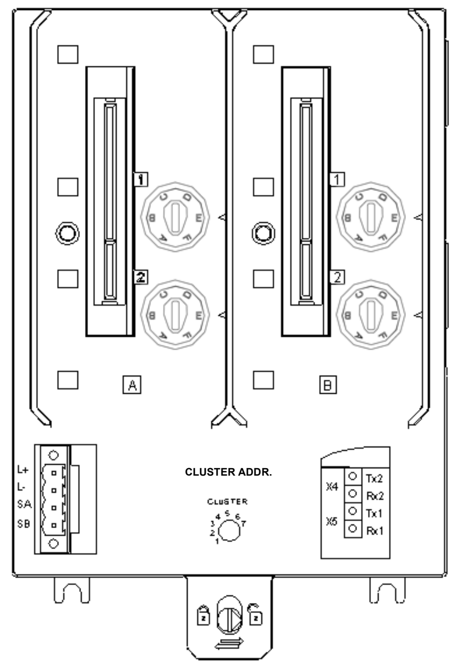


Figure 113. Block Diagram TU807

TU840, MTU for Redundant TB840/TB840A with Dual ModuleBus

Features



- A rotary switch for cluster address setting
- Mechanical keying prevents insertion of wrong module type
- Double ModuleBus connection
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

Description

The TU840 is a module termination unit (MTU) for redundant configuration of Optical ModuleBus Modem TB840.

The MTU is a passive unit having connections for power supply, double electrical ModuleBus, two TB840/TB840A and a rotary switch for cluster address (1 to 7) setting.

Four mechanical keys, two for each position, are used to configured the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

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

Technical Data

Table 70. TU840 Redundant MTU for TB840/TB840A

Item	Value
Power input	24 V d.c. (19.2 - 30 V)
ModuleBus current distribution Maximum 5 V 24 V	 1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Power Dissipation	2.0 W
Width	124 mm (4.88”)
Depth	47 mm (1.85”)
Height	186 mm (7.32”) including latch
Weight	0.45 kg (0.99 lbs.)

Dimensions

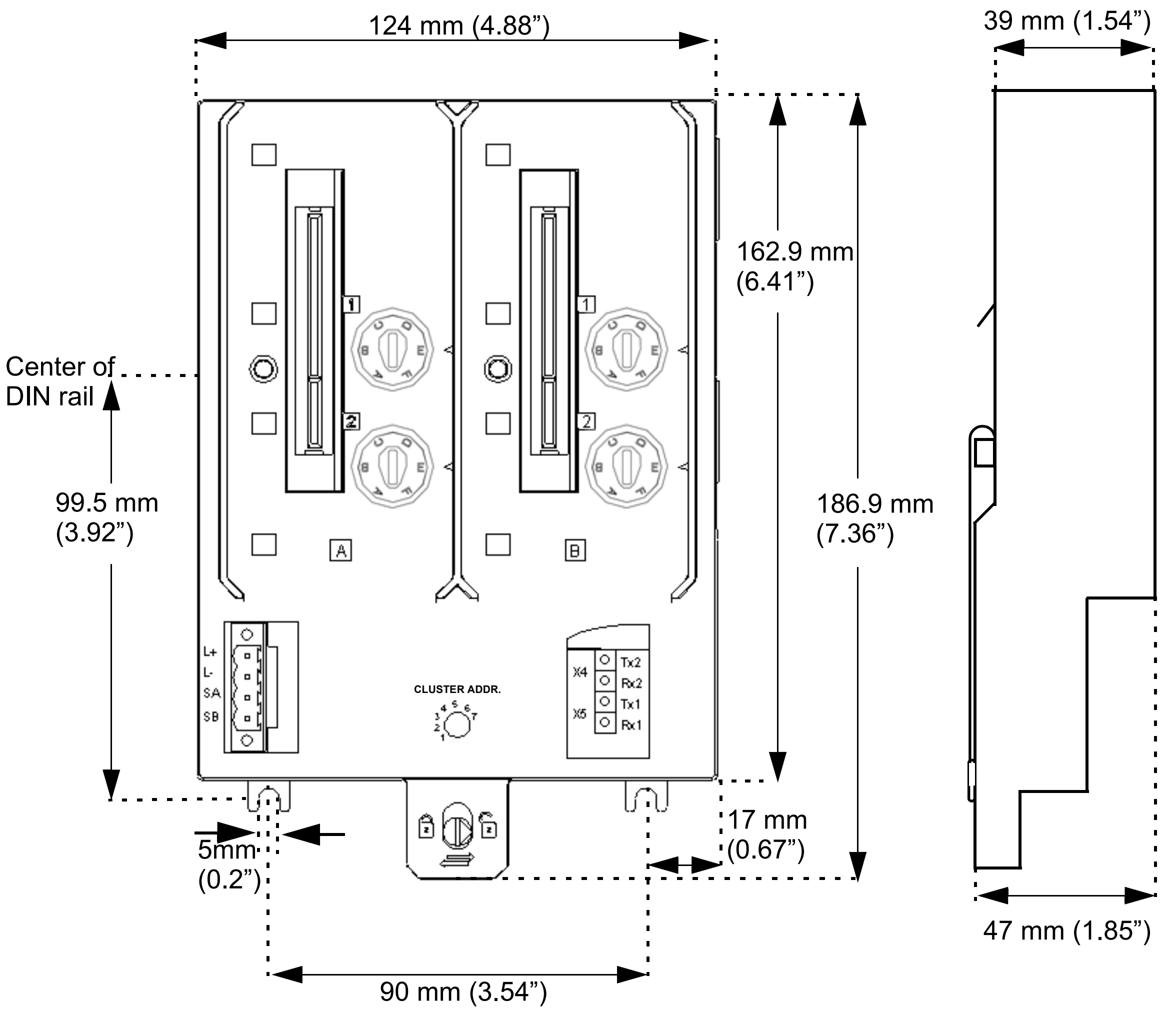


Figure 114. Dimensions TU840

Connections

Table 71. TU840 Power Supply Connections

Designation	Description
L+	+24 V d.c. Supply In
L-	0 V d.c. Supply In
SA	Redundant Power Supply “A” Monitoring Input
SB	Redundant Power Supply “B” Monitoring Input

Block Diagram TU840

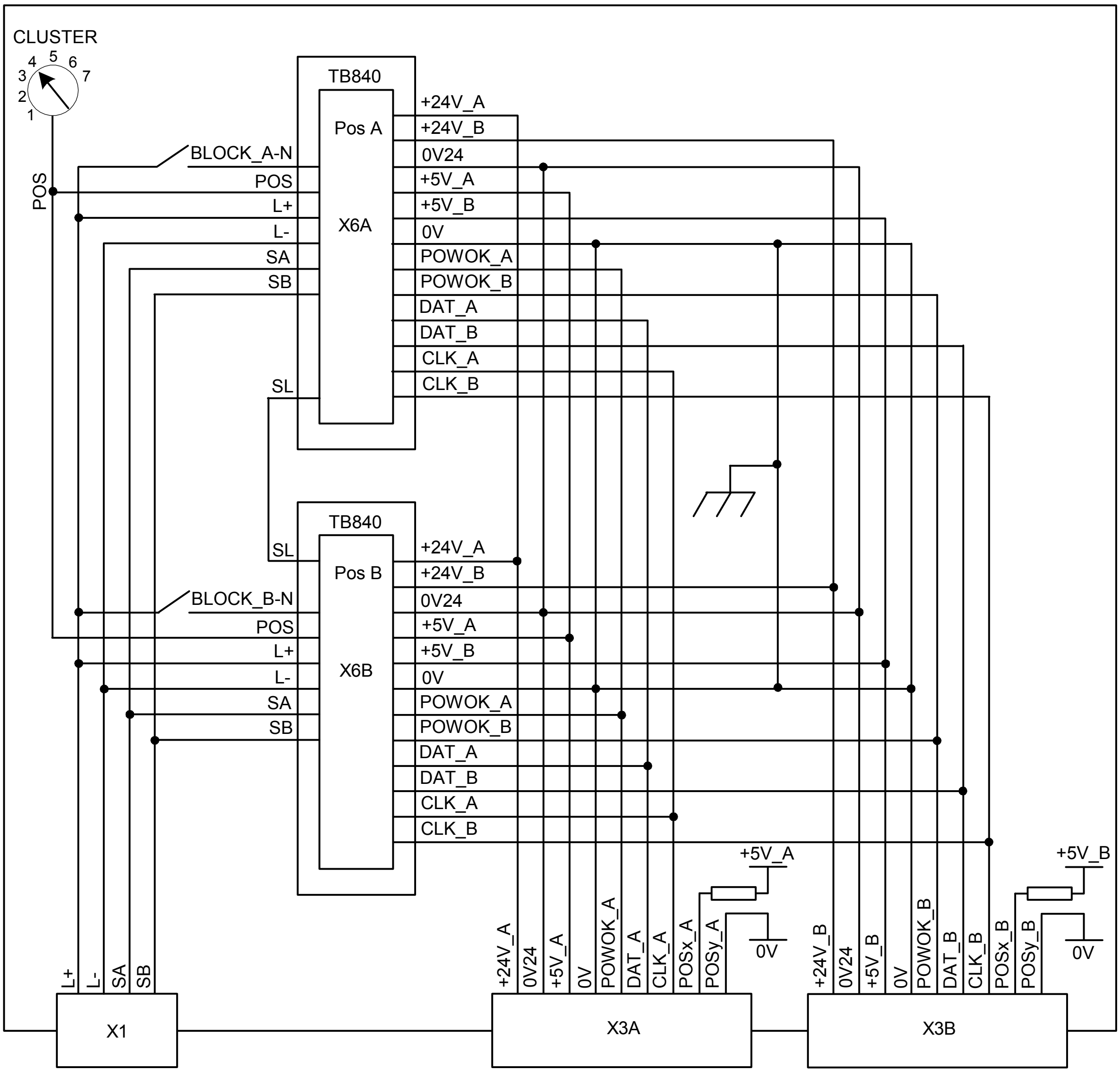
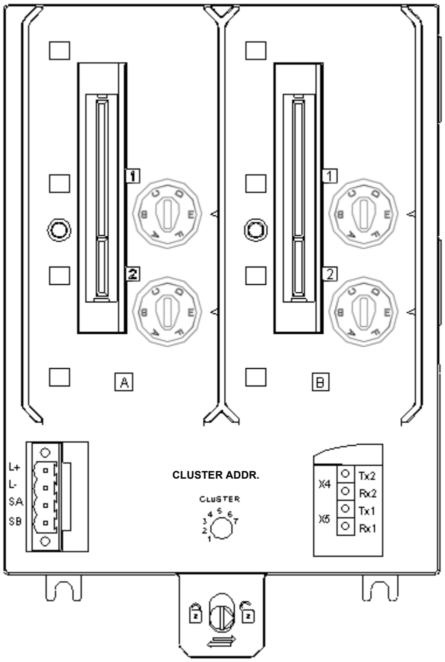


Figure 115. Block Diagram TU840

TU841, MTU for Redundant TB840/TB840A with Single ModuleBus

Features



- A rotary switch for cluster address setting
- Mechanical keying prevents insertion of wrong module type
- Single ModuleBus connection
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

Description

The TU841 is a module termination unit (MTU) for redundant configuration of Optical ModuleBus Modem TB840/TB840A.

The MTU is a passive unit having connections for power supply, a single electrical ModuleBus, two TB840/TB840A and a rotary switch for cluster address (1 to 7) setting.

Four mechanical keys, two for each position, are used to configured the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

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

Technical Data

Table 72. TU841 Redundant MTU for TB840/TB840A

Item	Value
Power input	24 V d.c. (19.2 - 30 V)
ModuleBus current distribution Maximum 5 V 24 V	 1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Power Dissipation	2.0 W
Width	124 mm (4.88”)
Depth	47 mm (1.85”)
Height	186 mm (7.32”) including latch
Weight	0.45 kg (0.99 lbs.)

Dimensions

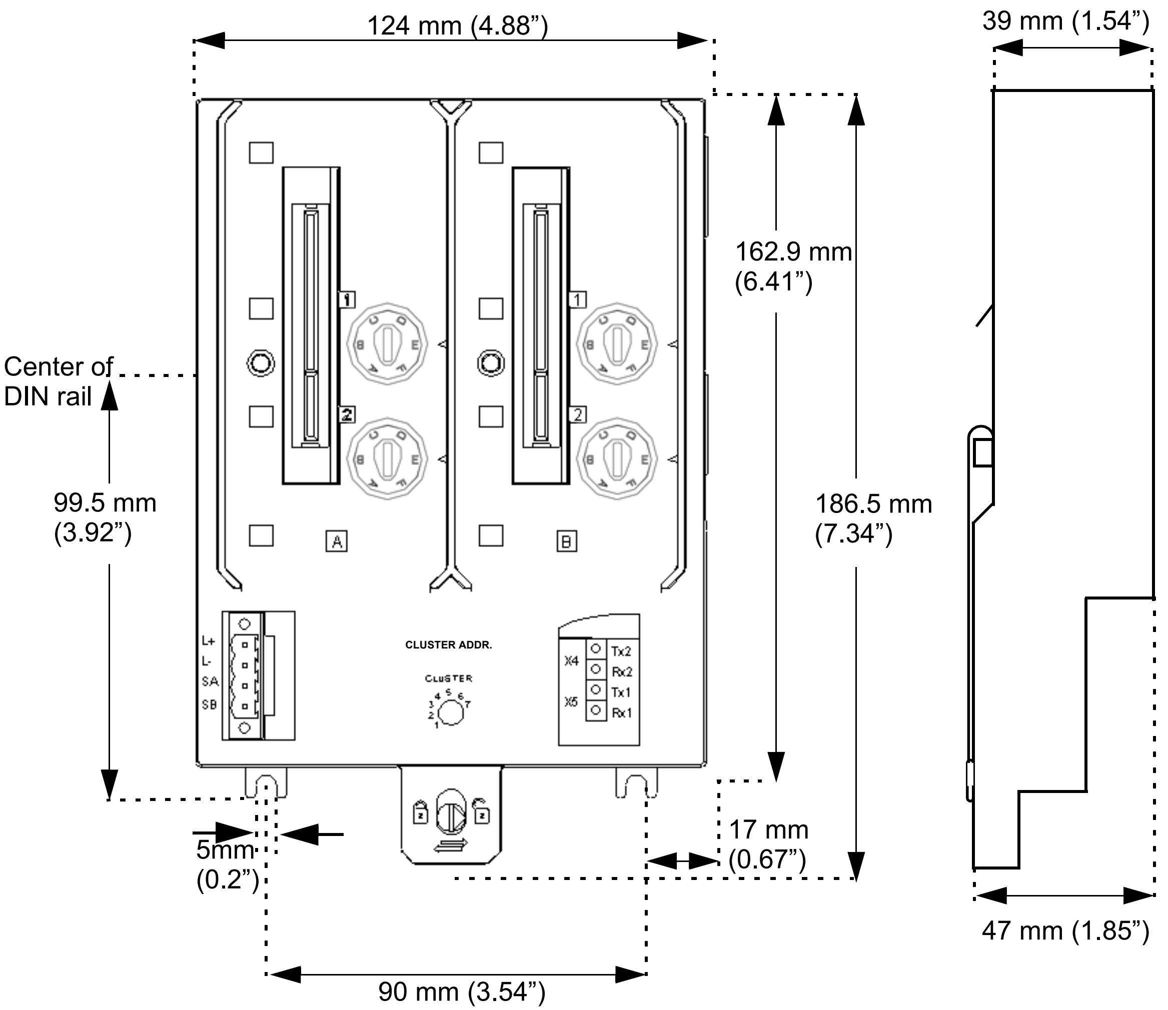


Figure 116. Dimensions TU841

Connections

Table 73. TU841 Power Supply Connections

Designation	Description
L+	+24 V d.c. Supply In
L-	0 V d.c. Supply In
SA	Redundant Power Supply “A” Monitoring Input
SB	Redundant Power Supply “B” Monitoring Input

Block Diagram TU841

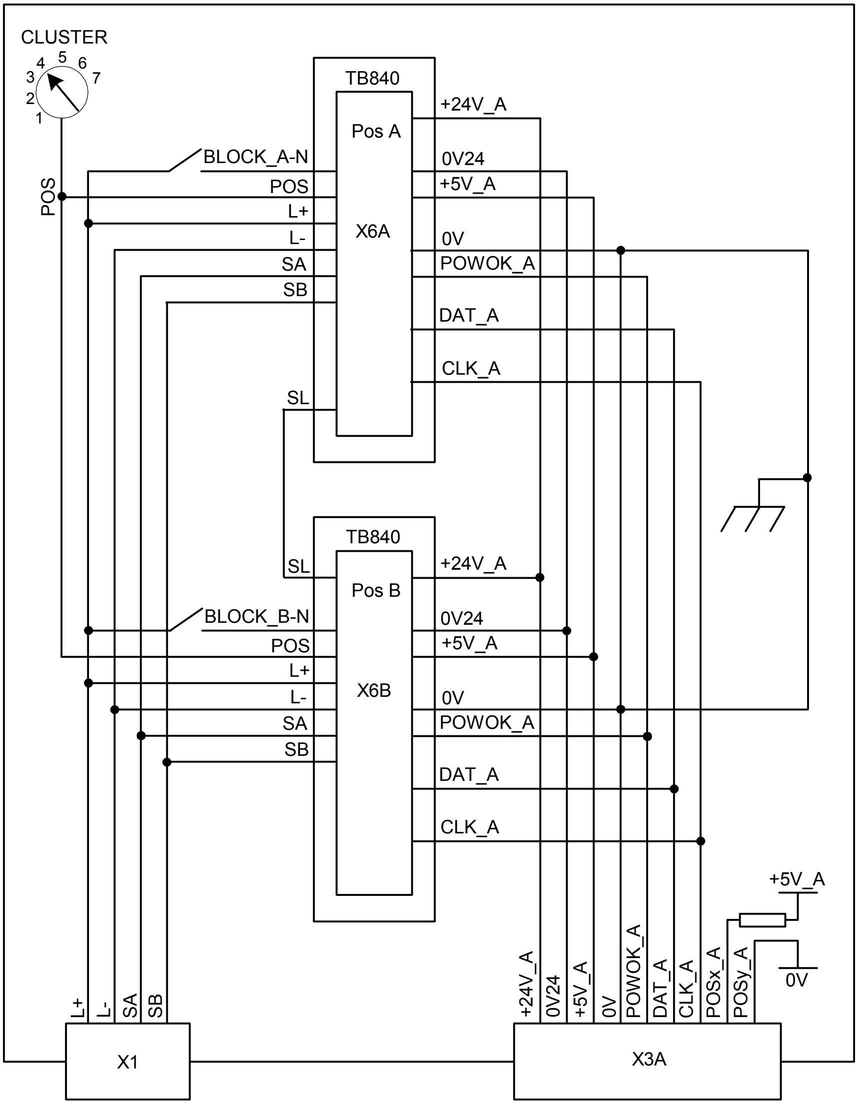
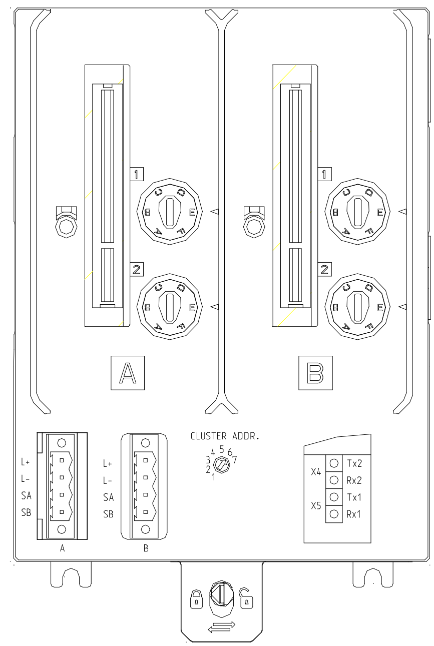


Figure 117. Block Diagram TU841

TU848, MTU for Redundant TB840/TB840A with Dual ModuleBus and Dual Power Supply Connections

Features



- Dual power supply connection
- A rotary switch for cluster address setting
- Mechanical keying prevents insertion of wrong module type
- Double ModuleBus connection
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

Description

The TU848 is a module termination unit (MTU) for redundant configuration of Optical ModuleBus Modem TB840/TB840A.

The MTU is a passive unit having connections for double power supply (one for each modem), double electrical ModuleBus, two TB840/TB840A and a rotary switch for cluster address (1 to 7) setting.

Two mechanical keys are used to configured the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

The MTU has a BLOCK signal that keeps the modules in its INIT state until it is locked in its position.

Technical Data

Table 74. TU848 Redundant MTU for TB840/TB840A

Item	Value
Power input	24 V d.c. (19.2 - 30 V)
ModuleBus current distribution Maximum 5 V 24 V	 1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Power Dissipation	2.5 W
Width	124 mm (4.88”)
Depth	47 mm (1.85”)
Height	186.5 mm (7.34”) including latch
Weight	0.45 kg (0.99 lbs.)

Dimensions

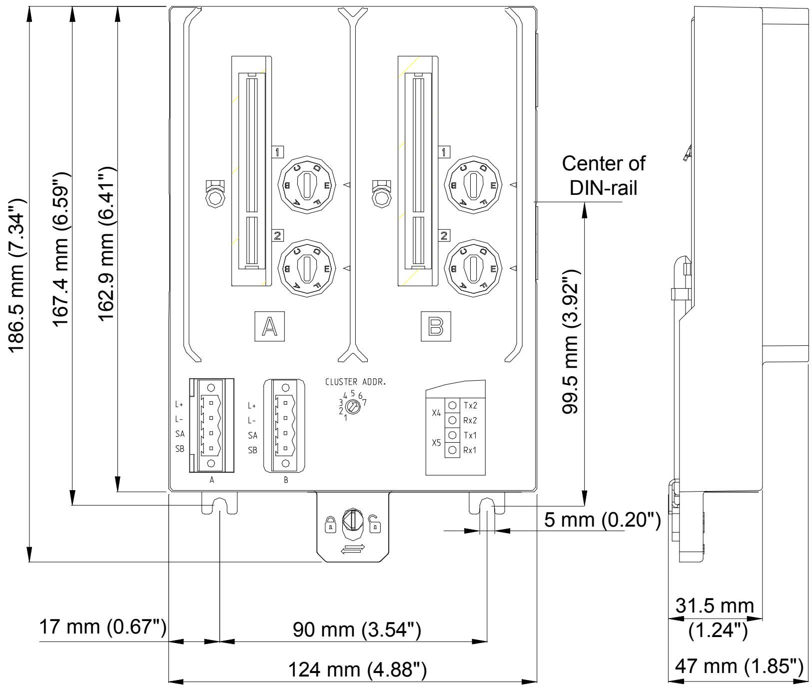


Figure 118. Dimensions TU848

Connections

Table 75. TU848 Power Supply Connections

Designation	Description
L+	+24 V d.c. Supply In
L-	0 V d.c. Supply In
SA	Redundant Power Supply “A” Monitoring Input
SB	Redundant Power Supply “B” Monitoring Input

Block Diagram TU848

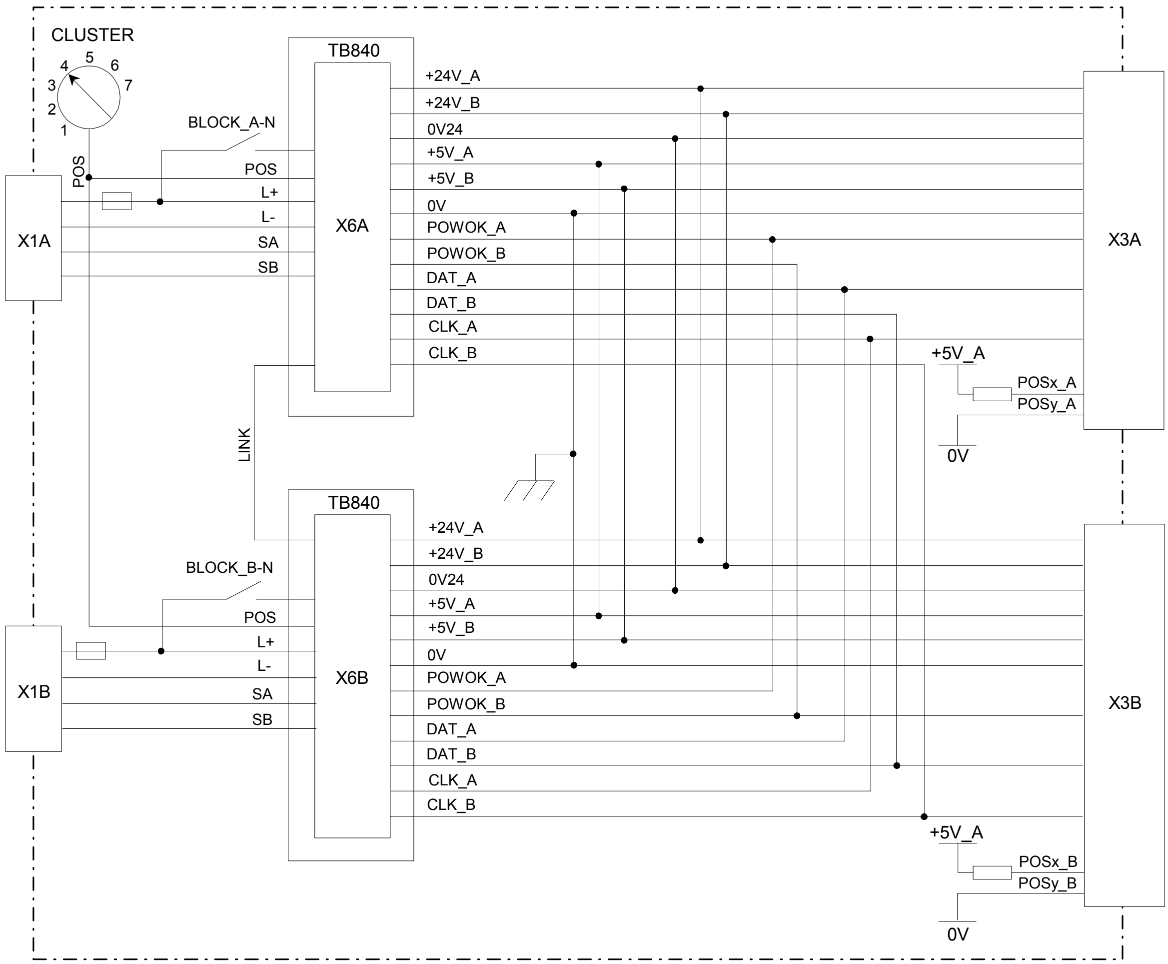
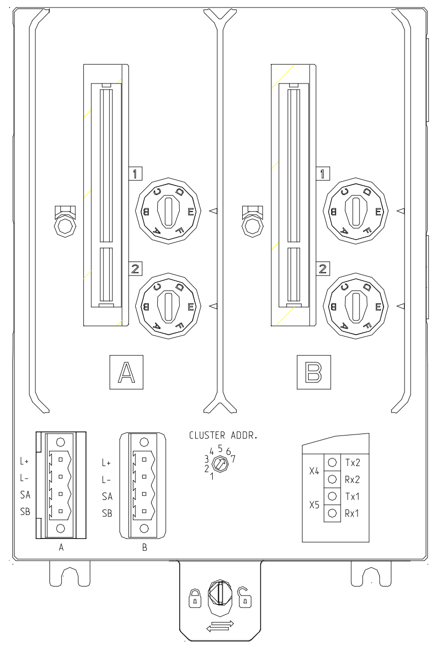


Figure 119. Block Diagram TU848

TU849, MTU for Redundant TB840/TB840A with Single ModuleBus and Dual Power Supply Connection

Features



- Dual power supply connection
- A rotary switch for cluster address setting
- Mechanical keying prevents insertion of wrong module type
- Single ModuleBus connection
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

Description

The TU849 is a module termination unit (MTU) for redundant configuration of Optical ModuleBus Modem TB840/TB840A.

The MTU is a passive unit having connections for double power supply, one for each modem, a single electrical ModuleBus, two TB840/TB840A and a rotary switch for cluster address (1 to 7) setting.

Four mechanical keys, two for each position, are used to configured the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

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

Technical Data

Table 76. TU849 Redundant MTU for TB840/TB840A

Item	Value
Power input	24 V d.c. (19.2 - 30 V)
ModuleBus current distribution Maximum 5 V 24 V	 1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
Equipment Class	Class I according to IEC 60536; (earth protected)
Ingress Protection	IP20 according to IEC 60529
Acceptable wire sizes	Solid: 0.2 - 2.5 mm^2 Stranded: 0.2 - 2.5 mm^2, 24 - 12 AWG Recommended torque: 0.5 Nm
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Power Dissipation	2.5 W
Width	124 mm (4.88”)
Depth	47 mm (1.85”)
Height	186.5 mm (7.34”) including latch
Weight	0.45 kg (0.99 lbs.)

Dimensions

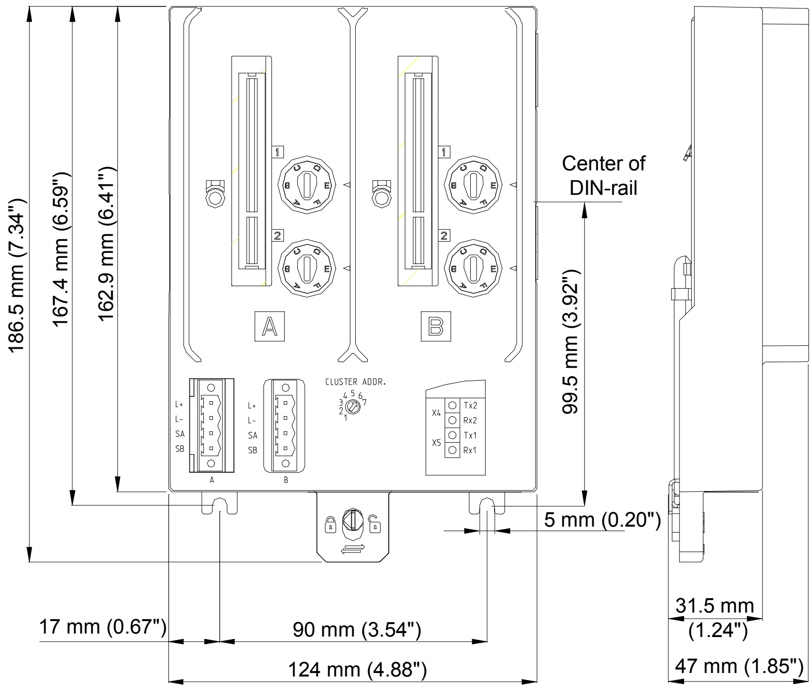


Figure 120. Dimensions TU849

Connections

Table 77. TU849 Power Supply Connections

Designation	Description
L+	+24 V d.c. Supply In
L-	0 V d.c. Supply In
SA	Redundant Power Supply “A” Monitoring Input
SB	Redundant Power Supply “B” Monitoring Input

Block Diagram TU849

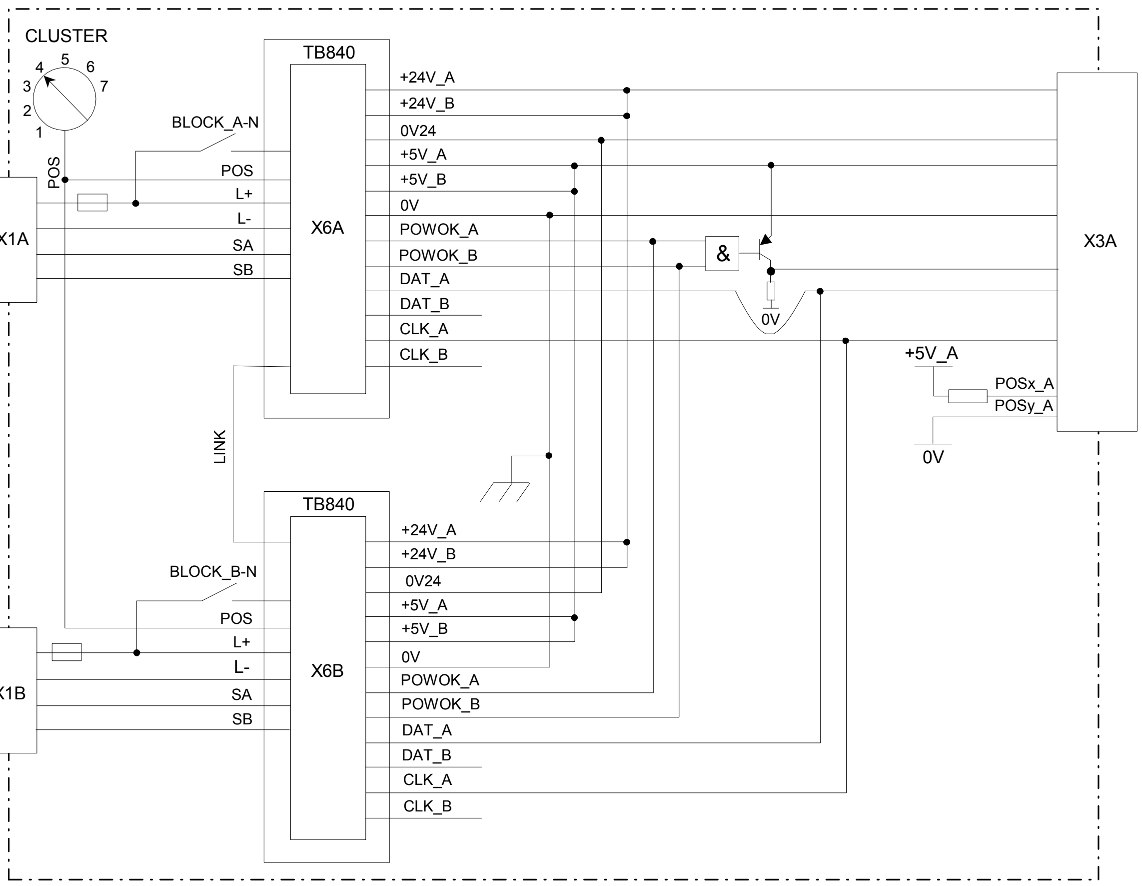


Figure 121. Block Diagram TU849

TK811 Opto Cable, Duplex Plastic Fibre

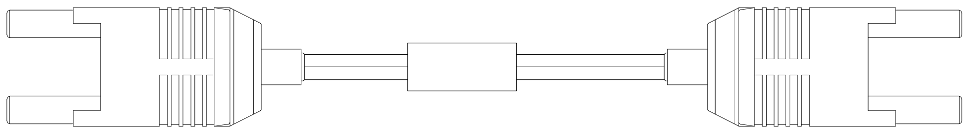


Figure 122.

Features

- Available in lengths of 1.5, 5 and 15 m.
- LSZH (Low Smoke Zero Halogene) plastic fiber.
- Classified according to UL1581.
- Classified according to AWM VW-1.
- Opto connectors type Agilent’s, former Hewlett-Packard, Versatile Link Latching connector.
- Extra low loss attenuation.

TK812 Opto Cable, Simplex Plastic Fibre

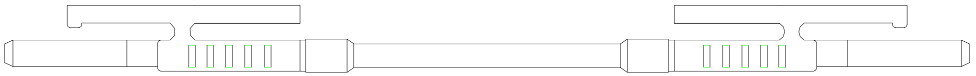


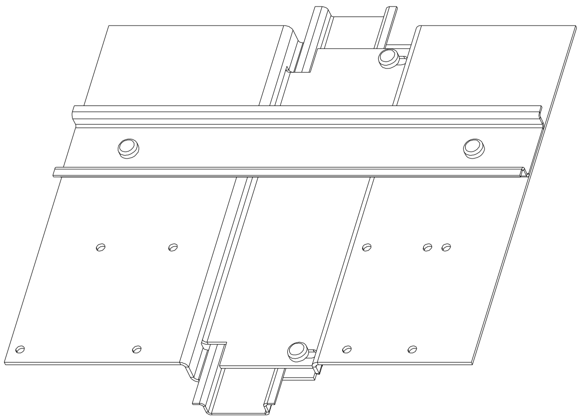
Figure 123.

Features

- Available in lengths of 1.5, 5 and 15 m.
- LSZH (Low Smoke Zero Halogene) plastic fiber
- Classified according to UL1581
- Classified according to AWM VW-1
- Opto connectors type Agilent’s, former Hewlett-Packard, Versatile Link Latching connector
- Extra low loss attenuation

Mounting Kit

Features



- Prepared for 9 different configurations
- DIN rail locking mechanism

Description

The Mounting Kit is used for horizontal mounting of CI801, CI840/CI840A and TB840/TB840A on a vertical DIN rail.

ModuleBus cable adapters can be mounted on the Mounting Kit together with communication modules.

Technical Data

Table 78. Mounting Kit

Item	Value
Width	200 mm (7.87”)
Depth	170 mm (6.69”)
Height	17 mm (0.67”)
Weight	0.5 kg (1.10 lbs.)

Configuration

There are 9 different configurations for mounting of MTU:s on the Mounting Kit, see Figure 124.

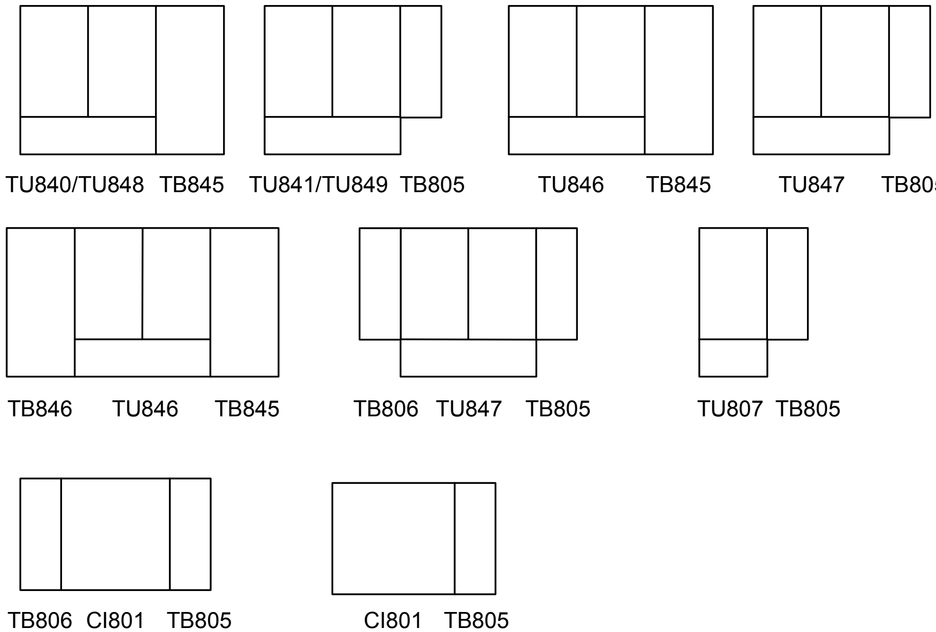


Figure 124. Configurations for mounting of MTU:s on the Mounting Kit

Horizontal and Vertical Mounting Profile

Features

- Good mechanical stability
- Good chassis ground connection
- Provided with groove for additional screw fastening of the modules

Description

On the horizontal aluminium profile are mounted:

- one DIN-rail with height 7.5 mm type NS 35/7.5 according to EN 50022
- one cable duct u-profile

The profile are available in three different lengths; 465 mm (19”), 592 mm (24”) and 719 mm (28.31”).

On the vertical aluminium profile are mounted:

- two DIN-rail, one vertical and one horizontal, with height 7.5 mm type NS 35/7.5 according to EN 50022
- one cable duct u-profile

The profile are available in lengths; 1800 mm (70.87”). The profile can be mounted to left, centered or to right in a cabinet.

Dimensions

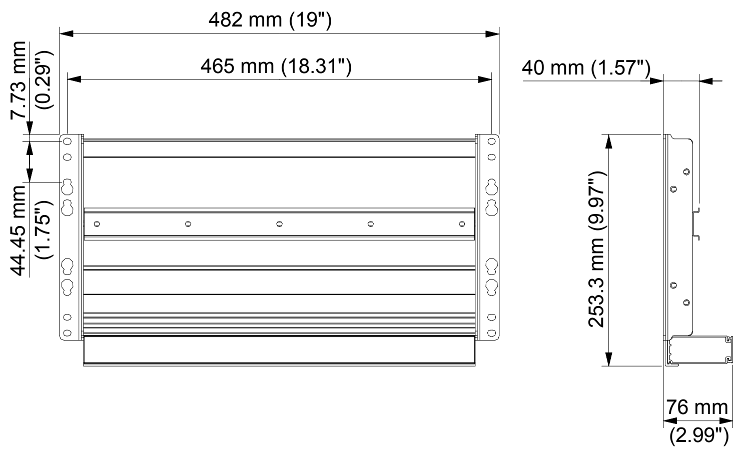


Figure 125. Horizontal Mounting Profile Dimensions

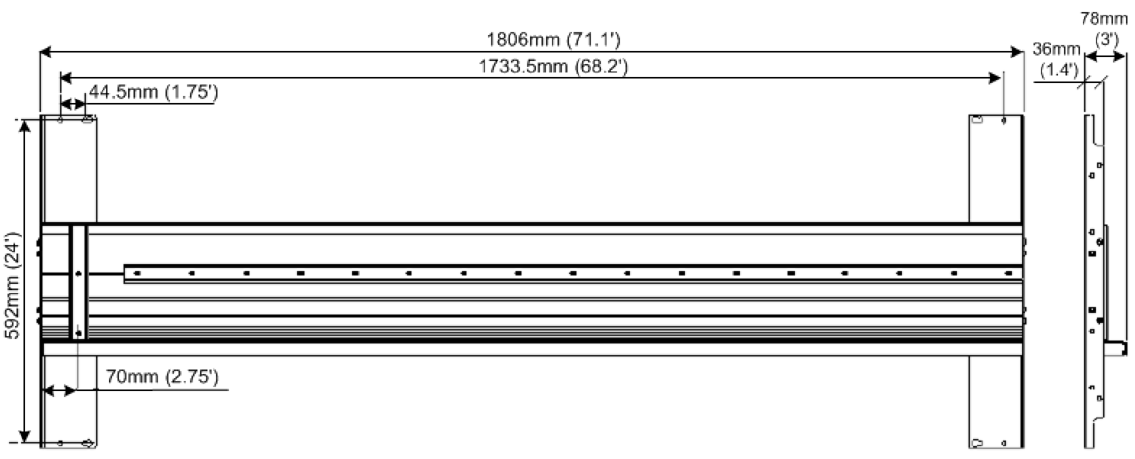


Figure 126. Vertical Mounting Profile Dimensions

Appendix C Power Up

Power Up on S800 I/O

S800 I/O will start under four different conditions.

1. Without configuration and without communication with the controller. Start the first time or after a long power off.
2. Without configuration but with communication with the controller. Start the first time or after a long power off.
3. With configuration but without communication with the controller. Start after a short power off.
4. With configuration and with communication with the controller. Start after a short power off.

Below follows a description how to start and how S800 behaves during start-up under different conditions.

1. Check that the circuit breakers on the power switch units are switched off.
2. Switch on the mains power, and check for correct mains voltage with a multimeter.
3. Switch on the circuit breaker on the power switch unit(s).

Without configuration and without communications with the controller:
See timing diagram Figure 127.

Indications on FCI

F (fault)	“on” at power up and “off” after self-test ok
R (run)	“off”
P (pow ok)	“on” if power supply ok
T1	“off”

T2	“off”
PR	“on” (only primary FCI in a redundant configuration)
DU	“off” (both FCI in a redundant configuration).

Indications on I/O Modules

F (fault)	“on”
R (run)	“off”
W (warning)	“off”
O (osp only outputs)	“off”

Without configuration but with communications with the controller:
See timing diagram Figure 128.

Indications on FCI

F (fault)	“on” at power up and “off” after self-test ok
R (run)	“off” at power up and “on” after configuration ok and commanded operational from the controller (can take about 1 to 4 minutes)
P (pow ok)	“on” if power supply ok
T1	“on” if cable 1 ok
T2	“on” if cable 2 ok
PR	“on” (only primary FCI in a redundant configuration)
DU	“off” (both FCI in a redundant configuration)

The backup will be started up after the I/O. When the backup has started

PR	“on” (only primary FCI in a redundant configuration)
DU	“on” (both FCI in a redundant configuration)

Indications on I/O Modules

F (fault	“on” at power up and “off” after the first access from the FCI
R (run)	“off” at power up and “on” for AI, DI after configuration and for AO, DO after configuration and commanded operational from the controller
W (warning	“off” at power up and after module operational updated from the module
O (outputs only)	“off” at power up and after module operational updated from the module

With configuration but without communications with the controller:
See timing diagram Figure 129.

Indications on FCI

F (fault)	“on” at power up and “off” after self-test ok
R (run)	“off”
P (pow ok)	“on” if power supply ok
T1	“off”
T2	“off”
PR	“on” (only primary FCI in a redundant configuration)
DU	“off” (both FCI in a redundant configuration)

Indications on I/O Modules

F (fault)	“on” at power up and “off” after the first access from the FCI
R (run)	“off” at power up and “on” for AI, DI after configuration from the FCI. AO and DO remains in “off”
W (warning)	“off” at power up and after module operational updated from the module
O (osp only outputs)	“off”

With configuration and communications with the controller:
See timing diagram Figure 130.

Indications on FCI

F (fault)	“on” at power up and “off” after self-test ok
R (run)	“off” at power up and “on” after configuration and commanded operational from the controller. (can take about 1 to 4 minutes)
P (pow ok)	“on” if power supply ok
T1	“on” if cable 1 ok
T2	“on” if cable 2 ok

The backup will be started up after the I/O. When the backup has started

PR	“on” (only primary FCI in a redundant configuration)
DU	“on” (both FCI in a redundant configuration)

Indications on I/O Modules

F (fault)	“on” at power up and “off” after the first access from the FCI
R (run)	“off” at power up and “on” for AI, DI after configuration and for AO,DO after configuration and commanded operational from the controller
W (warning)	“off” at power up and after the module operational updated from the module
O (osp only outputs)	“off” at power up and after module is operational it is handled by the module

Power up of backup FCI in a running system:
See timing diagram Figure 131.

Indications on FCI

Primary	
F (fault)	“off”
R (run)	“on”
P (pow ok)	“on”
T1	“on”
T2	“on”
PR	“on”
DU	“off” (on when the backup is running)

Backup	
F (fault)	“off”
R (run)	“off” (on when the backup is running)
P (pow ok)	“on”
T1	“on”
T2	“on”
PR	“off”
DU	“off” (on when the backup is running)

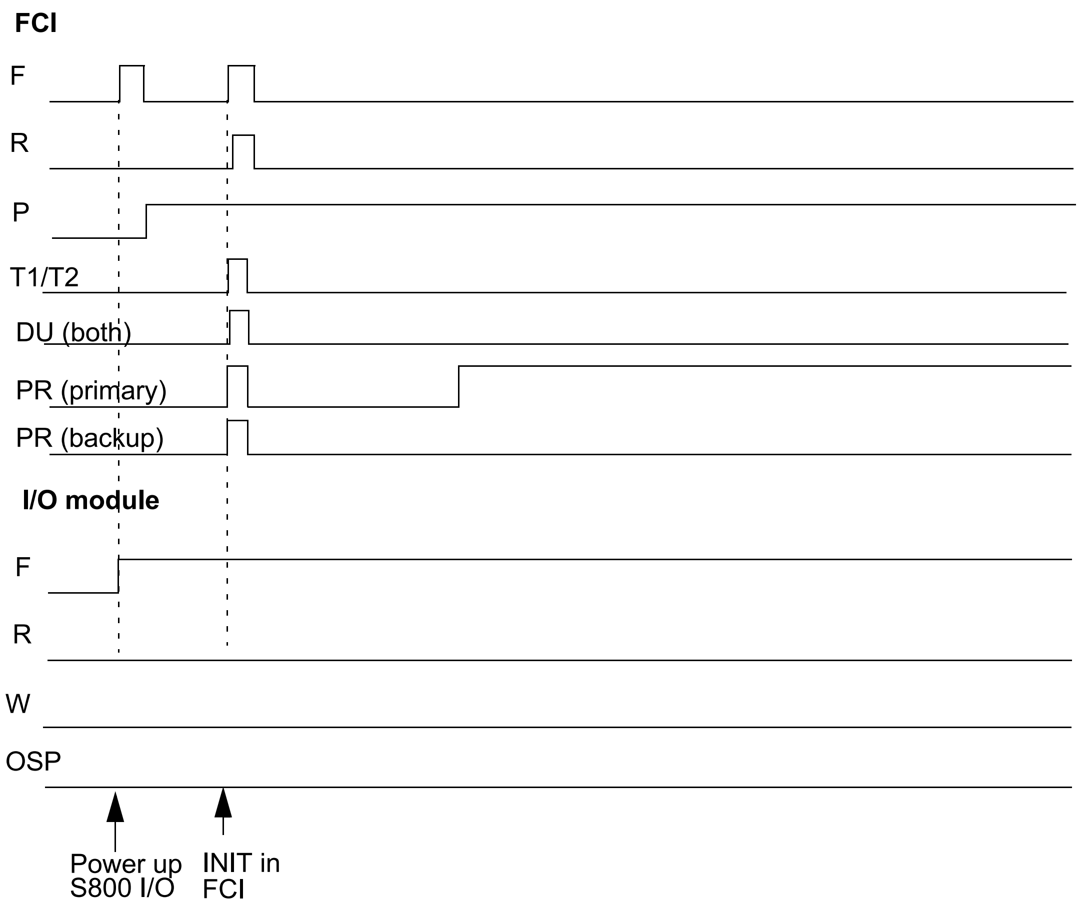


Figure 127. Power-up Timing Diagram, no Configuration and no Communications to Controller

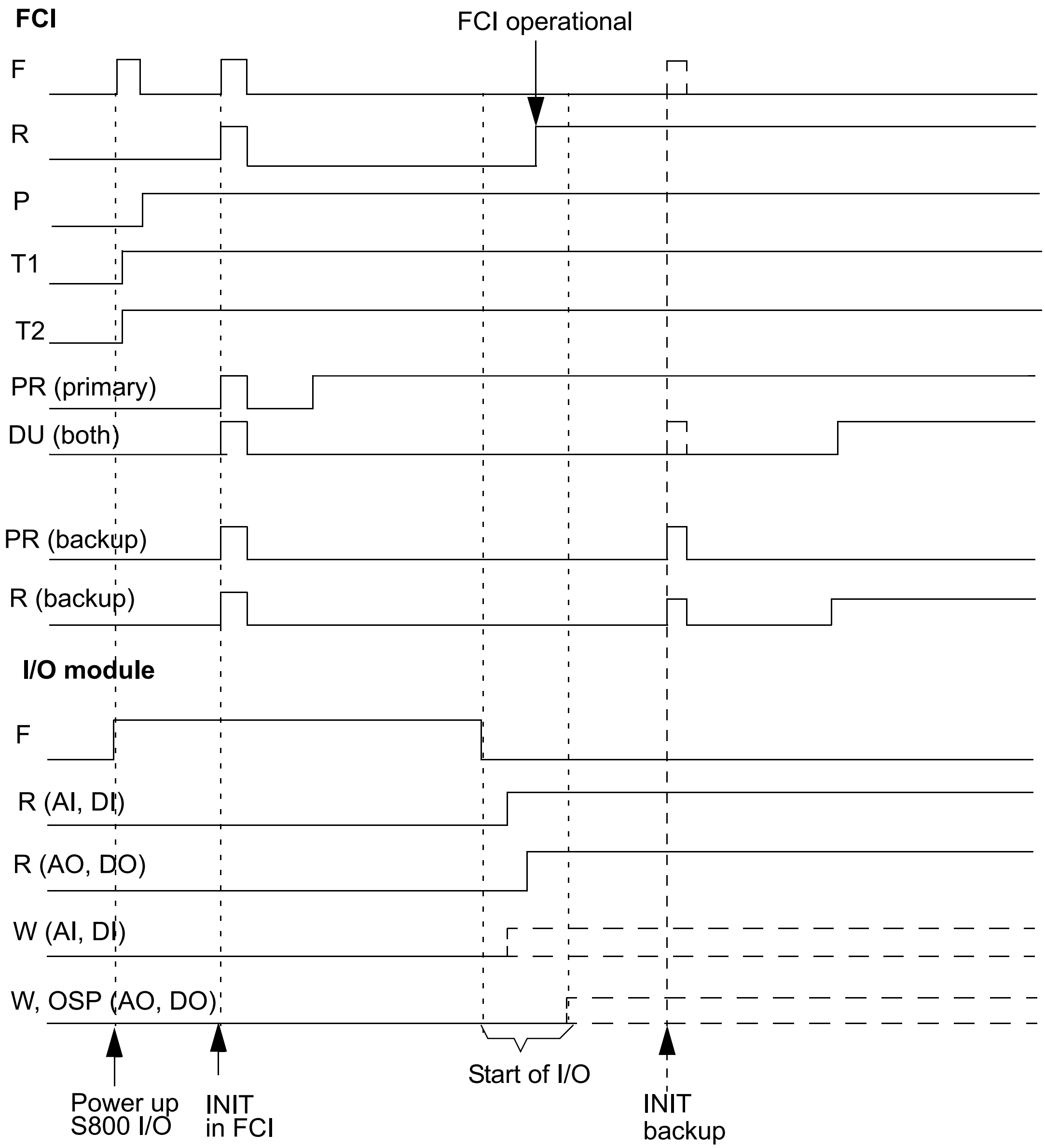


Figure 128. Power-up Timing Diagram, no Configuration and Communications to Controller

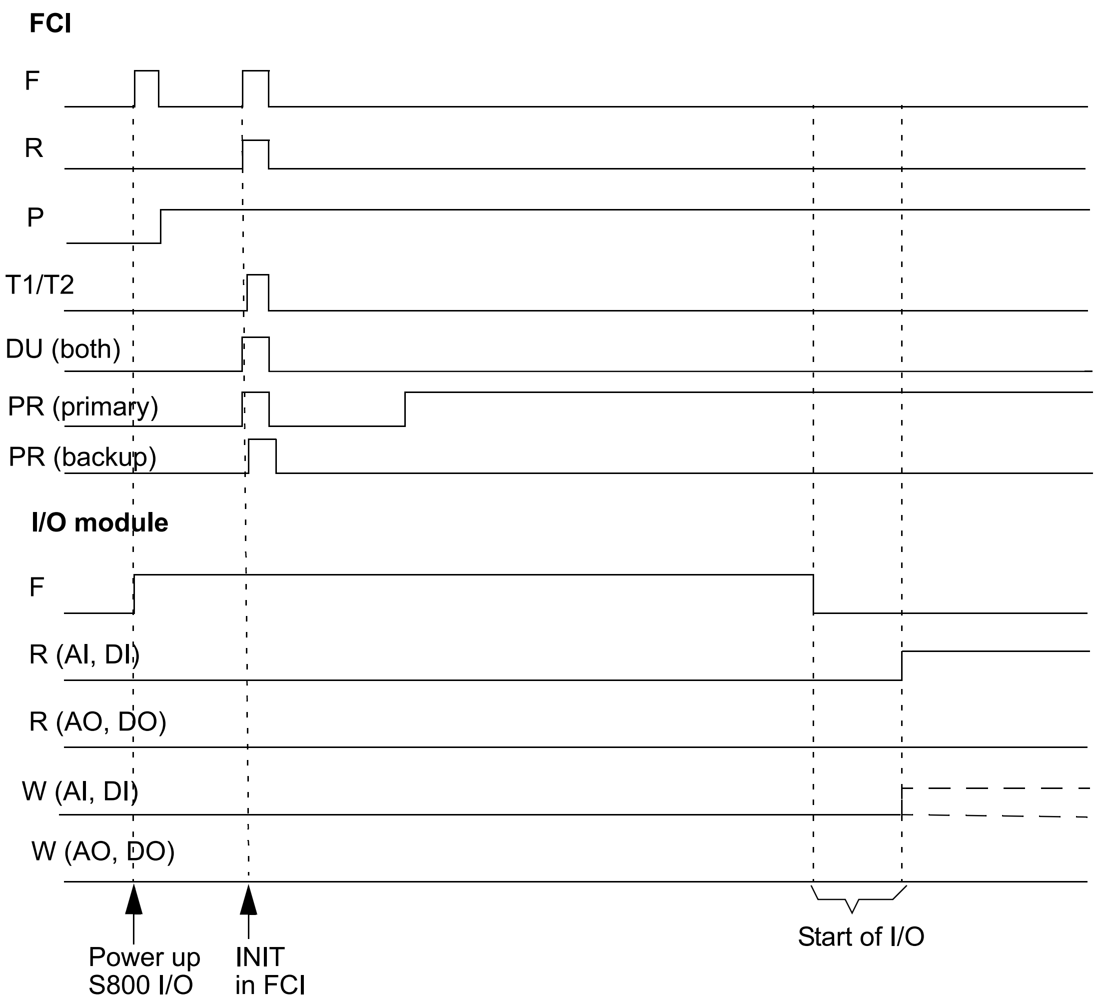


Figure 129. Power-up Timing Diagram, with Configuration and no Communications to Controller

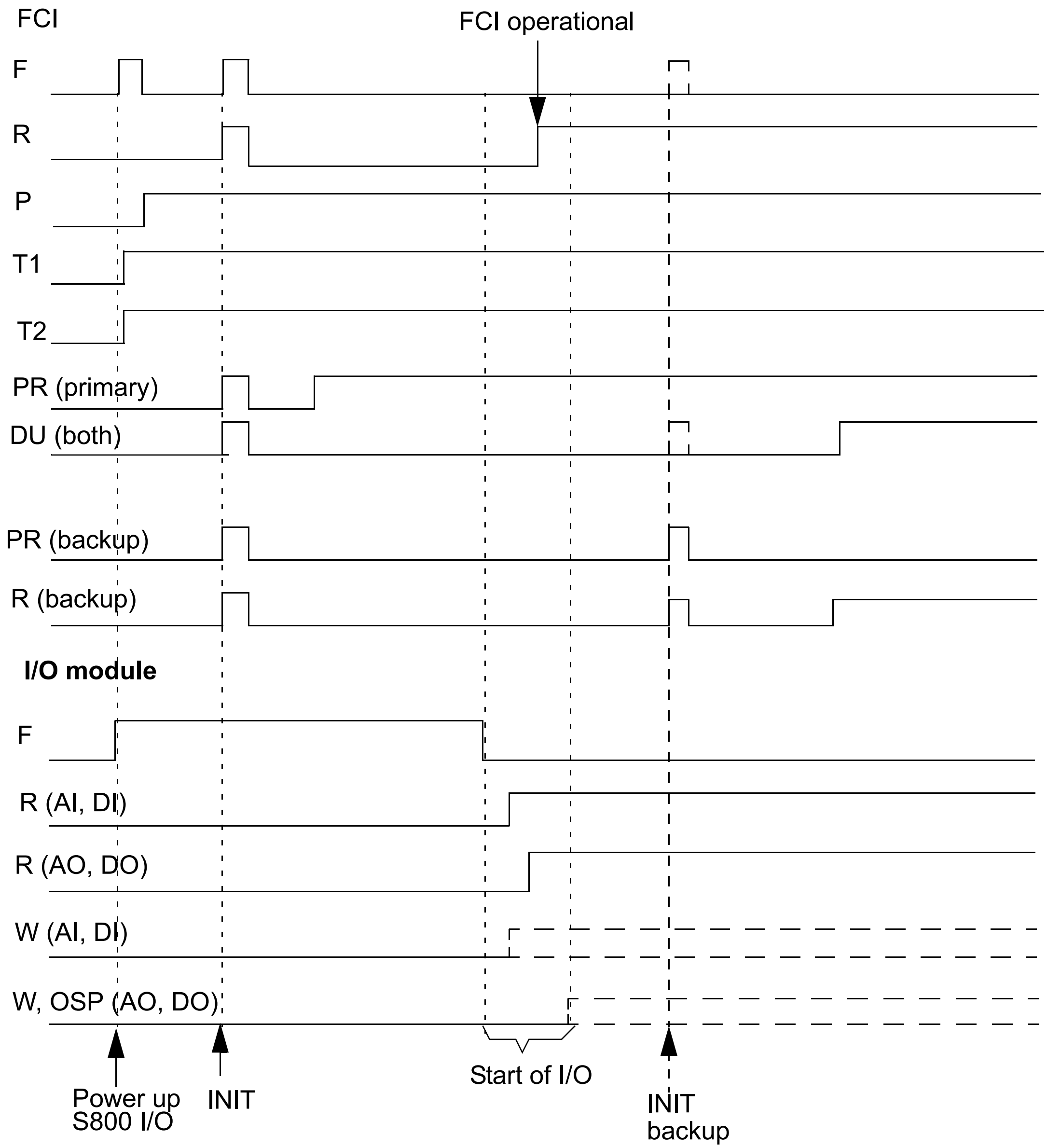


Figure 130. Power-up Timing Diagram, with Configuration and Communications to Controller

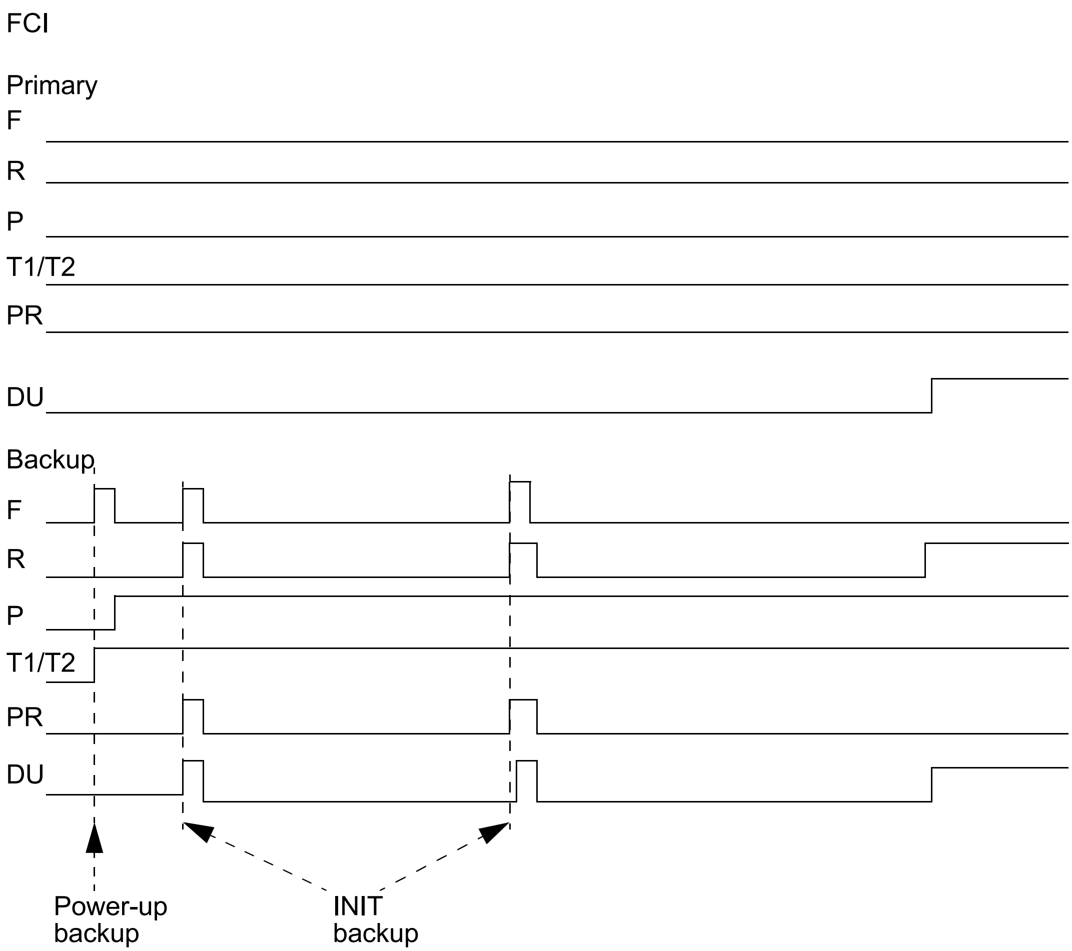


Figure 131. Power-up Timing Diagram, Power-up of Backup in a Running System

Appendix D Certifications

Certifications

The S800 I/O system is continuously enhanced with additional certificates. Table 79 describes the current certifications.

Table 79. Current Certifications for S800 Modules

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
Analog Input Modules						
AI801	X	X	X			
AI810	X	X	X			
AI815	X	X	X			
AI820	X	X	X			
AI825	X	X				
AI830	X	X	X			
AI830A	X	X	X			
AI835	X	X	X			
AI835A	X	X	X			
AI843	X	X	X			

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
AI845	X	X	X			
AI880/ AI880A	X	X	X	X		X
Analog Output Modules						
AO801	X	X	X			
AO810	X	X	X			
AO810V2	X	X	X			
AO815	X	X	X			
AO820	X	X	X			
AO845	X	X	X			
AO845A	X	X	X			
Field Communication Interface						
CI801	X	X	X			
CI810B	X	X	X			
CI820V1	X	X	X			
CI830	X	X	X			
CI840	X	X	X			

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
CI840A	X	X	X			
TB815	X	X	X			
Advant Fieldbus 100						
TC501V150	X					
TC506	X					
TC513V1	X					
TC514V2	X					
TC515V2	X					
Digital Input Modules						
DI801	X	X	X			
DI802	X	X				
DI803	X	X				
DI810	X	X	X			
DI811	X	X	X			
DI814	X	X	X			
DI818	X					
DI820	X	X				

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
DI821	X	X				
DI825	X	X				
DI828	X					
DI830	X	X	X			
DI831	X	X	X			
DI840	X	X	X			
DI880	X	X	X	X		X
DI885	X	X	X			
Digital Output Modules						
DO801	X	X	X			
DO802	X	X				
DO810	X	X	X			
DO814	X	X	X			
DO815	X	X	X			
DO818	X					
DO820	X	X				
DO821	X	X				
DO828	X					

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
DO840	X	X	X			
DO880	X	X	X	X		X
Power supply and voter						
SD821(4)	X	X				
SD822(4)	X	X				
SD823(4)	X	X				
SS822(4)	X	X				
SD832	X	X				
SD833	X	X				
SD834	X	X	X			
SS823	X	X	X			X
SS832	X	X				
Pulse Counting Modules						
DP820	X	X	X			
DP840	X	X	X			

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
Module Termination Units						
TU807	X	X	X			
TU810V1	X	X	X			
TU811V1	X	X				
TU812V1	X	X	X			
TU813	X	X				
TU814V1	X	X	X			
TU818	X					
TU819	X					
TU830V1	X	X	X			
TU831V1	X	X				
TU833	X	X	X			
TU834	X	X	X			
TU835V1	X	X	X			
TU836V1	X	X				
TU837V1	X	X				
TU838	X	X	X			
TU839	X	X				
TU840	X	X	X	X		

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
TU841	X	X	X	X		
TU842	X	X	X	X		
TU843	X	X	X	X		
TU844	X	X	X	X		
TU845	X	X	X	X		
TU846	X	X	X			
TU847	X	X	X			
TU848	X	X	X			
TU849	X	X	X			
TU850	X	X	X			
TU851	X					
TU852	X					
TU854	X					
TU890	X				X	
TU891	X					
TY801	X	X	X	X		
TY804	X					

Table 79. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety (4)	cULus Hazardous Location Class1 Zone 2 (1)	ATEX Hazardous Location Zone 2 (2)	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 (3)	SIL3
ModuleBus Communication Parts						
TB805	X	X	X			
TB806	X	X	X			
TK801V003	X					
TK801V006	X					
TK801V0012	X					
TB807	X	X	X			
TB810	X	X	X			
TB811	X	X	X			
TB820V2	X	X	X			
TB825	X	X	X			
TB826	X	X	X			
TB840/ TB840A	X	X	X	X		
TB842	X	X	X			
TB845	X	X	X			
TB846	X	X	X			

(1) Marking for mounting and interface: Class 1, Zone 2, AEx nA IIC T4, Ex nA IIC T4 Gc X
(2) Marking for mounting and interface: Ex II 3G Ex nA IIC T5 Gc
(3) Marking for mounting: Ex II 3G Ex nA IIC T5 Gc
Marking for interface: Ex II (1)G [Ex ia Ga] IIC
(4) cULus; UL 508, CAN/CSA C22.2 No. 142-M87

Appendix E Hardware Units for Essential Automation

A selection of the units described in this book is also available as versions for Essential Automation. These units have exactly the same technical specifications, but differ in the following characteristics.

- Electronically recognizable - S800 IO hardware status shows text 'eA'
- Color - main unit is in gray
- Type designation - name ends with '-eA'
- Article number - part ends with R2 instead of R1

The Table 80 lists the -eA units, certificates and type approvals that currently applies to each unit.

Table 80. All -eA Units and Certifications

Available eA Modules	CE	cULus Electrical Safety (1)	cULus Hazardous Location Class 1 Zone 2 (2)
AI801-eA	X	X	X
AI810-eA	X	X	X
AI815-eA	X	X	X
AI820-eA	X	X	X
AI825-eA	X	X	
AI830A-eA	X	X	X

Table 80. All -eA Units and Certifications (Continued)

Available eA Modules	CE	cULus Electrical Safety (1)	cULus Hazardous Location Class 1 Zone 2 (2)
AI835A-eA	X	X	X
AI843-eA	X	X	X
AI845-eA	X	X	X
AO801-eA	X	X	X
AO810V2-eA	X	X	X
AO815-eA	X	X	X
AO820-eA	X	X	X
AO845A-eA	X	X	X
DI801-eA	X	X	X
DI802-eA	X	X	
DI803-eA	X	X	
DI810-eA	X	X	X
DI811-eA	X	X	X
DI814-eA	X	X	X
DI818-eA	X		
DI820-eA	X	X	
DI821-eA	X	X	
DI825-eA	X	X	
DI828-eA	X		
DI830-eA	X	X	X
DI831-eA	X	X	X
DI840-eA	X	X	X

Table 80. All -eA Units and Certifications (Continued)

Available eA Modules	CE	cULus Electrical Safety [(1)]	cULus Hazardous Location Class 1 Zone 2 [(2)]
DO801-eA	X	X	X
DO802-eA	X	X	
DO810-eA	X	X	X
DO814-eA	X	X	X
DO815-eA	X	X	X
DO818-eA	X		
DO820-eA	X	X	
DO821-eA	X	X	
DO828-eA	X		
DO840-eA	X	X	X
DP820-eA	X	X	X
DP840-eA	X	X	X
CI801-eA	X	X	X
CI840A-eA	X	X	X
TB820V2-eA	X	X	X
TB840A-eA	X	X	X
TB825-eA	X	X	X
TB826-eA	X	X	X

(1) cULus: UL 508, CAN/CSA C22.2 No. 142-M87
(2) Marking for mounting and interface: Class 1, Zone 2, AEx nA IIC T4, Ex nA IIC T4 Gc X

INDEX

Revision History

Introduction

This section provides information on the revision history of this User Manual.

The revision index of this User Manual is not related to the 800xA 5.1 System Revision.

Revision History

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

Revision Index	Description	Date
-	Added Hardware Units for Essential Automation and other updates for 6.0	August 2014
A	Added Certifications	October 2015

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