symphony™

Instruction
Harmony Series

Simulation Block
SIM-100

ABB

Preface

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Equipment Environment
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Electrical Shock Hazard During Maintenance
Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.

SPECIFIC WARNINGS

A SIM-100 module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous. (p. 2-2, 3-2, 7-1, PR4-1, PR10-1)

Turn off all power before attempting the connections check maintenance procedure. Failure to do so could result in severe or fatal shock, or equipment damage. (p. PR9-1)

Support Services

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Introduction

Section 1

Overview

The SIM-100 Harmony Simulation Block is one part of a fully stimulated control simulator available for the Symphony Enterprise Management and Control System. The SIM-100 block along with Simulation LAN and API software, a Harmony controller, and a Conductor human system interface (HSI) combine to create the Harmony stimulated simulation system. This simulation system is a high fidelity training simulator designed for operator and maintenance training, control logic and operator validation, and control logic development and checkout.

NOTE: Abbreviated nomenclature is used in this instruction whenever possible (refer to Table 1-3). Refer to Section 8 for complete nomenclature.

The Harmony stimulated simulation system incorporates industry standard operator training simulator functionality into the Symphony system. The primary components of the stimulated simulator include:

- BRC-100 Harmony Bridge Controller.
- SIM-100 Harmony Simulation Block.
- Simulation LAN.
- Simulation management software (Simulation LAN and API).
- Instructor's console.
- Process models.

NOTE: This instruction discusses the Harmony components of the stimulated simulation system only. Refer to the ***Simulation LAN and API*** instructions (Table 1-2) for a complete description of the simulation management software, instructor's console, and process models.

The simulator uses the same control logic (i.e., function block configuration) and HSI displays that are implemented in the actual plant control scheme. The use of the actual control logic

and HSI displays insures that skills learned on the simulators are fully transferable to the real control system operation.

Figures 1-1 and 1-2 show Harmony stimulated simulation architectures. Figure 1-1 shows the architecture when using simulated I/O only. Figure 1-2 shows the architecture when using both simulated I/O and real I/O.

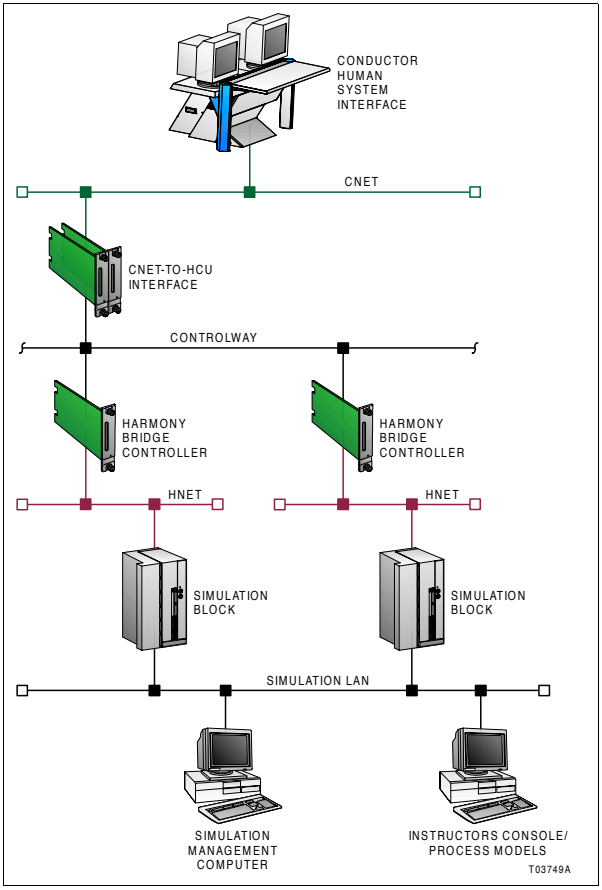

Figure 1-1. Harmony Stimulated Simulation Architecture (Simulated I/O)

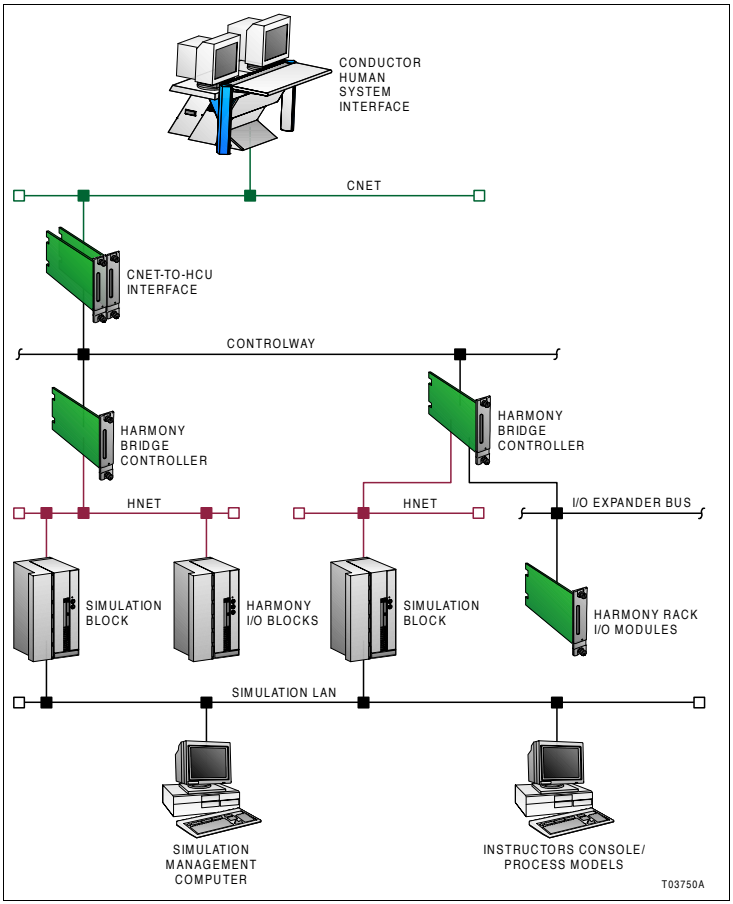

Figure 1-2. Harmony Stimulated Simulation Architecture (Simulated I/O and Real I/O)

Harmony Controller

A Harmony controller provides base regulatory, sequential, and advanced control in the Symphony system. A BRC-100 controller is a Harmony rack controller that can operate either as a process controller in a Harmony control unit or as a

simulator controller in the Harmony stimulated simulation system.

The controller has control logic (i.e., function block configuration) stored in memory that determines its operation. The control logic is created by linking individual function codes together. Function codes are predefined, fixed function algorithms. The controller supports numerous function codes for building the control configuration. The functions they perform range from computing (function generator, square root, etc.) to control (PID, pulse positioner, etc.) to I/O interface (analog input, digital output, etc.).

Process Controller

When operating as a process controller, it performs the actual process control based on the function block configuration stored in memory. The controller receives its process inputs from either or both Harmony I/O blocks and Harmony rack I/O modules and provides control outputs through these blocks and modules.

Simulator Controller

When operating as a simulator controller, the same function block configuration developed for process control is loaded into the controller unchanged. The field I/O normally interfaced through I/O blocks and rack I/O modules is simulated by the process models. The simulated I/O is directed through the SIM-100 block when the controller is put into simulation mode. A simulator controller can be configured to support a combination of simulated I/O and real I/O from I/O blocks and rack I/O modules. The controller firmware manages synchronization for the basic simulation functions: run, freeze, snapshot save, snapshot restore, and fast/slow.

NOTE: A controller supports only one SIM-100 block; each controller requires its own simulation block.

Hnet

The SIM-100 block and all Harmony I/O blocks communicate with the controller over Hnet. Hnet is a redundant, high speed serial network. It supports up to 66 local Hnet devices. Refer to the ***Harmony Communications Network (Hnet)*** instruction for a detailed explanation of Hnet including its connection and proper termination.

I/O Expander Bus

Harmony rack I/O modules communicate with the controller over I/O expander bus which is a high-speed, synchronous, parallel bus. This bus supports up to 64 rack I/O modules. Parallel signal lines located on the module mounting unit backplane make up the I/O expander bus.

Simulation Block

The SIM-100 block is a gateway between the Simulation LAN and the Harmony controller. It communicates with the controller over Harmony Communications Network (Hnet). It communicates with the simulation management computer over the Simulation LAN (i.e., Ethernet™).

The SIM-100 block can simulate field I/O interfaced through both Harmony I/O blocks and Harmony rack I/O modules. It supports both simulated I/O and real I/O. Real I/O is supported so that hard wired panel I/O can be used during simulations. The SIM-100 block can support I/O configurations containing:

- 64 simulated local rack I/O modules.
- 64 simulated remote rack I/O modules.
- 64 simulated I/O blocks with up to 24 I/O channels each.
- 3,584 I/O points managed in up to 10 I/O groups.

The SIM-100 block is configured by the simulation software over the Simulation LAN when a simulation is started. The block receives information prior to starting a simulation session which tells it the number and types of I/O devices to simulate. The information also includes the simulated I/O device operating status (operating or failed) and the quality (good or bad) of each I/O point. The block sends commands to the controller to request that the state of all controller logic be sent to the SIM-100 block for transfer to the simulation management computer.

The SIM-100 block is both a node on the Simulation LAN and a Hnet device. An IP address identifies the block on the simulation network. This address is user-defined and set with block switches. A device label identifies the block on Hnet. The device label for the SIM-100 block is P-HB-SIM-100. This label is fixed and cannot be changed.

Simulation LAN

The Simulation LAN provides the communication necessary to support simulation applications. The network is IEEE 802.3 Ethernet compliant, supports TCP/IP communication protocol, and operates at 10-Mbps. The Simulation LAN supports 10Base2 (thin coaxial), 10Base5 (thick coaxial), 10BaseT (category 5, unshielded twisted-pair), and 10BaseFL (fiber optic) cable. Standard Ethernet equipment and network topologies can be used in constructing the simulation network.

Compatibility

The SIM-100 block as part of the Harmony stimulated simulation system is compatible with existing INFI 90® OPEN systems. It supports simulation of existing INFI 90 OPEN I/O modules. Refer to the ***Simulation LAN and API*** instructions for information on INFI 90 OPEN I/O module support.

Features and Benefits

Skilled and trained operators. The use of actual HSI displays as well as actual control logic results in better trained operators.

Reduces plant startup time and cost. A fully stimulated control simulator enables testing of control logic prior to startup. A high fidelity, fully stimulated control simulator enables system tuning before online plant operation.

Lower simulator life cycle cost. As the control logic and HSI displays change over the life of the plant, there is no need to update complicated control logic models to replicate the changes. The new HSI displays and new control logic can be used as is by the simulator.

Long life cycle. By using the same hardware, control logic, and HSI displays, stimulated simulators do not become obsolete as changes are made to the real process control system.

Ideal training conditions. Simulated plant conditions do not sacrifice plant efficiency or safety during training exercises. Operators gain skills through repetitive training in normal operation, unusual plant activities, and malfunctions.

Reduced project development time. Engineering, control philosophies, control schemes, operator graphics, and database checks reduce costs by reducing control system project cycle times, lost energy production, and premature depreciation of capital equipment.

Greater efficiency. Higher operator efficiency, development of standard operating procedures, maintenance training, and new control scheme testing reduces unplanned outages and increases profitability.

Decreases simulation development time and cost. No additional time or cost in developing simulation models for the control logic or HSI displays. Only process models need to be developed.

Facilitates control logic changes. New control logic for an existing process can be tested and tuned before online operation. This assures a much higher success rate when implementing control logic changes to an existing process.

System tuning. Provides high fidelity duplication of plant performance for system tuning before the process is placed online.

Intended User

This instruction is intended for technical personnel responsible for installation, operation, maintenance, and repair of the SIM-100 block and associated mounting hardware. System engineers and technicians with a background in process control systems should read this instruction thoroughly before installing and using the block.

Instruction Content

Introduction — Gives an overview of the SIM-100 block operating as part of the Harmony stimulated simulation system, and describes the content and intended user of this instruction. It also highlights system features, lists reference documents, and contains specification information.

Description and Operation — Provides a functional block diagram description of the SIM-100 block.

Installation	Describes SIM-100 block installation and connection.
Operating Procedures	Details SIM-100 block front and rear panel items, startup, and stop/reset.
Troubleshooting	Provides troubleshooting information including LED error indications and status codes.
Maintenance	Includes a preventive maintenance schedule and lists the related procedures.
Repair and Replacement	Describes repair and replacement procedures for the SIM-100 block.
Replacement and Spare Parts	Provides a list of part nomenclature and part numbers.
Procedures	Individual procedure sections (e.g., PR1, PR6, PR8, etc.) detail installation, maintenance, and replacement actions. A procedure section typically gives the steps for a single task. Installation flowcharts and replacement flowcharts indicate the order in which these procedures are to be performed.

How to Use this Instruction

To use this instruction:

1. Read the introduction section for an overview of the SIM-100 block operating as part of the Harmony stimulated simulation system, and for a description of the instruction content.

2. Read the description and operation section to become familiar with SIM-100 block.

3. Read the installation section for the procedures to install the SIM-100 block. The section contains a flowchart that points to the various procedures that must be performed to complete installation and connection.

4. Read the operating procedures section for SIM-100 block operating details.

5. Refer to the troubleshooting, maintenance, and repair and replacement sections as necessary.

6. Refer to the replacement and spare parts section for part nomenclature and part numbers as necessary.

Document Conventions

This document uses standard text conventions to represent keys, display items and user data inputs:

Display item

Any item displayed on a screen appears as italic text. Example:

Running

User data input

Bold - Identifies any part of a command line that is not optional or variable and must be entered exactly as shown.

Italic - Identifies a variable parameter entered in a command line.

[ ] - Indicates an optional parameter; text within the brackets follows the previously described conventions.

Example:

CUP [*port*] [*baud*] [*file_name*.**CSP**]

SPECIAL KEYS - Identifies a specific key that is not alphabetic, numeric or punctuation. Examples:

Press **ENTER**.
Press **ESC V M**. (Press and release each key in sequence.)
Press **CTRL-ALT-SHIFT-DEL**. (Press all keys in sequence without releasing any one key until you have pressed them all.)

File names

Name - Indicates a file or directory name. Example:

file1.exe
c:\new

Revision variable

A ? indicates a value that may change depending on the version of an item. Example:

Part number: 1234567?0
Part number: 1234567??

Glossary of Terms and Abbreviations

Table 1-1 is a glossary of terms and abbreviations used in the instruction. It contains those terms and abbreviations that are unique to ABB Automation or have a definition that is different from standard industry usage.

Table 1-1. Glossary of Terms and Abbreviations

Term	Definition
Base	Mounting base for a block.
BRC	Harmony bridge controller.
Device label	Name (i.e., character string) assigned to a Hnet device. The device label identifies a block instead of a hardware address.
Function code (FC)	An algorithm that manipulates specific functions. These functions are linked together to form the control strategy.
Harmony network (Hnet)	Redundant serial communications system that allows data to be transmitted between Harmony devices.
I/O expander bus	Parallel communication bus between the Harmony controller and rack I/O.
MFT	Machine fault timer. Reset by the block processor during normal operation. If not reset regularly, the MFT times out and the I/O block stops.
Module mounting unit (MMU)	Card cage that provides electrical and communication support for Harmony rack I/O.
Processor bus adapter (PBA)	Adapter that connects a Harmony bridge controller to Hnet.

Reference Documents

Table 1-2 lists additional documents that relate to the SIM-100 block and are referenced in this instruction.

Table 1-2. Reference Documents

Number	Document Title
WBPEEUI210502??	Modular Power System II
WBPEEUI230017??	Harmony Bridge Controller
WBPEEUI240760??	Harmony I/O System, Block Power and Mounting Hardware
WBPEEUI240761??	Harmony Communications Network (Hnet)
WBPEEUI400008??	Simulation LAN and API, Developer Introduction and Installation
WBPEEUI400009??	Simulation LAN and API, Developer Manual
WBPEEUI400010??	Simulation LAN and API, Run-Time Manual

Abbreviated Harmony Nomenclature

Table 1-3 lists the abbreviated nomenclature used throughout the instruction to identify various Harmony components. Refer to Table 1-4 and Section 8 for complete nomenclature.

Table 1-3. Abbreviated Nomenclature

Nomenclature	Description
BRC-100	Harmony bridge controller
BRC-PBA	Processor bus adapter
HRM-MCL, HRM-PWR6	Cables
MCL-?10, MCL-?20, MCL-111	Block mounting column
MSC-CMB	Column mounting bars
MSC-DIST	Auxiliary power distribution panel
MSC-SIMBNC	10Base2 (thin coaxial) transceiver
MSC-TER2	Hnet terminator
SIM-100	Simulation block

Related Nomenclature

Refer to Section 8 for a listing of SIM-100 block nomenclature and part numbers. Table 1-4 provides a listing of related nomenclature.

Table 1-4. Related Nomenclature

Nomenclature	Description
IPCHS02	Power module chassis
P-HA-MCL-??000000	Block mounting column
P-HA-MSC-DIST1000	Auxiliary power distribution panel
P-HC-BRC-10000000	Harmony bridge controller
P-HC-BRC-PBA10000	Processor bus adapter
P-MK-HRM-MCL1000?	Column to column Hnet cable
P-MK-HRM-PBA1000?	Controller to mounting column Hnet cable

Design Standards

Table 1-5 lists the design standards for the SIM-100 block.

Table 1-5. Design Standards

Category	Standard	Description
Safety	ANSI/ISA S82.01-1994	Safety standards for process control equipment
	CSA C22.2 No. 1010.1	
	CSA C22.2 No. 142	
	IEC 61010-1	
Environmental	IEC 60068-2-1,2,14	Operating temperature
	IEC 60068-2-3,30	Operating relative humidity
	MIL-STD-810E 502.3 & 501.3	Storage/transportation temperature
	ISA S71.04 (level 1 liquids, solids, gases)	Air quality
	IEC 60068-2-6	Operating vibration (sinusoidal)
	MIL-STD-810E 514.4	Storage/transportation vibration Category 1, basic transportation
Vibration	MIL-STD-810E 514.4	Transportation
	IEC 60068-2-27	Shock
	IEC 61298-3	Endurance
EMI, RFI, and electrical surge	IEC 61000-4-2 (level 3)	ESD
	IEC 61000-4-3 (level 3)	EMI susceptibility
	IEC 61000-4-4 (level 3)	Electrical fast transient
	IEC 61000-4-5 (level 3)	Electrical surges
	IEC 61000-4-6 (level 3)	Conducted immunity
	IEC 61000-4-8 (level 3)	Magnetic fields
	CISPR-11	Radiated emissions
Flammable atmospheres	CSA C22.2 No. 213	Nonincendive equipment
	ISA S12.12	
	FM Class 3611	Division 2 equipment
Flammability of product components	IEEE 383	Intercabinet cables
	UL rating VW-1	Intracabinet cables
	UL 94 V-0, V-1, or V-2	Flammability of plastic materials

Table 1-5. Design Standards *(continued)*

Category	Standard	Description
CE Mark directives	73/23/EEC	Low voltage directive
	89/336/EEC	EMC directive
	92/31/EEC	
	90/683/EEC	CE marking directives
	93/68/EEC	
	93/465/EEC	
Certifications	CSA (pending)	Certified for use as process control equipment in an ordinary (nonhazardous) location
	Factory Mutual (FM) (pending)	Approved as nonincendive equipment for use in Class I; Division 2; Groups A, B, C, D; hazardous locations.

SUBJECT TO CHANGE WITHOUT NOTICE

Specifications

Tables 1-6 through 1-7 are SIM-100 block specifications.

Table 1-6. SIM-100 Block Specifications

Property	Characteristic/Value[1]
Microprocessor	32-bit processor running at 25 MHz
Memory	256 kb flash-ROM (boot sector) 2 Mb flash-ROM (program area) 2 Mb SRAM (72 pin SIMM module, 70 ns, proprietary design)
Block logic power (BLP)	21.6 VDC minimum 24.0 VDC nominal 28.0 VDC maximum
Current consumption	0.35 A typical (10BaseT) 0.4 A typical (10Base2, 10Base5, or 10BaseFL transceiver) 0.5 A maximum
Communication ports[2]	1 RJ-45 port for 10BaseT connection (preferred connection) 1 AUI port for 10Base2, 10Base5, or 10BaseFL transceiver connection 1 RS-232-C diagnostics port (full duplex)
10BaseT cable	Category 5, unshielded twisted pair

Table 1-6. SIM-100 Block Specifications *(continued)*

Property	Characteristic/Value[1]
Isolation	
Insulation resistance (100 VDC)	1.2 MΩ
Dielectric test VAC (45-65 Hz) or VDC	0.5 kV_{RMS}/1 min
Overvoltage category	I
Fusing	1.6 A, 250 V, 5 x 20 mm, fast-acting, low break capacity (IEC 127-2/II)
Dimensions	See table below

Type	Height		Width		Depth	
	mm	in.	mm	in.	mm	in.
Module	266	10.5	76	3.0	162	6.4
Base	267	10.5	138	5.4	169	6.7

NOTE: Refer to Appendix A for hardware drawings.

NOTE:
1. All specification values are maximums unless stated otherwise.
2. Supports one Simulation LAN connection. The RJ-45 port and AUI port are mutually exclusive. An RJ-45 port connection cannot be made if there is already an AUI port connection and vice versa. The SIM-100 module will automatically switch the internal Ethernet circuitry to the AUI port or RJ-45 port depending one where it senses activity.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Table 1-7. Environmental Specifications

Environment	Operating	Storage and Transportation
Air quality	Noncorrosive	Noncorrosive
Altitude	Sea level to 3,048 m (10,000 ft)	Sea level to 12,000 m (40,000 ft)
Relative humidity (noncondensing)	20% to 95% up to 55°C (131°F) 20% to 45% at 55° to 70°C (131° to 158°F)	20% to 95% up to 55°C (131°F) 20% to 45% at 55° to 70°C (131° to 158°F)
Temperature	0° to 70°C (32° to 158°F) (internal enclosure)	-40° to +85°C (-40° to 185°F)
Vibration	10 to 60 Hz, 1.37 mm (0.054 in.) pp 60 to 150 Hz, 1.0 G sine	0.74 G_{RMS} longitudinal 0.20 G_{RMS} transverse 1.04 G_{RMS} vertical 10 to 500 Hz random
Shock	—	15 G, 11 msec

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Description and Operation

Section 2

Introduction

This section provides a functional block diagram level description of the SIM-100 block. It also details mounting hardware options.

Description

A SIM-100 module mounted on a SIM-100 base forms a SIM-100 block (Fig. 2-1). The module contains the electronics. It handles the Hnet and Simulation LAN communication, and the I/O device simulation as directed by the simulation management computer. The base provides the Simulation LAN connection ports (P3 and P4). It connects and distributes signals between the SIM-100 module and the ports. The SIM-100 block shares the same housing layout and mounting methods with other Harmony blocks.

The front panel of the SIM-100 block communicates a considerable amount of information including block type, operating mode, and operating status. Front panel features include:

- Text-based front panel mode and status indicators.
- Front accessed power fuses with status indicators.
- Front accessed stop/reset button.
- Front mounted device ID and user label area protected by a clear plastic cover.

Refer to ***Front Panel*** in Section 4 for further explanation of front panel items.

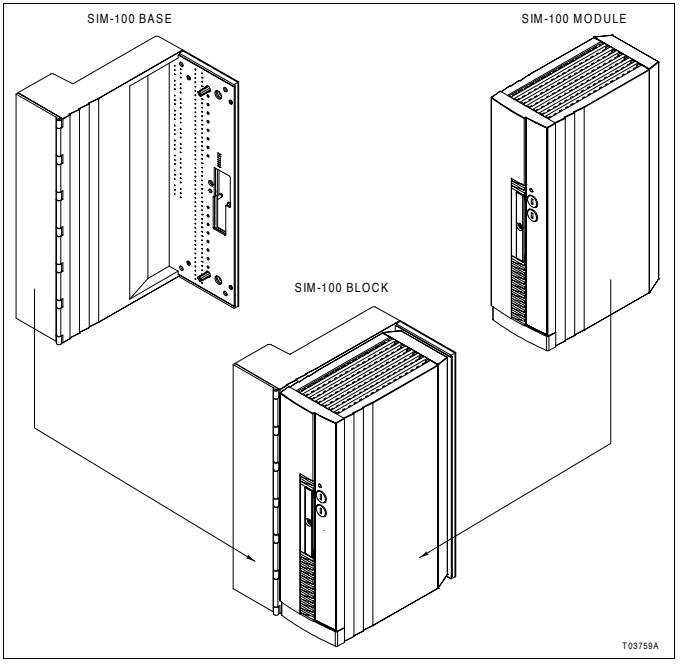

Figure 2-1. SIM-100 Block

Module

The SIM-100 module (Fig. 2-1) contains the processing circuitry. Power conversion functions are also included. Front panel LEDs show power and operating status.

WARNING	**A SIM-100 module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

The block packaging gives access to the processor board for configuration by removing the side of the module (Fig. 2-2). The SIM-100 module can be removed and installed while system power is applied. A retractable handle facilitates the installation and removal of the module.

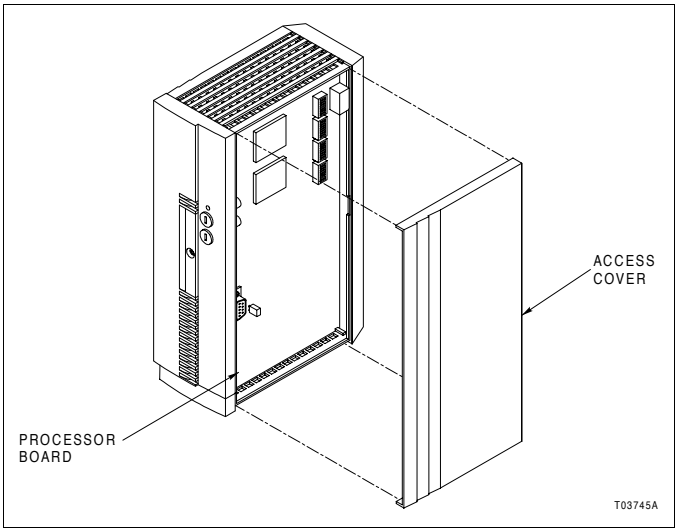

Figure 2-2. Configuration Switch and Jumper Access

The SIM-100 module mounts on a SIM-100 base. Mounting the module on the base makes the connections to Hnet and power. The Hnet and power connectors are actually a part of the mounting column and protrude through the base; refer to ***Block Mounting Column*** in this section. A captive mounting screw on the module secures it in place.

Figure 2-3 is a functional block diagram of the SIM-100 module.

Central Processing Unit

The central processing unit (CPU) is an integrated communications controller (ICC) that contains a 32-bit microprocessor running at 25 megahertz and its supporting circuitry. The ICC has built-in timers and control logic along with an integrated Ethernet coprocessor and serial channel interface.

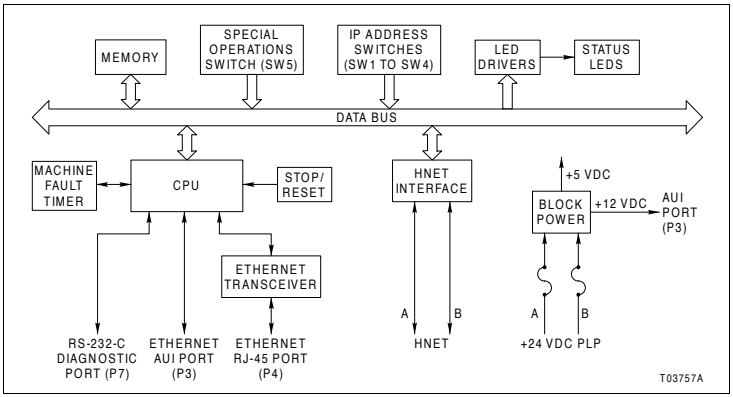

Figure 2-3. Functional Block Diagram

Ethernet

The integrated Ethernet coprocessor is used for Simulation LAN interface. The block supports several different Ethernet connection methods dependent on the physical transmission medium:

- 10Base2 (thin coaxial) - transceiver (MSC-SIMBNC) and BNC terminated thin coaxial cable.
- 10Base5 (thick coaxial) - transceiver (tap) and AUI cable.
- 10BaseT (category 5, unshielded twisted-pair) - RJ-45 terminated twisted-pair cable. The SIM-100 module has a built-in 10BaseT transceiver.
- 10BaseFL (fiber optic) - transceiver and ST or SMA terminated fiber optic cable.

The Ethernet ports are located on the base: RJ-45 twisted-pair port (P4) and 15-pin, D-type AUI port (P3).

RS-232-C

An integrated universal asynchronous receiver/transmitter (UART) circuit is used for the RS-232-C interface. The RS-232-C port is a nine-pin, D-type connector (P7) located behind the right-side access cover and is mainly used for firmware downloading and diagnostics. Refer to Appendix B for firmware upgrade procedures.

Memory

The module utilizes two types of memory: static-RAM (SRAM) memory and flash-ROM memory.

NOTE: The electronic ID (i.e., device ID) of the block is stored in ROM memory.

The SRAM memory for microprocessor use is a 72-pin SIMM SRAM module mounted on the processor board. This memory provides temporary storage to perform calculations and data manipulation. The Hnet interface also uses a shared SRAM memory to store received messages and messages to be transmitted.

The flash-ROM memory stores the operating firmware (i.e., boot and application programs). This type of memory provides the ability to download updated firmware without having to physically replace discrete components. Refer to Appendix B for firmware download procedures.

Hnet Interface

Hnet is the redundant, serial communication protocol over which the SIM-100 block communicates with the Harmony controller. Figure 2-4 details the Hnet interface section of the module circuitry. The Hnet interface encodes and transmits Hnet messages, receives and decodes Hnet messages, and monitors Hnet status.

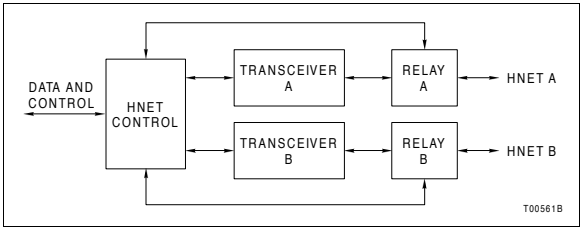

Figure 2-4. Hnet Interface

The Hnet control portion of the interface is a custom, application-specific integrated circuit (ASIC). This circuit manages the serial communication protocol between the SIM-100 block and the controller. It also performs data integrity checks. The interface checks for the following message errors: data

transmission error using cyclic redundancy check (CRC) method, maximum message reply time expired, and reply message overrun.

The Hnet control section also provides a means for the CPU to interrogate the Hnet to determine its condition. If a bus failure or stall is detected on either of the Hnet channels, the channel will be shut down locally until the problem is corrected.

The signal relays (A and B) allow the SIM-100 module to isolate itself from Hnet in the event of a component failure or to perform diagnostics. This important feature assures that a fault in one block cannot affect the communications of other blocks. The Hnet interface circuitry includes the logic that controls the relays.

Refer to the ***Harmony Communications Network (Hnet)*** instruction for a complete description of Hnet and for Hnet specifications.

Machine Fault Timer

The machine fault timer (MFT) is a built-in security feature. The timer is a one-shot timer that must be periodically reset by the CPU to prevent it from timing out. If an error condition exists that causes the module to fail or operate incorrectly, the timer will not be reset and will cause a time out condition. A time out condition triggers a reset signal to shut down the module.

The module performs a series of online diagnostics to verify circuit integrity. A detected hardware failure may cause a time out condition. If the cause of the problem is not a hardware failure the module and timer can be reset by the manual reset switch accessed through the block front panel. A hardware failure will most likely require a module replacement.

Block Power

The SIM-100 module provides onboard regulation of its operating voltages. The module accepts redundant 24 VDC inputs which it filters, auctioneers, and regulates. Each 24 VDC input is fused and monitored. Figure 2-5 details the block power section.

Logic Power

Redundant 24 VDC block logic power (BLP) is bussed through the mounting column to the module. The redundant BLP

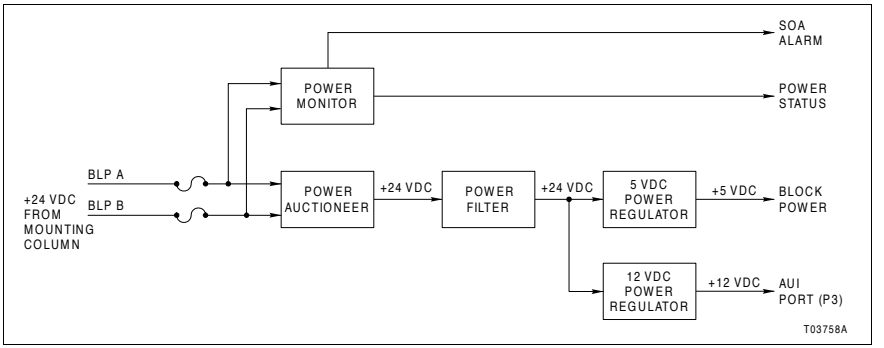

Figure 2-5. Block Power

power is auctioneered through summing diodes into a single 24 VDC. Onboard DC-to-DC converters develop the +5 VDC operating voltage from the integrated 24 VDC. Also, the single 24 VDC is converted to +12 VDC used to power the AUI port. To avoid damage from short circuits, the +12 VDC is protected by a resettable fuse.

The module tests itself for a +5 VDC out-of-range condition. When this voltage is outside its normal operating range, a hardware fault (i.e., power on reset) will occur and the block operation will halt.

Power Monitor

The power monitor circuits test and report the status of the redundant 24 VDC BLP inputs. The inputs are only tested for their presence or absence. The circuits do not test the inputs for voltage range. The SIM-100 module will generate a SOA alarm if the fuse for any of these inputs is bad or if the input voltage is absent.

Refer to the ***Block Power and Mounting Hardware*** instruction for a complete explanation of BLP power and the SOA alarm signal for power status monitoring.

LED Drivers and Status LEDs

The LED drivers control the front panel status indicators as directed by the CPU. The indicators show module operating status, communication status, and power status.

Switches

The special operations switch SW5 is used to enable normal operation and to enable firmware download. Switches SW1 through SW4 set the IP address for Simulation LAN communication.

Stop/Reset

Control logic determines the stop/reset pushbutton operation. The pushbutton is used to halt the module operation and to reset the module. It is accessible through a small hole in the front panel. Pressing the pushbutton once causes the module to perform an orderly shutdown. Pressing the pushbutton a second time resets the module.

Base

The SIM-100 module mounts on the SIM-100 base. Figure 2-6 shows the base.

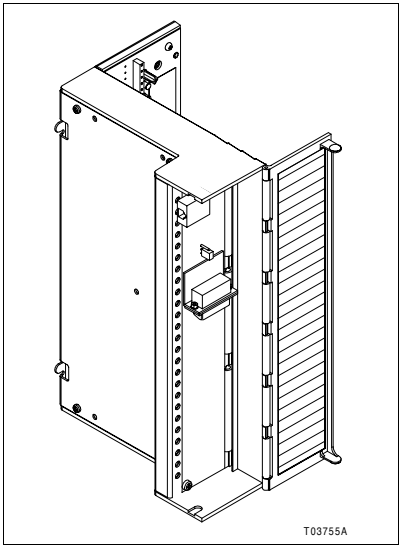

Figure 2-6. SIM-100 Base

The base attaches directly to a block mounting column; refer to ***Block Mounting Column*** in this section. Alignment posts help locate the base on the mounting column. The assembly is physically mounted using two captive screws. Tabs on the base insert into slots in the mounting column to help further secure the base in place. The Simulation LAN connects to the base and the Ethernet signals are routed internally to SIM-100 module connectors. Simulation LAN connections remain undisturbed if the module is removed or replaced.

The base has a front panel door to conceal and protect the connectors. A label is affixed to the inside of the door to explain and identify the Ethernet ports and the jumper settings.

Hardware Keying

The SIM-100 module as with other Harmony blocks requires its own type of base. Hardware keying using posts on the base and holes in the back of the module prevents an accidental mismatch of module and base. The block type and model number shown on the front panel of the module and the base are the same to easily identify that they are compatible.

Mounting Hardware

Block mounting hardware inside the enclosure creates the framework that both secures Harmony blocks in place and creates the system backplane to route power, communication signals, and chassis ground. Figure 2-7 shows some of the block mounting hardware available. Specifically it shows MSC-CMB column mounting bars and MCL-111 block mounting columns. Refer to the ***Block Power and Mounting*** instruction for a description of additional mounting hardware that can be used with the SIM-100 block.

Column Mounting Bar

The column mounting bars (Fig. 2-7) are for attaching block mounting columns. These supports attach to the vertical channels that run along the sides of the enclosure.

Block Mounting Column

The MCL-111 block mounting column is a single block height, stackable column (Figs. 2-7 and 2-8) that is used for attaching and connecting a SIM-100 block. The column attaches to the mounting bars; the SIM-100 block attaches directly to the column.

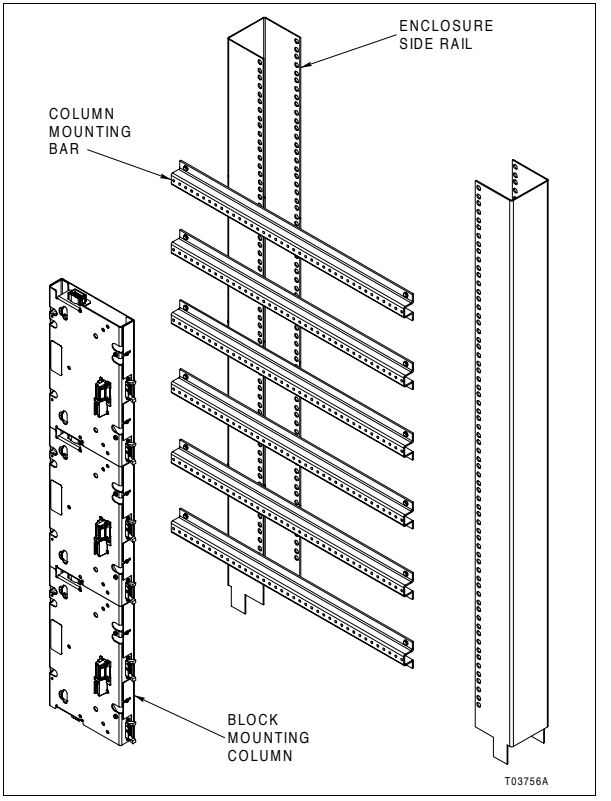

Figure 2-7. Block Mounting Hardware

Signal Distribution

The MCL-111 mounting column distributes both power and Hnet communication signal lines. For the SIM-100 block it routes redundant Hnet, redundant 24 VDC BLP power, system common, and a status output alarm (SOA) signal.

NOTE: The controller supports one SIM-100 block; each controller requires its own SIM-100 block.

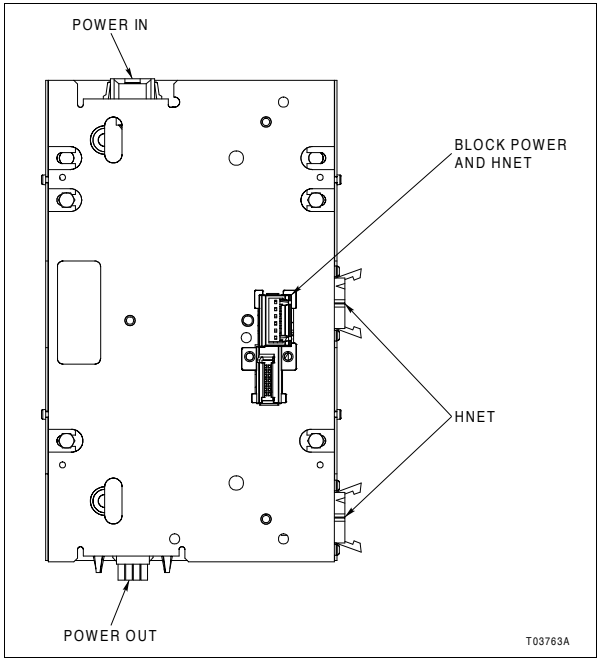

Figure 2-8. MCL-111 Block Mounting Column (Hnet Cover Plate Removed)

The MCL-111 column provides two Hnet connection points. When operating with simulated I/O only, the controller connects to the top Hnet connector and a Hnet terminator attaches at the bottom Hnet connector. When using real I/O from Harmony I/O blocks, multiple columns are connected together within an enclosure to form a single Hnet segment.

Typically, Hnet is cabled from the controller to the top connector of the MCL-111 column, then it cable connects from the bottom connector to a column with I/O blocks. Columns cannot be connected together, however, in a way that would put more than one SIM-100 block on the same Hnet.

For the BRC-100 controller, Hnet cable connects from the processor bus adapter (BRC-PBA). This assembly is the hardware adapter used to connect Hnet and other communications to the BRC-100 controller.

Installation

Section 3

Introduction

This section describes SIM-100 block installation and connection. This instruction discusses only SIM-100 block installation requirements. It does not provide any simulation system planning information and assumes all components have already been purchased and are ready to be installed.

Special Handling

Observe these steps when handling electronic circuitry:

1. ***Use Static Shielding Bag.*** Keep an assembly in its static shielding bag until ready to install it in the system. Save the bag for future use.

2. ***Ground Bags before Opening.*** Before opening a bag containing an assembly with static sensitive devices, touch it to the equipment housing or ground to equalize charges.

3. ***Avoid Touching Circuitry***. Handle assemblies by the plastic outer packaging; avoid touching the circuitry.

4. ***Ground Test Equipment***.

5. ***Use an Antistatic Field Service Vacuum.*** Remove dust from assemblies if necessary.

6. ***Use a Grounded Wrist Strap.*** Use the ABB Automation field static kit (part number 1948385A1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipative work surface) when working with modules. The kit grounds a technician and the static dissipative work surface to the same ground point to prevent damage to the circuitry by electrostatic discharge. Connect the wrist strap to the appropriate grounding plug on the power supply or to an unpainted portion of the enclosure with the alligator clip. The wrist strap must be effectively connected to the earth grounding electrode system through the AC safety ground.

7. ***Do Not Use Lead Pencils to Set Switches***. To avoid contamination of switch contacts that can result in unnecessary circuit board malfunction, do not use a lead pencil to set a switch.

Unpacking and Inspection

1. Examine the hardware immediately to verify that it has not been damaged in transit.

2. Notify the nearest ABB sales office of any damage.

3. File a claim for any damage with the transportation company that handled the shipment.

4. Use the original packing material and container to store the hardware.

5. Store the hardware in an environment of good air quality, free from temperature and moisture extremes and corrosives.

Installation and Connection Sequence

WARNING	**A SIM-100 module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

NOTE: Always follow the instructions given in ***Special Handling*** in this section when handling the SIM-100 module.

Figure 3-1 is the installation and connection flowchart. This flowchart applies whether installing a SIM-100 block in a new system or in an existing system.

In the flowchart, each flowchart block represents a single task. The PR code in the flowchart block identifies the procedure section that describes the steps to complete the indicated task. For example, turn to section PR4 to read about SIM-100 module installation. Some steps are self-explanatory and have no related procedure section. Complete all steps given in a procedure section before continuing to the next flowchart block. The procedure sections are located towards the back of the instruction.

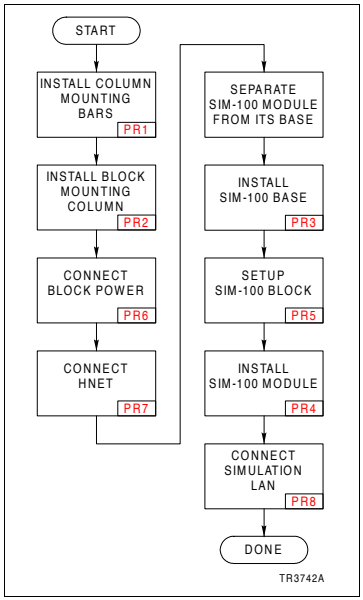

Figure 3-1. Installation and Connection Flowchart

Operating Procedures

Section 4

Introduction

This section provides operating information for the SIM-100 block. It describes front and rear panel items, and describes startup and stop/reset.

Front Panel

All Harmony blocks share similar front and rear panel layouts. Figure 4-1 shows the SIM-100 block front panel. The front panel communicates a considerable amount of information. At a glance the following information can easily be discerned:

- Block type and model.
- Operating mode.
- Operating status.
- Power status.
- Communication status.

A block type identifier enables quickly and easily identifying general block type. A model number distinguishes between the different block versions within a given block category.

Operating Mode - Normal and Fault

The NORMAL and FAULT indicate block operating mode. Table 4-1 summarizes the indications. Refer to Table 5-1 for corrective actions for any problem indications.

Block Status

The eight status indicators show normal and error status codes. The status appears as an eight-bit binary status code, which can be deciphered using look-up tables provided. LED eight is the most significant bit. Refer to Table 4-2 for normal operating mode status codes. Refer to Table 5-3 for error status codes.

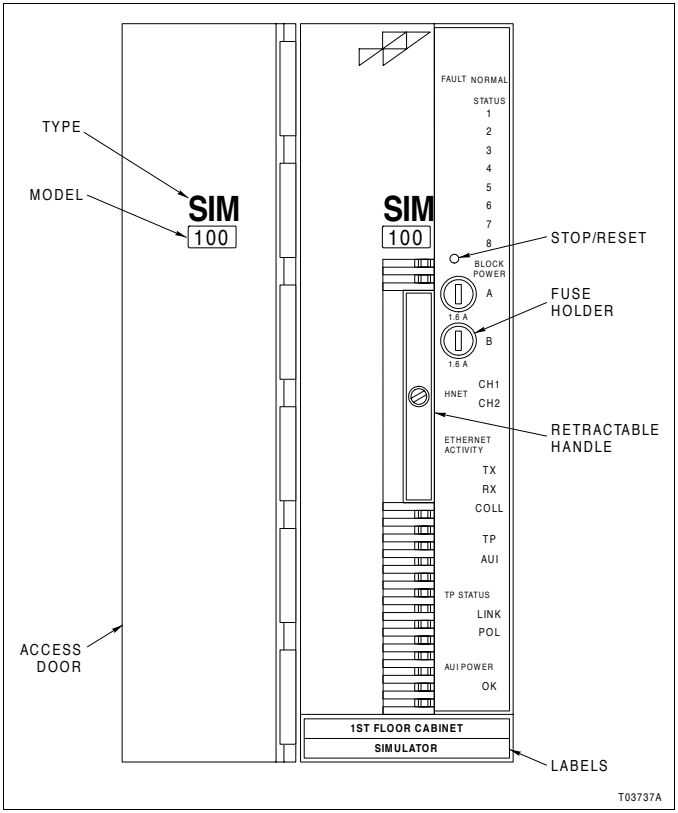

Figure 4-1. SIM-100 Block Front Panel

Table 4-1. Operating Mode - Normal and Fault LEDs

Indicator	State	Description
Normal	On	Operational and online.
	Flashing	Operational and offline. Connected to Simulation LAN but communication with controller not established or lost.
	Off	Fault condition exists (with FAULT indicator on).
		No power. If this condition exists, no front panel LEDs will be on.

Table 4-1. Operating Mode - Normal and Fault LEDs *(continued)*

Indicator	State	Description
Fault	On	CPU halted due to hardware or other fatal error; refer to Table 5-3.
		Machine fault timer expired. Refer to ***Machine Fault Timer*** in Section 2.
		Stop/reset button pressed.
	Off	No fault condition.
		No power. If this condition exists, no front panel LEDs will be on.

Table 4-2. Normal Operating Mode Status Codes

Status LEDs	Condition
1 2 3 4 5 6 7 8	Initial value at reset or powerup.
x x x x x x x 8	1. Startup; refer to ***Startup*** in this section. 2. Firmware download; refer to Table B-1.
x x x x x x 7 –	Run-time error; refer to Table 5-3.
– – – – – – 7 8	Normal operation.
1 – – – – 6 7 –	Normal stop; stop button pressed.

NOTES: – = LED off; x = varies.

Block Power

The block power indicators (A and B) give a good or bad status indication for the redundant 24 VDC block logic power inputs to the block. The status indicator on indicates a good power input. The inputs are tested after their front panel fuses, which means a bad input indication could be a blown fuse, bad connection, or it could be a problem with the actual power source. A problem with the power source, however, will cause a bad status indication on other blocks.

Communication Status

Table 4-3 summarizes communication status indications. These indications relate to Hnet and Simulation LAN communication.

ID Labels

The front panel contains two labels at the bottom of the SIM-100 module: inner and outer labels. The labels are located in a small recess covered by a removable clear plastic lens.

Table 4-3. Communication Status LEDs

LED		Description
Hnet	CH1 CH2	Indicates the status of the Hnet channel A and channel B relays: On = closed (good). Off = open (bad). Refer to ***Hnet Interface*** in Section 2 for an explanation of the Hnet channel relays.
Ethernet activity	TX	Indicates when any Ethernet packets are being sent on the Simulation LAN. Randomly flashes when the SIM-100 block is transmitting; off when the block is idle.
	RX	Indicates when any Ethernet packet is observed on the Simulation LAN even if addressed to another node. Randomly flashes when there is traffic on the Simulation LAN; off when the network is idle.
	COLL	Indicates when an Ethernet packet being sent collides with another packet on the Simulation LAN. Randomly flashes while the SIM-100 block is transmitting but at a much slower rate than TX and RX. Alternately driven on and off during a jabber condition. Jabber occurs when some faulty network transmitter is exceeding the maximum allowable frame duration of 20 to 150 msec.
	TP	Indicates that 10BaseT Simulation LAN is connected at the RJ-45 port (P4).
	AUI	Indicates that 10Base2, 10Base5, or 10BaseFL Simulation LAN is connected at the AUI port (P3).
Twisted-pair (TP) status	LINK	Indicates that 10BaseT Simulation LAN cabling is OK. The SIM-100 block senses the hub or switch at the other end of the cable.
	POLARITY	Indicates a polarity error in the 10BaseT Simulation LAN cable. The SIM-100 block will still communicate correctly. Logic circuitry in the block can correct the polarity of the incoming network signal.
AUI power	OK	Indicates the status of the AUI port 12 VDC power. A problem can be caused, for example, by a shorted cable or a damaged transceiver drawing excessive current.

Inner Label

The inner label is permanently adhered to the block. It gives device identification information which includes the device ID number and a device description. The device ID is both a serial number and the unique electronic ID assigned at the factory. The following is an example inner label:

Device ID: 123456789ABC
Simulator

Outer Label

The outer label, which is for customer use, provides an area for customer identification of the particular block. It also contains a brief block application description. The following is an example outer label:

1ST FLOOR CABINET
Simulator

Module Rear Panel

Figure 4-2 shows the rear panel of the SIM-100 module. The switch and connectors are recessed to allow resting the assembly face up on a table. Refer to Table PR5-2 for switch SW5 settings.

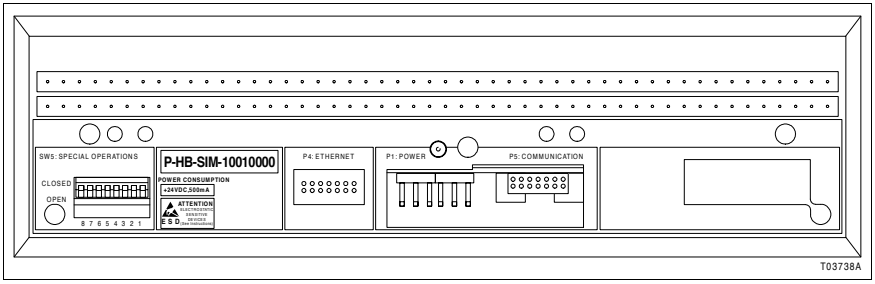

Figure 4-2. SIM-100 Module Rear Panel

Operation

This section details the SIM-100 block startup sequence and describes stop/reset button operation.

Startup

A startup sequence occurs after a power on or manual reset of the block. Plugging the SIM-100 module into its base connects power and begins the start up. The block first performs a series of startup diagnostics. Refer to ***Diagnostics*** in Section 5 for a description. During this phase the status LEDs show various codes while NORMAL remains off. If the diagnostics checks pass LEDs one through six turn off and LEDs seven

and eight turn on to indicate normal operation. Table 4-4 shows the startup sequence.

Table 4-4. LEDs - Startup Sequence

Normal	Fault	Status LEDs	Description
Off	Off	1 2 3 4 5 6 7 8	Initial value at reset or powerup.
Off	Off	x x x x x x x 8	Countdown sequence during startup diagnostic tests.
Off	Off	– – – – – – – –	Startup diagnostics complete (appears for a fraction of a second)
On	Off	– – – – – – 7 8	Normal operation.

NOTES: – = LED off; x = varies.
1. If the SIM-100 module stops before reaching the normal operation pattern, reset the module. If the problem persists, replace the module.

Stop/Reset

The stop/reset button (Fig. 4-1) is used to interrupt execution and to initiate a hardware reset. The button is accessed through the small opening on the front panel. Some type of thin rod, preferably nonmetallic, is required to press the button.

First Press Stop

Press the button once to halt operation. The electronics conduct an orderly shutdown after stop is initiated:

1. Deactivate all communication links.
2. Illuminate FAULT and set the status LEDs.

Second Press Reset

Press the button a second time to initiate a hardware reset. A hardware reset is required to recover from a module time-out or a manual stop (single press). After the hardware reset completes, the block then begins its startup sequence.

NOTE: If the module has already stopped due to an error (i.e., FAULT lit), a single press resets the module.

Troubleshooting

Section 5

Introduction

This section provides troubleshooting information necessary to isolate SIM-100 block errors. It is not meant to be all inclusive. If a problem exists that cannot be corrected using the information provided in this instruction, contact a local ABB service office for assistance.

Troubleshooting Procedures

Troubleshooting of the SIM-100 block is performed mainly by observing the block front panel LEDs. The operation of the front panel LEDs is described in ***Front Panel*** in Section 4.

The SIM-100 module runs diagnostics checks during startup and normal operation to test for hardware problems. Refer to ***Diagnostics*** in this section for a description. If the diagnostics detect a problem, reset the module. If the error recurs, replace the SIM-100 module.

> **NOTE:** All tables in this section give corrective actions for single block indications. If the same indication is given for more than one block, consider a power system or communications system problem.

Operating Mode - Normal and Fault LEDs

Table 5-1 summarizes the normal and fault LED indications and gives corrective actions.

Block Power LEDs

Table 5-2 summarizes the block power LED indications and gives corrective actions.

Table 5-1. Operating Mode - Normal and Fault LEDs

Indicator	State	Description	Corrective Action
Normal	On	Operational and online.	No action required.
	Flashing	Operational and offline. Connected to Simulation LAN but communication with controller not established or lost.	Normal indication until communication with controller has been established. If the problem persists, check the controller.
	Off	Fault condition exists (with FAULT indicator on).	Refer to FAULT LED description.
		No power. If this condition exists, no front panel LEDs will be on.	Refer to Table 5-2 for power problem corrective actions.
Fault	On	CPU halted due to hardware or other fatal error.	Refer to Table 5-3 for status code descriptions and corrective actions.
		Machine fault timer expired. Refer to ***Machine Fault Timer*** in Section 2 for a description.	Reset the SIM-100 module. If problem persists, replace the module.
		Stop/reset button pressed.	Reset the SIM-100 module.
	Off	No fault condition.	No action required.
		No power. If this condition exists, no front panel LEDs will be on.	Refer to Table 5-2 for power problem corrective actions.

Table 5-2. Block Power A and B LEDs

State	Description	Corrective Action
On	Good power input.	No action required.
Off	Bad power input.	1. Verify front panel block power A or B fuse on the module is present and good. If not, replace the fuse. 2. Verify the module is seated properly. 3. Check the condition of the power connector (P1) on the module. If bad, replace the module. 4. Check the condition of the mounting column connector. If bad, replace the mounting column. 5. If problem persists, replace the module.

Block Status LEDs

The eight status indicators show both normal and error status codes. The status codes appear in binary format. LED eight is the most significant bit. Refer to Table 5-3 to decipher status codes.

Table 5-3. Status Codes

Code		LED On	Condition	Corrective Action
69	0x45	1 – 3 – – – 7 –	Error during firmware upgrade	1. Reset SIM-100 module, then try upgrade again. 2. Check SW5 for proper firmware upgrade setting. Refer to Table PR5-2. 3. If problem persists, replace the SIM-100 module.
71	0x47	1 2 3 – – – 7 –	Bus error during SDMA	1. Reset SIM-100 module. 2. If problem persists, replace the SIM-100 module.
72	0x48	– – – 4 – – 7 –	Write protection error	
73	0x49	1 – – 4 – – 7 –	Run-time error on diagnostic port	
74	0x4A	– 2 – 4 – – 7 –	Flash-ROM checksumming failed	
80	0x50	– – – – 5 – 7 –	Bus error	
81	0x51	1 – – – 5 – 7 –	Address error	
82	0x52	– 2 – – 5 – 7 –	Illegal instruction	
83	0x53	1 2 – – 5 – 7 –	Division by zero	
84	0x54	– – 3 – 5 – 7 –	Check instruction	
85	0x55	1 – 3 – 5 – 7 –	Trap V	
86	0x56	– 2 3 – 5 – 7 –	Privilege violation	
87	0x57	1 2 3 – 5 – 7 –	Trace	
88	0x58	– – – 4 5 – 7 –	Emulator 1010 exception	
89	0x59	1 – – 4 5 – 7 –	Emulator 1111 exception	
90	0x5A	– 2 – 4 5 – 7 –	Unassigned exception	
91	0x5B	1 2 – 4 5 – 7 –	Trap X	
92	0x5C	– – 3 4 5 – 7 –	Nonmaskable exception	
93	0x5D	1 – 3 4 5 – 7 –	Spurious exception	
94	0x5E	– 2 3 4 5 – 7 –	Uninitialized exception	

Table 5-3. Status Codes *(continued)*

Code		LED On	Condition	Corrective Action
95	0x5F	1 2 3 4 5 – 7 –	Uninitialized exception from communication controller	1. Reset SIM-100 module. 2. If problem persists, replace the SIM-100 module.
96	0x60	– – – – – 6 7 –	Communication controller error	
97	0x61	1 – – – – 6 7 –	STOP interrupt[1]	
98	0x62	– 2 – – – 6 7 –	DSP interrupt[1]	
99	0x63	1 2 – – – 6 7 –	SOA interrupt[1]	
100	0x64	– – 3 – – 6 7 –	HNET ASIC interrupt[1]	
101	0x65	1 – 3 – – 6 7 –	Generic level 5 interrupt[1]	
102	0x66	– 2 3 – – 6 7 –	Generic Level 6 interrupt[1]	
103	0x67	1 2 3 – – 6 7 –	Generic level 7 interrupt[1]	
106	0x6A	– 2 – 4 – 6 7 –	Spurious interrupt from Hnet chip	
107	0x6B	1 2 – 4 – 6 7 –	Error while testing Hnet shared RAM	
108	0x6C	– – 3 4 – 6 7 –	CHT TX buffer full	
109	0x6D	1 – 3 4 – 6 7 –	CHT RX buffer full	
110	0x6E	– 2 3 4 – 6 7 –	LAN RX buffer full	
111	0x6F	1 2 3 4 – 6 7 –	LAN TX buffer full	
112	0x70	– – – – 5 6 7 –	Duplicate device label detected	
113	0x71	1 – – – 5 6 7 –	Hnet chip failure	
114	0x72	– 2 – – 5 6 7 –	Duplicate source address	
115	0x73	1 2 – – 5 6 7 –	ID-ROM access error	
128	0x80	– – – – – – – 8	Firmware download complete (downloaded file terminates with **CTRL-Z**)	No action required.
136	0x88	– – – 4 – – – 8	Firmware download beginning	
137	0x89	1 – – 4 – – – 8	Flash-ROM erase in progress during firmware download	
138	0x8A	– 2 – 4 – – – 8	Firmware download complete (downloaded file does not terminate with **CTRL-Z**)	
139	0x8B	– – 3 4 – – – 8		
—	0x8?	– x x 4 – – – 8	Receiving firmware code	
192	0xC0	– – – – – – 7 8	Normal operation	

NOTES: – = off; x = toggle.
1. External interrupt occurred before being configured by firmware.

Diagnostics

The SIM-100 module firmware contains various diagnostic routines used to verify proper operation of components and circuitry:

- CPU test.
- SRAM memory test.
- Flash-ROM memory test.
- Internal device tests (i.e., Ethernet, UART, timers, etc.).
- ID-ROM test.
- Hnet tests.

These diagnostics are automatically run during startup. If any of these tests detect a problem, the SIM-100 module will halt. If this occurs, reset the module. If the problem persists, replace the module. Refer to ***Startup*** in Section 4 for additional startup information.

SIM-100 Module Connectors (P1, P4, P5, P7)

The SIM-100 module has four connection points for external signals and power: P1 power, P4 Ethernet, P5 communication, and P7 RS-232-C port. Tables 5-4 through 5-7 list the pin assignments for these connectors.

Table 5-4. P1 Power Pins

Pin		Connection
A	1	BLP A (+)
	2	BLP B (+)
	3	NC
B	1	BLC A (–)
	2	BLC B (–)
	3	NC

NOTE: NC = not connected.

Table 5-5. P4 Ethernet Pins

Pin	Connection	Pin	Connection
1	Transmit (+)	2	Transmit (–)
3	Receive (+)	4	Receive (–)
5	Collision (+)	6	Collision (–)
7	+12 VDC	8	Ground
9	Ground	10	TP SQE
11	TP transmit (+)	12	TP transmit (–)
13	TP receive (+)	14	TP receive (–)

NOTE: TP = twisted pair.

Table 5-6. P5 Communication Pins

Pin	Connection	Pin	Connection
1	Ground	2	Clock A
3	Ground	4	Data A
5	Ground	6	SOA 1
7	NC	8	NC
9	SOA 2	10	Ground
11	Data B	12	Ground
13	Clock B	14	Ground

NOTE: NC = not connected.

Table 5-7. P7 RS-232-C Port Pins

Pin	Signal
1	Unused
2	Receive data (RXD)
3	Transmit data (TXD)
4	Unused
5	Signal ground
6	Unused
7	Ready to send (RTS)
8	Clear to send (CTS)
9	Unused

Maintenance

Section 6

Introduction

The reliability of any stand-alone product or control system is affected by the maintenance of the equipment. ABB Automation recommends that all equipment users practice a preventive maintenance program that will keep the equipment operating at an optimum level.

This section presents procedures that can be performed on-site. These preventive maintenance procedures should be used as guidelines to assist in establishing good preventive maintenance practices. Select the minimum steps required to meet the cleaning needs of your system.

Personnel responsible for maintenance should be familiar with the Harmony components of the Symphony system, have experience working with process control systems, and know what precautions to take when working on live AC systems.

Preventive Maintenance Schedule

Table 6-1 is the preventive maintenance schedule for the SIM-100 block. The table lists the preventive maintenance tasks in groups according to their specified maintenance interval. Some tasks in Table 6-1 are intuitive or self explanatory. Instructions for tasks that require further explanation are covered in the indicated procedure section.

NOTE: The preventive maintenance schedule is for general purposes only. Your application may require special attention.

Table 6-1. Preventive Maintenance Schedule

Task	Procedure	Frequency
General cleaning. Use a lint-free cloth and mild, all-purpose, nonflammable, commercial spray cleaner to remove dirt, fingerprints, and grease from the equipment (e.g., LCD screen, keypad, housing assembly). Spray the cleaner on the cloth and not directly on the equipment.	N/A	As required
Check cabinet air filters. Clean or replace them as necessary. Check the air filter more frequently in excessively dirty environments.	N/A	3 months
Check block faceplate and housing and the cooling fan assembly for dust. Clean as necessary using an antistatic vacuum. Insure air vents are free of dust and lint.	N/A	
Check all signal, power, ground, and cable connections associated with the block; verify they are secure.	PR9	
Complete all tasks in this table.	N/A	Shutdown

Repair and Replacement

Section 7

Introduction

This section explains repair and replacement procedures for the SIM-100 block.

Repair

Repair is limited to assembly replacement. If a block component such as the SIM-100 module or SIM-100 base fails, remove and replace it with another. Do ***not*** attempt to replace discrete components in any system assembly.

Replacement

WARNING	**A SIM-100 module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

NOTE: Always follow the instructions given in ***Special Handling*** in Section 3 when handling the SIM-100 module.

The replacement procedures for most parts and assemblies are intuitive. Figure 7-1 is the replacement flowchart, which contains replacement procedures for those parts and assemblies that need explanation.

In the flowchart, each flowchart block represents a single task. The PR code in the flowchart block identifies the procedure section that describes the steps to complete the indicated task. Some steps are self-explanatory and have no related procedure section. Complete all steps given in a procedure section before continuing to the next flowchart block. The procedure sections are located towards the back of the instruction.

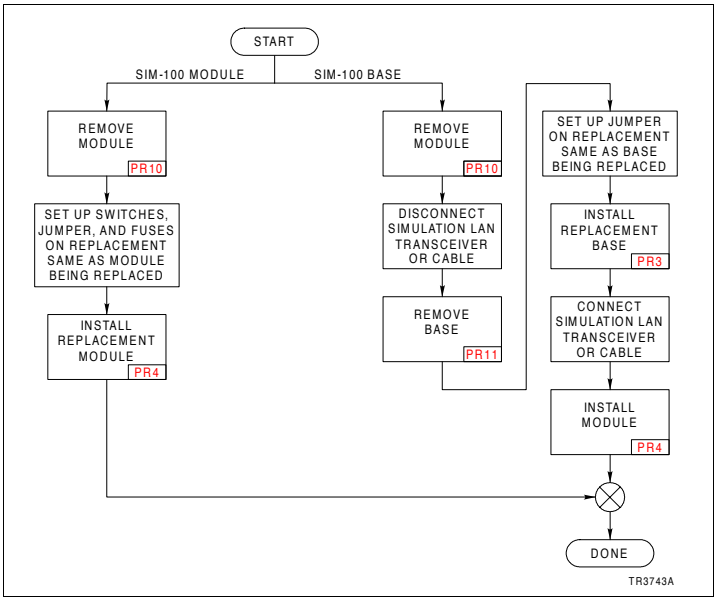

Figure 7-1. Replacement Flowchart

Replacement and Spare Parts

Section 8

Introduction

This section provides installation, replacement, and spare part nomenclature and part numbers. Contact ABB for help determining the quantity of spare parts to keep on hand for your particular system.

Block Nomenclature

Table 8-1 lists the SIM-100 block nomenclature.

Table 8-1. Simulation Block Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
P	**-**	**H**	**B**	**-**	**S**	**I**	**M**	**-**	**1**	**0**	**0**	_	_	_	_	_	**Block Nomenclature**
																	Module/Base Option
												0	C	1	_	_	Base
												1	0	0	_	_	Module
																	Reserved for Future Use
															0	0	Must be zeros

Cable Nomenclature

Table 8-2 lists cable nomenclature. Refer to the ***Harmony Communications Network (Hnet)*** instruction for Hnet cable nomenclature.

Table 8-2. Power Cable Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
P	**-**	**M**	**K**	**-**	**H**	**R**	**M**	**-**	**P**	**W**	**R**	**6**	**0**	**0**	**0**	_	**Power Cable**
																	Length
																x	1 to 8 for 1.0 to 8.0 m (3.3 to 26 ft)

Miscellaneous Nomenclature

Table 8-4 lists related, miscellaneous parts and their part numbers.

Table 8-3. Miscellaneous Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
P	**-**	**H**	**A**	**-**	**M**	**C**	**L**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**Stackable Block Mounting Column**
P	**-**	**H**	**A**	**-**	**M**	**S**	**C**	**C**	**M**	**B**	**1**	**0**	**0**	**0**	**0**	**Column Mounting Bar**
P	**-**	**H**	**A**	**-**	**M**	**S**	**C**	**S**	**I**	**M**	**B**	**N**	**C**	**0**	**0**	**10Base2 (Thin Coaxial) Transceiver**
P	**-**	**H**	**A**	**-**	**M**	**S**	**C**	**T**	**E**	**R**	**2**	**0**	**0**	**0**	**0**	**Hnet Terminator** (accommodates redundant channels)

Miscellaneous Parts

Table 8-4 lists related, miscellaneous parts and their part numbers.

Table 8-4. Miscellaneous Parts

Number	Part
1949438A1601	1.6 A, 250 V, 5 x 20 mm, fast-acting, low break capacity
200013A050T100	M5 × 10-mm, hex-head, thread-forming screw
6642146A1	Plastic lens
EL 2089	M6 Phillips-head screw (CAB-04/12)
EL 2094	M6 captive nut (CAB-04/12)
NIDHA16008	0.19-32 (no. 10) × 0.5 in., Phillips-head screw (CAB-01)
NMPCC16002	0.19-32 (no. 10) cage nut (CAB-01)

Hardware Drawings

Appendix A

Introduction

This section provides drawings showing dimensions for the SIM-100 block, block mounting column, and column mounting bar.

SIM-100 Block

Figures A-1 and A-2 are the SIM-100 module and SIM-100 base.

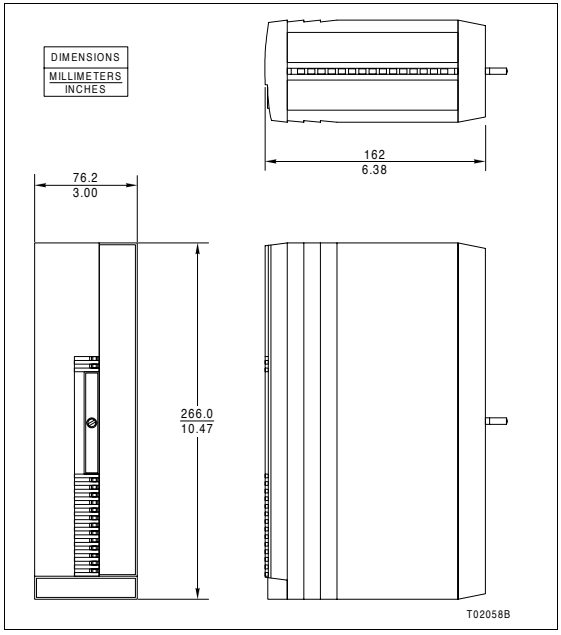

Figure A-1. SIM-100 Module

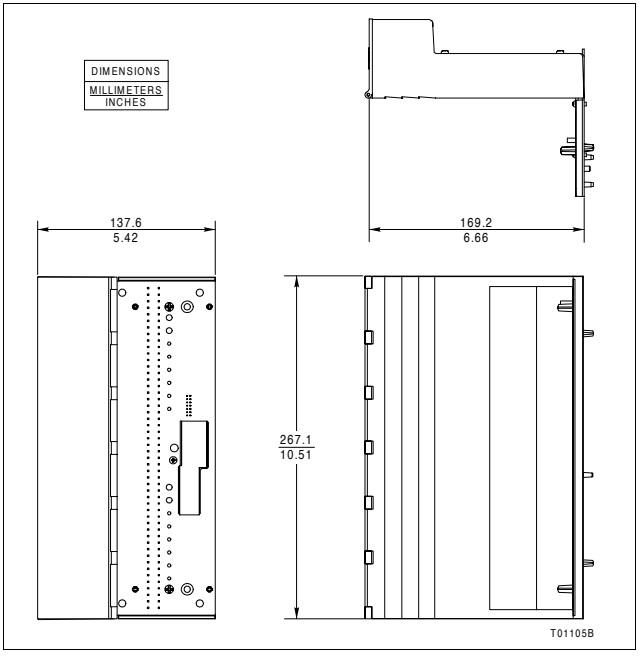

Figure A-2. SIM-100 Base

Block Mounting Column

Figure A-3 is the block mounting column.

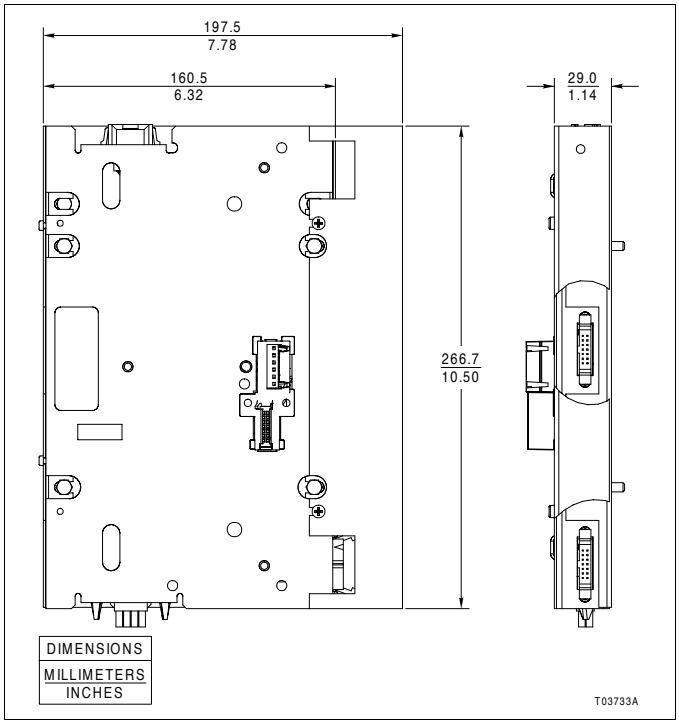

Figure A-3. Block Mounting Column

Column Mounting Bar

Figure A-4 is the column mounting bar.

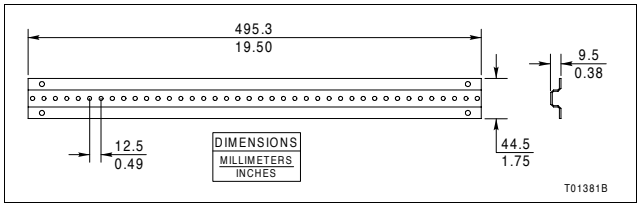

Figure A-4. Column Mounting Bar

Firmware Upgrade

Appendix B

Introduction

The SIM-100 block firmware resides in flash-ROM memory which provides the ability to upgrade firmware without having to physically replace discrete components. Currently, new firmware is loaded into the SIM-100 module through its diagnostic port (P7). This requires the side cover of the module to be removed and the special operations switch (SW5) on the back of the module to be set to enable firmware upgrade. The SIM-100 diagnostic port uses simple null modem (i.e., crossover), full duplex connection with no handshaking (Fig. B-1). Refer to Table 5-7 for P7 pin assignments.

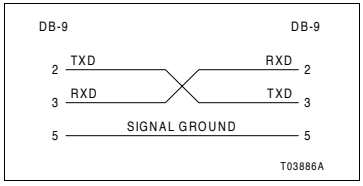

Figure B-1. RS-232-C Diagnostic Port Interconnection

Procedure

A download utility (***simdwnld.exe***) included with the Simulation LAN and API software is used to perform firmware downloading. To download firmware:

1. Remove the SIM-100 module. Refer to procedure section PR10 if necessary.

2. Record the current special operations switch SW5 settings.

3. Change switch SW5 settings to enable firmware upgrade from the diagnostic port:

SW5							
8	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1	0	0	0	0	0	0	0

NOTE: 1 = open or off, 0 = closed or on.

Refer to Table PR5-2 for a description of the settings.

4. Remove the right side cover of the SIM-100 module and connect a RS-232-C cable between the diagnostic port (P7) and the PC COM1 or COM2 port. Refer to Figure B-1 for the required RS-232-C signal connections.

5. Install the SIM-100 module and wait for startup to complete; refer to procedure section PR4 if necessary. The status LEDs should indicate:

Status LEDs							
–	–	–	4	–	–	–	8

NOTES: – = LED off.

6. Copy the SIM-100 firmware file (***vxsimrrn.abs***) to the directory where the ***simdwnld.exe*** utility is located. This is the same directory where the simulation software was installed; the default directory is:

C:\Program Files\ElsagBailey\Simulation LAN and API

7. From the simulation software directory, issue one of the following commands:

simdwmld com1 vxsimrrn.abs [erasect.s0]

-***or***-

simdwmld com2 vxsimrrn.abs [erasect.s0]

NOTE: erasect.s0 is an optional parameter.

8. Follow the instructions that appear on the PC screen and wait for the SIM-100 module to give a download complete indication. Table B-1 shows the LED sequence that occurs during the download.

Table B-1. LEDs - Firmware Upgrade

Normal	Fault	Status LEDs	Description
Off	Off	– – – 4 – – – 8	Firmware download beginning.
Off	Off	1 – – 4 – – – 8	Flash-ROM erase in progress.[1]
Off	Off	– – – 4 – – – 8	Flash-ROM erase terminated; waiting for firmware code.
Off	Off	– x x 4 – – – 8	Receiving firmware code.
Off	Off	– 2 – 4 – – – 8 – – 3 4 – – – 8	Download complete (downloaded file does not terminate with CTRL-Z).
Off	On	– – – – – – – 8	Download complete (downloaded file terminates with CTRL-Z).

NOTES: – = off; x = toggle.
1. Wait until LED 1 clears to indicate flash-ROM erase has completed before continuing with the download procedure.

9. Remove the SIM-100 module. Refer to procedure section PR10 if necessary.

10. Disconnect the cable from the diagnostic port (P7) and replace the module right side cover.

11. Set the special operations switch SW5 to its original settings.

12. Install the SIM-100 module. Refer to procedure section PR4 if necessary.

13. Verify that the SIM-100 block is operating properly:

Status LEDs							
–	–	–	–	–	–	7	8

NOTES: – = LED off.

Column Mounting Bar Installation

PR1

Purpose/Scope

30 min.

This procedure describes the steps necessary to install the MSC-CMB column mounting bars when using the MCL-111 mounting column. Two mounting bars are needed for each MCL-111 mounting column.

Refer to the ***Block Power and Mounting*** instruction when installing the column mounting bars when using MCL-?10 and MCL-?20 mounting columns.

Parts

Number	Qty	Description
EL 2089	8	M6 Phillips-head screw (CAB-04/12)
NIDHA16008		0.19-32 (no. 10) × 0.5 in., Phillips-head screw (CAB-01)
EL 2094	8	M6 captive nut (CAB-04/12)
NMPCC16002		0.19-32 (no. 10) cage nut (CAB-01)
P-HA-MSC-CMB10000	2	Column mounting bar

Tools

- Phillips screwdriver.

Procedure

☐ 1. Refer to Figure PR1-1 for mounting bar spacing.

☐ 2. Attach the column mounting bars to the side rails (Fig. PR1-2). When installing in a CAB-01 enclosure use four 0.19-32 screws and cage nuts per bar. When installing in a CAB-04 or CAB-12 enclosure use four M6 screws and captive nuts per bar.

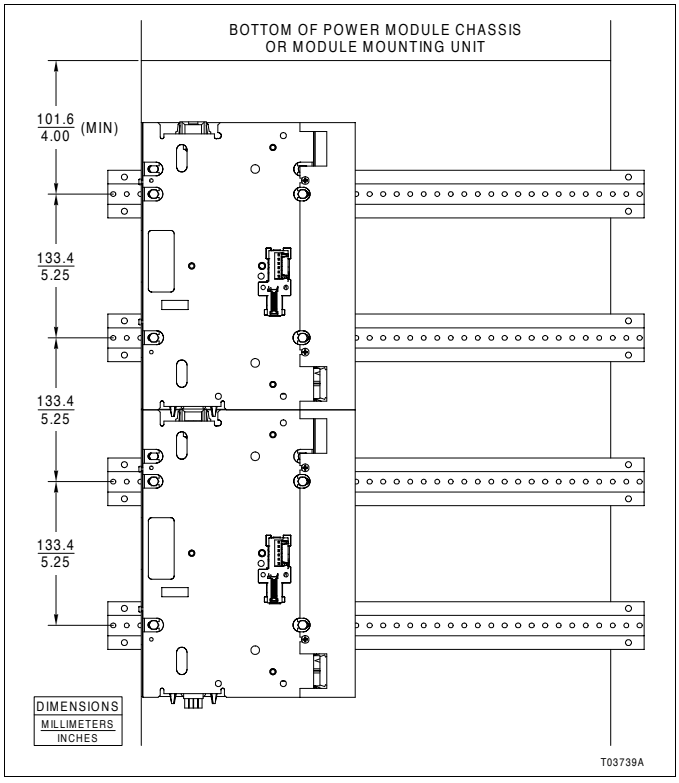

Figure PR1-1. Column Mounting Bar Spacing

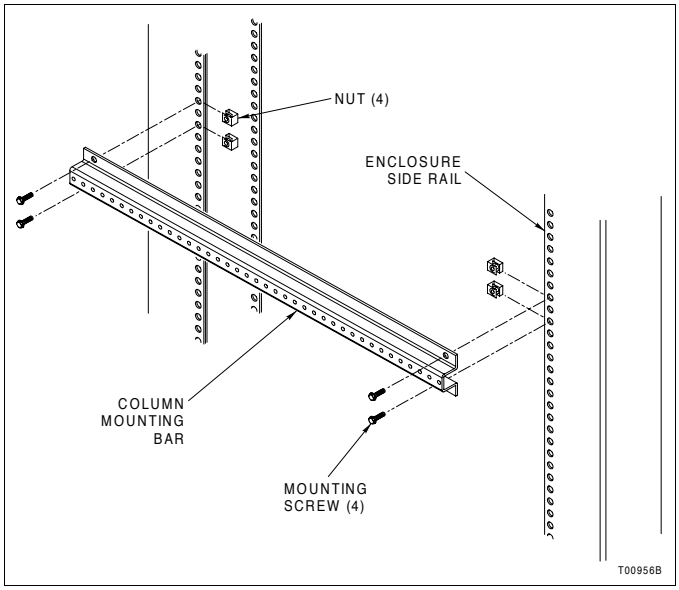

Figure PR1-2. Column Mounting Bar Attachment

Block Mounting Column Installation

PR2

Purpose/Scope

30 min.

This procedure describes the steps necessary to install the MCL-111 blockmounting column. This section contains two procedures: single column and stacked column. Up to seven MCL-111 mounting columns can be connected together or stacked.

Refer to the ***Block Power and Mounting*** instruction for the procedures to install MCL-?10 and MCL-?20 mounting columns.

Parts

Number	Qty	Description
P-HA-MCL-11100000	1	Stackable block mounting column
200013A050T100	4	M5 × 10-mm, hex-head, thread-forming screw

Tools

- M5 nut driver.

Refer to the ***Single Column Procedure*** when installing one MCL-111 block mounting column or thefirst mounting column in a series of stacked block mounting columns.

Power connectors at the topand bottom of the stackable mounting column allow chaining power from one column to the next. The first column connects to the power system, then the power is distributed from column to column through the power connectors. Refer to the ***Stacked Column Procedure*** in this section when installing a mounting column that is to connect to a previously installed column.

NOTE: It is suggested to install the top mounting column in a stack first then work downward installing any additional columns.

Single Column Procedure

☐ 1. Remove the Hnet cover plate from the MCL-111 mounting column (Fig. PR2-1). Remove the two screws that secure the cover plate to the column. The plate will be reinstalled afterthe Hnet cables and Hnet terminator have been connected.

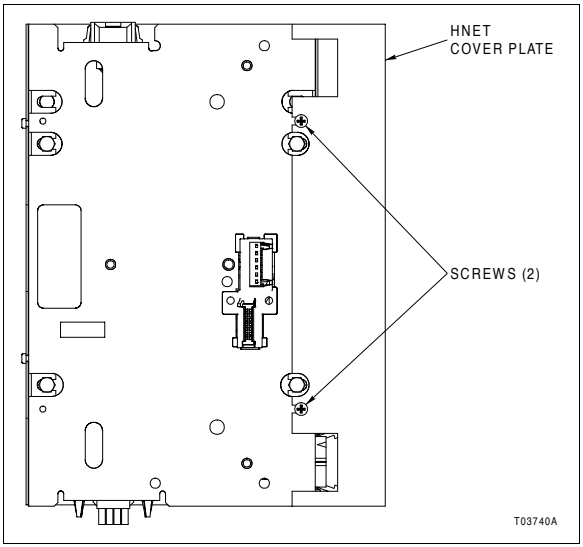

Figure PR2-1. Hnet Cover Plate Removal

☐ 2. Align then attach the block mounting column to the column mounting bars using four M5 screws (Fig. PR2-2). Make sure the column is lined up with other installed columns so that the block cooling vents will line up.

If installing in an enclosure that does not have a cooling fan assembly, the horizontal location of the column is not fixed. Determine column spacing based on the desired wiring channel width.

If installing in an enclosure with a cooling fan assembly, the column must be mounted so that the SIM-100 module vents line up with the cooling assembly nozzle. Position the column so that the right side of the column lines up with the top, right side of the nozzle.

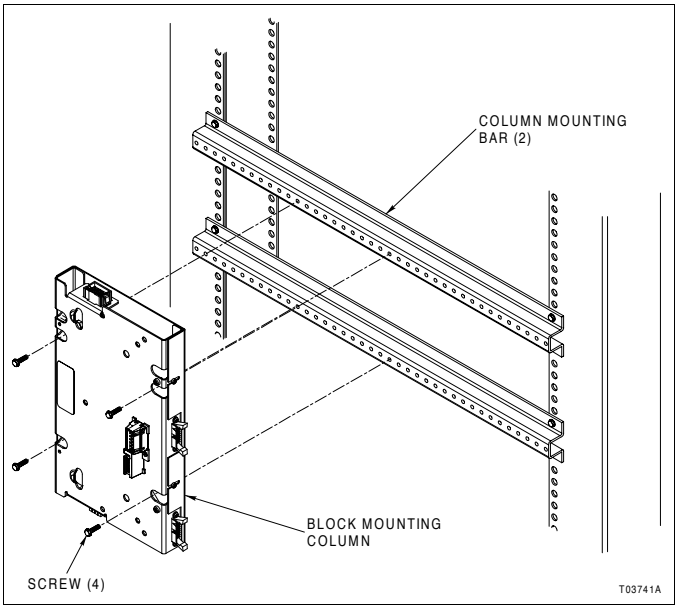

Figure PR2-2. Single Column Attachment

Stacked Column Procedure

☐ 1. Remove the Hnet cover plate from the MCL-111 mounting column (Fig. PR2-1). Remove the two screws that secure the cover plate to the column. The plate will be reinstalled after the Hnet cables and Hnet terminator have been connected.

☐ 2. Align the simulation mounting column directly under a previously installed MCL-111 mounting column (Fig. PR2-3).

☐ 3. Slide the column up to make the power connection.

☐ 4. Attach the column to the mounting bars using four M5 screws.

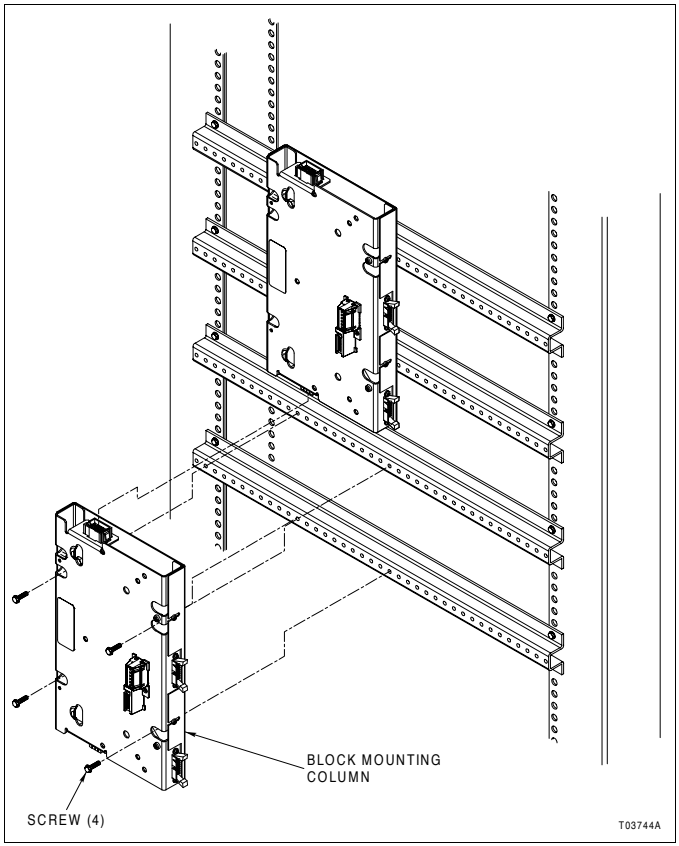

Figure PR2-3. Stacked Column Attachment

SIM-100 Base Installation

PR3

Purpose/Scope

5 min.

This procedure gives the steps required to install a SIM-100 base.

Parts None.

Tools
- Phillips screwdriver.

Procedure

☐ 1. Verify the block location. The SIM-100 block mounts on an MCL-111 mounting column.

☐ 2. Position the base on the mounting column. Insert the tabs at the back, left side of the base into the slots in the column as shown in Figure PR3-1. Tilt the base slightly to properly insert the tabs. The base is properly positioned when the posts on the back of the base line up with the alignment holes in the column. The mounting column connectors should protrude through the base.

☐ 3. Tighten the two captive screws to attach the base to the column.

☐ 4. Verify the back of the base is flush with the mounting column.

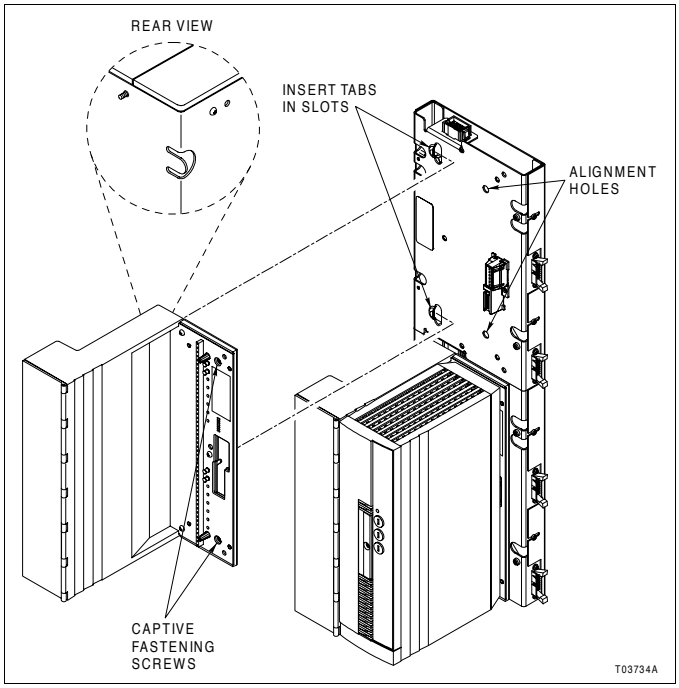

Figure PR3-1. SIM-100 Base Attachment

SIM-100 Module Installation

PR4

Purpose/Scope

1 min.

This procedure gives the steps required to install a SIM-100 module.

NOTE: Always follow the instructions given in ***Special Handling*** in Section 3 when handling the SIM-100 module.

Parts None.

Tools
- Flat-blade screwdriver.

Safety Considerations

WARNING	**1. A SIM-100 module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

Procedure

☐ 1. Verify the block location. SIM-100 modules are keyed to compatible SIM-100 bases to prevent a mismatch.

☐ 2. Grasp the retractable handle when inserting the module. Insure the handle is extended completely so that the fastening screw does not stick out from the back of the module (Fig. PR4-1).

☐ 

3. Position the module on the base. It is properly positioned when the posts protruding from the base line up with the alignment holes on the back of the module.

NOTE: Do not use the fastening screw to align the module.

☐ 4. Gently push the module in until the front of the base and the front of the module are flush. This should not require much pressure. If the module cannot be pushed in flush with the base, then either it is not properly aligned or it is not compatible with the particular base.

☐ 5. Tighten the captive front panel fastening screw. The fastening screw actually threads into the mounting column and not into the base. Do not overtighten.

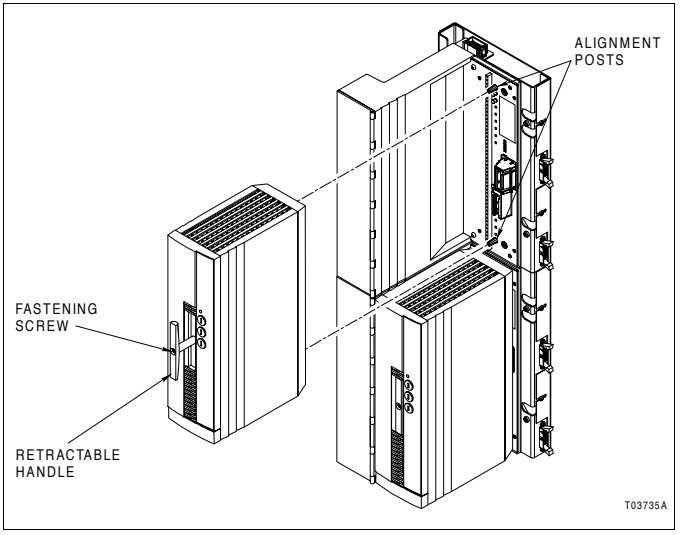

Figure PR4-1. SIM-100 Module Attachment

SIM-100 Setup

PR5

Purpose/Scope

15 min.

This procedure gives the steps required to set up the SIM-100 block for proper operation. This includes setting switches, verifying and setting jumpers, and checking for fuses.

Parts None.

Tools
- Small-tipped, flat-blade screwdriver.
- Needlenose pliers (optional).

Procedure

☐ 1. Verify the heartbeat jumper E1 on the SIM-100 base is set as shown in Table PR5-1; refer to Figure PR5-1 for the jumper location. This jumper only affects the RJ-45 port operation.

Table PR5-1. Jumper E1 (Base) - Heartbeat

Option[1]	E1	Description
Disable	C B A	Disable heartbeat signal

☐ 2. Set the special operations switch SW5 located on the back of the module (Table PR5-2).

Table PR5-2. Switch SW5 (Module) - Special Operations

Pole	Setting	Function
1/2/3/4	0	Normal operation.
5	0	Diagnostic port: disable XON/XOFF (hardware flow control).
	1	Not used.
6[1]	0	Diagnostic port: 9,600 baud.
	1	Not used.

Table PR5-2. Switch SW5 (Module) - Special Operations *(continued)*

Pole	Setting	Function
7/8	0/0	Normal operation.
	0/1	Firmware upgrade from diagnostic port.
	1/0	Enable diagnostics (for ABB use only).
	1/1	Not used.

NOTE: 1 = open or off, 0 = closed or on.
1. Diagnostic port has the following fixed characteristics: no parity, eight data bits, and one stop bit.

☐ 3. Remove the access cover from the right side of the module (Fig. PR5-2).

☐ 4. Verify the machine fault timer (MFT) jumper E1 is inserted to enable the MFT timer (Fig. PR5-3). The machine fault timer jumper is for ABB use only. Always operate the SIM-100 module with the machine fault timer circuit enabled. Unpredictable module operation could occur if disabled.

☐ 5. The SIM-100 block is a node on the Simulation LAN (i.e., Ethernet). Set switches SW1 through SW4 to the IP address assigned to the block. The address must be converted to binary format to set the switches. Table PR5-3 provides examples of IP address settings.

Table PR5-3. Switches SW1 through SW4 (Module) - Example IP Address Settings

Address	SW4								SW3								SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
10.41.4.17	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1
177.12.1.28	1	0	1	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0

NOTE: 0 = on or closed; 1 = off or open.
1. Pole one for each switch is the most significant bit.

☐ 6. Replace the access cover.

☐ 7. Verify 1.6 A, 250 V fuses are present in both the BLP A and BLP B block power fuse holders on the SIM-100 module.

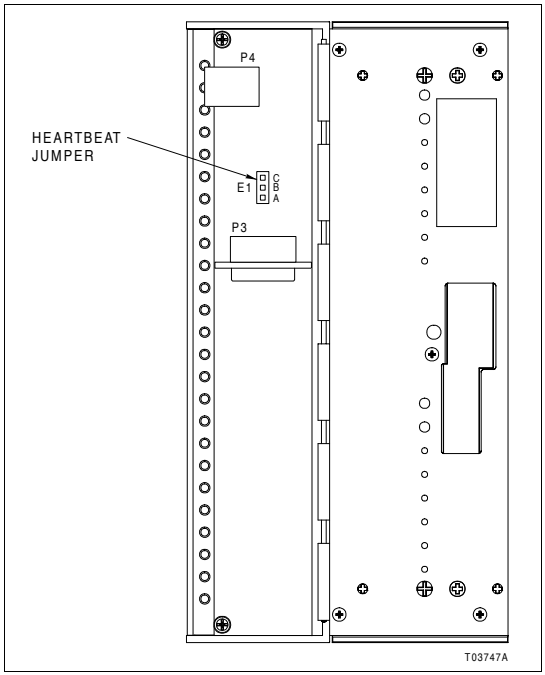

Figure PR5-1. SIM-100 Base

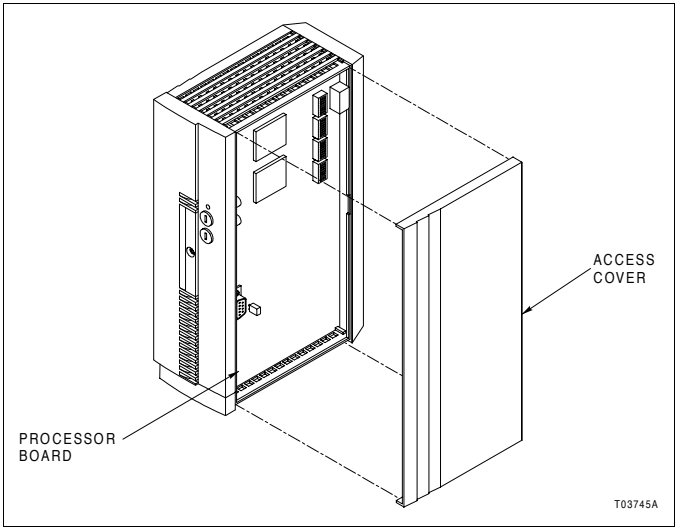

Figure PR5-2. SIM-100 Module Switch and Jumper Access

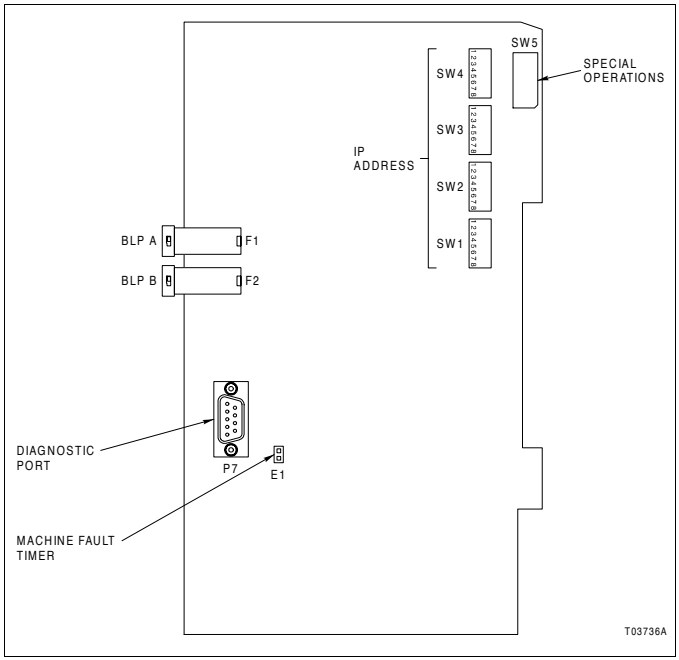

Figure PR5-3. SIM-100 Module Board Layout

24 VDC Power Connection

PR6

Purpose/Scope

10 min.

This procedure gives the steps required to connect 24 VDC power to operate the SIM-100 block. The block is typically powered by the Modular Power System II.

Prerequisites

- Modular Power System II installed.
- MSC-DIST Auxiliary Power Distribution Panel installed (if required).

Parts

Number	Qty	Description
P-MK-HRM-PWR6000x	1	Power cable

Tools

- Modular Power System II instruction.
- Block Power and Mounting Hardware instruction.

Redundant 24 VDC power (BLP) is cabled to the power input connector of the MCL-111 block mounting column (Fig. PR6-1). It is then internally routed to the block connector for SIM-100 block use and to the power output connector for stacking columns.

In a single bay enclosure, BLP power directly cable connects from the power system (i.e., IPCHS02 Power Module Chassis) to the mounting column using an HRM-PWR6 cable. The following methods can be used for multibay enclosure block power connection:

- In the primary bay where the power system resides, BLP power directly cable connects from the power system to the mounting column using an HRM-PWR6 cable.
- In a secondary bay where there is no power system, BLP power can directly cable connect from the power system in the primary bay to a mounting column in a secondary bay using one of the longer HRM-PWR6 cables.
- In a secondary bay, the MSC-DIST power distribution panel can be installed to bus the BLP power. The BLP power cable connects from the power system to the

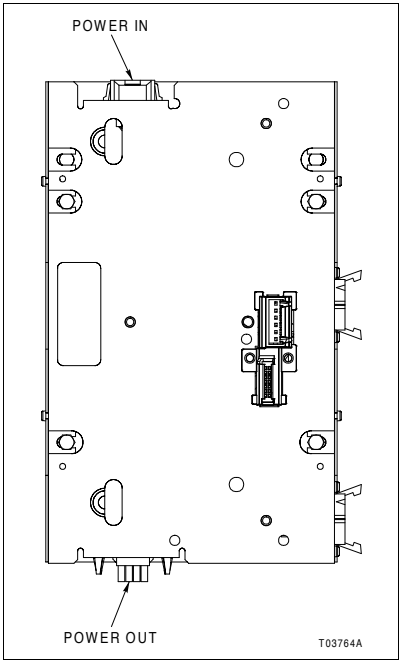

Figure PR6-1. 24 VDC Power Connectors

distribution panel, then from the distribution panel to the mounting column. An HRM-PWR6 cable is used to connect between the mounting column and the distribution panel.

Refer to the ***Modular Power System II*** and ***Block Power and Mounting Hardware*** instructions for further explanation and power connection details.

Procedure

☐ 1. Attach the appropriate end of the HRM-PWR6 power cable to the power input connector of the MCL-111 block mounting column (Fig. PR6-1).

☐ 2. Connect the other end of the power cable to the power source as described in the following paragraphs.

- If connecting directly to the Modular Power System II, attach the HRM-PWR6 cable to an available connector (P1 through P10) on the IPCHS02 chassis. Refer to the ***Modular Power System II*** instruction.
- If connecting directly to the Modular Power System II through an MSC-DIST distribution panel, attach the HRM-PWR6 cable to an available connector (P1 through P4 and P6 through P9) on the distribution panel. Refer to the ***Block Power and Mounting Hardware*** instruction.

Hnet Connection

PR7

Purpose/Scope

10 min.

This procedure describes Hnet connection and termination.

Parts

Number	Qty	Description
P-HA-MSC-TER20000	1	Hnet terminator
P-MK-HRM-MCL1000x	System dependent	Column to column Hnet cable

Tools

- Harmony Bridge Controller instruction.
- Harmony Communications Network (Hnet) instruction.

An intracabinet Hnet segment must be properly terminated at both ends. When used for simulation, one end of the Hnet segment terminates at the mounting column and the other end terminates at the controller. Refer to the ***Harmony Communications Network (Hnet)*** instruction for a description of Hnet, Hnet specifications, Hnet terminators, and additional Hnet related information.

Procedure

Figure PR7-1 shows standard Hnet connection for simulated I/O in a single Harmony controller. Figure PR7-2 shows standard Hnet connection for simulated I/O in multiple Harmony controllers. Figure PR7-3 shows standard Hnet connections for simulated I/O and nonredundant real I/O in a single Harmony controller. Figure PR7-4 shows standard Hnet connections for simulated I/O and redundant real I/O in a single Harmony controller.

NOTE: Columns cannot be connected together in a way that would put more than one SIM-100 block on the same Hnet.The controller supports one SIM-100 block.

☐ 1. Make the necessary cable connections as shown in Figures PR7-1 through PR7-4. Connect the Hnet cable from the controller to the top Hnet connector on the MCL-111 mounting column. Refer to the ***Harmony Bridge Controller*** or ***Harmony Communications Network (Hnet)*** instruction for controller to

mounting column connection options including the cable to use.

☐ 2. Install an MSC-TER2 Hnet terminator in the location shown in Figures PR7-1 through PR7-4. Figure PR7-5 shows the MSC-TER2 Hnet terminator.

☐ 3. Install the Hnet cover plate (Fig. PR7-6). Use the two screws previously removed to attach the cover plate to the mounting column.

☐ 4. When all required cable connections are made and all required terminators are installed there should be no open Hnet connectors on any mounting column. Verify there are no open Hnet connectors.

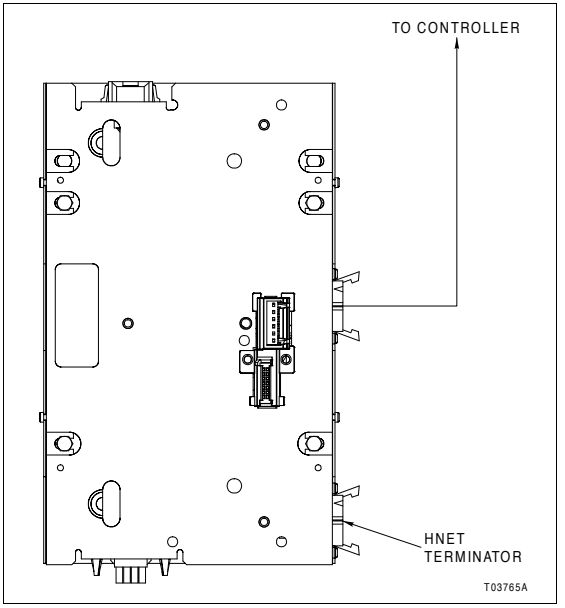

Figure PR7-1. Single MCL-111 Column Hnet Connections

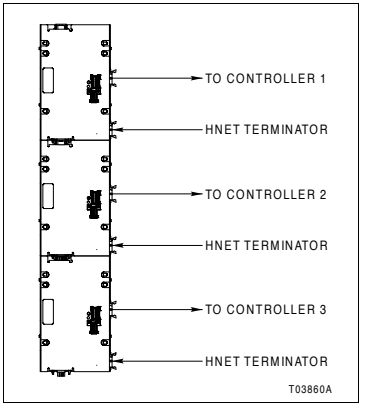

Figure PR7-2. Multiple MCL-111 Column Hnet Connections

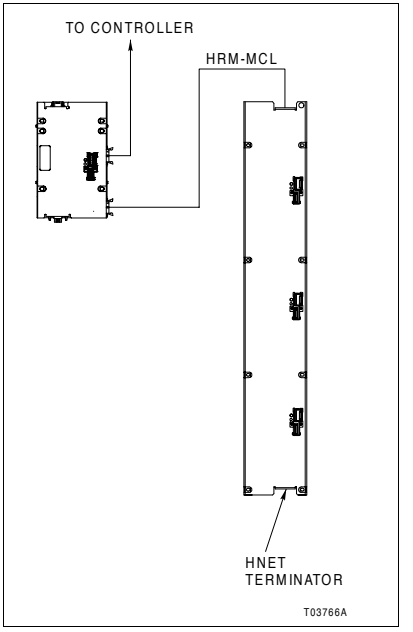

Figure PR7-3. MCL-111 to MCL-?10 Column Hnet Connections

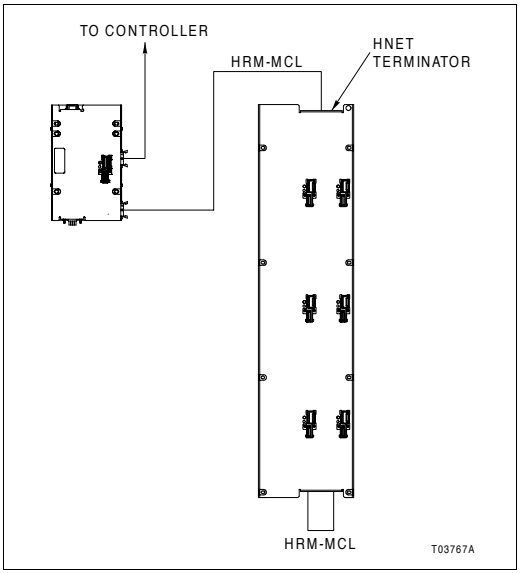

Figure PR7-4. MCL-111 to MCL-?20 Column Hnet Connections

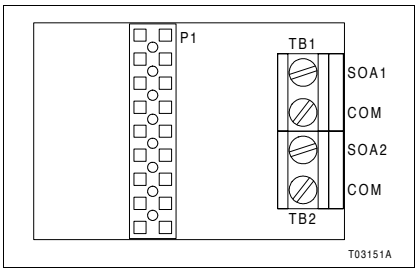

Figure PR7-5. MSC-TER2 Hnet Terminator

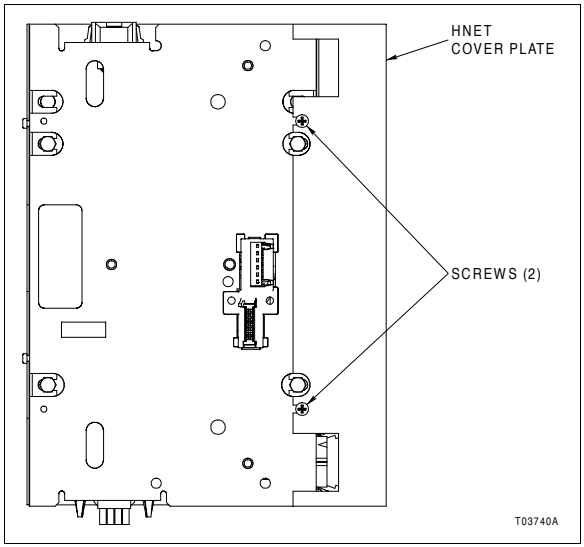

Figure PR7-6. Hnet Cover Plate Installation

Simulation LAN Connection

PR8

Purpose/Scope

10 min.

This procedure describes Simulation LAN connection (i.e., Ethernet). The Simulation LAN supports 10Base2 (thin coaxial), 10Base5 (thick coaxial), 10BaseT (category 5, unshielded twisted-pair), and 10BaseFL (fiber optic) cable. Standard Ethernet equipment and network topologies can be used when connecting to the network.

The preferred Simulation LAN connection method is 10BaseT cable. A transceiver is not required for this connection. An Ethernet switch is recommended for connecting Simulation LAN segments.

Parts

Number	Qty	Description
P-HA-MSC-SIMBNC00	1	10Base2 transceiver
Not applicable		10Base5 transceiver and AUI cable
Not applicable		10BaseFL transceiver

Tools

Phillips screwdriver (required for transceiver installation).

The Simulation LAN signals are isolated. 12 VDC and ground are provided to the transceiver, nonisolated, at the AUI port. AUI power isolation and additional network signal isolation are provided by the transceiver.

Procedure

☐ 1. For 10BaseT, connect a twisted-pair cable (category 5, unshielded) terminated with an RJ-45 connector to the RJ-45 port (P4) on the SIM-100 base (Fig PR8-2).

-***or***-

Connect a 10Base2, 10Base5, or 10BaseFL transceiver to the DB-15 AUI port (P3) on the SIM-100 base (Fig PR8-2). Depending on the model, the transceiver either connects directly to

the AUI port or it requires an AUI cable connected between the AUI port and the transceiver port.

NOTE: Follow the transceiver manufacturer's instructions on how to configure the SQE (heartbeat) signal and how to install retaining brackets if applicable.

☐ 2. If connecting a 10Base2 or 10BaseFL transceiver, install the transceiver bracket provided using two M4 screws and washers (provided) in the location shown in Figures PR8-3 and PR8-5. Locate the rubber spacers between the bracket and transceiver (optional).

☐ 3. Make the Simulation LAN connection as appropriate. Figures PR8-3 through PR8-1 provide some example connection methods.

NOTES:

1. The SIM-100 block supports one Simulation LAN connection. The RJ-45 port and AUI port are mutually exclusive. An RJ-45 port connection cannot be made if there is already an AUI port connection and vice versa. The SIM-100 module will automatically switch the internal Ethernet circuitry to the AUI port or RJ-45 port depending one where it senses activity.

2. The example Ethernet connections shown in Figures PR8-3 and PR8-4 are with the SIM-100 block located at the end of an Ethernet segment. The 50 ohm terminator may be located in a different place depending on the location of the block on the segment.

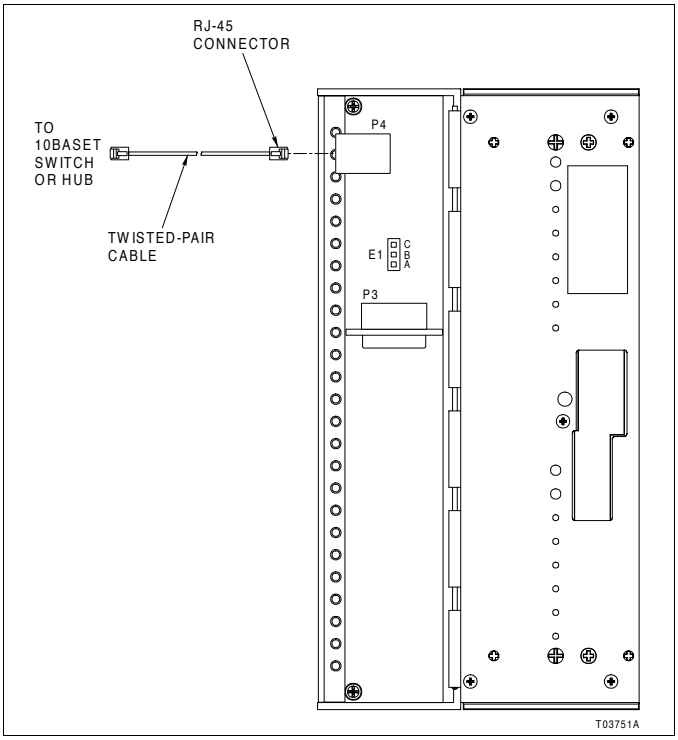

Figure PR8-1. 10BaseT Example Connection

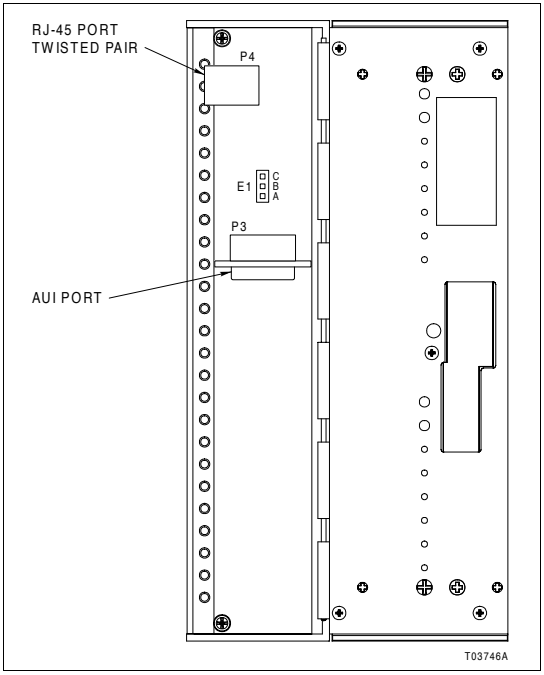

Figure PR8-2. SIM-100 Base

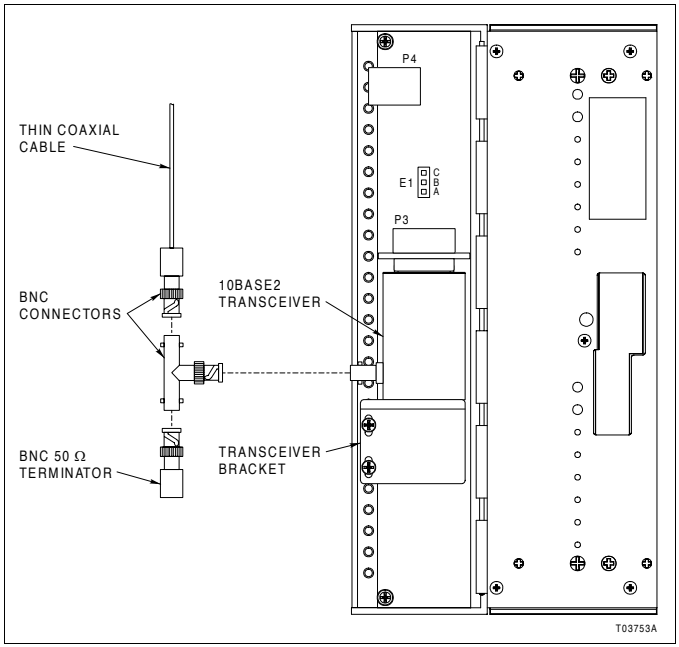

Figure PR8-3. 10Base2 Example Connection

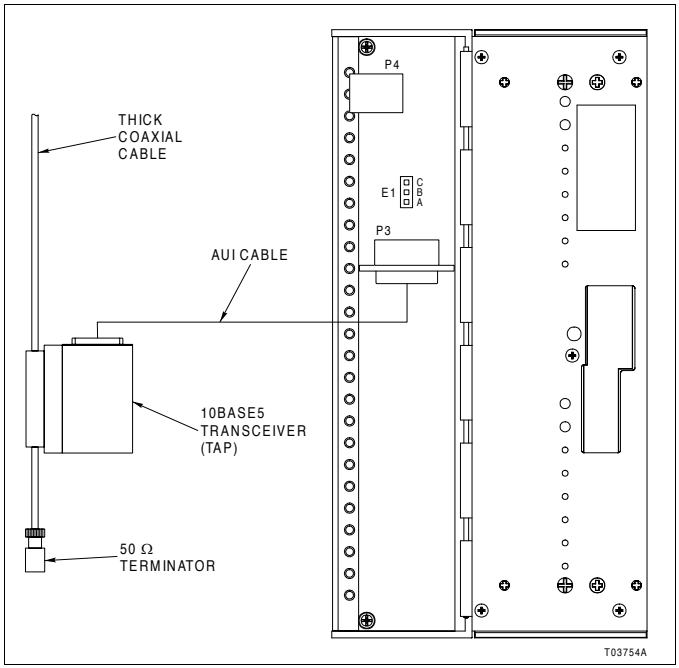

Figure PR8-4. 10Base5 Example Connection

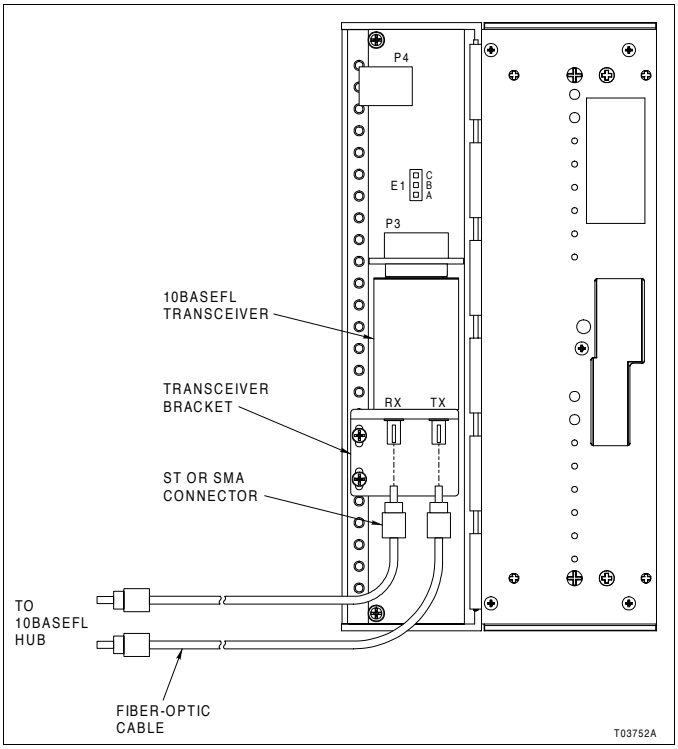

Figure PR8-5. 10BaseFL Example Connection

Connections Check

PR9

Purpose/Scope

10 min.

This procedure explains how to check connections. Check all signal wiring, power, ground, and cable connections within the enclosure to verify their integrity.

Parts None.

Tools
- Flat-blade screwdriver.
- Phillips screwdriver.

Safety Considerations

WARNING	**1. Turn off all power before attempting the connections check maintenance procedure. Failure to do so could result in severe or fatal shock, or equipment damage.**

Procedure

When checking connections, always turn a screw, nut, or other fastening device in the direction to tighten only. If the connection is loose, it will be tightened. If the connection is tight, the tightening action will verify that it is secure. There should ***not*** be any motion done to loosen the connection.

NOTE: ABB Automation recommends this preventive maintenance task be performed during power supply preventive maintenance while the power to the enclosure is off.

☐ 

1. Verify that power is removed before checking any connections for tightness.

☐ 2. Verify that all field wiring connections are secure.

☐ 3. Verify that all power wiring connections are secure.

☐ 4. Check all cable connections.

SIM-100 Module Removal

PR10

Purpose/Scope

1 min.

This procedure gives the steps required to remove a SIM-100 module from its base.

NOTE: Always follow the instructions given in ***Special Handling*** in Section 3 when handling the SIM-100 module.

Parts None.

Tools
- Flat-blade screwdriver.
- Thin rod for reset button, preferably nonmetallic.

Safety Considerations

WARNING	**1. A SIM-100 module should not be inserted or removed with power applied when located in a class I, division 2 hazardous location unless the area is known to be nonhazardous.**

Procedure

☐ 1. Depress the stop/reset button once to halt block operation if not already halted.

☐ 

2. Loosen the captive front panel fastening screw (Fig. PR10-1).

☐ 3. Grasp the module by its handle and gently pull.

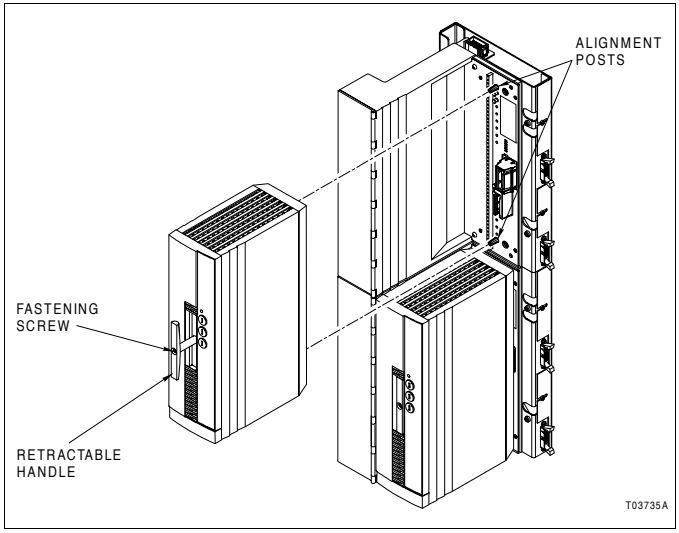

Figure PR10-1. SIM-100 Module Removal

SIM-100 Base Removal

PR11

Purpose/Scope

5 min.

This procedure gives the steps required to remove a SIM-100 base.

Parts None.

Tools
- Phillips screwdriver.

Procedure

☐ 1. Loosen the two captive screws that attach the base to the column (Fig. PR11-1).

☐ 2. Slide the base to the right so the tabs on the back of the base clear the slots in the column as shown in Figure PR11-1, then remove the base.

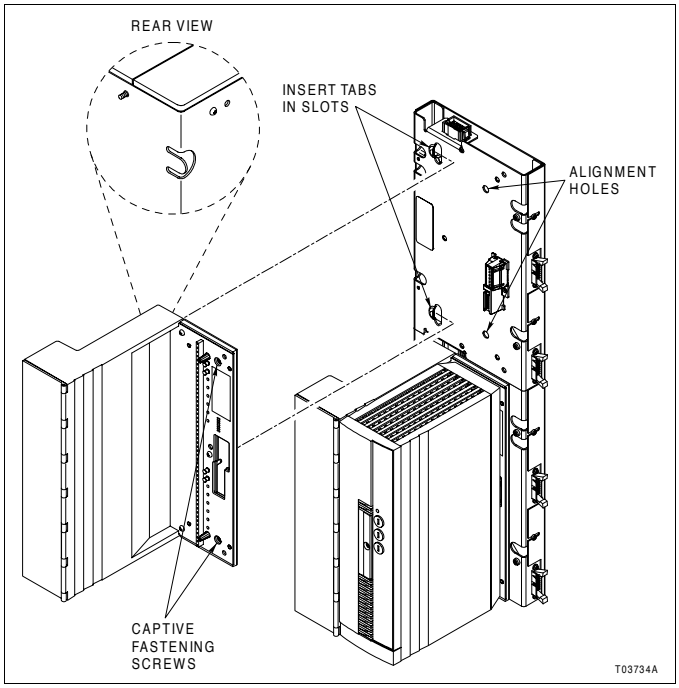

Figure PR11-1. SIM-100 Base Removal

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