



Sinneslöschen

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CUSTOMER TECHNICAL DOCUMENTATION

SSB-2E Compatibility Guide

Sinneslöschen System Bus

Document Number: RM-SSB2E-04
Revision: D
Release Date: February 11, 1998
Supersedes: Revision C, August 22, 1997
Distribution: Customer / OEM / Authorized Service

This guide describes approved compatibility practices for SSB-1, SSB-2 and SSB-2E installations. It is intended for system integrators, field-service personnel, OEM engineering groups and customers responsible for maintaining installed Sinneslöschen equipment.

Sinneslöschen Systems Corporation
1450 Meridian Technology Drive
Sunnyvale, CA 94089 USA
Technical Support: 1-800-555-0142
Documentation Fax: 408-555-0163

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CAUTION

Do not install, relocate or remove SSB modules in energized equipment unless the applicable system service procedure explicitly permits live insertion. Standard SSB chassis are not designed for hot insertion. Disconnect system power and observe electrostatic-discharge precautions before changing module configuration.

Third-party product names are used for identification only and remain the property of their respective owners.

Technical Support

For compatibility assistance, record the chassis model, SSB generation, module types and revisions, slot positions, termination hardware, timing modules, bridge hardware and installed software revision before contacting Technical Support.

North American Technical Support: 1-800-555-0142

Direct: 408-555-0186

Fax: 408-555-0127

E-mail: support@sinnesloschen.com

Document Control

Document	RM-SSB2E-04 - SSB-2E Compatibility Guide
Current Revision	D
Release Date	February 11, 1998
Product Family	Sinneslöschen System Bus (SSB)
Primary Coverage	SSB-2E, SSB-2, selected SSB-1 legacy configurations
Related Software	SSB Configuration Utility 2.6; SSB Diagnostic Toolkit 2.4
Related Hardware	SSB-2E chassis; SSB timing modules; SSB-1 compatibility adapters; SL-9816 PCI / SSB Peripheral Bridge
Maintaining Organization	Systems Engineering / Technical Documentation

Revision History

Rev.	Date	Status	Summary
A	03.16.94	Released	Initial SSB-2E compatibility reference. Covered SSB-2 module migration, chassis wiring and first-generation enhanced timing rules.
B	02.07.95	Superseded	Added SSB-1 adapter guidance, legacy timing-module requirements and expanded troubleshooting examples.
C	08.22.97	Superseded	Added revised module-identification rules, Windows NT configuration utility procedures and preliminary PCI bridge information.
D	02.11.98	Current	Consolidates TB-95-028 guidance, adds SL-9816 integration requirements, revised mixed-generation matrices, new termination examples and SSB Configuration Utility 2.6 report interpretation.

Change Bars and Field Updates

Printed copies of this guide may be supplemented by Technical Bulletins. Where a bulletin conflicts with this manual, the bulletin applies to the hardware and revision range stated in the bulletin. Revision D incorporates compatibility information current through February 11, 1998, but does not supersede product-specific Service Bulletins.

Conventions Used in This Guide

Convention	Meaning
CURRENT	Supported current-generation configuration.
SUPPORTED	Configuration approved when all listed conditions are met.
CONDITIONAL	Configuration requires specific adapter, timing, slot or termination conditions.
SERVICE ONLY	Configuration may be maintained but is not recommended for new installation.
NOT SUP- PORTED	Configuration is outside qualified operating limits.
VERIFY	Required information cannot be determined from product family alone; inspect module or chassis revision.

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Chapter 1

Purpose, Scope and Compatibility Philosophy

1.1 Purpose

The Sinneslöschen System Bus was designed to support modular industrial, laboratory, instrumentation and OEM systems with long service lives. As a result, many installed systems contain hardware introduced at different points in the SSB product history. This guide defines the combinations that may be operated together and the conditions required to preserve electrical, timing and service compatibility.

Compatibility is not determined by connector fit alone. A module may physically enter a later chassis while remaining electrically or operationally unsuitable. Conversely, an earlier module may remain fully supportable when an approved adapter, timing module, termination arrangement or bridge configuration is used.

The guide is intended to answer four service questions:

1. Can the identified module and chassis combination be operated together?
2. If so, what additional hardware or configuration restrictions apply?
3. What information must be recorded before an established system is changed?
4. Which diagnostic procedure should be used if the resulting system does not operate as expected?

1.2 Covered SSB Generations

This revision covers three principal generations:

- **SSB-1**, introduced 1985 and maintained under legacy support;
- **SSB-2**, introduced 1989 and widely represented in the installed base;
- **SSB-2E**, introduced 1993 and the current enhanced SSB implementation.

SSB-2E is an evolutionary extension of SSB-2, not a replacement electrical standard. The base data path, module mechanical format and principal service concepts remain related. SSB-2E extends addressing, burst-transfer capability, module identification and timing control while preserving support for qualified SSB-2 hardware.

SSB-1 predates those enhancements and requires separate consideration. Its electrical signaling is related to later SSB systems but its arbitration, timing, identification and termination practices differ sufficiently that direct interchange must never be assumed.

1.3 Compatibility Hierarchy

When multiple sources of compatibility information exist, use the following order of authority:

1. Product-specific Service Bulletin applicable to the exact serial or revision range.
2. Current Technical Bulletin, including TB-98-011 for mixed SSB installations.
3. Current revision of this guide.
4. Product data sheet and service manual.
5. Configuration Utility report generated from the installed system.
6. Older printed compatibility tables retained with the equipment.

SERVICE NOTE

A Configuration Utility report is a record of what the utility can identify. It is not, by itself, proof that every installed module combination is qualified. Older SSB-1 modules may not report sufficient identification data for automatic compatibility determination.

1.4 Installed-System Principle

An operating, documented installation should not be altered solely to conform to a newer preferred arrangement. Sinneslösch supports many long-life systems in which a qualified historical configuration differs from the layout recommended for new assemblies. Before moving a module, replacing a chassis or installing a bridge, preserve the existing configuration record and determine whether the proposed change modifies any of the following:

- electrical bus length;
- termination location;
- module slot order;
- arbitration priority;
- address allocation;
- interrupt assignment;
- timing-module requirement;
- bridge firmware behavior;
- host software assumptions.

1.5 Terminology

In this guide, *chassis* refers to the mechanical card cage and backplane assembly. *Backplane segment* refers to the electrically continuous portion of the SSB bus participating in the configuration. *Module* refers to a plug-in SSB circuit assembly. *Bridge* refers to an interface that translates between SSB and another host bus, principally the SL-9816 PCI / SSB Peripheral Bridge. *Adapter* refers to passive or active hardware used to permit a selected legacy module to operate within an approved later-generation configuration.

1.6 When to Contact Technical Support

Contact Sinneslöschen Technical Support before proceeding when any of the following applies:

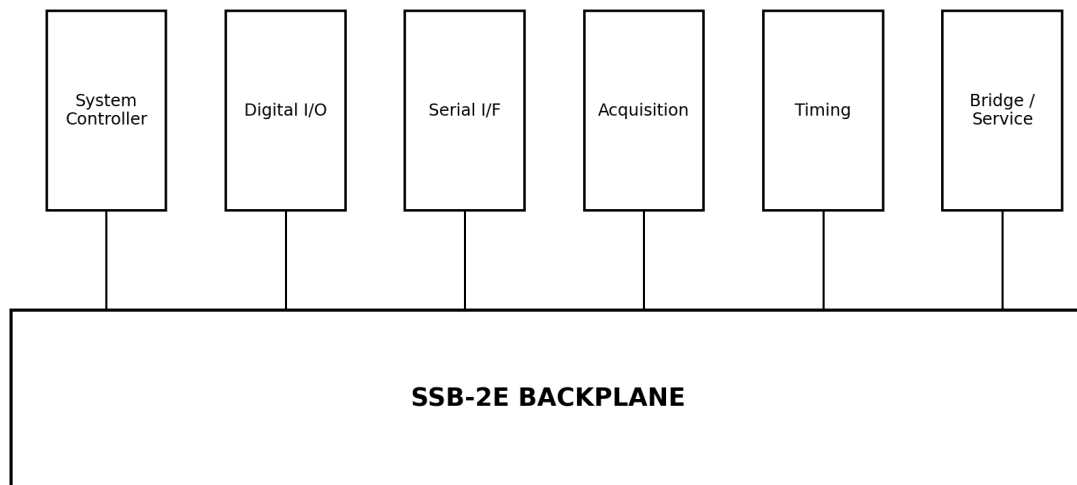
- the module revision is unreadable or not listed in a current matrix;
- the chassis has been field-modified;
- more than one SSB generation is present and no configuration record is available;
- a non-Sinneslöschen module occupies the SSB backplane;
- the system includes customer-specific OEM hardware with no public data sheet;
- the termination arrangement differs from the examples in AN-SSB-17;
- intermittent failures appear only under high bus activity;
- bridge firmware is older than the revision required by the applicable support file package.

Chapter 2

SSB Architecture Overview

2.1 Functional Architecture

SSB provides a shared backplane for control, data acquisition, communications, instrumentation and application-specific modules. The bus is intentionally modular: processing and peripheral functions may be replaced independently where compatibility rules permit.



Shared data, address, arbitration, interrupt and service signals

Termination is applied at the physical ends of the active backplane segment.

Figure 2.1: Representative SSB-2E backplane topology.

A typical system contains one controlling function, one or more peripheral or acquisition modules and required bus-conditioning hardware. Systems that support bus mastering may contain more than one potential master, although arbitration priority and timing limits must be verified.

2.2 Common Signal Classes

Across SSB generations, backplane signals can be grouped into the following functional classes:

- data transfer;
- address and address extension;

- transfer control;
- arbitration;
- interrupts;
- module identification and service;
- clock or timing reference where applicable;
- power, ground and protective reference.

The exact pin use and timing vary by generation. This guide therefore describes compatibility at the system level rather than serving as a connector pinout reference.

2.3 Data Path

The standard SSB data path is 16 bits wide. Byte-oriented transfers are supported through transfer-control signals and module-specific logic. SSB-2E burst operation increases sustained throughput by allowing multiple sequential 16-bit data transfers under a single qualified transaction sequence; it does not convert the base SSB backplane into a general 32-bit data bus.

2.4 Addressing

SSB-1 supports the original system address model intended for modular controllers and instrumentation. SSB-2 expands address selection and standardizes a larger peripheral map. SSB-2E introduces extended-address cycles for systems requiring a broader mapping range while retaining base-cycle compatibility for qualified SSB-2 modules.

In mixed SSB-2 / SSB-2E systems, legacy modules must remain within address ranges supported by the module hardware. An extended-address capable controller cannot make an earlier module respond outside its implemented decode range.

2.5 Arbitration

SSB-1 uses centralized arbitration with fixed service assumptions. SSB-2 revises arbitration timing and provides formal support for selected bus-mastering modules. SSB-2E further improves grant timing and includes additional diagnostic visibility into arbitration state.

A bus-mastering module approved for SSB-2 is not automatically approved for every SSB-2E chassis. Qualification depends on module revision, chassis timing class and the presence of other masters.

2.6 Interrupts

Vectored interrupt service is available throughout the SSB family, but vector range, priority interpretation and electrical loading differ between generations. Mixed-generation installations should preserve documented interrupt assignments whenever possible. Reassigning interrupts to solve an apparent conflict can create software incompatibility even when the electrical configuration is valid.

2.7 Module Identification

SSB-2 introduced improved module-identification conventions. SSB-2E extends these conventions to expose additional revision and capability information to supported configuration software. SSB-1 modules may identify only a class code, a partial identifier or no electronically readable information at all.

For this reason, the following physical information remains part of the service record:

- front-panel or card-edge product label;
- assembly number;
- hardware revision letter;
- option or jumper markings;
- serial number where present.

2.8 Performance Expectations

SSB systems are designed for predictable technical operation rather than maximum benchmark throughput. A correctly configured mixed-generation system may operate at timing compatible with its slowest qualified participant. Reduced transfer rate is acceptable where specified; intermittent operation is not.

Do not increase bus timing solely because all modules appear to function during a short diagnostic test. Qualification requires operation across temperature, interrupt load, DMA activity and worst-case module response timing.

Chapter 3

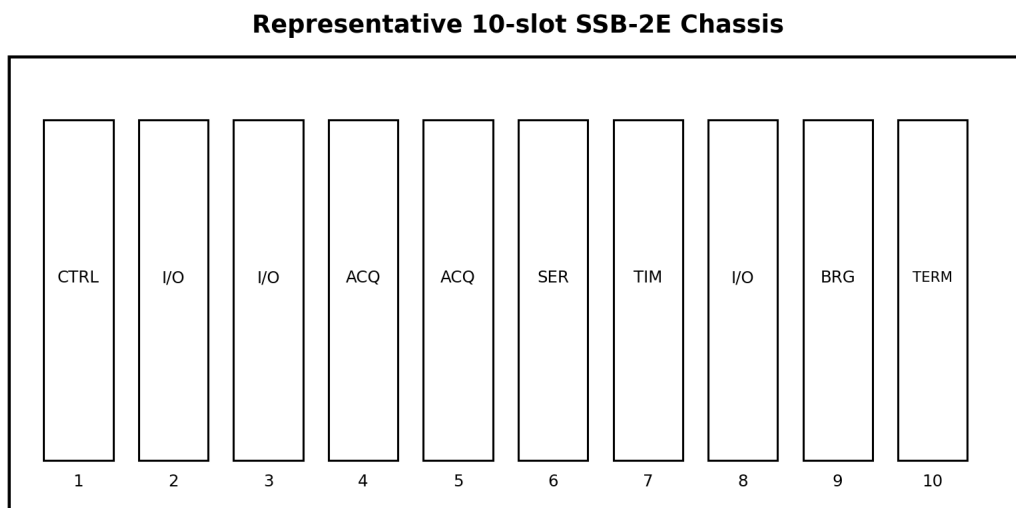
Mechanical and Chassis Requirements

3.1 Module Envelope

Standard SSB modules use a Eurocard-derived mechanical format with a rear backplane connector and front extraction hardware. Chassis may provide different slot counts and cooling arrangements, but compatible systems preserve connector alignment, insertion depth and card-guide geometry.

Modules must never be forced into a slot. Resistance beyond normal connector insertion force may indicate card-guide misalignment, incompatible mechanical keying, bent connector contacts or a non-SSB slot.

3.2 Representative Chassis Layout



Example only. Slot restrictions depend on module revision, chassis wiring, timing and termination.

Figure 3.1: Representative SSB-2E chassis arrangement. Actual slot restrictions vary by system.

Slot 1 is commonly reserved for a system controller or bus-management function in standard chassis, but OEM systems may use a different controller location. The final slot may contain a terminator assembly in short systems or a functional module followed by a chassis-end terminator. Never infer termination from slot number alone.

3.3 Chassis Classes

For compatibility planning, Sinneslöschen documentation groups chassis into three service classes:

Class	Typical Slots	Service Characteristics
Compact	4-6	Short backplane; limited module count; often integrated in terminals or instruments; termination may be built into the chassis end assembly.
Standard	8-12	General industrial and laboratory use; removable termination; supports normal SSB-2E module mix and selected legacy configurations.
Extended	14-20	Large acquisition or test systems; tighter loading and timing limits; may require intermediate timing support depending on module mix.

The class names are descriptive and do not replace the chassis model number. Always identify the exact chassis before applying a compatibility matrix.

3.4 Cooling

Module compatibility includes thermal compatibility. Later SSB-2E systems may contain higher-density logic than earlier SSB chassis and generally provide improved forced-air cooling. Conversely, certain legacy modules dissipate concentrated heat in linear regulators or interface drivers and may exceed local airflow assumptions when installed adjacent to newer high-power modules.

Recommended service practice:

- preserve blanking panels or airflow guides supplied with the chassis;
- do not operate extended chassis with covers removed except for brief diagnostic access;
- verify fan operation before qualifying an intermittent timing problem;
- leave one slot of separation where a product-specific note requires thermal spacing;
- remove accumulated dust from filters according to system maintenance instructions.

3.5 Connector Inspection

Before installing a legacy module into a later chassis, inspect both mating connectors for:

- bent or recessed contacts;
- oxidation or contamination;
- evidence of overheating;
- damaged guide pins;
- previous field rework;
- foreign material in unused positions.

Connector-cleaning agents not approved for electronic backplane use can leave films that change contact resistance. Do not use abrasive cleaning methods on plated contacts.

3.6 Keying and Reserved Positions

Some system products use mechanical keys or reserved slot wiring to prevent incompatible installation. The absence of a key does not imply universal compatibility. OEM chassis may include customer-specific wiring on otherwise unused connector positions. Before moving standard modules into an OEM chassis, consult the system configuration record.

3.7 Module Retention

Fasteners and extractors are part of the mechanical qualification. A module left partially seated can pass a stationary bench test and fail under vibration or thermal cycling. Tighten front-panel retaining hardware to normal service torque; do not use excessive force to compensate for a connector that does not seat correctly.

3.8 Backplane Modifications

Field modifications to backplane wiring, terminator networks or auxiliary connectors should be treated as configuration-controlled changes. If modification is discovered and no documentation exists, photograph or diagram the wiring before disturbing it and contact Technical Support.

CAUTION

Do not assume that an undocumented jumper is unnecessary. OEM and field-service modifications may implement address selection, timing accommodation or termination changes not visible to configuration software.

Chapter 4

Electrical Environment and Signal Groups

4.1 Power Distribution

SSB chassis distribute regulated logic power and, in selected systems, auxiliary voltages required by interface or instrumentation modules. The presence of a connector contact does not guarantee that every chassis supplies every optional voltage.

Before installing an unfamiliar module, verify:

- required logic supply;
- auxiliary supply requirements;
- maximum module current;
- chassis power-supply capacity;
- startup inrush limits where specified.

A system with adequate steady-state power can still exhibit startup failures if multiple high-inrush modules are added without checking the chassis power budget.

4.2 Ground and Reference Practices

SSB separates logic return, chassis protective ground and selected analog reference functions at the module level. Laboratory and data-acquisition systems may include additional grounding requirements to prevent measurement error or ground-loop current.

Do not defeat chassis grounding to correct a communication fault. Apparent improvement after removing protective ground usually indicates a separate installation problem that must be corrected properly.

4.3 Logic Levels

The SSB family uses 5 V logic signaling on the core backplane. Later modules may contain lower-voltage internal logic but present SSB-compatible interface levels at the backplane. This distinction matters when probing signals: internal device thresholds are not the same as bus-level service thresholds.

4.4 Signal Loading

Every installed module contributes capacitive and DC loading to shared bus signals. Extended chassis and mixed-generation systems must remain within qualified loading limits. The practical service consequences are:

- a module can fail only when another module is installed even though their address ranges do not overlap;

- moving a module can change edge quality enough to expose marginal termination;
- an empty slot between two modules does not electrically remove either module from the bus;
- powered-off external equipment attached through certain interface modules may alter signal loading.

4.5 Address Signals

Base address signals are driven during each normal transfer. SSB-2E extended-address operation adds a qualified extension phase recognized only by capable modules. Legacy SSB-2 modules ignore the extension and respond only to their implemented base range.

Address conflicts may therefore occur when a legacy module decodes fewer high-order bits than a later system assumes. When installing older hardware, compare actual decode behavior rather than relying only on the configured logical address.

4.6 Data Signals

The 16-bit data path supports word and byte transfers. Modules that implement only 8-bit peripheral functions must correctly respond to byte selection. Improper byte-lane assumptions can produce symptoms that resemble intermittent data corruption, especially when a host changes from a native SSB controller to a PCI bridge.

4.7 Control Signals

Transfer-control signals define address validity, data direction, transfer strobe and completion. SSB is asynchronous at the transaction level: a target must acknowledge within the permitted timing window. The controller may insert wait time for slower modules, but each system generation defines maximum qualified response intervals.

4.8 Arbitration Signals

Bus-request and grant functions control temporary mastership by capable modules. In a system with only one master, arbitration faults may remain hidden until a DMA-capable acquisition or interface module is installed. Service testing should therefore include representative bus-master activity where applicable.

4.9 Interrupt Signals

Interrupt lines are shared resources with vectored identification. Electrical compatibility does not guarantee software compatibility; the host must recognize the assigned vector and service model. Document interrupt assignment before replacing a controller or bridge.

4.10 Service and Identification Signals

SSB-2 and SSB-2E reserve service functions used by configuration and diagnostic utilities. SSB-2E expands the information available to software, but a legacy module may return partial data or a generic class identifier.

SERVICE NOTE

A module reported as UNKNOWN by the Configuration Utility is not automatically defective. First verify whether the module revision predates electronic identification support.

4.11 Noise and Installation Environment

Industrial installations can subject SSB systems to conducted and radiated noise not present on a service bench. When diagnosing field-only errors, consider:

- motor contactors and variable-frequency drives;
- long serial or analog cables entering the same cabinet;
- poor cabinet bonding;
- damaged cable shields;
- unapproved power-supply replacements;
- missing chassis covers or filters;
- high ambient temperature.

Do not change SSB timing as a first response to an environmental noise problem. Correct the installation fault and then return the system to its documented timing configuration.

Chapter 5

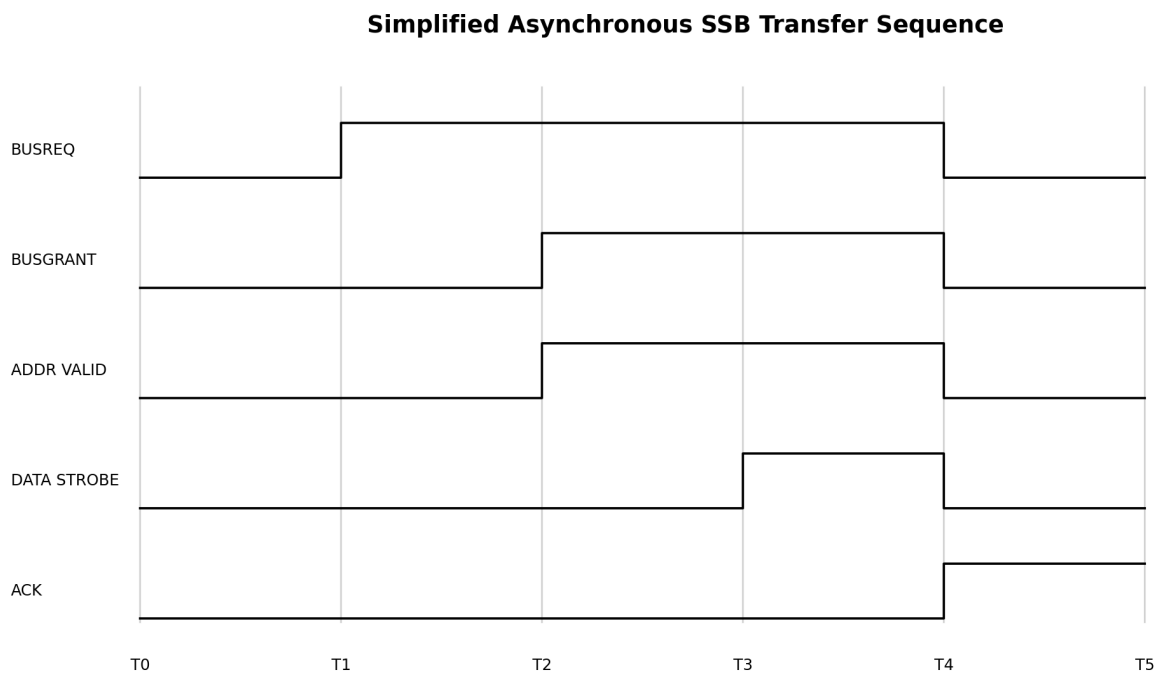
Bus Operation and Timing

5.1 Asynchronous Transfer Model

SSB transfers are qualified by handshake rather than a single fixed system clock. This permits modules with different internal speeds to share a system, but it also makes response-time limits and signal quality important.

A simplified transfer consists of:

1. bus ownership established;
2. address and transfer type presented;
3. target decode interval;
4. data transfer strobe;
5. target acknowledgment;
6. release of transfer-control signals.



Timing shown is conceptual. Use module and chassis timing limits for service qualification.

Figure 5.1: Conceptual asynchronous transfer sequence.

5.2 Response Classes

For compatibility service work, modules are grouped into nominal response classes rather than by a single published access time:

Class	Typical Use	Compatibility Consideration
F	Fast logic / memory	Normally operates at full SSB-2E timing when module revision is qualified.
N	Normal peripheral	Standard industrial I/O, serial, control and instrumentation functions.
L	Legacy / slow	Earlier SSB-1 or specialized modules requiring extended acknowledgment window or timing accommodation.
D	Dynamic master	DMA or bus-mastering modules whose behavior depends on arbitration and burst limits.

The class is a service concept and may not be printed on the module. Use the compatibility matrix or product documentation to determine actual timing requirements.

5.3 SSB-1 Timing

SSB-1 assumes longer decode and acknowledgment intervals and less formalized multi-master operation. Later controllers can usually accommodate selected SSB-1 targets only when a timing module or adapter forces an approved legacy window.

Operating an SSB-1 target at a faster acknowledgment timeout can produce three characteristic failures:

- intermittent target-not-present errors;
- correct low-rate operation but failure during repeated block access;
- apparent success at room temperature followed by failure at temperature extremes.

5.4 SSB-2 Timing

SSB-2 reduces unnecessary bus dead time and formalizes timing for bus-mastering modules. Most SSB-2 target modules are compatible with SSB-2E base cycles when the module revision is listed as supported.

5.5 SSB-2E Timing

SSB-2E adds qualified burst behavior and tighter diagnostic visibility. A burst-capable master may transfer a sequence of words without repeating the entire ownership sequence for each word, subject to limits on burst length, target capability and fairness to other bus requesters.

A legacy target that is not burst-capable must be accessed using ordinary base cycles. Configuration software and device drivers are responsible for selecting the appropriate mode when the module is correctly identified.

5.6 Timeouts

Bus timeout settings should remain at documented values. Increasing a timeout can make an unsupported module appear to work while masking a deeper compatibility problem. Decreasing a timeout can produce false faults on valid legacy hardware.

When a timeout fault occurs:

1. record the failing address and module;
2. verify the module revision;
3. verify timing-module presence and position;
4. run a single-module transfer test if service conditions permit;
5. inspect termination and signal quality before changing timing parameters.

5.7 Burst Transfer Limits

Burst capability is negotiated by software and hardware support. The following restrictions apply generally:

- do not enable burst mode for an unidentified module;
- do not assume all modules of the same functional type support bursts;
- bridge DMA settings must agree with the target module's transfer capability;
- mixed-generation chassis may be intentionally limited to base cycles for qualification.

5.8 Arbitration Fairness

High-rate acquisition or display-transfer modules can occupy a significant portion of bus bandwidth. SSB-2E arbitration prevents a qualified master from indefinitely blocking other requesters, but system software must still select appropriate burst and DMA parameters.

A system that passes module diagnostics but loses serial characters or misses low-rate I/O events under heavy acquisition load may have an arbitration or driver-configuration problem rather than defective hardware.

5.9 Timing Qualification After Change

After adding or replacing a timing-sensitive module, exercise the system under representative load. A minimum service qualification should include:

- cold start and warm restart;
- simultaneous activity on high-rate modules;
- interrupt load;
- DMA or burst activity where used;
- at least 30 minutes of continuous transfer testing;



- review of diagnostic error counters.

Chapter 6

Generation Compatibility

6.1 Compatibility Review Workflow

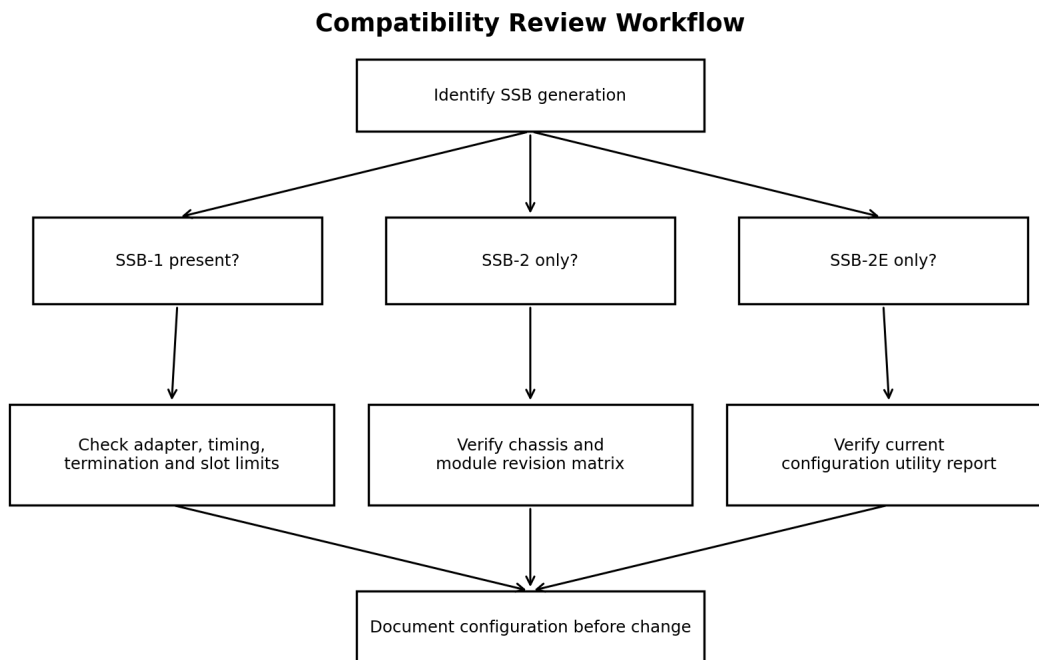


Figure 6.1: Recommended compatibility review workflow.

The correct question is not simply “Is this an SSB module?” The required sequence is to identify the generation, revision, chassis and system role, then verify conditions imposed by the complete configuration.

6.2 SSB-2E with SSB-2

SSB-2E was designed to preserve a practical migration path for established SSB-2 hardware. Many non-mastering SSB-2 modules operate in SSB-2E standard chassis without adapters, provided that:

- the module revision is listed as supported;
- the module is assigned a base address within its implemented range;
- interrupt configuration is supported by the host;
- slot loading and termination remain within limits;
- burst operation is disabled for targets that do not support it.

Bus-mastering SSB-2 modules require additional review because arbitration and ownership timing are revision-sensitive.

6.3 SSB-1 in SSB-2 / SSB-2E Systems

SSB-1 hardware requires one of three outcomes:

1. **Supported directly under a documented exception.** A small number of late SSB-1 revisions incorporate interface changes that permit direct installation in specified later chassis.
2. **Supported conditionally.** An approved compatibility adapter, timing module, slot restriction or special termination arrangement is required.
3. **Not supported.** The module must remain in an SSB-1 chassis or be replaced by a later functional equivalent.

Physical fit alone is not evidence for case 1.

6.4 SSB-2E Modules in Earlier Chassis

Current SSB-2E modules are generally not qualified for SSB-1 chassis. Installation in SSB-2 chassis depends on whether the module requires extended addressing, burst capability, enhanced identification power conditions or revised timing not present in the earlier chassis.

Modules designed specifically as backward-compatible service replacements are identified in product documentation. Do not infer backward compatibility from a common connector.

6.5 Mixed Mastering

Systems containing more than one bus master require explicit compatibility review. Common concerns include:

- grant timing;
- maximum uninterrupted ownership interval;
- interrupt interaction;
- DMA boundary handling;
- bridge ownership behavior;
- recovery after master timeout.

If an older master has no current compatibility listing, operate the system with that module as a target-only device only if the product documentation explicitly supports such a mode.

6.6 Address Compatibility

A valid mixed-generation address plan must account for actual decode width. Some legacy modules respond to mirrored address regions because they decode fewer address bits than later controllers expose. A software tool may show two logically different ranges that reach the same physical module.

Recommended practice is to place legacy modules in conservative base ranges and reserve extended ranges for SSB-2E devices specifically designed to use them.

6.7 Interrupt Compatibility

Preserve established interrupt vectors when moving an installed system to a newer host. If reassignment is necessary, confirm both hardware jumper or configuration settings and the driver or application expectation.

An interrupt that appears stuck may be caused by:

- vector conflict;
- incompatible interrupt polarity or acknowledge behavior;
- missing bridge mapping;
- software expecting the former controller's vector translation;
- a service adapter left in diagnostic mode.

6.8 Compatibility Ratings

Throughout Appendix A, the following ratings are used:

SUPPORTED Qualified for normal operation when standard installation rules are followed.

CONDITIONAL Qualified only with the listed adapter, timing, slot, bridge or software condition.

SERVICE ONLY Existing installations may be maintained; new installation is not recommended.

NOT SUPPORTED Do not operate the combination.

VERIFY REVISION Compatibility depends on exact assembly revision or OEM configuration.

6.9 Configuration-Control Rule

When a working legacy system is changed, record both *before* and *after* configurations. A troubleshooting record that only states the final failed arrangement discards the most valuable information: the last known-good configuration.

Termination and Signal Integrity

7.1 Why Termination Matters

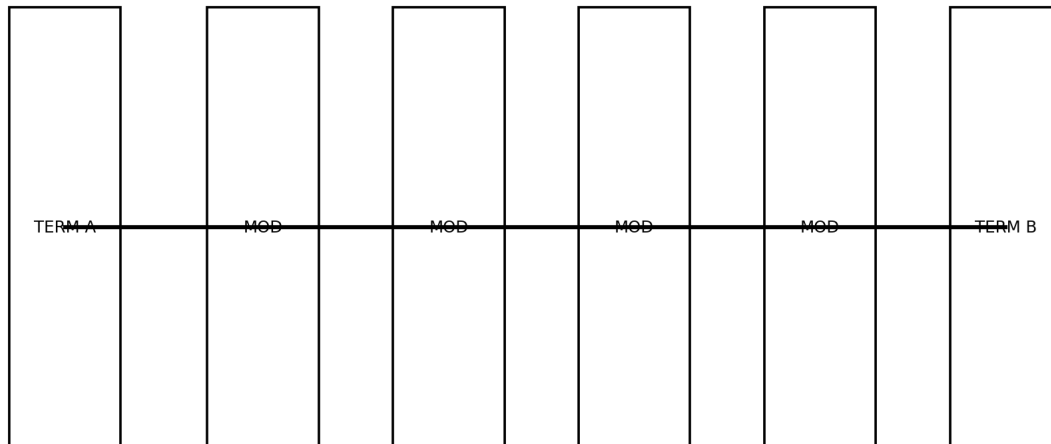
SSB backplanes carry shared digital signals over a physical structure long enough for edge reflections and loading to matter. Proper termination controls those reflections and preserves valid logic thresholds across the active bus segment.

A termination fault can resemble almost any other intermittent digital failure. Typical symptoms include:

- startup success on some power cycles but not others;
- failures that depend on which modules are active;
- transfer errors at one end of an extended chassis;
- diagnostic passes with chassis covers removed and failures after reassembly;
- increased errors after moving a module without changing software;
- temperature-sensitive communication faults.

7.2 End Termination

Correct: active bus segment terminated at both physical ends



Unused connector positions inside the active segment do not define a termination point.

Figure 7.1: Simplified end-termination concept.

The active electrical bus segment must be terminated at its physical ends. An unused internal slot is not an end. A chassis extension cable, adapter or bridge-side backplane connection may move the true electrical endpoint beyond the visible card cage.

7.3 Terminator Types

SSB service documentation recognizes three broad terminator functions:

- **Chassis-end terminator assemblies**, installed at the physical end of a standard backplane;
- **Integrated termination**, built into selected compact chassis;
- **Legacy compensation networks**, used with certain SSB-1 mixed-generation arrangements.

Do not substitute a terminator solely because it has the same connector. Network values and signal coverage differ by generation and application.

7.4 Single-Chassis Systems

In a normal single standard chassis, verify both ends of the active backplane. Depending on chassis design, the controller-end termination may be integrated, removable or implemented through a system controller assembly. The opposite end generally uses a dedicated terminator or integrated end assembly.

7.5 Extended Systems

Extended chassis introduce additional loading and propagation delay. Where the system uses a chassis extension, the interconnect must be treated as part of the active bus. Intermediate termination is normally incorrect unless explicitly specified for a segmented architecture.

7.6 Mixed SSB-1 Systems

Selected SSB-1 modules present different loading from later SSB hardware. Approved compatibility adapters may include buffering or compensation networks; in other configurations a legacy terminator assembly is required.

CAUTION

Do not install both an adapter-integrated compensation network and a separate legacy compensation terminator unless the applicable matrix explicitly requires both. Over-termination can reduce signal amplitude and cause failures that resemble inadequate termination.

7.7 Verification Procedure

When termination is uncertain:

1. power down the system;
2. record all installed modules and slot positions;
3. identify the physical ends of the active backplane segment;
4. identify each terminator or integrated termination point;
5. compare part and revision markings with AN-SSB-17;
6. inspect for undocumented jumpers or added resistor networks;
7. restore the documented configuration before powering the system.

7.8 Oscilloscope Evaluation

Qualified service organizations may use an oscilloscope to evaluate edge quality when ordinary diagnostics do not isolate an intermittent fault. Observe only designated service test points or use approved

high-impedance probing methods. Excessive probe capacitance can alter the waveform being diagnosed.

Useful observations include:

- overshoot and undershoot;
- double transitions caused by reflection;
- slow edge rate under excessive loading;
- different edge quality at opposite ends of the chassis;
- ringing that increases when a particular module is installed.

This guide does not specify waveform limits for every chassis revision; use the product service documentation when formal electrical qualification is required.

7.9 Termination After Service

After replacing or relocating a module, do not close the service case until termination has been re-verified and the system passes sustained transfer testing. A configuration that appears functional during a short boot sequence may fail only under maximum bus activity.

Chapter 8

Timing Modules, Adapters and Slot Restrictions

8.1 Timing Modules

Timing modules provide controlled accommodation for configurations whose slowest participant falls outside normal later-generation timing. Depending on the application, a timing module may extend acknowledgment windows, modify grant timing or qualify selected transfer-control relationships.

Timing modules are not performance upgrades and should not be installed “just in case.” Unnecessary timing hardware can reduce throughput or conflict with a later controller that already provides the required accommodation.

8.2 Placement

Placement rules depend on chassis wiring and timing-module function. Common patterns include:

- adjacent to the system controller;
- adjacent to a defined group of legacy modules;
- in a dedicated chassis timing position;
- at a bridge-side service slot.

Never move a timing module to free a convenient slot without verifying the system configuration record.

8.3 SSB-1 Compatibility Adapters

A compatibility adapter may provide one or more of the following:

- signal buffering;
- timing qualification;
- address translation or masking;
- interrupt adaptation;
- legacy termination compensation;
- mechanical keying or connection transition.

An adapter is qualified for a specific module family or revision range. It is not a universal SSB-1-to-SSB-2E converter.

8.4 Slot Restrictions

Slot restrictions typically arise from electrical loading, physical routing, interrupt priority or timing distance from the controller. A module specified for “slots 2-5” should not be relocated to slot 9 merely because configuration software can still identify it.

8.5 Empty Slots

Empty slots may be left within an SSB backplane unless the chassis documentation requires blanking panels for airflow. Electrically, the backplane remains continuous through unused positions. Therefore, moving the last installed module inward does not move the physical bus endpoint.

8.6 Adjacent-Module Restrictions

Certain analog or high-current modules may carry adjacency restrictions for thermal or noise reasons. A digital compatibility matrix does not override those product-specific installation rules.

8.7 Controller Replacement

Replacing an original SSB controller with a later controller or PCI bridge can alter timing even if every peripheral module remains in its original slot. Treat controller replacement as a system configuration change and re-run compatibility review, termination verification and load testing.

8.8 Legacy Module Replacement

When a legacy module is replaced by a current functional equivalent:

1. preserve original address and interrupt assignments where supported;
2. remove any compatibility adapter no longer required;
3. verify whether the timing module remains necessary for other legacy modules;
4. update configuration records and software identification files;
5. retain the removed module label information in the service record.

8.9 Unsupported Workarounds

The following are not approved methods of obtaining compatibility:

- cutting or insulating backplane contacts;
- adding unapproved resistor networks;
- increasing host timeouts beyond published limits;
- disabling diagnostics to suppress a module warning;
- forcing a configuration utility database entry for an unidentified revision;



- operating with a terminator removed because the system “boots without it.”

Chapter 9

PCI Integration with the SL-9816

9.1 Purpose of the Bridge

The SL-9816 PCI / SSB Peripheral Bridge allows supported SSB peripheral equipment to remain in service when the original host processor or workstation is replaced by a PCI-based system. The bridge is particularly useful in laboratory, industrial and OEM installations where the SSB peripheral investment and application wiring remain serviceable.

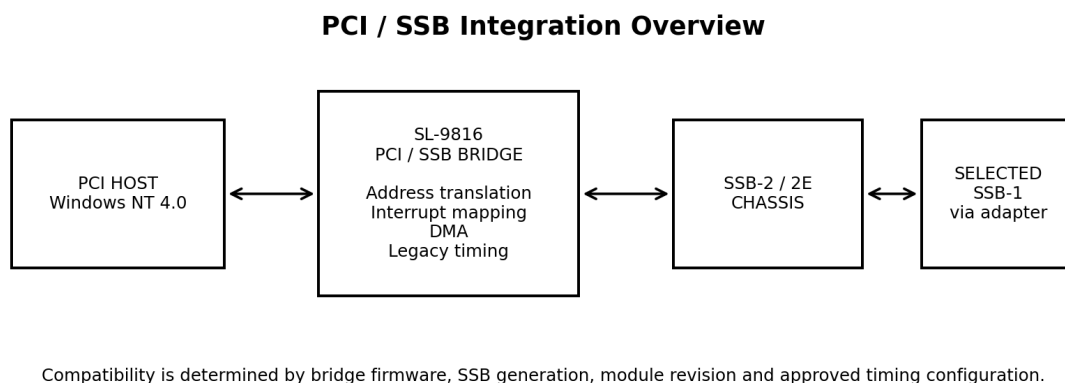


Figure 9.1: SL-9816 integration overview.

9.2 Supported Generations

The bridge directly supports approved SSB-2 and SSB-2E configurations. Selected SSB-1 modules may operate through the same SSB chassis only when the applicable legacy adapter, timing and termination conditions are satisfied.

The SL-9816 does not remove SSB compatibility restrictions. It translates host-bus transactions; it does not convert an unsupported SSB module into a supported one.

9.3 Address Translation

PCI address space is mapped into configured SSB ranges by the bridge. Each active window must be sized and aligned so that it does not expose unintended mirrored regions on legacy modules.

Recommended practice is to create separate windows for:

- base SSB control and status space;

- peripheral memory regions;
- high-volume acquisition buffers;
- service or diagnostic ranges where required.

9.4 Interrupt Mapping

The bridge maps SSB interrupt events to host interrupts recognized by the Windows NT driver or other qualified host software. Preserve the logical meaning of existing SSB vectors even if the PCI host uses a different physical interrupt mechanism.

If an application was originally written for a native SSB controller, verify that its driver layer uses supported bridge services rather than directly assuming the former controller register layout.

9.5 DMA

The SL-9816 supports DMA for approved module and driver combinations. DMA should be enabled only where the SSB target or master is qualified for the selected transfer mode.

A common migration error is to enable PCI-side DMA because the host supports it while overlooking the fact that a legacy SSB peripheral was originally serviced by programmed I/O. The resulting failure may occur only under sustained transfer.

9.6 Legacy Timing Accommodation

Bridge firmware includes timing profiles for supported SSB classes. Additional chassis timing hardware may still be required for SSB-1 devices because the bridge controls only the host-side initiation and timeout behavior; it cannot correct every backplane electrical characteristic.

9.7 Driver and Firmware Coordination

Use the driver, configuration utility and bridge firmware revisions supplied together in the current SL-9816 support package unless a Technical Bulletin instructs otherwise. Mixing a newer utility with an older bridge firmware can produce misleading capability reports.

9.8 Migration Procedure

A recommended host migration sequence is:

1. generate and print a Configuration Utility report from the original system if possible;
2. record slot, revision, address and interrupt information manually;
3. verify current termination and timing hardware;
4. install the SL-9816 and qualified driver on the replacement host;
5. configure SSB address windows without changing peripheral assignments;

6. verify module identification before enabling DMA or burst behavior;
7. perform low-rate functional tests;
8. perform sustained transfer and interrupt-load tests;
9. compare diagnostic counters with the original system baseline.

9.9 Common Bridge Symptoms

Symptom	Likely Areas to Check
No SSB modules identified	Driver loaded, bridge resources, SSB cable/backplane connection, controller enable, bridge firmware.
Only first modules identified	Address window size, backplane termination, chassis extension, module-loading issue.
Interrupts absent	Bridge vector mapping, driver configuration, module interrupt enable, vector conflict.
DMA errors under load	Target capability, burst setting, bridge firmware, arbitration, termination.
Legacy module times out	Timing profile, required timing module, adapter revision, slot restriction.
System works after warm restart only	Power sequencing, module reset timing, auxiliary supply, outdated bridge firmware.

Chapter 10

Configuration Software and Reports

10.1 SSB Configuration Utility 2.6

SSB Configuration Utility 2.6 is the standard customer-accessible tool for identifying supported SSB-2 and SSB-2E configurations. It may also report partial information for selected SSB-1 hardware.

The utility is intended to document and verify configuration. It is not a substitute for the compatibility rules in this manual.

10.2 Report Contents

A normal report may include:

- host or controller type;
- SSB generation detected;
- chassis identifier where electronically available;
- slot position;
- module type and revision;
- configured base address;
- interrupt assignment;
- timing class or timing warning;
- termination status where supported by hardware;
- bridge firmware and driver revision;
- compatibility warning text.

10.3 Identification States

The utility uses several service-oriented identification states:

IDENTIFIED Module type and supported revision information read successfully.

PARTIAL ID Module class recognized but complete revision data unavailable.

LEGACY Module identified as an older supported class requiring manual compatibility review.

UNKNOWN No database match or insufficient electronic identification data.

CONFLICT Address, interrupt or configuration overlap detected.

An UNKNOWN result is not an instruction to remove the module. Record its physical label and consult the matrix.

10.4 Configuration Reports

Always save or print a report before modifying an established system. A service record should identify the utility version because later releases can describe the same hardware differently as the identification database improves.

10.5 SSB Diagnostic Toolkit 2.4

The controlled-distribution Diagnostic Toolkit provides lower-level functions for authorized service organizations. It can exercise bus transfers, interrupt service, arbitration and module-level diagnostics beyond the standard Configuration Utility.

Some tests intentionally suspend normal device operation. Do not run them on production equipment unless the service procedure permits interruption.

10.6 Recommended Report Naming

For local customer records, Sinneslöschen recommends filenames containing system identifier and date, for example:

LINE3-CTRL-980211.CFG

or

LABSYS2-SSB-980211.TXT

The filename convention is not enforced by the utility; it is intended only to simplify maintenance history.

10.7 Manual Verification Items

The utility cannot reliably determine:

- undocumented backplane modifications;
- terminator resistor values on older assemblies;
- airflow and thermal spacing;
- external cabling quality;
- OEM-specific jumper meanings;
- whether a legacy module label matches an internal field modification.

Therefore, automatic configuration output should be attached to, not substituted for, a physical service inspection.

Chapter 11

Installation and Change-Control Procedure

11.1 Pre-Service Record

Before opening the chassis, record:

- system model and serial number;
- customer configuration identifier if applicable;
- current symptom or reason for change;
- installed software revision;
- SSB Configuration Utility version;
- current configuration report filename;
- date and technician.

Photographs may be useful for complex systems, especially where cable routing, jumpers or legacy adapters are involved.

11.2 Power-Down Procedure

Follow the system service manual. At minimum:

1. stop the application and place controlled equipment in a safe state;
2. shut down the host operating system where applicable;
3. switch off system power;
4. disconnect mains power where the service procedure requires it;
5. wait for power-supply indicators to extinguish;
6. apply electrostatic-discharge protection before touching modules.

11.3 Module Removal

Label external cables before disconnecting them. Release retaining hardware evenly and use the module extractors rather than pulling on connectors, heat sinks or front-panel cables.

Place removed modules in static-protective packaging. Do not stack unprotected boards on the chassis or service bench.

11.4 Module Installation

Verify the replacement assembly number and revision before insertion. Align both card guides, confirm that no cable is trapped, and seat the connector using even pressure through the approved extraction/insertion hardware.

Reinstall retaining fasteners and any airflow hardware before final qualification.

11.5 Configuration Changes

When changing address or interrupt settings, record original positions before moving jumpers or switches. Avoid changing more than one independent variable at a time during troubleshooting.

11.6 Post-Service Verification

After power is restored:

1. observe normal power and chassis indicators;
2. verify controller startup;
3. run the Configuration Utility;
4. compare module count and identification with the pre-service report;
5. run applicable module diagnostics;
6. test application function;
7. perform sustained-load testing where timing or bus hardware was changed;
8. save the final configuration report.

11.7 Configuration Record

A useful configuration record contains enough information for another technician to reconstruct the system without relying on memory. Appendix B provides a printable worksheet.

11.8 Returning a System to Known-Good State

If a modification creates unexplained failures, return the system to the last documented working configuration before attempting additional changes. This establishes whether the new failure is caused by the modification or by an unrelated condition discovered during service.

Chapter 12

Diagnostic Procedures

12.1 Diagnostic Strategy

Effective SSB diagnosis proceeds from system-wide conditions to module-specific tests. Replacing modules at random can temporarily move an electrical loading problem and create misleading conclusions.

Recommended order:

1. power and cooling;
2. physical seating and connectors;
3. termination;
4. configuration and address conflicts;
5. timing and adapters;
6. controller / bridge function;
7. module-specific diagnostics;
8. application software.

12.2 Power-On Failures

If the system does not complete startup after an SSB change:

1. power down immediately if there is odor, smoke, abnormal heat or repeated power cycling;
2. inspect the new module orientation and seating;
3. verify power budget and required auxiliary supplies;
4. remove the changed module and restore the previous configuration;
5. determine whether normal startup returns;
6. if startup returns, review compatibility before reinstalling the module.

12.3 Module Not Identified

For a module missing from Configuration Utility output:

1. verify that the slot is part of the active backplane;
2. inspect seating and connector condition;
3. identify whether the module supports electronic identification;

4. check address or identification jumpers;
5. inspect for another module using the same base address;
6. test in the documented slot if the module was relocated;
7. run authorized bus-scan diagnostics where available.

12.4 Intermittent Transfer Errors

Intermittent errors require disciplined observation. Record whether the failure correlates with:

- system temperature;
- module activity level;
- DMA operation;
- a particular external device;
- cover or cabinet position;
- time after startup;
- vibration or mechanical disturbance.

Then verify termination and signal loading before replacing the target module.

12.5 Interrupt Failures

Interrupt faults may appear as a device that responds to polled access but never signals completion. Check:

- module interrupt enable;
- vector assignment;
- vector conflicts;
- bridge mapping;
- host driver configuration;
- service adapter or diagnostic mode;
- interrupt acknowledge timing for legacy hardware.

12.6 DMA and Burst Failures

If low-rate programmed transfers pass but DMA fails:

1. disable burst mode and retest;
2. verify target DMA qualification;
3. verify arbitration and bridge firmware;

4. reduce test block size;
5. monitor diagnostic error counters;
6. inspect termination if failures remain load-dependent.

12.7 Address Conflicts

A conflict may be obvious, with two devices responding simultaneously, or subtle, with a legacy module decoding a mirrored range used by another device.

To isolate:

1. record configured ranges;
2. consult actual decode width for legacy modules;
3. temporarily disable one conflicting candidate if the service procedure permits;
4. repeat bus scans at both base and mirrored addresses;
5. select a conservative non-overlapping address plan.

12.8 Thermal Failures

A module that fails only after warm-up may have an internal defect, inadequate chassis airflow or timing margin exposed by temperature. Confirm fan operation and module spacing before changing bus timing.

12.9 Field Wiring Effects

Disconnecting external wiring can help isolate whether a module or attached field device contributes to the fault. Observe safety requirements before disconnecting control or instrumentation circuits.

12.10 Diagnostic Logging

For complex cases, keep a chronological log of each change and result. Record negative results as carefully as successful ones. A note that “termination verified, no change” prevents the same test from being repeated by the next service engineer.

Chapter 13

Troubleshooting Reference

13.1 Symptom Table

Symptom	Probable Cause Areas	Recommended First Actions
System does not power after module change	Mis-seated module, short, power budget, incompatible auxiliary requirement	Power down; remove changed module; inspect connector and supply requirements.
Controller starts but no SSB modules appear	Controller enable, bridge driver, backplane connection, termination, failed controller interface	Restore prior config; inspect controller/bridge status; verify bus connection.
One module missing	Seating, address conflict, unsupported ID, slot restriction, defective module	Verify physical label/revision; compare prior slot; check address; run scan.
Several modules at far end missing	Termination, chassis extension, connector damage, excessive loading	Inspect physical bus endpoint and terminators; compare with AN-SSB-17.
Intermittent timeout	Legacy timing, marginal termination, thermal issue, heavy bus load	Verify timing module; run sustained test; inspect termination and cooling.
Errors only during DMA	Arbitration, burst capability, bridge firmware, target limitation	Disable burst; verify DMA qualification and firmware.
Errors only after adding unrelated module	Electrical loading, address mirror, interrupt conflict	Check termination/loading; verify decode and vectors.
Serial device loses data under acquisition load	Arbitration fairness, driver latency, interrupt priority	Review DMA burst settings and interrupt mapping.
Configuration Utility says UNKNOWN	Legacy module, unsupported revision, database mismatch	Read physical label; do not remove solely on software message.
Configuration Utility says CONFLICT	Duplicate address/vector or incompatible setting	Compare configuration entries and hardware switches/jumpers.
Works with cover removed	Thermal or grounding/EMI effect	Check fans, filters, airflow, cover bonding; do not qualify open-chassis operation.
Works after warm restart only	Reset timing, firmware, power sequencing, legacy startup requirement	Check controller/bridge firmware and reset accommodation.
Repeated interrupt	Stuck device, vector conflict, acknowledge mismatch	Disable affected function if safe; verify vector and module revision.

Symptom	Probable Cause Areas	Recommended First Actions
Data appears byte-swapped	Host/bridge byte-lane configuration, software assumption	Verify bridge mode and driver; compare original host behavior.
Module works in one slot only	Slot restriction, backplane damage, signal integrity	Compare matrix; inspect backplane; do not assume module fault.
System hangs during scan	Bus master active, unsupported diagnostic operation, severe conflict	Restore documented config; use authorized toolkit with production devices inactive.

13.2 Diagnostic Message Reference

Common Configuration Utility messages are summarized below. Exact wording may vary by host platform.

Message	Interpretation / Action
MODULE NOT IDENTIFIED	No complete database match. Verify physical label and revision; consult legacy matrix.
UNSUPPORTED MODULE COMBINATION	At least one detected combination falls outside the current qualification table. Do not continue without review.
TERMINATION CONFIGURATION NOT VERIFIED	Hardware cannot electronically confirm required termination. Perform physical inspection.
LEGACY TIMING MODULE REQUIRED	Detected module class requires approved timing accommodation in the current chassis.
ADDRESS CONFLICT DETECTED	Two configured or detected devices overlap in address space.
INTERRUPT CONFLICT DETECTED	Two modules or mappings use an incompatible interrupt assignment.
BRIDGE FIRMWARE REVISION BELOW RECOMMENDED	Update only using the qualified support package for the installed SL-9816 revision.
BURST DISABLED FOR LEGACY TARGET	Normal protective behavior; target will operate with base cycles.
CONFIGURATION REPORT COMPLETE	Scan completed; review warnings before modifying system.
BUS DIAGNOSTIC INTERRUPTS SYSTEM OPERATION	Selected Diagnostic Toolkit function will suspend normal operation.

13.3 Escalation Package

When a case is referred to Sinneslöschen Technical Support, include where possible:

- support case number;

- system model and serial number;
- Configuration Utility report;
- module list with revisions;
- sketch or photograph of slot positions;
- termination and timing hardware identification;
- SL-9816 driver / firmware revision if present;
- exact error messages;
- description of last known-good configuration;
- changes made immediately before the fault;
- diagnostic tests already performed.

A complete escalation package reduces repeated field work and helps engineering distinguish configuration faults from component failures.

Chapter 14

Migration and Long-Term Support

14.1 Service-Life Planning

Many SSB systems were purchased for equipment expected to remain in service substantially longer than ordinary workstation products. Sinneslöschen therefore recommends planning migration at the system level rather than waiting for a single obsolete component to force an emergency redesign.

14.2 Preserve Configuration Information

Maintain local copies of:

- system manuals;
- SSB compatibility documentation;
- configuration reports;
- application software and installers;
- driver revisions;
- bridge firmware files;
- OEM configuration records;
- service history.

Online availability of older files is not guaranteed indefinitely.

14.3 Host Modernization

The preferred migration for many systems is to replace the host while retaining qualified SSB peripherals. The SL-9816 provides this path where the peripheral equipment remains supportable.

Host modernization is most successful when the existing system has documented addresses, interrupt assignments and software interfaces. Undocumented direct access to original controller registers can require application modification even when the hardware migration is straightforward.

14.4 Module Replacement

Where a current replacement exists, qualify one functional area at a time. Avoid simultaneous host, chassis and peripheral replacement unless the entire system is being revalidated as a new configuration.

14.5 When to Retain Legacy Hardware

Retaining an older module may be reasonable when:

- it performs a specialized function with no direct replacement;
- the system is stable and well documented;
- spare assemblies remain available;
- qualification cost exceeds the near-term benefit of replacement;
- the module can be isolated behind a supported bridge or adapter.

14.6 When to Replace

Replacement should be considered when:

- the module is repeatedly failing and no repair source remains;
- configuration requires unsupported workarounds;
- the host software can no longer be maintained;
- the power or cooling requirement is no longer compatible with the chassis;
- the system must support new functions outside the legacy architecture.

14.7 Documentation at Final Migration

When an SSB system is finally removed from service, preserve its last configuration record with the replacement-system documentation. This provides a traceable relationship between historical I/O wiring, device identities and new system assignments.

Chapter 15

System Qualification and Acceptance Testing

15.1 Purpose of Qualification

A configuration that starts successfully is not necessarily qualified. SSB service qualification verifies that the system continues to operate under the electrical, timing, interrupt and data-transfer conditions expected in normal use. Qualification is especially important after changes to chassis generation, controller type, bridge hardware, timing modules, termination or bus-mastering devices.

The objective is not to reproduce factory environmental testing in the field. The objective is to demonstrate that the changed configuration operates with adequate margin and that no new compatibility warning has been introduced.

15.2 Minimum Qualification Sequence

Unless a product-specific procedure requires additional testing, perform the following after a compatibility-sensitive change:

1. visual inspection and configuration verification;
2. cold start from fully powered-down condition;
3. configuration scan and warning review;
4. basic access test to each installed module;
5. interrupt verification for interrupt-driven modules;
6. sustained programmed-transfer test;
7. DMA or bus-master test where applicable;
8. simultaneous activity on representative high-load modules;
9. warm restart and software reinitialization;
10. final configuration report and error-counter review.

15.3 Cold-Start Test

Leave the system unpowered long enough for logic and power-supply rails to decay fully before the cold-start test. Observe startup indicators, fan operation, controller diagnostics and the time required for the host to enumerate the SSB configuration.

A system that operates only after a warm restart may have a reset-timing, power-sequencing, auxiliary-supply or bridge-firmware problem. Do not classify warm-start-only behavior as acceptable legacy op-

eration unless a product-specific document explicitly states that behavior.

15.4 Module Access Test

Perform at least one read and one write or command transaction to each writable module class, using the product's approved diagnostic method. Read-only identification is insufficient because some wiring or byte-lane faults appear only during data transfer.

For output modules connected to live industrial equipment, use the safe diagnostic mode defined by the system service procedure. Never energize field outputs solely to satisfy a bus test.

15.5 Interrupt Verification

Where practical, generate a known interrupt from each interrupt-driven module and verify that:

- the correct vector is reported;
- no unexpected vector appears;
- the interrupt clears normally after service;
- repeated interrupts do not accumulate;
- unrelated modules continue to operate while the interrupt test runs.

15.6 Sustained Transfer Test

A sustained transfer test should run long enough to expose temperature and loading effects that a brief startup test cannot reveal. For general service work, Sinneslöschen recommends a minimum of 30 minutes. High-rate acquisition or visualization systems should be tested at a load representative of normal operation.

Record transfer errors, retry counts, bus timeouts and arbitration warnings. A single corrected retry can be meaningful if the baseline system normally records none.

15.7 DMA / Bus-Master Test

If the system uses DMA or multiple bus masters, include a test that creates overlapping demand. For example, operate a data-acquisition transfer while another module generates interrupts or while the host performs ordinary peripheral access.

Verify that lower-rate devices remain responsive and that no master holds the bus beyond qualified limits.

15.8 Thermal Soak

For field qualification, operate the assembled system with covers installed and normal cooling active. A service bench with open panels can produce misleading results. Where the original fault was temperature-related, extend the test until internal temperatures have stabilized.

15.9 Qualification Record

Record:

- exact before and after configuration;
- test software and revision;
- duration of sustained tests;
- observed warnings or corrected errors;
- technician conclusion;
- any remaining service limitation.

A configuration should not be returned to production with unresolved SSB compatibility warnings unless Technical Support has documented the exception.

15.10 Acceptance Criteria

A normal field qualification passes when:

- every intended module is identified or manually verified;
- no unsupported module combination remains;
- termination and timing requirements are satisfied;
- no uncorrected bus transfer errors occur;
- interrupt and DMA functions operate as expected;
- application operation is stable under representative load;
- final configuration documentation is complete.

Chapter 16

OEM and Customer-Specific SSB Systems

16.1 Why OEM Systems Require Separate Review

Sinneslöschen OEM programs may use standard SSB modules, customer-specific modules, modified chassis wiring or configuration practices that are not fully represented in public product documentation. A system can therefore be valid under an OEM configuration record while appearing unusual when compared with a standard catalog system.

The existence of an SSB connector or standard module within an OEM system does not authorize arbitrary replacement with catalog hardware. The OEM configuration record remains part of the compatibility definition.

16.2 Recognizing an OEM Configuration

Indicators include:

- project or customer configuration number on the chassis label;
- non-standard front-panel labeling;
- customer-specific module names;
- reserved or blocked slot positions;
- wiring harnesses not shown in standard service manuals;
- configuration utility entries marked OEM or UNKNOWN;
- service documentation supplied under a project agreement.

16.3 Customer-Specific Modules

A customer-specific module may implement standard SSB electrical behavior while using an identifier not present in public software databases. In such cases, the configuration utility can report a generic class, partial identity or no identity.

Do not substitute a standard module solely because the external function appears similar. Customer hardware may implement special signal levels, timing, connector assignments or application logic.

16.4 Modified Backplanes

Some OEM chassis use otherwise standard SSB backplanes with limited modifications, such as auxiliary connector wiring, reserved pins or power distribution for a specialized module. Such modifications must be preserved unless the project documentation authorizes removal.

16.5 Service Replacement

When an OEM-specific part is unavailable, Technical Support may recommend one of four paths:

1. repair or exchange of the original module;
2. current functional replacement with adapter or software change;
3. host modernization while retaining the original peripheral set;
4. system-level migration to a new platform.

16.6 Documentation Control

Public manuals such as this guide should be attached to, not substituted for, the OEM service package. Where an OEM document and this guide differ, the project-specific document applies to the project configuration stated in that document.

16.7 Field Changes

Do not perform undocumented jumper changes or slot rearrangements on OEM systems simply to eliminate an automatic warning. Escalate the case with photographs, module labels and configuration reports.

Chapter 17

Compatibility Case Studies

17.1 Purpose

The following cases illustrate how the compatibility rules in this guide are applied. The examples are representative service scenarios and are not substitutes for exact product documentation.

17.2 Case 1 - SSB-2 Digital I/O in an SSB-2E Standard Chassis

Initial condition. A laboratory system uses an SSB-2E standard chassis and current controller. An older SSB-2 digital I/O module is available as a service replacement for a failed module of the same functional class.

Review. The replacement revision is listed as supported in SSB-2E. It uses a base address within the legacy map, does not act as a bus master and uses a standard interrupt vector. No adapter is required. The existing termination is valid for the standard chassis.

Action. Record the original module revision and slot, install the replacement in the same slot, preserve address and interrupt settings, run Configuration Utility 2.6 and perform I/O verification.

Result. SUPPORTED. No timing module required.

SERVICE NOTE

The fact that the replacement is older than the chassis is not itself a reason to reject it. Generation compatibility and exact revision are the controlling factors.

17.3 Case 2 - Early SSB-1 Serial Interface Added to an SSB-2E Chassis

Initial condition. A customer wishes to reuse an early SSB-1 serial interface in a newer SSB-2E chassis after the original SSB-1 controller is retired.

Review. The module is physically compatible with the card guide and connector but its revision predates direct later-chassis qualification. The compatibility matrix requires an SSB-1 adapter and legacy timing accommodation. The module should be placed within the approved early-slot range and burst access must not be used.

Action. Verify exact revision, install the approved adapter and timing hardware, place the module in the documented slot, preserve the serial transceiver option, and perform sustained communications testing under bus load.

Result. CONDITIONAL. New installation is acceptable only under the documented legacy conditions.

17.4 Case 3 - Existing SSB-1 Module Moved to a Different Slot

Initial condition. A working mixed-generation system is reorganized to make physical room for a new acquisition module. A legacy SSB-1 module is moved from slot 3 to slot 8 without changing address or

software.

Symptom. The system boots, but the legacy module produces intermittent timeouts after several minutes of high bus activity.

Analysis. The module's qualification required placement close to the controller and a specific timing-module relationship. The software configuration remained correct, so the problem initially appeared unrelated to the slot move.

Action. Restore the module to slot 3, return the new module to an unrestricted slot, and repeat load testing.

Result. Original operation returns. The service record is updated to make the slot restriction explicit.

17.5 Case 4 - SSB-2E Acquisition Chassis Migrated to PCI Host

Initial condition. A laboratory data-acquisition system retains its SSB-2E chassis and peripheral modules but replaces an aging host with a Windows NT 4.0 workstation and SL-9816 bridge.

Review. All peripheral modules are current or qualified SSB-2 revisions. Existing addresses and interrupts are documented. No SSB-1 hardware is present.

Action. Install the current SL-9816 support package, reproduce address windows, verify interrupt mappings, begin with burst mode disabled, then enable qualified DMA features one module at a time.

Qualification. Run simultaneous acquisition and serial I/O load, compare error counters with the old host baseline and retain the final configuration report.

Result. SUPPORTED migration path.

17.6 Case 5 - Unknown Module Reported by Configuration Utility

Initial condition. Configuration Utility 2.6 reports MODULE NOT IDENTIFIED in an established OEM system that is otherwise operating normally.

Incorrect response. Remove the module or replace it with a standard catalog part solely because software cannot identify it.

Correct response. Record physical label, assembly number, revision and OEM project identifier. Compare with the project configuration record. If the module is documented and the system remains unchanged, preserve the established configuration.

Result. UNKNOWN is an identification state, not proof of failure.

17.7 Case 6 - Repeated Bus Timeout After Terminator Replacement

Initial condition. A damaged terminator assembly is replaced with one from another SSB chassis. The connector is identical and the system starts normally.

Symptom. Under sustained acquisition load, several modules report intermittent bus timeouts.

Analysis. The replacement terminator uses a network intended for a different SSB generation. It over-terminates selected lines and reduces signal amplitude at the far end of the extended chassis.

Action. Install the correct terminator specified by AN-SSB-17 and repeat load testing.

Result. Timeouts disappear. Physical interchangeability did not imply electrical equivalence.

17.8 Case 7 - DMA Failure with Normal Programmed I/O

Initial condition. After PCI migration, a legacy acquisition module passes ordinary register tests but fails during large data transfers.

Review. The module was never qualified for DMA and was originally serviced through programmed I/O. The new host driver automatically enabled DMA for the module class.

Action. Disable DMA for the legacy module while retaining it for current SSB-2E devices. Verify bridge firmware and retest.

Result. Stable operation returns. The migration record notes the module-specific transfer restriction.

17.9 Case 8 - Configuration Works Only with Chassis Cover Removed

Initial condition. A standard SSB-2E system passes diagnostics on the service bench with the cover removed but fails after installation in the cabinet.

Analysis. Temperature rises significantly with the cover installed because a failed fan and obstructed filter reduce airflow. A high-density module develops timing errors only after thermal stabilization.

Action. Restore cooling, clean filter, confirm fan current and repeat qualification with the chassis fully assembled.

Result. No bus timing changes are required. The failure was environmental, not a compatibility defect.

17.10 Case 9 - Mirrored Address Conflict

Initial condition. A new SSB-2E module is assigned an extended base range that appears not to overlap an older SSB-1 peripheral.

Symptom. Writes to the new device occasionally alter status on the legacy peripheral.

Analysis. The SSB-1 module decodes fewer high-order address bits and responds to a mirrored region that overlaps the new mapping.

Action. Move the new module to a non-mirrored range and document the legacy module's effective decode window.

Result. Address plan becomes stable without hardware replacement.

17.11 Case 10 - Mixed Mastering Produces Lost Serial Characters

Initial condition. A system contains a high-rate SSB-2E acquisition master and an older SSB-2 bus-mastering storage interface. Both are individually qualified.

Symptom. During simultaneous transfers, a low-rate serial interface occasionally overruns.

Analysis. Long DMA bursts and arbitration settings delay interrupt service beyond the serial driver's expected interval. No electrical bus errors are recorded.

Action. Reduce maximum burst length, verify arbitration fairness and retest with simultaneous acquisition and serial traffic.

Result. Stable operation returns. Compatibility includes system-level service latency, not only electrical operation.

17.12 Case 11 - Timing Module Left Installed After Legacy Module Removal

Initial condition. The final SSB-1 module is replaced by a current SSB-2E equivalent, but the legacy timing module remains in the chassis.

Symptom. System operation is stable but sustained throughput is lower than expected and Configuration Utility reports a legacy timing condition.

Action. Confirm that no remaining module requires the timing accommodation, remove the timing module according to the service procedure, restore standard timing and repeat qualification.

Result. Normal performance returns. Legacy support hardware should be removed when its documented requirement no longer exists.

17.13 Case 12 - OEM Backplane Modification Misidentified as Damage

Initial condition. A technician finds wire modifications on the rear of an OEM SSB chassis and assumes they are an unapproved field repair.

Review. The OEM configuration record shows that the wiring was installed during production to provide auxiliary signals for a customer-specific module.

Action. Leave the wiring intact, document its condition and use the OEM procedure for module replacement.

Result. No corrective action required. Historical modifications must be understood before they are removed.

Chapter 18

Environmental, Reliability and Service Considerations

18.1 Industrial Environment

SSB products are widely used in environments where temperature, vibration, electrical noise and service life exceed ordinary office-computer conditions. Compatibility decisions must therefore include the installation environment, not only bus logic.

18.2 Temperature

A mixed-generation configuration must remain within the operating range of its least tolerant module. Later industrial-temperature controllers do not extend the rating of a legacy peripheral designed for a narrower range.

Temperature can also change timing margin. A module that operates only when cold or only after warm-up should be treated as faulty or marginal until the cause is identified.

18.3 Vibration and Mechanical Retention

Industrial cabinets may experience continuous low-level vibration or occasional shock. Module retaining hardware, card guides and external cable strain relief should be restored after service. Intermittent connector contact caused by incomplete seating can resemble a bus timing fault.

18.4 Power Quality

Use the chassis power-supply specifications when adding modules. External line disturbances should be addressed with appropriate facility power conditioning rather than by altering bus timing or removing protective grounding.

18.5 Electrostatic Discharge

Observe standard ESD handling practices. Some SSB modules contain interface devices connected directly to backplane signals and can be damaged without visible evidence. Use grounded wrist straps, static-safe work surfaces and protective packaging.

18.6 Battery-Backed or Non-Volatile Devices

Some memory and controller modules retain configuration or data when system power is removed. Before replacing such hardware, determine whether calibration, configuration, licensing or customer data

must be backed up.

18.7 Long-Term Storage

Spare modules stored for extended periods should remain in static-protective packaging in a controlled environment. Before installing a long-stored spare, inspect connectors and verify that any replaceable battery or time-sensitive component remains serviceable.

18.8 Repair vs. Replacement

Legacy SSB hardware may be supported through module exchange, authorized repair or functional replacement depending on product status. Component-level field repair is not recommended unless the service organization is authorized and has the applicable documentation.

18.9 Configuration Stability

Once a long-life system has been qualified, avoid unnecessary change. Firmware, drivers and utility versions should be updated for a documented reason, not solely because a newer package exists.

18.10 Documentation as a Service Component

For installed SSB systems, documentation is part of the service configuration. Keep compatibility guides, application notes, configuration reports and local change records with the equipment or in the responsible maintenance system.

Chapter A

Compatibility Matrices

A.1 How to Use These Matrices

The tables below summarize common compatibility classes. They do not replace product-specific bulletins. If an exact module revision is covered by a Service Bulletin, follow the bulletin.

A.1.1 Legend

SUPPORTED	Normal qualified use.
CONDITIONAL	Requires the listed condition.
SERVICE ONLY	Existing installation may be maintained; new installation not recommended.
VERIFY REVISION	Exact module revision or OEM record required.
NOT SUPPORTED	Do not install.

A.2 Module Class vs. Chassis Generation

Module Class	SSB-1 Chassis	SSB-2 Chassis	SSB-2E Standard	SSB-2E Extended
SSB-1 digital I/O	SUPPORTED	CONDITIONAL	CONDITIONAL	SERVICE ONLY
SSB-1 serial interface	SUPPORTED	CONDITIONAL	CONDITIONAL	SERVICE ONLY
SSB-1 analog acquisition	SUPPORTED	VERIFY REVISION	CONDITIONAL	NOT SUPPORTED
SSB-1 memory / buffer	SUPPORTED	VERIFY REVISION	SERVICE ONLY	NOT SUPPORTED
SSB-1 bus master	SUPPORTED	SERVICE ONLY	VERIFY REVISION	NOT SUPPORTED
SSB-2 digital I/O	NOT SUPPORTED	SUPPORTED	SUPPORTED	SUPPORTED
SSB-2 serial interface	NOT SUPPORTED	SUPPORTED	SUPPORTED	SUPPORTED
SSB-2 acquisition	NOT SUPPORTED	SUPPORTED	SUPPORTED	SUPPORTED
SSB-2 bus master	NOT SUPPORTED	SUPPORTED	VERIFY REVISION	VERIFY REVISION
SSB-2 memory / buffer	NOT SUPPORTED	SUPPORTED	SUPPORTED	SUPPORTED
SSB-2E base peripheral	NOT SUPPORTED	VERIFY REVISION	SUPPORTED	SUPPORTED

Module Class	SSB-1 Chassis	SSB-2 Chassis	SSB-2E Standard	SSB-2E Extended
SSB-2E burst peripheral	NOT SUPPORTED	NOT SUPPORTED	SUPPORTED	SUPPORTED
SSB-2E bus master	NOT SUPPORTED	NOT SUPPORTED	SUPPORTED	SUPPORTED
SSB-2E extended-address module	NOT SUPPORTED	NOT SUPPORTED	SUPPORTED	SUPPORTED

A.3 Typical Conditions for Legacy SSB-1 Classes

Legacy Class	Adapter	Timing Module	Slot Rule	Notes
Digital I/O, late rev.	Sometimes	Often	Near controller preferred	Verify interrupt option and output driver revision.
Serial interface, late rev.	Sometimes	Often	Standard slots 2-6	External transceiver type may impose separate grounding rules.
Analog acquisition	Usually	Usually	Mid-chassis only	Noise and auxiliary supply requirements vary widely.
Memory / buffer	Revision-specific	Usually	Near controller	Mirrored address decode is common on early assemblies.
Bus mastering	Specialized	Required	Restricted	Maintain only where a qualified historical configuration exists.
Customer OEM module	Unknown	Unknown	Per OEM record	Do not infer compatibility from connector or apparent function.

A.4 SL-9816 Host Integration Matrix

SSB Configuration	Bridge Support	Default Mode	Conditions
SSB-2E only	SUPPORTED	Full qualified mode	Use current driver and firmware; burst enabled only for capable targets.
SSB-2 only	SUPPORTED	Base cycle / DMA as qualified	Preserve legacy addresses and interrupt vectors.
SSB-2 + SSB-2E	SUPPORTED	Mixed mode	Review mastering modules and extended-address use.
Selected SSB-1 + SSB-2E	CONDITIONAL	Legacy timing for SSB-1	Adapter/timing/termination required by module class.

SSB Configuration	Bridge Support	Default Mode	Conditions
SSB-1 only	SERVICE ONLY	Legacy mode	Preferred migration is to retain original controller or replace peripherals; consult support.
Unknown OEM modules	VERIFY REVISION	Conservative base cycles	Require OEM or engineering record before qualification.

A.5 Chassis Loading Guidance

Chassis Class	Typical Slots	Legacy Modules	Bus Masters	Service Guidance
Compact	4-6	Limited	1 preferred	Check integrated termination and cooling before adding high-power modules.
Standard	8-12	Supported per matrix	1-2 qualified	Normal service platform for mixed SSB-2/2E systems.
Extended	14-20	Restricted	Revision-specific	Verify timing, loading and terminator location; sustained load test required after change.
OEM custom	Varies	Per project	Per project	Obtain configuration record; public matrix may not apply.

Chapter B

Configuration Worksheets

B.1 System Identification Worksheet

System / Equipment ID
Customer / Department
System Model
System Serial Number
Chassis Model
SSB Generation
Host / Controller
Operating System / Software
Configuration Utility Version
Date
Technician
Support Case Number

B.2 Module Configuration Worksheet

Slot	Module / Label	Rev.	Address	IRQ	Role	Notes
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

B.3 Termination and Timing Worksheet

Controller-end termination
Far-end termination
Chassis extension present
Timing module present
Timing module position
SSB-1 adapter(s) present
Adapter module/revision
Backplane modification observed
Cooling verified
Configuration report saved as

B.4 Change Record

Date	Technician	Change	Result / Qualification
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Chapter C

Service Message Reference

C.1 Configuration and Diagnostic Messages

The following table expands the most common service messages used by SSB Configuration Utility 2.6 and selected Diagnostic Toolkit functions.

Message	Severity	Service Interpretation
MODULE IDENTIFIED	Info	Module class and revision were read successfully. Review compatibility status before modification.
PARTIAL MODULE ID	Info	Class recognized but revision or option data incomplete; inspect physical label.
MODULE NOT IDENTIFIED	Caution	No complete database match. May be legacy, OEM or unsupported hardware.
ADDRESS CONFLICT DETECTED	Error	Two address ranges overlap or a legacy decode mirror has been detected.
INTERRUPT CONFLICT DETECTED	Error	Interrupt mapping is not unique or violates host configuration.
LEGACY TIMING MODULE REQUIRED	Caution	Current module/chassis combination requires approved timing accommodation.
TIMING MODULE NOT DETECTED	Caution	Utility expected a detectable timing assembly but did not receive identification. Physical inspection required.
TERMINATION CONFIGURATION NOT VERIFIED	Caution	Termination cannot be confirmed electronically. Inspect physical ends of active segment.
UNSUPPORTED MODULE COMBINATION	Error	Combination is outside current qualification. Restore known-good configuration or contact support.
BURST MODE DISABLED	Info	Target is operating with base cycles. Normal for legacy or non-burst modules.
DMA MODE NOT QUALIFIED	Caution	Driver requested DMA for a module not listed as qualified. Use programmed I/O until reviewed.
BUS TIMEOUT	Error	Target did not acknowledge within the selected qualified window. Check timing, address, module status and termination.
BUS ARBITRATION TIMEOUT	Error	Requested mastership was not resolved. Check bus-master modules and controller/bridge state.
UNEXPECTED INTERRUPT VECTOR	Error	Host received a vector not assigned in current configuration. Check module jumpers and bridge mapping.
BRIDGE OFFLINE	Error	SL-9816 driver cannot communicate with bridge hardware. Check PCI resources, driver and firmware.
BRIDGE FIRMWARE REVISION BELOW RECOMMENDED	Caution	Firmware does not match current support package; update only per qualified procedure.

Message	Severity	Service Interpretation
CONFIGURATION REPORT COMPLETE	Info	Scan completed. Warnings may still require manual review.
DIAGNOSTIC TEST PASSED	Info	Selected test completed within test conditions; does not supersede system qualification.
DIAGNOSTIC TEST FAILED	Error	Review detailed failure code and restore system to known-good state before further changes.
BUS DIAGNOSTIC INTERRUPTS SYSTEM OPERATION	Warning	Test suspends or interferes with normal device service. Do not run on active production process.

C.2 Failure Codes

Diagnostic Toolkit failure codes are grouped by class:

Range	Class	Meaning
100-199	Identification	Missing, partial or contradictory module identity.
200-299	Addressing	Decode, mapping or address-window error.
300-399	Transfer	Data or acknowledgment failure during programmed transfer.
400-499	Interrupt	Vector, acknowledge or mapping failure.
500-599	Arbitration / DMA	Mastership, DMA or burst-transfer failure.
600-699	Bridge	SL-9816 driver, firmware or PCI resource problem.
700-799	Configuration	Incompatible module, slot, timing or termination condition.

The detailed numeric code supplied by the toolkit should be included in a support case. Do not convert the code into a guessed component replacement without reviewing the associated diagnostic text.

Chapter D

Reference Documents and Glossary

D.1 Related Sinneslöschen Documents

Document	Title	Use
AN-SSB-17	SSB Termination Requirements	Detailed termination examples for SSB-1, SSB-2 and SSB-2E systems.
TB-95-028	Legacy Timing Notes	Timing considerations for selected SSB-1 modules in later systems.
TB-98-011	Mixed SSB Configuration Requirements	Current bridge, timing and termination requirements for mixed-generation installations.
DS-SL9816-01	SL-9816 Data Sheet	Bridge features, host requirements and environmental specifications.
RM-SL9816-01	SL-9816 Reference Manual	Address mapping, interrupt handling, DMA and driver configuration.
AN-SL9816-02	PCI / SSB Migration Planning	Recommended host migration workflow.
UM-SLRT34-01	SL/RT 3.4 User Manual	System software operation on supported embedded targets.
RM-SLRT34-02	SL/RT 3.4 System Reference	Device, interrupt and system-service programming reference.

D.2 Glossary

Term	Definition
Acknowledgment	Bus response indicating that a target has accepted or supplied data for the current transfer.
Adapter	Hardware used to permit a selected legacy module or interface to operate in an approved later-generation configuration.
Address decode	Logic that determines whether a module responds to a presented bus address.
Arbitration	Process by which one requester receives temporary ownership of the shared bus.
Backplane	Chassis interconnection assembly carrying shared SSB signals and power between module slots.
Base cycle	Standard non-burst SSB transaction supported by qualified SSB-2/2E devices and used for legacy targets.

Term	Definition
Bridge	Hardware translating transactions between SSB and another host bus, principally PCI through the SL-9816.
Burst transfer	SSB-2E operation in which multiple sequential data words are transferred under an optimized qualified transaction sequence.
Bus master	Module capable of initiating bus transactions after receiving ownership through arbitration.
Compatibility adapter	SSB service accessory providing buffering, timing, signal adaptation or related legacy accommodation.
Configuration report	Output from SSB Configuration Utility describing detected modules and settings.
DMA	Direct Memory Access; transfer method allowing data movement with reduced host processor intervention.
Extended address	SSB-2E address extension used by capable modules beyond the base legacy map.
Legacy module	Earlier-generation hardware retained under current support policy.
Module revision	Hardware revision letter identifying engineering or manufacturing changes within a product designation.
OEM configuration	Customer-specific system or assembly maintained under a project or production agreement.
SSB	Sinneslöschen System Bus.
SSB-1	Original SSB generation introduced in 1985.
SSB-2	Revised SSB generation introduced in 1989 with expanded addressing and improved arbitration.
SSB-2E	Enhanced SSB generation introduced in 1993 with extended addressing, burst support and improved identification.
Target	Module responding to a transaction initiated by a controller or bus master.
Termination	Electrical network applied at physical ends of the active bus segment to control reflections and preserve signal integrity.
Timing module	Configuration-specific SSB accessory used to provide approved timing accommodation in selected systems.
Vector	Identifier used to associate an interrupt request with the appropriate service routine or device.

D.3 Documentation Feedback

Corrections or comments concerning this manual may be sent to Sinneslöschen Documentation Services. Include the document number RM-SSB2E-04, revision D and the applicable page or section.

Documentation Services

Fax: 408-555-0163

E-mail: documentation@sinnesloschen.com

Chapter E

Electrical Compatibility Reference

E.1 Purpose and Limitations

This appendix provides system-level electrical values useful for compatibility review and troubleshooting. It is not a design specification for third-party SSB modules. Product data sheets and OEM engineering documents remain authoritative for connector-level design.

The values below describe the nominal environment expected by qualified Sinneslöschen hardware. Where a product-specific specification is tighter, use the tighter specification.

E.2 Nominal Supply Environment

Supply	Nominal	Service Range	Notes
Logic +5 V	+5.00 V	+4.85 to +5.25 V at backplane	Principal SSB logic supply. Verify under load at representative chassis point.
Auxiliary +12 V	+12.0 V	Per chassis specification	Present only in chassis that support modules requiring auxiliary positive supply.
Auxiliary -12 V	-12.0 V	Per chassis specification	Common on selected analog and serial-interface systems; not guaranteed in all chassis.
Protective ground	Chassis	Bonded to enclosure	Must not be lifted to correct communication or noise faults.
Logic return	0 V	Chassis-defined	Shared logic reference; analog systems may include separate signal references.

SERVICE NOTE

Measure supply voltage with the system assembled and operating under representative load. A bench supply measurement with modules removed does not verify backplane voltage at full current.

E.3 Logic-Level Compatibility

The SSB backplane uses 5 V logic-compatible signaling. Service interpretation is based on qualified system thresholds rather than the internal logic family used on any individual module.

A module using lower-voltage internal devices must include the required level interface and must not expose non-SSB logic levels directly to the backplane.

E.4 Loading Classes

For field compatibility, shared-signal loading is treated in relative classes:

Class	Relative Load	Typical Hardware
L1	Low	Later SSB-2E buffered logic and simple control peripherals.
L2	Normal	Most SSB-2 / SSB-2E I/O, serial and memory modules.
L3	High	Earlier interfaces, multi-function acquisition modules, selected adapter combinations.
L4	Legacy critical	Selected SSB-1 modules or OEM assemblies requiring explicit chassis loading review.

A standard chassis may contain many L1/L2 modules but only a limited number of L3/L4 devices depending on length and termination. Appendix A compatibility ratings take this effect into account.

E.5 Transfer Timing Profiles

The following service profiles illustrate the relative transaction windows used in compatibility analysis. These values are not universal device specifications.

Profile	Typical Ack Window	Typical Use	Service Meaning
Legacy-L	up to 1.20 us	Qualified SSB-1 targets	Requires legacy timing accommodation in later systems.
Standard-2	up to 0.75 us	Normal SSB-2 targets	Supported by SSB-2E base cycles when revision is qualified.
Standard-E	up to 0.50 us	Normal SSB-2E targets	Current default profile for non-burst access.
Fast-E	up to 0.30 us	Selected memory / buffer hardware	Use only for modules explicitly listed as fast-profile capable.
Burst-E	target dependent	SSB-2E burst-capable modules	Multiple sequential transfers; profile includes arbitration and burst-length rules.

CAUTION

Do not use the timing values in this appendix to create an unlisted compatibility mode. They explain service behavior; they do not authorize manual timeout changes outside qualified profiles.

E.6 Reset and Startup Behavior

SSB systems use controller-driven startup combined with module-local reset logic. Older modules may require longer stabilization before first access. Later controllers and the SL-9816 accommodate qualified devices through startup profiles.

Symptoms of inadequate reset accommodation include:

- module absent only on cold start;
- module appears after a manual rescan;
- host requires warm restart before normal operation;
- first transaction times out while later transactions succeed.

E.7 Interrupt Electrical Loading

Shared interrupt resources must remain within chassis loading limits. A legacy module can contribute greater loading than a later module even if it generates interrupts infrequently. This is one reason module-count limits are not based only on software vector availability.

E.8 External Interface Isolation

Serial, analog and industrial I/O modules can conduct noise from external equipment into the chassis. Isolation provided by the module must remain intact. Bypassing shield or reference arrangements can degrade SSB operation even though the external signal itself remains readable.

E.9 Power Budget Worksheet

For each installed module record maximum logic current and auxiliary current from its data sheet. Sum module requirements and compare with the chassis rating, retaining the margin specified by the chassis service manual.

Slot	Module	+5 V	+12 V	-12 V	Notes
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Total					
Chassis rating					
Remaining margin					

Chapter F

Module-Class Service Notes

F.1 Digital I/O Modules

Digital I/O modules are generally among the least timing-sensitive SSB peripherals, but their external load, interrupt mode and output behavior must be preserved during replacement.

Before replacing a digital I/O module, record:

- input/output direction configuration;
- logic polarity;
- output default state at reset;
- interrupt-on-change settings;
- field connector wiring;
- external supply arrangement.

A replacement that is bus-compatible can still be application-incompatible if reset outputs differ.

F.2 Serial Interface Modules

Serial modules may support RS-232, RS-422, RS-485 or customer-specific physical interfaces. Bus compatibility does not establish external-interface compatibility.

Check transceiver option, termination/bias settings, baud generator configuration and interrupt behavior. In mixed-generation systems, serial modules are sensitive to excessive interrupt latency even when ordinary register access is stable.

F.3 Analog I/O and Acquisition Modules

Analog modules combine SSB digital compatibility with additional requirements for grounding, shielding, auxiliary supplies and calibration.

When moving an analog module to a different chassis:

- verify auxiliary supply availability;
- preserve analog reference and shield connections;
- review adjacency to high-current digital modules;
- perform calibration or verification required by the product procedure;
- confirm sampling or DMA mode after host migration.

F.4 Memory and Buffer Modules

Memory and buffer modules can be among the fastest SSB targets and may expose address-width differences between generations. Earlier modules often decode a limited range and can mirror into later extended spaces.

When replacing or remapping memory hardware, verify byte-lane behavior, parity options, write-protect settings and any battery-backed content before service.

F.5 Display and Visualization Interfaces

Display-related SSB modules can generate sustained transfer load and may use DMA or bus mastering. After configuration changes, test both static display access and continuous update conditions.

A display module that operates with test patterns but fails during full application use may be exposing an arbitration, DMA or host-driver problem rather than a graphics fault.

F.6 Storage Interfaces

Storage interfaces can hold bus ownership for relatively long transfers. In mixed-master systems, review burst length and fairness. Preserve device numbering and termination on the external storage bus independently of SSB termination.

F.7 Communications Modules

Network or communication modules can produce bursts of interrupts and DMA activity tied to external traffic. Qualification should include representative network load rather than an idle link test.

F.8 Controller Modules

Controller replacement is a system-level change. Record current firmware, boot configuration, interrupt map and any local non-volatile settings. Do not assume a newer controller will automatically reproduce the timing behavior of an older native SSB controller.

F.9 Bus-Mastering Acquisition Modules

These modules require explicit arbitration and DMA qualification. Verify that the module revision is approved for the chassis and host, then test concurrent activity with other masters.

F.10 Timing and Service Modules

Timing modules, service adapters and terminators may not appear in the application software at all, yet they can be essential to compatibility. Always include them in physical configuration records.

F.11 OEM Modules

Treat unidentified customer-specific modules conservatively. Preserve slot, address, adapter and timing conditions until project documentation establishes an approved alternative.

Chapter G

Sample Configuration Utility Reports

G.1 Example 1 - Standard SSB-2E Laboratory System

The following example illustrates a normal report with no legacy modules. Identifiers are representative.

SINNESLOSCHEN SSB CONFIGURATION UTILITY 2.6

REPORT DATE: 02.11.98 14:32:17

HOST: SL DEVELOPMENT SYSTEM

CONTROLLER: SSB-2E SYSTEM CONTROLLER

CHASSIS CLASS: STANDARD / 10 SLOT

SLOT	TYPE	REV	ADDRESS	IRQ	STATUS
---	-----	---	-----	---	-----
1	SYSTEM CONTROLLER	C	00000000	--	IDENTIFIED
2	DIGITAL I/O	D	00010000	40	IDENTIFIED
3	DIGITAL I/O	D	00011000	42	IDENTIFIED
4	ANALOG ACQUISITION	B	00020000	44	IDENTIFIED
5	ANALOG ACQUISITION	B	00024000	46	IDENTIFIED
6	MULTI-PORT SERIAL	C	00030000	48	IDENTIFIED
7	TIMING / SYSTEM SERVICE	B	00038000	--	IDENTIFIED
8	DIGITAL I/O	C	00040000	4A	IDENTIFIED
9	RESERVED	--	-----	--	EMPTY
10	CHASSIS END TERMINATION	--	-----	--	VERIFIED

BUS GENERATION: SSB-2E

EXTENDED ADDRESSING: AVAILABLE

BURST TRANSFERS: AVAILABLE

LEGACY TIMING PROFILE: NOT REQUIRED

TERMINATION CONFIGURATION: VERIFIED

ADDRESS CONFLICTS: NONE

INTERRUPT CONFLICTS: NONE

CONFIGURATION REPORT COMPLETE

G.2 Interpretation

This system uses only identified SSB-2E modules. No compatibility adapter or legacy timing profile is required. An empty slot at position 9 does not change the physical termination point; the end terminator remains at slot 10.

G.3 Example 2 - Mixed SSB-1 / SSB-2E System

SINNESLOSCHEN SSB CONFIGURATION UTILITY 2.6

REPORT DATE: 02.11.98 16:05:44
 HOST: INDUSTRIAL CONTROL SYSTEM
 CONTROLLER: SSB-2E SYSTEM CONTROLLER
 CHASSIS CLASS: STANDARD / 12 SLOT

SLOT	TYPE	REV	ADDRESS	IRQ	STATUS
1	SYSTEM CONTROLLER	B	00000000	--	IDENTIFIED
2	LEGACY DIGITAL I/O	?	00008000	30	PARTIAL ID
3	LEGACY SERIAL INTERFACE	?	00009000	32	LEGACY
4	SSB-1 COMPATIBILITY ADAPTER	C	-----	--	IDENTIFIED
5	LEGACY TIMING MODULE	B	-----	--	IDENTIFIED
6	SSB-2 DIGITAL I/O	E	00012000	34	IDENTIFIED
7	SSB-2E DIGITAL I/O	B	00014000	36	IDENTIFIED
8	SSB-2E SERIAL INTERFACE	B	00016000	38	IDENTIFIED
9	EMPTY	--	-----	--	EMPTY
10	EMPTY	--	-----	--	EMPTY
11	SYSTEM SERVICE	B	0001F000	--	IDENTIFIED
12	CHASSIS END TERMINATION	--	-----	--	NOT ELECTRONICALLY VERIFIED

BUS GENERATION: MIXED SSB-1 / SSB-2 / SSB-2E
 LEGACY TIMING PROFILE: ACTIVE
 BURST TRANSFERS: DISABLED FOR LEGACY TARGETS
 TERMINATION CONFIGURATION: PHYSICAL INSPECTION REQUIRED

WARNING: MODULE IN SLOT 2 REQUIRES MANUAL REVISION VERIFICATION
 WARNING: TERMINATION CONFIGURATION NOT VERIFIED

CONFIGURATION REPORT COMPLETE

G.4 Interpretation

The report does not declare the system invalid. It states that slot 2 requires manual identification and that termination cannot be verified electronically. The technician must compare physical labels with the compatibility record and inspect the chassis endpoint before making changes.

G.5 Example 3 - SL-9816 PCI / SSB Migration

SINNESLOSCHEN SSB CONFIGURATION UTILITY 2.6
 REPORT DATE: 02.12.98 09:17:03
 HOST: PCI WORKSTATION / WINDOWS NT 4.0
 BRIDGE: SL-9816 PCI / SSB PERIPHERAL BRIDGE
 DRIVER: 1.0
 BRIDGE FW: 1.03
 CHASSIS CLASS: STANDARD / 10 SLOT

PCI WINDOW 0: D8000000-D80FFFFF -> SSB BASE 00000000

PCI WINDOW 1: D8100000-D81FFFFFF -> SSB BASE 00100000

SLOT	TYPE	REV	ADDRESS	IRQ	MODE
1	BRIDGE-SIDE CONTROLLER	A	00000000	--	BASE
2	SSB-2 DIGITAL I/O	F	00010000	40	BASE
3	SSB-2 SERIAL INTERFACE	E	00012000	42	BASE
4	SSB-2E ACQUISITION	B	00100000	44	DMA / BURST
5	SSB-2E ACQUISITION	B	00120000	46	DMA / BURST
6	SSB-2 MEMORY BUFFER	D	00020000	--	DMA
7	EMPTY	--	-----	--	EMPTY
8	SYSTEM SERVICE	B	0003F000	--	BASE
9	EMPTY	--	-----	--	EMPTY
10	CHASSIS END TERMINATION	--	-----	--	VERIFIED

ADDRESS TRANSLATION: OK

INTERRUPT MAPPING: OK

DMA: ENABLED FOR QUALIFIED MODULES

BURST: ENABLED FOR SLOTS 4-5

LEGACY TARGET BURST: DISABLED

CONFIGURATION REPORT COMPLETE

G.6 Interpretation

The report shows that SSB-2 peripherals remain on base cycles while SSB-2E acquisition modules use DMA and burst transfers. This is normal. A mixed system does not need to operate every module at the same transfer mode.

G.7 Example 4 - Address Conflict with Legacy Decode

SLOT	TYPE	ADDRESS	STATUS
2	LEGACY MEMORY BUFFER	00040000	LEGACY
5	SSB-2E ACQUISITION	00440000	IDENTIFIED

WARNING: POSSIBLE LEGACY ADDRESS MIRROR

LEGACY MODULE MAY DECODE 00440000 AS 00040000

ADDRESS CONFLICT DETECTED

The correct action is to remap the later module to a range outside the legacy device's effective decode window. Increasing timeout values or changing termination cannot correct an address conflict.

Chapter H

Field Service Checklists

H.1 Before Visiting the Equipment

Where possible obtain:

- system model and serial number;
- customer description of fault;
- most recent configuration report;
- software release information;
- previous service case numbers;
- notice of any recent module, host or facility changes;
- applicable OEM or Service Bulletin references.

H.2 Before Power-Down

- Record current application state.
- Save diagnostic logs.
- Print or save Configuration Utility output.
- Confirm safe shutdown of connected process equipment.
- Label external cables that will be removed.
- Note unusual indicators before they disappear at shutdown.

H.3 Physical Inspection

- Verify chassis model and generation.
- Check fan operation and filters.
- Inspect module seating and retainers.
- Record all module labels and revisions.
- Record slot positions.
- Identify adapters, timing modules and terminators.
- Inspect connectors for damage or heat discoloration.
- Note undocumented wiring or jumpers.
- Verify external cable strain relief.

H.4 After Hardware Change

- Confirm all modules seated and retained.
- Restore airflow panels and covers.
- Confirm terminators are installed at physical endpoints.
- Confirm timing module requirement.
- Confirm adapter requirement.
- Verify address and interrupt settings.
- Restore external cables.
- Remove tools and loose hardware from chassis.

H.5 After Power-Up

- Observe normal power indicators.
- Confirm fans start.
- Confirm host / controller boot.
- Run Configuration Utility.
- Compare module list with pre-service record.
- Review every warning.
- Perform basic function tests.
- Perform load test if timing, termination, controller or bridge changed.
- Save final configuration report.

H.6 Before Closing the Service Case

- Record final hardware configuration.
- Record software / driver / firmware revisions.
- Record tests performed and duration.
- Record any remaining service limitation.
- Attach configuration report.
- Return removed parts according to RMA or customer procedure.
- Provide customer with any required operating restriction.

H.7 Do Not Close the Case If

- an unsupported module combination remains;

- termination is unverified after a bus change;
- the system operates only after warm restart;
- corrected bus errors continue to accumulate;
- a timing module is installed without a documented requirement;
- a bridge warning has been suppressed rather than resolved;
- the final configuration differs from the service record.

Chapter I

Timing Qualification Tables

I.1 Purpose

These tables provide a structured method for deciding which timing profile to test when exact product-specific instructions are not immediately available. They do not authorize unsupported combinations. A module listed as VERIFY REVISION or NOT SUPPORTED elsewhere in this guide remains subject to that restriction.

I.2 Target Timing Selection

Target Type	Preferred Profile	Fallback	Notes
Current SSB-2E digital I/O	Standard-E	Standard-2	Use Standard-2 only for documented compatibility testing.
Current SSB-2E serial	Standard-E	Standard-2	Interrupt latency may be more important than access time.
SSB-2E acquisition, register access	Standard-E	Standard-2	DMA data path may use separate qualified mode.
SSB-2E memory / buffer	Fast-E where specified	Standard-E	Never force Fast-E on an unidentified revision.
SSB-2 digital I/O	Standard-2	Legacy-L only if bulletin requires	Most qualified revisions operate normally in SSB-2E base cycles.
SSB-2 serial	Standard-2	Legacy-L for selected early revisions	Verify interrupt service under load.
SSB-2 acquisition	Standard-2	Legacy-L only by revision	DMA qualification separate.
SSB-1 digital I/O	Legacy-L	None	Later chassis generally require timing accommodation.
SSB-1 serial	Legacy-L	None	Preserve transceiver and interrupt configuration.
SSB-1 analog / acquisition	Legacy-L	None	Often requires adapter and slot restriction in addition to timing.
OEM / unknown	Conservative profile per project	None	Obtain project or support guidance before production use.

I.3 Bus-Master Qualification

Master Type	Arbitration	Burst	Qualification Requirement
Native SSB-2E controller	Current	Supported	Verify system module mix and fairness under load.
SL-9816 bridge	Current bridge profile	Per target	Match driver and firmware; verify interrupt mapping and DMA windows.
SSB-2 bus master, late rev.	SSB-2 compatible	Usually no SSB-2E burst	Verify exact revision and concurrent-master behavior.
SSB-2 bus master, early rev.	Revision-specific	No	SERVICE ONLY or VERIFY REVISION.
SSB-1 bus master	Legacy	No	Maintain only in historically qualified configurations.
OEM master	Project-specific	Project-specific	Public matrix insufficient; obtain project documentation.

I.4 Qualification Load Profiles

Profile	Minimum Duration	Activity
Q1 Basic	10 minutes	Repeated register access, interrupt generation and configuration scans. Suitable for simple I/O change with no timing hardware change.
Q2 Standard	30 minutes	Simultaneous I/O, interrupts and representative application activity. Default after module replacement or slot relocation.
Q3 High Transfer	45 minutes	Sustained acquisition, memory transfers or display updates with ordinary peripherals active. Required after DMA/burst changes.
Q4 Mixed Master	60 minutes	Two or more bus masters, concurrent interrupts and representative external traffic. Required after arbitration-sensitive change.
Q5 Legacy Mixed	60 minutes	Legacy target access plus high-rate current modules; includes cold start and thermal stabilization. Required after SSB-1 integration change.

I.5 Error Acceptance

A compatibility qualification is not a statistical burn-in exercise. The expected number of uncorrected SSB protocol errors is zero. Corrected retries or warning counters should be compared with the last known-good baseline; a new count appearing only after a configuration change requires investigation.

I.6 Cold / Warm Start Matrix

Condition	Cold Start	Warm Restart	Interpretation
Normal	Pass	Pass	Expected behavior.
Reset timing issue	Fail / intermittent	Pass	Review controller, bridge firmware and legacy reset accommodation.
Power budget / sequencing	Fail	May pass	Check supply rails, inrush and auxiliary power.
Software initialization	Pass	Fail / inconsistent	Review driver or application reinitialization sequence.
Marginal thermal hardware	Pass cold	May fail after runtime	Check cooling and sustained-load behavior.

I.7 Timing-Change Control

If a timing profile must be changed under Technical Support direction, record the previous value, reason for change, authorizing case number and test results. Do not leave undocumented temporary timing values in production systems.

Chapter J

Configuration Decision Records

J.1 Purpose

A compatibility decision is easier to maintain when the reasoning is preserved, not only the final slot list. The following templates are intended for engineering groups, OEM integrators and service organizations maintaining long-life SSB equipment.

J.2 Compatibility Decision Form

System / Project	
Date	
Engineer / Technician	
Change Requested	
Reason for Change	
Current Chassis	
Current Controller / Bridge	
SSB Generations Present	
Legacy Modules Present	
Timing Module Present	
Adapters Present	
Termination Verified	
Related Bulletin(s)	
Compatibility Result	SUPPORTED / CONDITIONAL / SERVICE ONLY / NOT SUPPORTED / VERIFY REVISION
Conditions Required	
Qualification Profile	Q1 / Q2 / Q3 / Q4 / Q5
Support Case / Approval	
Final Disposition	

J.3 Legacy Module Identification Record

Physical Label	
Assembly Number	
Revision	
Serial Number	
Functional Description	

Original Slot
Original Address
Original Interrupt
Electronic ID Result
Adapter Required
Timing Requirement
Termination Condition
OEM / Project Reference
Photograph Reference
Notes

J.4 Bridge Migration Record

Original Host
Original Controller
Replacement Host
Operating System
SL-9816 Hardware Revision
Driver Revision
Bridge Firmware
PCI Window 0
PCI Window 1
Interrupt Mapping Verified
DMA Enabled Modules
Burst Enabled Modules
Legacy Timing Profile
Pre-Migration Report
Post-Migration Report
Qualification Result

J.5 Incident Reconstruction Notes

When documentation is incomplete, record observations before changing the system. Useful evidence includes handwritten labels, spare-module markings, cable tags, old configuration printouts and service stickers. Do not discard these items until the configuration has been reconstructed.

J.6 Example Decision Narrative

A useful decision note is concise but specific:

“SSB-1 serial interface Rev. F retained in slot 3 during host migration. Module requires compatibility adapter and Legacy-L timing profile under TB-98-011. Address 00009000 and vector 32 preserved. SL-9816 burst disabled for module. Q5 qualification completed 60



minutes with simultaneous acquisition load; no bus errors. Configuration approved under case SC-98-04172."

A poor note would state only "legacy card works." The detailed record explains why it works and what conditions must be preserved.

Chapter K

Quick Reference for Experienced Service Personnel

K.1 Mixed-Generation Review in Ten Steps

1. Identify chassis model and SSB generation.
2. Record every installed module and revision.
3. Mark all SSB-1 hardware separately.
4. Identify controller or SL-9816 bridge revision.
5. Record addresses and interrupts.
6. Identify adapters, timing modules and terminators.
7. Compare module classes with Appendix A.
8. Resolve every CONDITIONAL or VERIFY REVISION item.
9. Select the appropriate qualification load profile.
10. Save before/after configuration reports and service notes.

K.2 Five Rules That Prevent Most Service Errors

1. Do not move a working legacy module without recording its slot and timing conditions.
2. Do not assume connector compatibility equals electrical compatibility.
3. Do not change termination or timing as a guess.
4. Do not enable DMA or burst for an unidentified legacy target.
5. Do not discard the last known-good configuration record.

K.3 Information to Have Before Calling Technical Support

- system model and serial number;
- support case number if one already exists;
- chassis model;
- controller / bridge hardware and revision;
- module list with revisions;
- slot map;

- address and interrupt map;
- timing-module and adapter information;
- termination arrangement;
- configuration report;
- exact fault and when it occurs;
- last known-good configuration.

K.4 Compatibility Status Summary

SUPPORTED	Proceed using ordinary installation and qualification rules.
CONDITIONAL	Proceed only after all listed conditions are met and documented.
SERVICE ONLY	Maintain existing qualified installation; avoid creating a new configuration.
VERIFY REVISION	Stop and identify exact hardware or project record before change.
NOT SUPPORTED	Do not operate the combination.

K.5 Final Reminder

The most reliable SSB system is usually the one whose configuration history is known. Compatibility engineering exists to preserve that history while allowing necessary repair and modernization.



END OF DOCUMENT

RM-SSB2E-04 Revision D

February 11, 1998

Sinneslöschen Systems Corporation
Customer Technical Documentation