Intel® NetStructure™ SS7 Boards

SS7HD Migration Guide

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Intel Converged Communications, Inc.
Parsippany, NJ 07054

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Revision History

Date	Revision	Description
October 2003	001	Supports the SS7HDPD4TE production release.
June 2003	001-01	Initial draft to support SS7HDPD4TE trial release.

Introduction 1

The Intel® NetStructure™ SS7HD boards are a family of signaling boards that offer high performance and high density for signaling, call control, wireless messaging, and Intelligent Network applications. The SS7HD boards can be used with the existing set of SS7 protocols (MTP, ISUP, TUP, SCCP, TCAP, MAP, IS41 and INAP allowing great flexibility when building SS7 applications or platforms. The SS7HDPD4TE board (a PCI board, with four T1/E1/J1 interfaces and an Ethernet port) is the first SS7HD board to be made available, with SS7HD CompactPCI boards to follow in subsequent releases.

The purpose of this document is to assist customers that are migrating their solutions from earlier generation SS7 boards (SPCI4, SPCI2S and CPM8) to SS7HD boards. This document applies directly to the SS7HDPD4TE board, but the information is also relevant to other boards in the SS7HD family.

The protocol APIs used by the SS7HD boards remain identical to existing APIs and the configuration commands and messages are largely unchanged and consequently few changes are required to port an existing application. However, the SS7HD boards provide significantly increased link and processing capacity over earlier generation SS7 boards and therefore some changes to the configuration and maintenance procedures are required. These changes are described in this document.

1.1 Related Information

This document should be read in conjunction with the following documents:

- *SS7HDPD4TE Installation Guide* – C47813
- *SS7HDP Regulatory Notices* – C47814
- Product data sheet available at *http://www.intel.com/design/network/products/telecom/*
- *SS7HD Programmer's Manual* – 05-2063-001

The protocol documentation applicable to earlier generation SS7 boards is also applicable when using SS7HD boards. This documentation includes:

- *ISUP Programmer's Manual* – U04SSS
- *TUP Programmer's Manual* – U09SSS
- *SCCP Programmer's Manual* – U05SSS
- *TCAP Programmer's Manual* – U06SSS
- *MAP Programmer's Manual* – U14SSS
- *INAP Programmer's Manual* – U16SSS
- *IS41 Programmer's Manual* – U17SSS

For general information on the SS7 products and solutions provided by Intel, visit *http://www.intel.com/go/ss7*.

Hardware Features 2

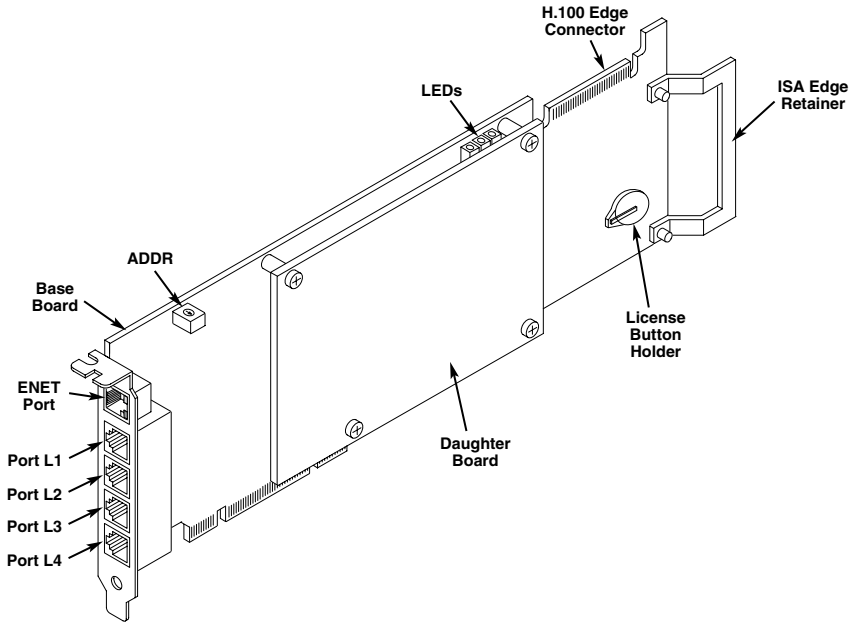
2.1 SS7HD PCI Board Physical Layout

The SS7HD PCI board (SS7HDPD4TE) is a long universal expansion PCI Board that supports 3.3V/5V signaling environments, a 64/32-bit bus width, and a bus speed of 66/33 MHz. The product consists of two primary assemblies:

- Baseboard - A 64-bit PCI board that includes the physical interfaces, framing, CT switch capabilities and the main CPU that controls the complete product.
- Daughter board - Includes the signaling processors that handle the Message Transfer Part 2 (MTP2) protocol layer which runs on the board.

The physical construction of the SS7HDPD4TE board is shown in Figure 1.

Figure 1. SS7HDPD4TE Board



2.1.1 Interface Support

The SS7HDPD4TE board supports four T1/E1 interfaces, a single Ethernet port and an H.100 CT bus interface. The T1/E1 interfaces not only support the standard trunk termination (provided on earlier generation SS7 boards), but also support software selectable high-impedance connections for monitoring applications.

2.1.2 PCI Bus Support

The SS7HD boards extend the PCI support offered in early generation SS7 boards (SPCI4, SPCI2S and CPM8). In addition to 32-bit operation running at 33MHz, the SS7HD boards support both 64-bit and 66 MHz PCI operation. Table 1 shows the supported PCI modes of operation.

Table 1. PCI Operation Modes Supported by SS7HD Boards

Bus Width	Bus Clock Rate	Signaling Environment	
		3.3 V	5 V
32-bit	33 MHz	Yes	Yes
32-bit	66 MHz	Yes	No
64-bit	33 MHz	Yes	Yes
64-bit	66 MHz	Yes	No

2.1.3 H.100 Bus Termination

PCI boards with an H.100 CT Bus require that the clock lines at each end of the CT Bus be terminated. When using SS7HD boards, this can be achieved under software control. Boards at either end of the H.100 CT Bus should have their bus terminators enabled by sending an MVD_MSG_CNFCLOCK message with the **clk_term** parameter set appropriately. This can also be achieved by sending an MGT_MSG_CONFIG0 message with bit 3 of the **l1_flags** field set to 1. See the *SS7HD Programmer's Manual* for detailed information on the MVD_MSG_CNFCLOCK and MGT_MSG_CONFIG0 messages.

Note: For systems that do not use the H.100 CT Bus, it is not necessary to send the MVD_MSG_CNFCLOCK message.

2.1.4 License Buttons

The SS7HD boards use a license button to validate the usage of different software code files. The license button is the same type of physical device as that used with earlier generation SS7 boards. However, license buttons used on earlier generation SS7 boards or variants do **not** work with SS7HD boards.

Configuration and Maintenance 3

There are two methods of configuring SS7HD boards:

- using the s7_mgt utility in conjunction with a text configuration file (config.txt)
- by a user application making direct use of the message passing interface for modules

For most common applications with static configurations, the s7_mgt tool is sufficient. Changes to the commands used by the s7_mgt tool to accommodate the additional capabilities of the SS7HD boards are described in Section 3.1.

For more complex configurations, or those requiring extensive use of dynamic configuration, the message passing interface may be required. Changes to the configuration messages to accommodate the additional capabilities of the SS7HD boards are described in Section 3.2.

For detailed information on the configuration commands and messages used by SS7HD boards, see the *SS7HD Programmer's Manual*.

3.1 Configuration Command Changes

The s7_mgt protocol configuration utility provided for SS7HD boards takes its configuration information from a file typically called config.txt. Many of the commands in this configuration file can remain unchanged, while others have been changed only to increase value ranges. The configuration command changes are described in the following topics:

- config.txt File Changes
- Command Change Summary

3.1.1 config.txt File Changes

In existing config.txt configuration files, the commands that are most likely to require change are:

- SS7_BOARD
- MTP_LINK
- LIU_CONFIG

In most cases, changing the config.txt to use the new formats of these three commands is sufficient to allow the reconfiguration of a system that used earlier generation SS7 boards to a system that uses SS7HD boards.

To convert a system that uses earlier generation SS7 PCI boards (SPCI4 or SPC2S) to a system that uses the SS7HDPD4TE board requires changes to the config.txt file. The required changes are described below.

SS7_BOARD Command Change

The generic SS7_BOARD command replaces the SEPTELPCI_BOARD and SEPTELCP_BOARD commands. The SS7_BOARD command includes a board type identifier that is used to indicate the board type. The board type identifier for the SS7HDPD4TE is SS7HDP. For the CompactPCI boards, the board identifier should be set to SS7HDC.

To convert an entry for an SPCI4 or SPC2S board to an entry for an SS7HDPD4TE board, change the following lines:

FROM

```
SEPTELPCI_BOARD      0         0x0042    ss7.dc3     MTP2
                     |           |         |           |
                <board_id>   <flags> <code_file> <run_mode>
```

TO

```
SS7_BOARD   0     SS7HDP      0x0042    ss7.dc4     MTP2
            |       |           |         |           |
      <board_id> <board_type> <flags> <code_file> <run_mode>
```

Note: Code files for SS7HD boards have a .dc4 extension.

MTP_LINK Command Change

The SS7HDPD4TE board includes two signaling processors each capable of supporting up to 32 links. To accommodate this, the **blink** parameter in the MTP_LINK command has changed from a single value to a pair of values separated by a hyphen, where the first value specifies the signaling processor (sp_id) and the second value specifies the link on that processor (sp_channel).

For example, to process the link on the fourth channel of the first signaling processor on the SS7HD board, change the following lines:

FROM

```
MTP_LINK   0      0       2      2       0      3      5     16    0x0006
           |      |       |      |       |      |      |      |      |
      <link_id>   | <link_ref>  | <board_id>  | <stream>   |    <flags>
            <linkset_id>       <slc>         <blink>      <timeslot>
```

TO

```
MTP_LINK   0      0       2      2       0     0-3     5      16    0x0006
           |      |       |      |       |      |      |      |      |
      <link_id>   | <link_ref>  | <board_id>  | <stream>   |    <flags>
            <linkset_id>       <slc>         <blink>      <timeslot>
```

LIU_CONFIG Command Change

When using SS7HD boards, the LIU_CONFIG *must* be used to explicitly define each Line Interface Unit (LIU) that is required in the configuration setup.

Note: If no LIU_CONFIG commands are used, all T1/E1 interfaces are disabled.

3.1.2 Command Change Summary

Table 2 provides a summary of the command changes that support the enhancement capabilities provided by the SS7HD boards.

Note: See the *SS7HD Programmer's Manual* for detailed information on each command.

Table 2. Command Changes

Command	Changed	Backward Compatible	Change Details
SS7_BOARD	Yes	No	Replaces the SEPTELPCI_BOARD command and takes <board_type> as an additional parameter.
MTP_LINK	Yes	No	The **<blink>** parameter is replaced by a compound parameter that specifies both the signaling processor and the signaling processor channel on the board to be used for processing of the link.
MONITOR_LINK	Yes	No	The **<blink>** parameter is replaced by a compound parameter that specifies both the signaling processor and the signaling processor channel on the board to be used for processing of the link. An SS7HD board has the ability to support the monitoring of some links and the termination of other links at the same time. This is achieved by using the MONITOR_LINK and MTP_LINK commands in the same config.txt file.
LIU_CONFIG	Yes	Yes	The **<liu_type>** parameter supports two new values: • 6 - E1 high-impedance (for monitoring applications) • 7 - T1 high-impedance (for monitoring applications)
LIU_SC_DRIVE	No	Yes	Not applicable.
SCBUS_LISTEN	No	Yes	Not applicable.
MTP_CONFIG	No	Yes	Not applicable.
MTP_LINKSET	No	Yes	Not applicable.
MTP_ROUTE	No	Yes	Not applicable.
MTP_USER_PART	No	Yes	Not applicable.
ISUP_CONFIG	No	Yes	Not applicable.
ISUP_CFG_CCTGRP	No	Yes	Not applicable.
TUP_CONFIG	No	Yes	Not applicable.
TUP_CFG_CCTGRP	No	Yes	Not applicable.

3.2 Message Definition Changes

Details of the message changes are described in the following topics:

- Primary Message Definition Changes
- Message Change Summary

3.2.1 Primary Message Definition Changes

The messages that are most likely to require changes to existing configuration methods are the addition of messages for per-link configuration. The previous format of the MGT_MSG_CONFIG0 is insufficient to hold the much larger number of links that can be supported by SS7HD boards.

The MGT_MSG_CONFIG0 message has therefore been simplified by removing the per-link configuration and each link is now configured using a separate message. The MGT_MSG_L1_CONFIG is used to configure a link and the MGT_MSG_L1_END message can be used to remove a link. Together, these two new messages can be used to dynamically configure links.

3.2.2 Message Change Summary

Table 3 provides a summary of the command changes to support the enhanced capabilities provided by the SS7HD boards.

Table 3. Message Changes

Message	Changed	Backward Compatible	Change Details
MGT_MSG_L1_CONFIG	New	No	Not applicable.
MGT_MSG_L1_END	New	No	Not applicable.
MVD_MSG_SC_CONNECT	Yes	No	Added support for 16 LIUs. A new set of values has been defined to reference the signaling processors. The signaling processor reference has changed from 0x80 (on earlier generation SS7 boards) to 0x90, 0x91, 0x92, or 0x93 depending on the signaling processor being used (on SS7HD boards).
MVD_MSG_SC_DRIVE_LIU	Yes	No	Added support for 16 LIUs. This message no longer supports connections from the LIU to the signaling processor. It only supports connections from the LIU to the CT Bus. The user can use the functionality provided by the MVD_MSG_SC_CONNECT message to make connections between the LIU and a signaling processor.
MVD_MSG_SC_LISTEN	Yes	No	Added support for 16 LIUs. A new set of values has been defined to reference the signaling processors. The signaling processor reference has changed from 0x80 (on earlier generation SS7 boards) to 0x90, 0x91, 0x92, or 0x93 depending on the signaling processor being used (on SS7HD boards).

Table 3. Message Changes (Continued)

Message	Changed	Backward Compatible	Change Details
MVD_MSG_SC_MULTI_CONNECT	Yes	No	Added support for 16 LIUs. A new set of values has been defined to reference the signaling processors. The signaling processor reference has changed from 0x80 (on earlier generation SS7 boards) to 0x90, 0x91, 0x92, or 0x93 depending on the signaling processor being used (on SS7HD boards).
LIU_MSG_CONFIG	Yes	No	Added support for 16 LIUs. Added support for High Impedance.
LIU_MSG_CONTROL	Yes	Yes	Added support for 16 LIUs. Added support for Pseudo Random Bit Sequence (PRBS) generation.
LIU_MSG_R_CONFIG	Yes	Yes	Added support for 16 LIUs. Response message may contain additional information.
LIU_MSG_R_CONTROL	Yes	Yes	Added support for 16 LIUs. Response message may contain additional information.
LIU_MSG_R_STATS	Yes	Yes	Added support for 16 LIUs. Version 1 uses old message exactly the same. Version 2 gives new Pseudo Random Bit Sequence (PRBS) statistics.
LIU_MSG_R_STATE	Yes	Yes	Added support for 16 LIUs.
MGT_MSG_CONFIG0	Yes	Yes	A new value for the board type parameter has been added that is, 3. The use of board type 3 for SS7HD boards requires the use of the MGT_MSG_LAYER1_CONFIG message to configure each link. Configurations using board type 2 are still supported but only allow for the configuration of up to four links.
MVD_MSG_CLOCK_PRI	Yes	Yes	Added support for 16 LIUs.
MVD_MSG_CNFCLOCK	Yes	Yes	Added support for H.100 clock termination.
MVD_MSG_SC_FIXDATA	Yes	Yes	Added support for 16 LIUs.
API_MSG_CNF_IND	No	Yes	Not applicable.
API_MSG_RX_IND	No	Yes	Not applicable.
API_MSG_TX_REQ	No	Yes	Not applicable.
MGT_MSG_EVENT_IND	No	Yes	Not applicable.
MGT_MSG_MTP_EVENT	No	Yes	Not applicable.
MGT_MSG_SS7_EVENT	No	Yes	Not applicable.
MGT_MSG_SS7_STATE	No	Yes	Not applicable.
MTP_MSG_R_RT_STATUS	No	Yes	Not applicable.
MTP_MSG_ACT_SL	No	Yes	Not applicable.
MTP_MSG_CNF_ROUTE	No	Yes	Not applicable.

Table 3. Message Changes (Continued)

Message	Changed	Backward Compatible	Change Details
MTP_MSG_DEACT_SL	No	Yes	Not applicable.
MTP_MSG_PAUSE	No	Yes	Not applicable.
MTP_MSG_RESUME	No	Yes	Not applicable.
MTP_MSG_STATUS	No	Yes	Not applicable.
MVD_MSG_CLK_IND	No	Yes	Not applicable.
MVD_MSG_LIU_STATUS	No	Yes	Not applicable.
MVD_MSG_R_CLK_STATUS	No	Yes	Not applicable.
MVD_MSG_RESETSWX	No	Yes	Not applicable.
SS7_MSG_R_STATE	No	Yes	Not applicable.
SSD_MSG_RESET	No	Yes	Not applicable.
SSD_MSG_RST_BOARD	No	Yes	Not applicable.
SSD_MSG_STATE_IND	No	Yes	Not applicable.

Protocol Support 4

Protocol support is described in the following topics:

- MTP2
- Monitoring
- Other Protocols

4.1 MTP2

The software for SS7HD boards supports the MTP2 protocol with up to 64 signaling links per board. The initial release does not support the running of protocol layers other than MTP2 on the SS7HD board.

4.2 Monitoring

SS7HD boards support monitoring-only operation when used with the appropriate license button. This can be used in conjunction with the high impedance LIU modes to allow passive monitoring. In addition, when licensed for MTP2 operation, the SS7HD boards can support a mixed mode of both SS7 termination and monitoring.

4.3 Other Protocols

To support the protocol layers above MTP2, the higher layer software can be supplied to run on the host. These protocols include MTP3, ISUP, TUP, SCCP, TCAP, MAP, IS41 and INAP. In all cases, the APIs to the protocols remain identical to the protocol APIs for existing modules. No changes are required to the configuration of these higher level protocols.

Future releases of the SS7HD board software will allow these protocols to be run on the board freeing the CPU power of the host for use by the application.

Development Package 5

The production release of the SS7HDPD4TE board requires the use of the SS7 Development Package for Linux (V3.01 or later). This package is required to use the board and provides an updated set of drivers.

Note: The development package continues to support existing board types.

5.1 Linux* Support

The SS7 Developement Package for Linux supports a number of different kernel versions. The kernel versions supported by V3.01 of the development package are shown below. For each kernel version, a uni-processor and symetric-multiprocessor (SMP) driver is provided.

- Red Hat* Linux* Version 7.2 (with Kernel Version 2.4.7-10)
- Red Hat* Linux* Version 7.2 (with Kernel Version 2.4.9-13)
- Red Hat* Linux* Version 7.3 (with Kernel Version 2.4.18-3)
- Red Hat* Linux* Version 8.0 (with Kernel Version 2.4.18-14)

5.2 Windows* Support

The first release of the SS7HD boards does *not* support the Windows* operating system. Support for Windows* NT* 4.0, Windows* 2000 and Windows* XP Pro will be added in a future release.

5.3 Code Files

Download code files for SS7HD boards are identified by the .dc4 filename extension. The code file ss7.dc4 currently provides both MTP2 and monitoring operation. It will support other protocols at a later release. The monitor.dc4 code file is no longer required as support for monitoring is provided within the ss7.dc4 code file.

5.4 SSD/SSDH Module

The module that interfaces between the message passing environment on the host and the board itself is generically called ssd. A new version of this module, called ssdh, has been created for SS7HD boards. The ssdh module must be used with the SS7HD boards.

Glossary 6

config.txt	A text file used for protocol configuration.
CT Bus	A time division multiplex (TDM) bus that provides 1024, 2048, or 4096 time slots for exchanging voice, fax, or other network resources on a PCI (H.100) or CompactPCI (H.110) backplane. The Enterprise Computer Telephony Forum (ECTF) developed the H.100 hardware compatibility specification that defined the CT Bus, a high-performance mezzanine bus. The CT Bus works with both SCbus and Multivendor Integration Protocol (MVIP) compatible products. The ECTF implementation of the CT Bus for CompactPCI bus is called the H.110 standard.
MTP	Message Transfer Part. Layers 1 to 3 of the SS7 protocol stack broadly equivalent to the Physical, Data Link and Network layers in the OSI protocol stack. See also MTP1, MTP2, and MTP3.
MTP1	Message Transfer Part Level 1. An SS7 stack layer that defines the physical and electrical characteristics of the signaling links of the SS7 network. Signaling links use DS0 channels and carry raw signaling data at a rate of 48, 56 or 64 kbps.
MTP2	Message Transfer Part Level 2. An SS7 stack layer that provides link-layer functionality. Ensures that two end points of a signaling link can reliably exchange signaling messages. It provides error checking, flow control and sequence checking.
MTP3	Message Transfer Part Level 3. An SS7 stack layer that provides network-layer functionality. Ensures that messages can be delivered between signaling points across the SS7 network regardless of whether the signaling points are directly connected. It provides node addressing, routing, alternate routing and congestion control.
ISUP	ISDN User Part. A SS7 stack layer that defines the messages and protocol used in the establishment and tear down of voice and data calls over the public switched network, and to manage the trunk network on which they rely.
LIU	Line Interface Unit.
Link	A physical and logical connection between two signaling points.
Linkset	One or more signaling links that are connected to adjacent signaling points.
PRBS	Pseudo Random Bit Sequence. A technique used for bit error rate testing on T1/E1/J1 trunks.
route	An MTP concept that determines how signaling is distributed over linksets. A route consists of a destination point code and the linkset ID of one or two link sets over which traffic to the destination node should be routed. When two linksets are provided, the user can choose to load share traffic or treat the link sets as primary and secondary.
TUP	Telephone User Part. An SS7 stack layer that is the predecessor to ISUP (Integrated Services User Part). TUP was employed for call control purposes within and between national networks, both wireline and wireless. ISUP adds support for data, advanced ISDN, and IN (Intelligent Networks). See also ISUP.
s7_mgt	A utility that performs one time protocol configuration of all protocol modules using configuration parameters from the config.txt file.
SS7	Signaling System Number 7

SS7HD	An identifier for the family of Intel® NetStructure™ High Density SS7 boards.
SS7 Protocol Stack	A set of software modules that implement the various layers of the SS7 protocol stack.

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