TimeHub® 5500 System

NEBS Level 3 Certified Building Integrated Timing Supply for Carrier-Grade Networks

Summary

The Microchip TimeHub® 5500 System is the next-generation Building Integrated Timing Supply (BITS) designed for communication service provider networks. The TimeHub 5500 System is designed to meet all traditional central office synchronization and timing requirements.

Explosive growth in telecommunications traffic, especially in video and data, has led to new technologies and critical applications. Service providers are growing to meet this demand. As a result, the requirements for synchronization have changed dramatically.

Microchip's TimeHub 5500 System is a modular, fully redundant timing distribution system that tracks incoming timing references and qualifies the signals against network timing standards. It then filters and distributes precise timing to all equipment in the central office.

The TimeHub 5500 System's main shelf provides up to 160 1+1 protected outputs. If more outputs are required, up to four expansion shelves can be connected to the main shelf, increasing the capacity to over 1,400 fully protected 1+1 ports per system.

Management and Alarm Collection

The TimeHub 5500 system provides a new dimension in management by integrating and monitoring the performance of legacy equipment.

As an intelligent network element, the TimeHub 5500 system provides full visibility and manageability of all input and output ports and all cards on the main and expansion shelves. System parameters can be modified and controlled through any of its multiple interfaces—serial and Ethernet.

Microchip's TimePictra® Element Management System is available to support TimeHub 5500 synchronization networks. TimePictra platform is a web-enabled management system with full FCAPS capabilities: fault, configuration accounting (inventory), performance and security management. This carrier-grade platform has a scalable, modular architecture that will grow and evolve with the network.

Monitoring Inputs

The ability to monitor multiple inputs allows performance measurement of existing local and remote BITS or any DS1 line. Up to eight DS1 and one 5 or 10 MHz inputs can be monitored simultaneously and their results sent to the NOC. This helps ensure that legacy BITS meet carrier-grade standards for reliability and compatibility with existing central office equipment.

Key Features

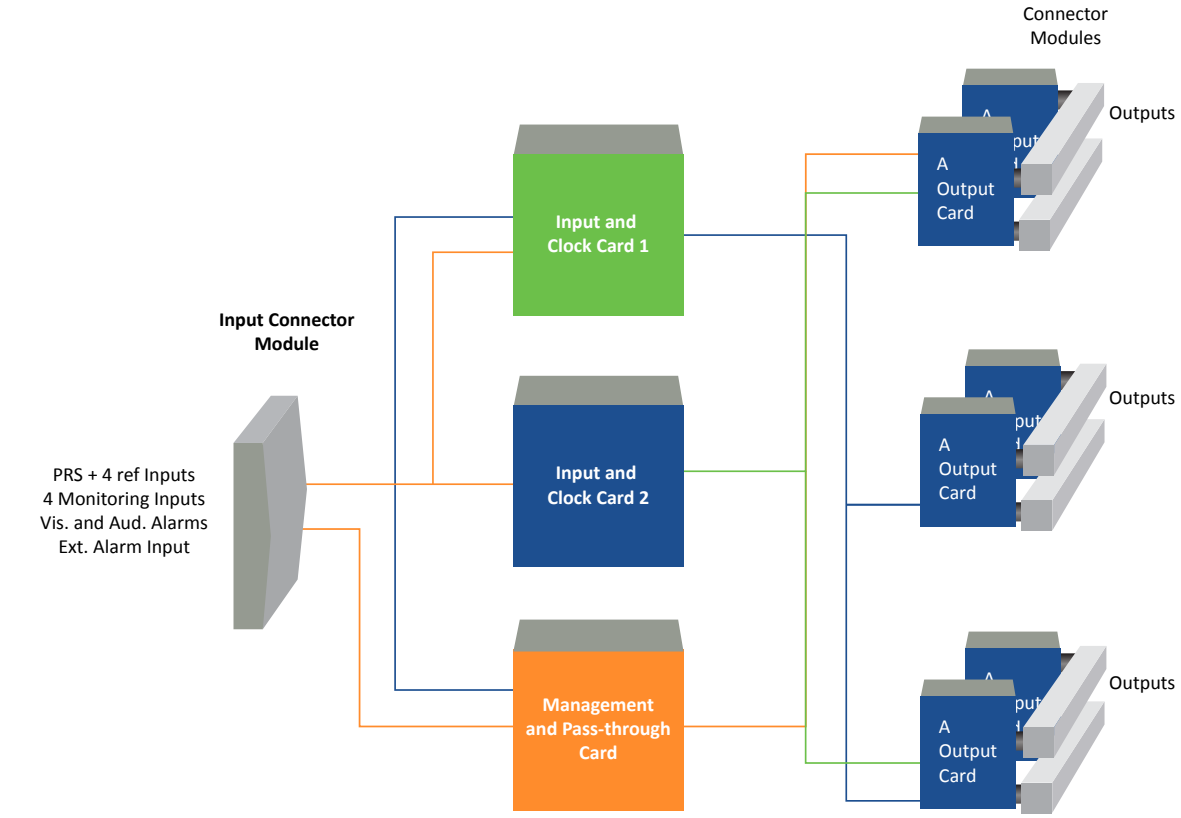
- Next-generation Building Integrated Timing Supply (BITS) cards IPv4 and IPv6
- Supports all physical layer synchronization requirements
- More than 1400 protected outputs per system
- Single output card generates CC and DS1 signals
- Full SSM support
- Main or remote shelf operation
- TL1 management
- TL 9000 quality certified
- NEBS level 3 certified

Key Benefits

- Single platform for TDM and packet network synchronization
- Redundancy protects client clocks and network elements from potential service outages
- Proven interoperability with wide range of network elements and synchronization clients
- Scalable: plug-in cards and expansion shelves allow easy incremental growth

Applications

- Carrier network synchronization



TimeHub 5500 System Architecture

Input and Clock Cards

The input and clock cards are combined in a single card with a highly stable clock engine. Each card accepts four DS1 inputs and one selectable 5 or 10 MHz input, plus four addional DS1 inputs for monitoring purposes only.

The cards are available in either rubidium or quartz versions. The Stratum 2 and Stratum 3E clocks exceed the minimum specification requirements during holdover.

SmartClock Technology

SmartClock technology improves the performance and accuracy of the clocks. Using intelligent firmware algorithms, SmartClock "learns" the effects of aging and temperature on the clock while it is locked to the reference signal and stores this information. When the incoming reference signals are lost or disqualified, SmartClock uses the stored data to compensate for frequency changes during holdover. The system will continue to distribute highly stable synchronization signals while predicting and correcting the behavior of the oscillators until input reference signals are restored. SmartClock provides a superior level of synchronization and timing stability during holdover that other methods cannot achieve.

Output Cards

Each of the TimeHub 5500 System's output cards provide 40 outputs. The outputs are split in two groups of 20 outputs each.

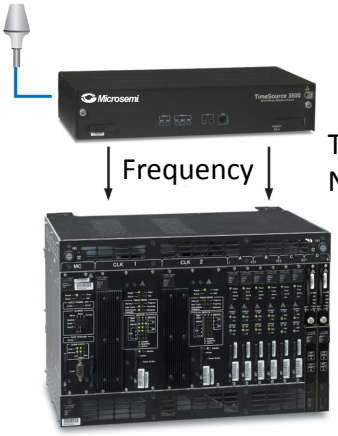
Depending on passive connector modules plugged in the back of the shelf, each group can provide 20 DS1 or CC output signals. The output cards recognize the connector modules and automatically switch each group to the appropriate signal type.

Output modules can be mixed in any combination to provide DS1 and CC output signals from the same card group. This unique feature adds flexibility to the TimeHub 5500 system, minimizing inventory costs and simplifying planning and maintenance of the synchronization network.

Protected Outputs

The TimeHub 5500 System 1+1 is a truly hitless protection scheme. Unlike 1:n protection schemes where only one card provides output signals at a time, in the TimeHub 5500 System 1+1 scheme, both output cards remain active. If a card fails or is removed, the mate card is already providing a signal to the network elements. No time is lostwaiting for a stand-by card to recognize a failure before it becomes active. The result is a clean, hitless timing signal no other protection scheme can offer.

TimeSource® Primary Reference Source



Time-of-Day Connection (Establishes NTP Stratum Level 1 Traceability)

TimeHub® 5500System Building Integrated Timing Supply

TimeHub 5500 System Main Shelf shown with TimeSource PRS

Expansion Shelf

When 160 ports are not enough, the TimeHub 5500 System offers additional outputs via its expansion shelves. Each of the four additional expansion shelves can provide up to 320 protected outputs, bring the total capacity of a single system to 1440 ports. All communication and alarms are managed by the TimeHub 5500 System's Main shelf through redundant expansion link cabling.

Main or Remote

A remote shelf makes it possible to synchronize network equipment located on multiple floors or in other buildings within large central office facilities, while maintaining phase alignment with a main synchronization system. A unique TimeHub 5500 feature allows utilizing the same main shelf and cards as a remote system. This reduces inventory costs and simplifies the transition from main to remote shelves when expanding or upgrading central offices.

By setting a switch on the main shelf to operate as a remote system, intelligent algorithms in the management and clock cards modify their operation by adjusting their parameters and electronics to operate as a remote system.

The ST2 and ST3E clock cards will align in phase to the active CC input signal. Upon losing the CC reference signals, the intelligent clocks will provide ST2 or ST3E holdover performance preventing data slips for hours or days. This proprietary TimeHub 5500 System feature gives the maintenance crew additional time to troubleshoot network problems, while ensuring the network continues to provide carrier-grade Quality of Service. The TimeHub 5500 System's remote shelves can also operate in conjunction with existing BITS. Carriers can enhance older BITS systems with state-of-the-art synchronization technology, while maximizing the value of their investment in legacy technology.

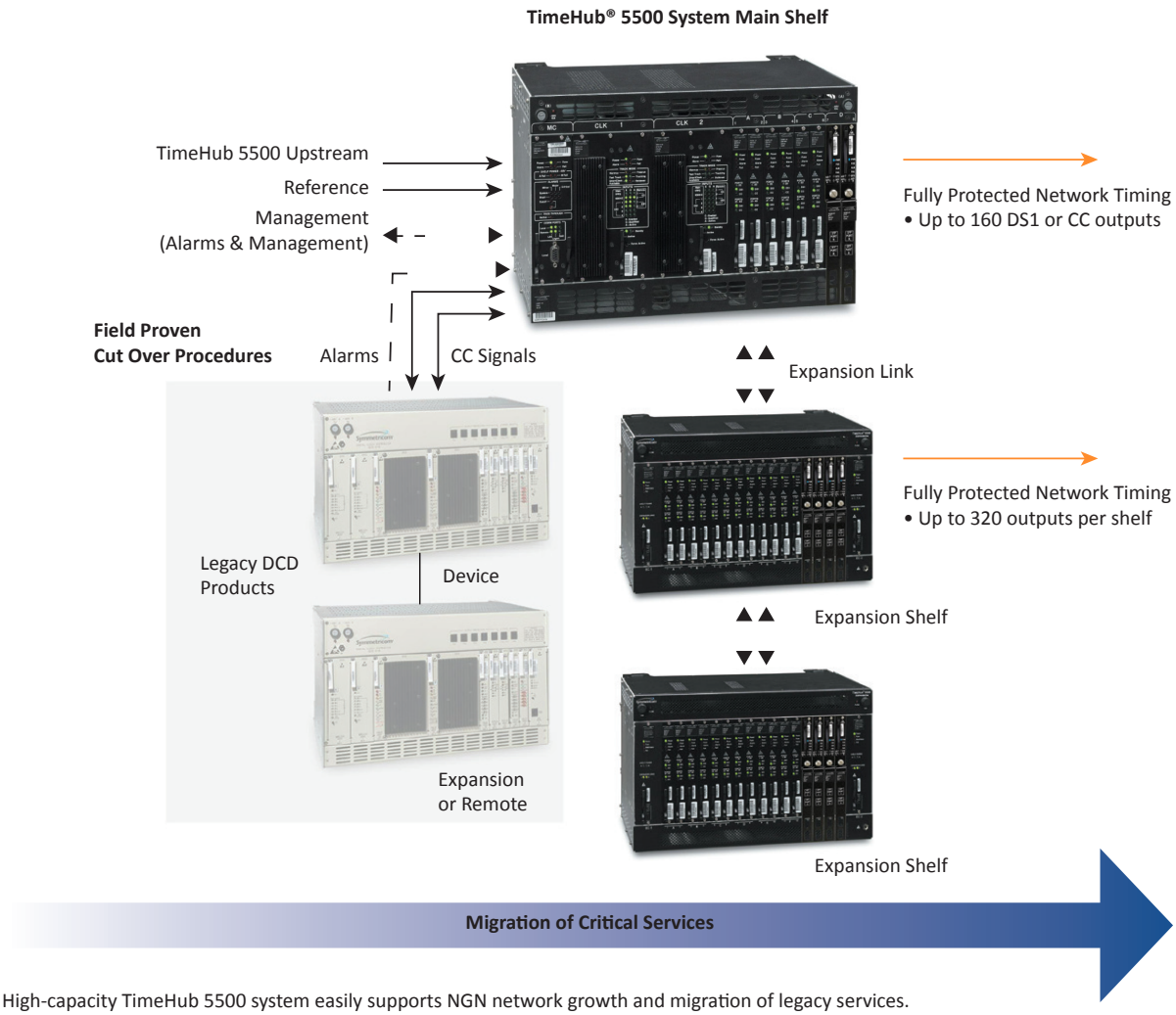
SSM Support

Synchronization Status Message (SSM) is a useful tool for monitoring and maintaining the health of the synchronization network. Main, expansion and remote TimeHub 5500 products support the latest SSM messages.

System Update

To keep the TimeHub 5500 Main and Remote systems with the latest features and standard recommendations, software can be easily downloaded.

Maintenance personnel can remotely download firmware into the system in minutes via the Ethernet connection. This saves time and avoids sending a maintenance crew to the site to replace cards.



High-capacity TimeHub 5500 system easily supports NGN network growth and migration of legacy services. Cut over without impact on connected network elements.

Connectivity

The TimeHub 5500 System offers serial and Ethernet connectivity. Multiple TCP/IP sessions allow NOC personnel as well as local maintenance people to access the system. Microchip's network element management system, the TimePictra Platform, provides visibility for all network elements from the TimeHub 5500 System, TimeSource® Enhanced PRTC and third-party network elements.

NEBS Level 3 Certification

Microchip's TimeHub 5500 system is Network Equipment Building System (NEBS) Level 3 certified. This ensures all TimeHub 5500 system components meet carrier-grade standards for safety, reliability and compatibility with the customer's existing equipment.

Applications

The TimeHub 5500 system was designed for critical applications where network elements require truly hitless timing, flexibility and growth capability for NGN physical layer synchronization requirements as well as application and management layer packet timing requirements.

Legacy Microchip or third-party synchronization equipment can easily be upgraded by front-or back-ending them with TimeHub 5500 systems. The TimeHub 5500 system will collect the alarms and monitor their performance, while integrating them into a management environment.

Microchip Global Services

Microchip provides synchronization services that assist customers with the planning, deployment and maintenance of synchronization infrastructure. Services are designed to help lower costs, streamline processes, ensure quality, and deliver the highest level of performance from your synchronization network.

Specifications

Main Shelf

- Reference and monitoring inputs:
  4 DS1 (1.544 Mb/s), 1 5/10 MHz (selectable)
- Phase alignment input: 1 CC (64 kbps)
- Additional monitoring inputs: 4 DS1 (1.544 Mb/s)
- Input framing: D4 or ESF (selectable)

Remote Shelf

- Reference inputs: 2 CC (64 kbps)
- Auxiliary SSM inputs: 2 DS1 (1.544 Mb/s)

Main and Remote Shelves

- Clock types:
  - ST2: Rubidium based, 9 inputs
  - ST3E: Quartz based, 9 inputs
- Holdover stability:
  - ST2: Typically better than 1×10^{-11} in 24h (25°C)
  - Exceeds GR-1244 for ST2 clocks
  - ST3E: Typically better than 1×10^{-10} in 24h (25°C)
  - Exceeds GR-1244 for ST3E clocks
- Clock control: Direct Digital Synthesis (DDS) with smart-clock technology
- Output capacity: up to 160 protected (1 + 1) or unprotected outputs
- Expansion: up to 4 expansion shelves per main or remote

Expansion Shelf

- Output capacity: up to 320 protected (1+1) or unprotected outputs
- Redundancy: 2 identical links to main shelf, 2 identical controller cards

Output Cards

- Outputs per card: 40
- Output signals: DS1 and CC from the same card 40 DS1, 40 CC, or 20 DS1 and 20 CC
- Framing: D4 or ESF, selectable in two groups of 20

Electrical

- Signals:
  - DS1: GR-499-CORE
- Line code code B8ZS 100Ω balanced, W-W
  - CC: GR-378-CORE
- Line code bipolar RTZ 133Ω balanced, W-W
  - 5/10 MHz: Sine or square wave
- 0.5 V p-p 50 Ω unbalanced, BNC
- Operating voltage: −42V dc to −60V dc
- Current
  - Main, Remote: 6A (max.)
  - Expansion: 4A (max.)

Alarms

- Severity (audible and visible):
- Minor, Major, Critical: N.O. and N.C. contacts
- External alarm inputs: 10

Management and Communication

- Communication ports:
  - 1 Serial RS-232
  - 1 Ethernet connection (10 Base-T)
- Connectors:
  - 2 DB-9F (front and rear)
  - 1 RJ-45 in the rear
- Baud rate: 1200, 2400, 9600, 19200
- Sessions: up to 10 simultaneous TCP/ IP sessions
- Storage capacity: over 1,000 events

General

- SSM: Compliant with SSM specifications per T1X1.3 TR-33, Telcordia GR-253-CORE and GR-378-CORE
- Operating temperature: -5°C to +55°C (23°F to 131°F)
- Operating humidity: 5% to 95%
- Shelf dimensions mm (in.): 267 H × 422 W × 295 D (10.5" H × 16.6" W × 11.6" D)
- Certifications:
  - Telcordia NEBS Level 3 certified
  - AT&T TP-76200/76450
  - VZ.TPR.9305
  - UL 62368-1, CSA C22.2 no. 62368-1