

# DCD-523

## Digital Clock Distributor Network Synchronization System



The DCD-523 is a synchronization and timing distribution system that provides the accurate clock references needed throughout your network to assure reliable synchronization. The DCD-523 platform addresses timing applications from Stratum 1 to Stratum 3. Its system architecture offers the enhanced reliability of a fault-tolerant network to address all existing and future timing/synchronization needs.

Modular design provides optimum flexibility. For example, Primary Reference Clock (PRC) ST1 applications are provided by adding any of the TimeSource® products, or the DCD-LPR (Local Primary Reference) system to the input of the DCD-523 Multi-Reference Controller (MRC).

Or, for slave clock applications, the DCD-523 can be equipped with a variety of clocks, including the ST2E, TNC, and ST3E, with outputs in any timing signal format.

The DCD-523 is backwards compatible with most existing DCD cards. The user can migrate to the DCD-523 and preserve existing quality.

Management of the system is possible via the Version 5 cards. Inputs and outputs to and from the system can be provisioned, alarms and status can be retrieved, and performance data collected can be downloaded to analyze network performance. SSM messaging is supported by the Version 5 cards.

## Architecture

A fully redundant modular architecture is used throughout the DCD-523 from the reference inputs and clock cards, to the timing outputs.

Automatic, hitless switching ensures continued operation if any input reference signal, input card, or on-line clock is lost.

The timing output signals are protected with a 1:N switch matrix. Each active plug-in card has its own dc/dc power converter for additional reliability.

## Reference Inputs

A variety of input cards are available for the DCD-523. Enhanced performance for ST1 applications is available using the optional MRC, which provides a majority vote algorithm that optimizes up to four reference inputs plus the internal clocks.

Other input cards accept DS1, analog, and composite clock timing reference sources. SSM messaging is supported via two new dual input cards.

## Clocks

The redundant, on-line, ultra-stable, clocks filter the input timing signal to virtually eliminate phase transients, jitter and frequency wander feedthrough. If the input reference is lost or out of tolerance, the clocks provide highly stable holdover timing to allow the network to operate error-free for several hours or many days, depending on the clock installed (rubidium or quartz).

The performance level of each clock exceeds the relevant industry requirements in both locked and holdover modes. The ST3E is specifically designed for new synchronous transmission systems such as SONET. The ST2E improves upon those capabilities and provides fault tolerant clock performance suitable for PRS applications.

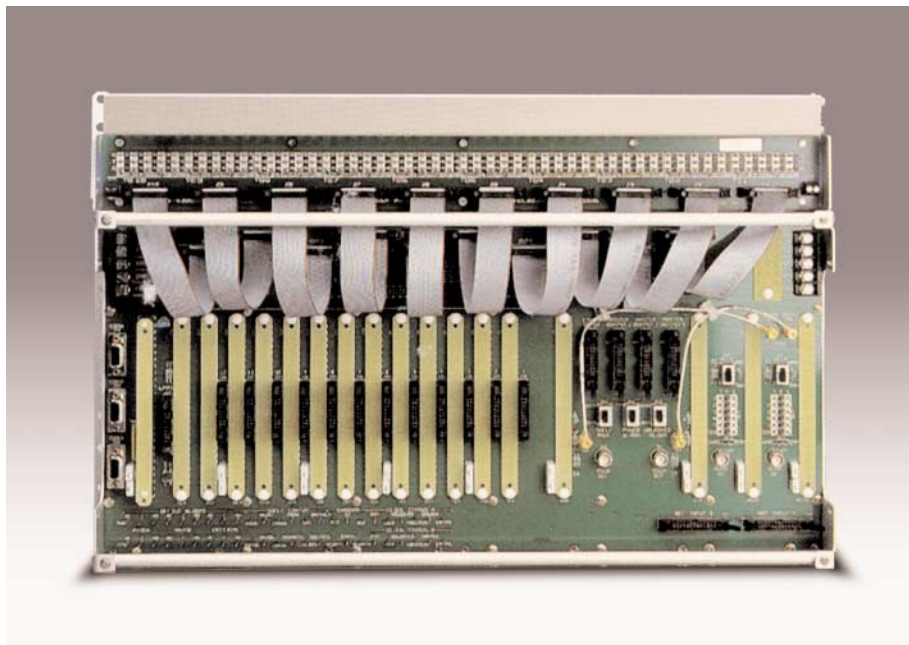
## Timing Outputs

DS1, E1, CC, analog, or logic-level timing output signals are provided by plug-in cards with up to 10 ports each. A fully equipped system can provide up to 480 timing outputs.

Output signals and formats may be intermixed in any shelf and are protected by automatic switching.

The optional Synchronous Clock Insertion Unit (SCIU) inserts traceable DCD timing onto DS1 circuits for special applications. An E1 version is also available.

Each master or expansion shelf has 12 card positions. All positions are available for timing outputs, sync clock insertion, sync monitoring, or other applications.

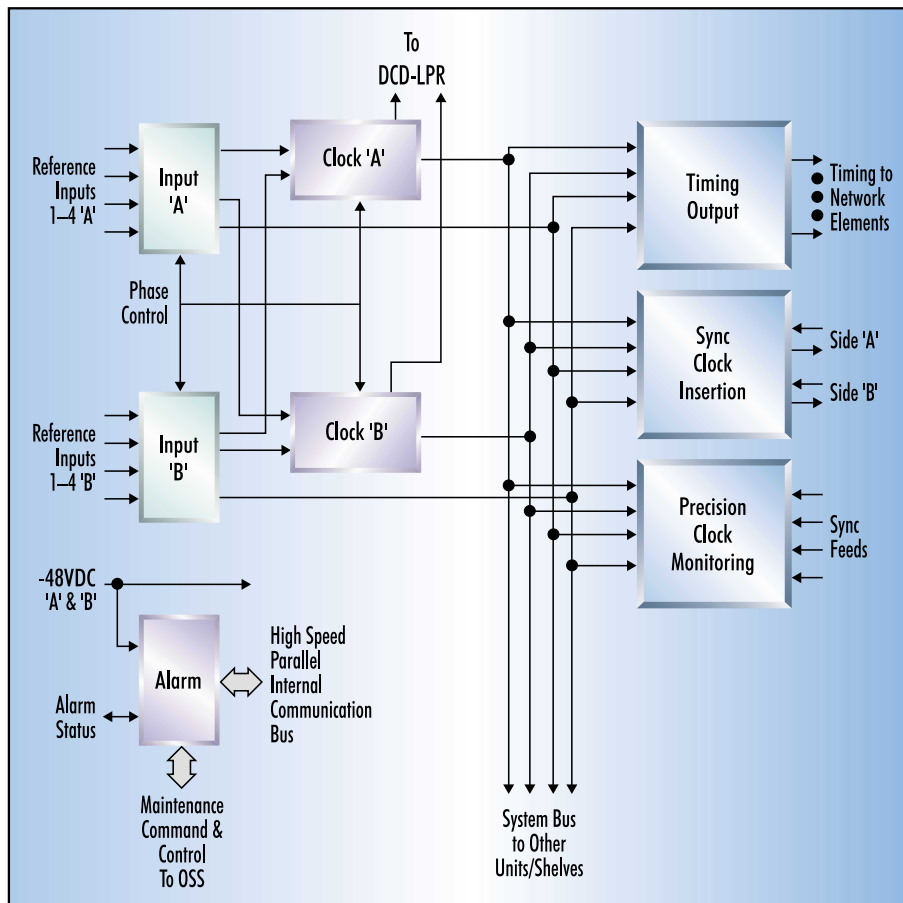


The DCD-523 is designed for installation in standard NEBS racks (or cabinets) flush or recessed. Shown with rear-access customer connections.

## System Highlights

FEATURE	BENEFIT
Fully integrated clock system for all levels of timing signals.	Provides BITS synchronization service anywhere in your network.
Smart front end (Multi-Reference Controller) option selects, qualities and majority votes from multiple reference inputs.	Always operates with the best reference available for optimum performance.
High-stability filter clocks: ST2E, TNC, ST3E, ST3. Upgradable to full PRC or ST1 performance with TimeSource or DCD-LPR.	Hierarchical network partitioning; increases overall network timing precision and performance for SONET, etc.
Phase transient management.	Eliminates phase transients, jitter and wander. Facilitates network hitless architecture.
Timing outputs in a wide variety of format combinations.	Provides the exact sync signal needed for every network element.
Fault-tolerant telecom architecture; distributed intelligence; modular/expandable.	Addresses all existing and future timing and synchronization needs.
SSM Handling capability	Easy interface to the latest SONET systems and compatibility with the latest SSM standards.

## System Diagram



## Sync Monitoring

The optional Precision Sync Monitoring unit (PSM) provides better than 5-ns resolution performance reports of MTIE and TVAR. Each PSM plug-in monitors four links; the PSM can be used in place of two TO cards.

## Status and Control

DCD-523 status is indicated locally by LEDs and relay closures. For remote maintenance and diagnostics, the DCD-523 interfaces to a network OSS via the Maintenance Interface System (MIS). Current status, real-time alarms, sync monitoring, and the event log are transmitted either autonomously or on demand.

## Management

Via a new generation of cards (Version 5) the system can be remotely provisioned, controlled and monitored.

## SSM Capability

SSM messages can be handled by the DCD-523.

## Software Download

Software can be downloaded to the MIS card, allowing the system to be updated and upgraded when required.

## DCD-523 Specifications

**SYSTEM** Total DCD-523 system provides up to 48 output card positions: master shelf with 12 outputs card positions plus up to 3 expansion shelves with 12 output card positions each • 1:N protection per shelf • Dual input cards referenced from up to 4 secure sources each • Dual on-line clocks (automatic switching) • Control, alarms and precision monitoring locally or from remote network control center.

REFERENCE INPUT	Signal type	<b>DS1</b>	<b>CC</b>	<b>Analog</b>	<b>E1</b>	<b>Analog</b>	<b>Analog</b>
		T1.102	Bipolar RTZ	6.703, § 10	6.703, § 6	Sine Wave	Square Wave
	Rate	1.544 Mb/s	64/8 kb/s	2.048	2.048 Mb/s	1, 5, 10 MHz	2.048 MHz
	Impedance	100Ω	135Ω	75Ω	75Ω	75Ω	75Ω

INTERNAL CLOCK	Clock type	<b>Stratum 2E</b>	<b>TNC</b>	<b>Stratum 3E</b>	<b>Stratum 3</b>
		Rubidium	OCXO	OCXO	TCXO
	Holdover (25°C) 0 - 24 hrs	$2 \times 10^{-11}$	$3 \times 10^{-10}$	$3 \times 10^{-10}$	$3 \times 10^{-10}$
	Pull-In	$1.6 \times 10^{-8}$	$7.5 \times 10^{-7}$	$5.6 \times 10^{-6}$ or $2 \times 10^{-6}$	$4.6 \times 10^{-6}$

TIMING OUTPUTS <sup>2</sup>	Signal type	<b>DS1</b>	<b>E1</b>	<b>CC</b>	<b>Square Wave</b>	<b>Analog</b>	<b>Logic Level</b>
		T1.102	6.703 § 6	Bipolar RTZ	6.703 § 10	Sine Wave	RS-232, 422, 423, TTL
	Frequency or Rate	1.544 Mbps	2.048 Mbps	64/8 Kbps	2.048 MHz	8 kHz or 1, 5, 10 MHz	4 kb/s to 2.048 Mb/s
	Ports/Card	10	10	10	10	2	5 or 10

MONITORING	Signal	4 at 1.544 Mb/s per card or 4 at 2.048 Mb/s or MHz per card
	Resolution	≤ 5 ns
	Storage	96—15 min. data registers
	Measurements	MTIE (maximum TIE); TVAR (time variance); phase and digital error performance

MAINTENANCE INTERFACE	Language	TL1
	Alarm/Status	Contact closures, front panel LEDs, Serial Alarms
	Remote Interface	RS-232, DB-9

GENERAL	Mounting	NEBS 23-inch rack; flush or recess mounting; depth 12 inches; rear access
	Power	Dual -48 Vdc ± 10%
	Temperature	0° to 50° C (operational)

<sup>1</sup> The 2E and 3E are TR-1244 compliant clocks.

<sup>2</sup> Various combinations of timing signals available with card options.

<sup>3</sup> Specifications subject to change without notice.



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