



StarClock 200E

Expandable Synchronization Timing System

Highlights

- Up to 3,062 Outputs available
- Specialized inputs cards providing T1, 1.544MHz, E1, 2.048MHz and CC, 5/10MHz sinewave
- Stratum 1/Primary Reference Clock (PRC), Stratum 2/Transit Node Clock (TNC), or Stratum 3E/Local Node Clock (LNC) Synchronization Timing System
- Stratum 2/TNC and Stratum 3E/LNC reference oscillators
- Specialized output cards providing DS1, Composite Clock (CC), E1, 2.048MHz Square Wave, RS-422 (1.544MHz or 8kHz Square Wave), Time of Day (TOD), 5/10MHz sine, Network Time Protocol (NTP) with InterRange Instrumentation Group (IRIG-B)
- Outputs are synchronized to one of two redundant input references
- Monitors performance of up to 10 inputs
- Synchronization status messages meet Bellcore GR-378 and ANSI T1X1.3 TR-33
- Fully Redundant power, -48Vdc nominal
- Fully Network Equipment-Building System (NEBS) Level 3 certified: GR 63, 78, 1089 CORE
- NEBS 19-/23-inch rack mounting
- Patented Direct Digital Frequency Synthesizer (DDFS) for all Stratum levels (CleverClock™ oscillator predictability algorithm)
- Ethernet TCP/IP and RS-232 ports for remote system configuration and reporting
- Hitless switching between input references, clock cards and protected outputs
- Phase locked CC outputs
- Conforms with all relevant Bellcore documentation
- Fully modular for expandability and flexibility

The CXR Larus StarClock 200E™ is a totally integrated and expandable system for use in T1, E1, 2.048MHz, CC, 5 and 10MHz synchronization applications. The StarClock 200E system provides flexible and cost effective solutions to Stratum 1/PRC, 2/TNC, and 3E/LNC digital transmission timing and synchronization applications. The system can be utilized in either DS1 or E1 environments simply by selecting the appropriate modules and shelf.

The StarClock 200E circuit card provisioning settings and operating functions are software generated, affording both speed and flexibility in system application changes, testing, and monitoring. Except for the 5/10MHz and NTP output card selections, each of the output cards provides 20 outputs and the CXR Larus rack-mounted Master shelf can accommodate up to 10 output cards. The maximum number of outputs per Master shelf is 200, which can be arranged in 100 protected pairs if desired, on a card-by-card basis.

The optional Expansion shelf provides up to an additional 360 outputs (or 180 protected), for a total of 558 outputs (279 protected). A total of 8 expansion shelves can be



combined to provide up to 3,062 total outputs (1,531 protected), enough for the largest Central Office. Optional modules include track and hold cards with integral GPS receivers. Designed to provide timing for transmultiplexers, Digital Access and Crossconnect Systems (DACS), SONET equipment, digital switches, VoIP media gateways, vocoders, and channel banks. The StarClock 200E offers internal system monitoring and performance measurement combined with remote and local reporting in TL1 format or pull down menu. All system configurations, including GPS, DS1 and E1 clocks are mounted in the system shelf and operate in similar or dissimilar pairs. Stratum upgrades are achieved by replacing plug-in circuit packs. Performance measurement and monitoring as well as local and remote reporting features can be selected initially or installed later as system upgrades.

The StarClock 200E systems (Stratum 1, 2, and 3E versions) use two 54511 T1, 54512 E1/2.048MHz, or 54513 CC, 5/10MHz Input Cards. Stratum 3E/LNC systems add two 54522 Stratum 3E/LNC Track and Hold Cards, while Stratum 2E, 2/TNC configurations include two 54523 2E, Stratum 2/TNC Track and Hold Cards. Stratum 1/PRC configurations are equipped with two 54591 GPS Stratum 1/PRC Track and Stratum 3E/LNC Hold Cards (Stratum 3E holdover) or two 54593 GPS Stratum 1/PRC Track and Stratum 2/TNC Hold Cards (Stratum 2 holdover). Each 54591 and 54593 module incorporates a radio receiver and timing processor for use with the Global Positioning System (GPS) of satellites.

Holdover performance above STR2 and ST3E is accomplished by a predictability algorithm, CleverClock™ that automatically corrects for the drift characteristic of a given oscillator.

Input cards convert input signals into reference timing for the track and hold circuits. The track and hold cards provide the essential features of phase tracking, jitter smoothing, and holdover clock on input reference failure. Output driver cards supply any mix of twenty DS or E1 framed all-ones, CC, 2.048MHz Square Wave, 1.544MHz EIA RS-422 Square Wave, 8kHz EIA RS-422 Square Wave, and TOD outputs or four 5/10MHz outputs for driving



CXR Larus StarClock 200E

D type channel banks, DACS, transmuxes (LTs), PBXs, or other network transmission and switching equipment. The GPS cards typically lock on multiple satellites, but will lock to one satellite and provide the required tracking accuracy. Two additional modules are available, the Network Time Server plug-in Module, Model 54580 which provide NTP and IRIG-B outputs, and the Model 54581 Timing Insertion Unit Module, which allows legacy equipment not equipped with external timing inputs to receive the benefit of improved Stratum level timing.

Stratum Definitions

Stratum 1/PRC

The stratum clock normally tracks Cesium or GPS input signals from four to eight satellites maintained to be traceable to UTC time to an accuracy of 1×10^{-11} . The unit is also capable of deriving timing when tracking only one satellite. If no GPS input is available, the 54593 or 54591 card will track a connected input reference or, in the absence of inputs, operate in holdover mode as ST2 or ST3E from an internal rubidium (54593) or ovenized crystal (54591) oscillator.

Stratum 2/TNC/Stratum 2E

The stratum clock tracks an input under normal conditions, and holds to the last best estimate during impaired conditions. The long term drift with no input reference is less than 1.6×10^{-8} in one year for ST2 and 1×10^{-8} per year for ST2E. The short term drift is less than 1×10^{-10} in

24 hours, equivalent to one frame slip in 7 days in holdover mode. CXR Larus' Stratum 2 clock drifts less than 7.5×10^{-11} per day, or the first frame slip in about 9.6 days. In reality, the first frame slip will happen in about 60 days under typical conditions. The ST2E drift is less than 1×10^{-11} per day at 22 °C.

Stratum 3E/LNC

The stratum clock tracks input signals within ± 7.1 Hz of 1.544MHz from a Stratum 3 or better source. The drift with no input reference is less than 5×10^{-9} in 24 hours. This equates to less than two frame slips in 24 hours as compared to 255 slips for Stratum 3. Typical drift performance is less than 9×10^{-10} in 24 hours and less than one slip in 36 hours.

Ordering Information:

Shelves and Accessories:

54500-16	Mounting Shelf, Master, E1/CC input
54500-17	Mounting Shelf, Master, DS1 input
54501-1	Blank Card, all slots except Clock and SMU
54502-1	Blank Card, Clock and SMU slots
54510-0	Mounting Shelf, Expansion, E1/CC input
54510-1	Mounting Shelf, Expansion, DS1 input

Input Modules:

54511-2	DS1 Input Module, Master Shelf
54512-3	2.048 Square Wave Input Module, Master Shelf
54512-4	E1 Input Module, Master Shelf
54513-3	Composite Clock Input Module, Master Shelf
54513-4	5 MHz Input Module, Master Shelf
54514-0	E1 Input Module, Expansion Shelf
54514-1	DS1 Input Module, Expansion Shelf

Clock Modules:

54522-5	ST3E/LNC Track and Hold Module
54523-3	ST2/TNC Track and Hold Module
54591-2	GPS ST1/PRC with STR3E Track and Hold Module
54593-2	GPS ST1/PRC with STR2 Track and Hold Module

Synchronization Monitor Modules:

54541-2	DS1 Synchronization Monitor Module
54542-3	E1 Synchronization Monitor Module

Information Management Modules:

54550-21	E1 Information Management Module, AB, TL1
54550-22	E1 Information Management Module, AB, Menu
54550-23	DS1 Information Management Module, AB, TL1
54550-24	DS1 Information Management Module, AB, Menu

Alarm Modules:

54560-2	Alarm Module
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Output Modules:

54571-2	DS1 Output Module, 20 Outputs
54572-3	Composite Clock Output Module, 20 Outputs
54573-4	E1 Output Module, 20 Outputs
54574-2	2.048 Square Wave Output Module, 20 Outputs
54575-2	1.544 MHz EIA RS-422 Output Module, 10 Outputs
54575-3	8 KHz EIA RS-422 Output Module, 10 Outputs
54577-1	5/10 MHz Sine Wave Output Module
54580-2	Simple Network Time Protocol (SNTP) /IRIG-B Output
54580-4	Simple Network Time Protocol (SNTP) no IRIG-B Output
54581-1	Timing Insertion Unit Module, retimes 2 DS1 inputs

General Specifications:

System Supply Voltage: -42 Vdc to -57Vdc, A and B Power Feeds

Shelf Power:

-48 Vdc nominal; current drain (fully loaded):

	Stratum 3E/LNC	Stratum 2/TNC	Stratum 1/PRC
Cold start	2.28A	3.80A	4.00A
After Warmup	1.83A	2.20A	2.30A

Approximate Power Consumption (fully loaded)

	Initial (cold)	Steady state
Stratum 1/PRC	187W	110W (after 15 minutes)
Stratum 2/TNC	182W	105W (after 15 minutes)
Stratum 3E/LNC	110W	88W (after 5 minutes)

Card Fuses: Type GMT

Operating Temperature:

0-45 degrees C, not to exceed a variance of +/- 5 degrees per hour (refer to Users Manual for details)

Storage Temperature: -40 to 70 degrees C.

Humidity:

Operating: 0-95%, non-condensing at 40 degrees C.

Storage: Up to 95% RH

Shelf Dimensions:

19.00" (48.2 cm) Wide X 12.10" (30.7 cm) Deep X 12.25" (31.1 cm) High (7RU high)

Weight: 28 lbs (12.6kg) maximum per shelf, fully loaded

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