EndRun
TECHNOLOGIES
"Smarter Timing Solutions"

Telecom *Clock Output Module*

E1, T1 or Composite Clock

The Telecom Clock Output Module is an option available for the Meridian and Tycho product lines. The module provides two outputs which can be any combination of E1, T1 and Composite Clock. An alarm function with relay contacts for Minor, Major and Critical conditions is available as an option. User configuration of the outputs is via the front-panel display and keypad (Meridian only), the standard network port, or an RS-232 serial port. Framing, Alarm, and Line Build-Out (T1 only) are all user configurable.

FEATURES

- Two outputs: any combination of E1, T1 or Composite clock.
- Easy user configuration: Framing, Alarm, Line Build-Out.
- Sync Status Messaging (SSM).
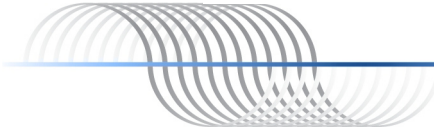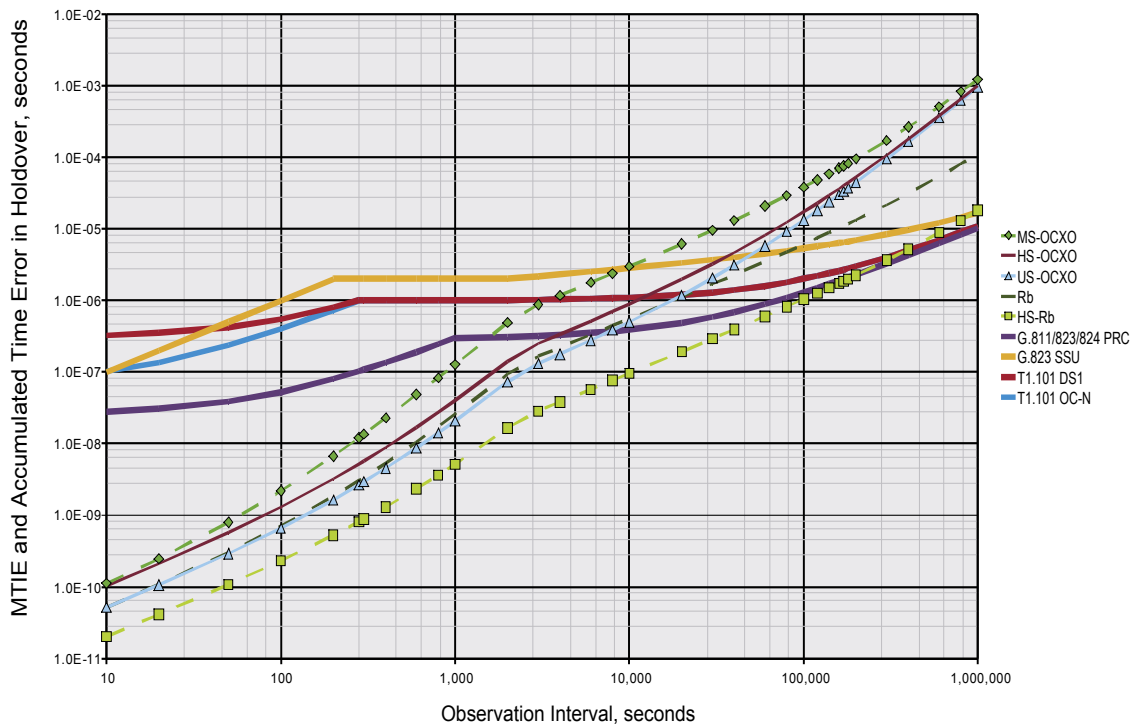- Alarm Output is optional.

Oscillator Options

Both short-term stability and holdover accuracy are critical in synchronizing T1/E1 telecommunications networks. The Meridian and Tycho can be configured with an oscillator upgrade to fit your requirements. For detailed information on the oscillators, including stability and aging, see a separate Oscillator Options datasheet.

Stratum 1 clocks for digital switches require low levels of jitter and wander because propagation of the timing signal through the network can have a phase error multiplication effect. If the stability of the timing signal at the source is not good enough, downstream network elements that depend upon the recovered version of this clock will experience "whip crack" phase transients large enough to cause sporadic buffer overflows. By starting with a stable source, a usable clock can be recovered even after multiple hops. Holdover accuracy is important because a persistent frequency mismatch at the two ends of a T1/E1 link ulti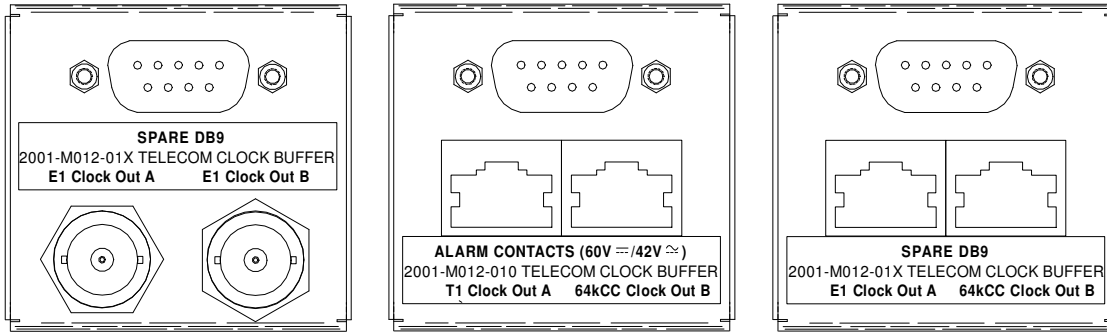mately causes persistent buffer overruns and data loss. Specifications comparing the various oscillators and the corresponding jitter/wander masks are shown below:

**EndRun Disciplined Oscillator Holdover Performance
vs G.811/G.823/G.824 and T1.101 Jitter/Wander Masks**

5° C Max Delta in Holdover, 7.5° C/hr Max Slewrate

Chart legend: MS-OCXO, HS-OCXO, US-OCXO, Rb, HS-Rb, G.811/823/824 PRC, G.823 SSU, T1.101 DS1, T1.101 OC-N

Y-axis: MTIE and Accumulated Time Error in Holdover, seconds

X-axis: Observation Interval, seconds

Telecom Clock Output Module
Specifications

SPARE DB9
2001-M012-01X TELECOM CLOCK BUFFER
E1 Clock Out A   E1 Clock Out B

ALARM CONTACTS (60V⎓/42V∿)
2001-M012-010 TELECOM CLOCK BUFFER
T1 Clock Out A   64kCC Clock Out B

SPARE DB9
2001-M012-01X TELECOM CLOCK BUFFER
E1 Clock Out A   64kCC Clock Out B

COMPOSITE CLOCK OUTPUT

– Quantity*: Zero, one or two.
– Type: Transformer-coupled complementary-pair via 2xRJ48C.
   Single-ended via 2xBNC.
– Frequency: 64 kbps.
– Synchronization: Phase locked to the internal system 10 MHz.
– Data Format: All ones with user-selectable bipolar violation (BPV).
– Line Z: 110Ω nominal (complementary pair), or 75Ω nominal (single-ended).
– Pulse Shape: Conforms to ITU-T G.703.
– Pulse Amplitude: 3.4V pk into 133Ω, 3.0V pk into 110Ω, 2.4V pk into 75Ω.
– MTIE/Jitter/Wander: Conforms to ITU-T G.811/G.823 when locked.**
– Line Code: Bipolar Return to Zero, Alternate Mark Inversion (AMI), 5/8 Duty Cycle.
   User-selectable for 64kcc AMI with no BPV, 64kcc AMI with 8 kHz BPV,
   or 64kcc with 8kHz BPV and missing BPV at 400 Hz.
– Alarm Code: User-selectable for BPV off (AIS) at Major (Blue) Alarm,
   or BPV always on. All zeros (LoS) at Critical (Red) Alarm.
– Connector*: RJ-45 style modular jack (RJ48C-compatible), 1 per output,
   or BNC (single-ended).

E1 CLOCK OUTPUTS

– Quantity*: Zero, one or two.
– Type: Transformer-coupled complementary-pair via 2xRJ48C.
   Single-ended via 2xBNC.
– Frequency: 2.048 Mbps.
– Synchronization: Phase locked to the internal system 10 MHz.
– Data Format: All ones. User-selectable for Unframed, Double-frame
   or CRC4 Multi-frame.
– Line Z: 120Ω nominal (complementary pair), or 75Ω nominal (single-ended).
– Pulse Shape: Conforms to ITU-T G.703.
– Pulse Amplitude: 3.0V pk into 120Ω, 2.2V pk into 75Ω.
– MTIE/Jitter/Wander: Conforms to ITU-T G.811/G.823 when locked.**
– Line Code: Bipolar Return to Zero, Alternate Mark Inversion (AMI).
   (Identical to HDB3 for all ones data.)
– Alarm Code: User-selectable for Alarm Indication Signal (AIS),
   or Sync Status Messaging (SSM) on Sa4 through Sa8,
   or none at Major (Blue) Alarm.
   All zeros (LoS) at Critical (Red) Alarm.
– Connector*: RJ-45 style modular jacks (RJ48C-compatible), 1 per output,
   or BNC (single-ended).

T1 CLOCK OUTPUTS

– Quantity*: Zero, one or two.
– Type: Transformer-coupled complementary-pair.
– Frequency: 1.544 Mbps.
– Synchronization: Phase locked to the internal system 10 MHz.
– Data Format: All ones. User-selectable for Unframed, D4 SuperFrame (SF)
   or CRC6 Extended SuperFrame (ESF).
– Line Z: 100Ω nominal .
– Pulse Shape: Conforms to ITU-T G.703.
– Pulse Amplitude: 3.0V pk.
– MTIE/Jitter/Wander: Conforms to ANSI T1 101 and ITU-T G.811/824 when locked.**
– Line Build-Out: User-selectable for short haul DSX-1 0-655 ft.
– Line Code: Bipolar Return to Zero, Alternating Mark Inversion (AMI).
   (Identical to B8ZS or PDE with all ones data.)
– Alarm Code: User-selectable for Alarm Indication Signal (AIS),
   or Sync Status Messaging (SSM), or none at Major (Blue) Alarm.
   All zeros (LoS) at Critical (Red) Alarm.
– Connector*: RJ-45 style modular jacks (RJ48C-compatible), 1 per output.

ALARM RELAY OUTPUTS

– Quantity*: Zero or Three.
– Type: Form C.
– Rating: 750 mA @ 42VAC/60VDC.
– NC Contact: Closed for alarm-active condition.
– NO Contact: Closed for alarm-inactive condition.
– Minor Alarm: Active at minor clock faults.
– Major Alarm: Active at major clock fault (Blue Alarm).
– Critical Alarm: Active at clock operational fault (Red Alarm).
– Connector: DB9 Female.

COMPLIANCE

– CE, FCC.

* Specify outputs and connectors at time of order. Maximum quantity of E1, T1 and/or Composite Clock outputs is two and they must use the same connector type. For example: one E1 output and one T1 output both with RJ-45 style connectors. Alarm Relay is an additional option.

** The specifications on this datasheet require an OCXO or rubidium oscillator. TCXOs will not meet the jitter/wander requirements of G.811/G.823/G.824.

NOTE: This module is designed to provide high-stability Building Integrated Timing Supply (BITS) reference clock signals directly to digital equipment.