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OSA 5548C BITS/TSG
Timing Signal Generator

Features

- **Unique design for Master, Expansion and Remote shelves**
- **Entirely new family of TSG with 3U and 6U shelves**
- **Adapts to all telecom node sizes, from a few 10's up to 1000's of Synchronization outputs**
- **Intuitive and modular architecture**
- **Digital indication of active input on the active clock module**
- **Extremely compact: up to 200 DS1 or CC protected or unprotected outputs in a 6U shelf**
- **Single System (Master and 4 expansions) allows up to 1000 protected outputs**
- **Passthrough of input signal if failure or removal of both clock modules**
- **Stratum 1 PRS with optional GPS card(s)**
- **Choice of Stratum 2 or Stratum 3E holdovers**
- **Universal input card design (DS1, CC, 5/10MHz)**
- **Universal output card design (DS1, CC)**
- **Available 20 pins output connector for compatibility with legacy wire-wrap panels**
- **SSM on complete system (Master, Expansion, Remote)**
- **TL1 manageable with Local and Remote intuitive Graphical User Interface**
- **Up to 80 retiming channels**
- **Optional NTP and IRIG-B output blades**
- **Optional IEEE-1588 PTP Output**
- **NEBS Level 3 Certified**

General Information

Introduction

The 5548C Timing Signal Generator (TSG) is designed to provide telecom operators with reliable synchronization, using the latest in hardware and software technologies. The 5548C system provides a scalable synchronization solution ranging from 20 unprotected up to thousands of 1:1 protected outputs.

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Unparalleled flexibility
The 5548C can be a Stratum 1 redundant source if you decide to include one of two possible GPS cards (this does not change the number of inputs or outputs available).

In addition to DS1 and Composite Clock (CC) output cards, any of the 10 main output slots can be equipped with time distribution modules (NTP or IRIG-B) or with DS1 re-timing cards.

With it's complete and consistent family (6U: 200 outputs, 3U: 60 outputs, expansions, …), the 5548C is the TSG of choice when you need scalability and reduced spare parts inventory. This flexibility makes the 5548C the most versatile TSG in the marketplace.

Extreme Compactness
Each card is only 4 inches tall, contributing to a higher overall port/volume ratio, and therefore reducing the size of the 5548C 6U shelf design to accommodate overcrowded Telecom Hub Rooms and Switching Center rack spaces.

High Availability
All cards are intelligent and communicate with each other to implement a distributed intelligence message passing system. This approach ensures absence of single points of failure and reliable uptime.

Inputs
The 5548C TSG uses a universal Input Card (INC) designed to reduce spare counts and accepts the following signals:

- DS1 (GR-499) with or without SSM
- CC (GR-378) as input reference or to ensure CC phase and byte alignment
- 5 and 10 MHz sine

Each Input card can accept up to four signals and can be 1:1 protected with an adjacent identical "B" card. Two input groups (therefore four slots) are available for Input Cards, giving flexibility from 4 unprotected inputs (one card) to 8 protected inputs (4 cards). The universal input tile in the back of equipment includes the following connectors:

- 133Ω symmetrical (CC) on wire wrap
- 100Ω symmetrical (DS1) on wire wrap Terminated (nominalor-20dB) or Bridged (high impedance)
- 50Ω unbalanced on BNC

GPS Modules*
In addition to line input card, one or two GPS input cards can fitted to meet Stratum 1 requirements without the need of installing and managing external receiver(s) or Cesium clock. This allows the simplification of the sync plan by flattening the sync distribution hierarchy and results in a reduction of the overall provisioning, operating and maintenance costs.

The presence of GPS input also gives access to precise time information that can distributed via NTP or IRIG-B. Additionally, 5548C can accept any external GPS reference as one on the input Line of the INC.

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Input Selection
The active reference input is selected among the set of eligible input signals based on one of the following criteria:

- Priority table
- SSM value
- Performance Threshold mask
- User selection

Tracking & Holdover
This card forms the beating heart of the OSA 5548C TSG. The input reference jitter and wander are filtered by a high quality oscillator with DDS technology.

- Rubidium (Rb)
- Double Oven Quartz (OCXO)

Pass-through
In the extreme case of total failure of both oscillator cards or if they are pulled out, the pass-through feature of the 5548C TSG still keeps the office alive. In this case synchronization is obtained from one input reference of the first INC's group and distributed without filtering to the INC's output section.

Outputs
The 5548C TSG uses a universal Output Card of 20 outputs that will configure itself automatically when detecting the output tile set. Output cards slots are, like all the other functionalities on this TSG, separated in intuitive A and B groups (adjacent cards slot).

The 5548C 6U TSG counts 10 groups of outputs, giving you the flexibility from 20 unprotected outputs to 200 protected outputs on one shelf (and the flexibility of having some outputs protected and some unprotected).

The 5548C TSG provides maximum flexibility towards different interconnection requirements with its wide choice of modular tile sets.

Output Connectors

The 5548C TSG provides maximum flexibility towards different interconnection requirements with its choice of modular tile sets:

- 20 x 100Ω balanced (DS1) on wire wrap
- 20 x 133Ω balanced (CC) on wire wrap
- 10 x 100Ω balanced (DS1) and 10 x 133□□ balanced (CC) on wire wrap
- 20 x 100Ω balanced (DS1) on 2 x 20 pins connector for compatibility with legacy equipment wire wrap panel
- 20 x 133Ω balanced (CC) on 2 x 20 pins connector for compatibility with legacy equipment wire wrap panel
- 10 x 100Ω balanced (DS1) and 10 x 133□□ balanced (CC) on 2 x 20 pins connector for compatibility with legacy equipment wire wrap panel
- Remote-mounted output wire wrap panel (optional) *

Performance Measurement
All active inputs are constantly measured against the current output reference with 1ns resolution. The local processing of performance data presents the data in a way that reduces network
overhead for remote retrieval. The computed MTIE and TDEV curves are:

- used internally for the input selection
- compared to standard masks to raise alarms if the curves are out of limits
- sent to the management station(s) for display, user validation and storage.

Time Code Units (TCU)*
Time Code Units (TCU) allow precise time distribution when at least one GPS card is installed. This is a major advantage compared to having to additionally install and manage an external receiver with its GPS antenna and cabling. Two kinds of Time Code Units output cards are available: TCU-NTP and TCU-IRIG-B. The NTP card provides full NTP server functionality on a separate **10** BaseT RJ-45 connector. The IRIG-B card provides four IRIG-B signals (two **1** kHz AM, two DC level shift) on BNC connectors. Time output cards can be fitted into any main output card slot.

Re-Timing*
Each re-timing card provides 8 DS1 re-timing channels and the card occupies only one output card slot. Configurable alarm thresholds can be set via management software in terms of slips per hour/day/week. This allows continuous monitoring and immediate detection of synchronization problems on the incoming traffic signals and results in a higher Quality of Service.

.**Expansion or remote shelves***
Up to 4 expansion shelves can be chained to the main shelf for a total of 1000 outputs, optionally protected 1:1. Chaining of the expansion shelves is redundant in order to ensure maximum reliability.

Management
The management card provides connectivity with local and remote synchronization management systems via a TL1 interface over RS-232 (local) and TCP/IP (remote). OSA Local Manager and SyncView Next Generation Management software provide, locally and remotely, powerful fault, configuration, accounting/inventory, performance and security management functions through an intuitive graphical user interface. Local alarm information is provided as:

- Internal buzzer (audible)
- Relay contacts (electrical)
- Status LED's on front panel (visual)

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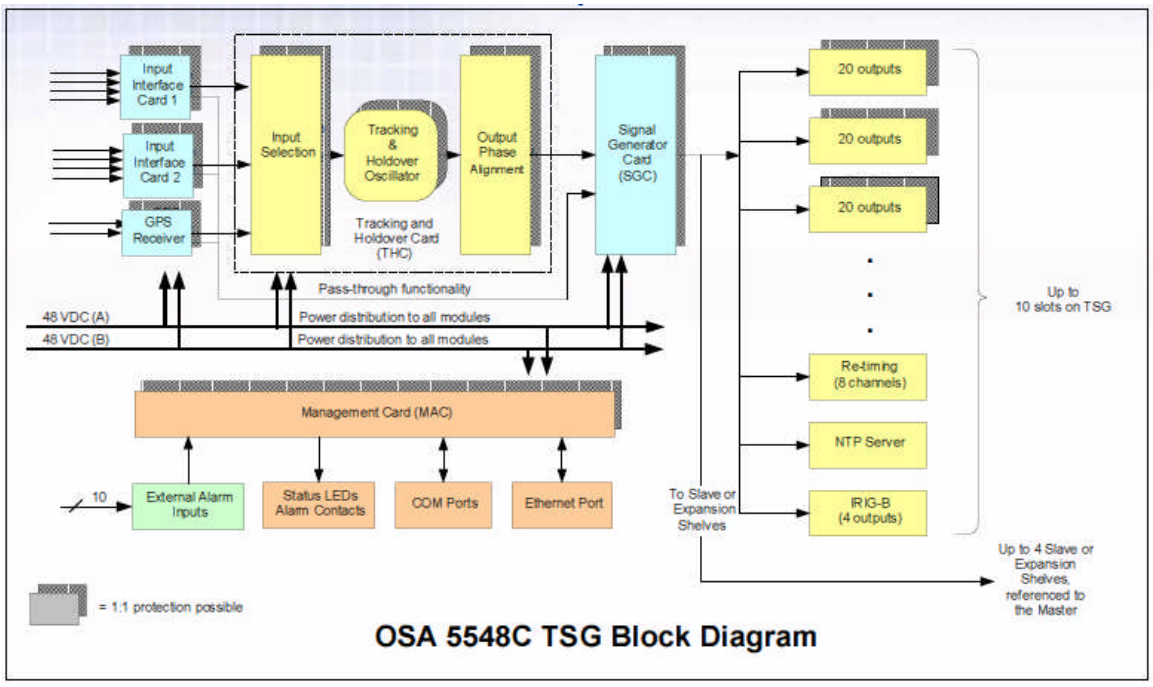
Third party equipment can easily be managed through a set of 10 electrical alarm collection inputs; a specific user-configurable alarm message can be associated to each alarm input. As a future option, the 5548C will also be manageable directly by SNMP with embedded agent.

Simplified Maintenance
TSG and Expansion Shelves share the same cards; this reduces homologation activity, stock of spare parts as well as overall administrative complexity and results in reduced cost of ownership. All cards are easily reprogrammable via a simple software download and managed via a global shelf release.



OSA 5548C TSG Block Diagram

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OSA 5548C TSG Specifications

Overall Architecture

- **5548C 6U TSG main shelf:** 8 inputs + 2 GPS receivers, 200 outputs
- **5548C 3U* mini TSG main shelf:** 4 inputs + 2 GPS receivers, 60 outputs
- Up to 4 Expansion Shelves per main shelf, 200 outputs each for 1000 outputs total (dedicated redundant communication bus between master and expansion shelves).
- Remote shelves can also be connected, using CC or DS1 in order to propagate correctly the Bytes alignment (CC signal) or the SSM (DS1 signal). This allows a virtually unlimited output capacity.
- All cards can be protected 1:1

Re-timing

- Re-timing modules take same slots as main output modules
- 8 DS1 traffic carrying signals per module
- Up to 80 re-timed DS1 signals on TSG
- Configurable alarm thresholds in slips per hour/day/week
- Protection with by-pass relay

Inputs

- Up to 8 line inputs in 6U TSG (4 in 3U mini TSG), optionally 1:1 protected, 4 inputs/ module
- Input types: DS1, CC, 5 MHz, 10 MHz individually SW-selectable
- Up to 2 GPS inputs, active L1 antenna, 1575.42 MHz
- DS1 inputs can be terminated, “terminated – 20dB” or bridged (high impedance)

Management

- Status LED’s on front panel
- Contact relay alarm closures (2x3 N.O. or N.C. contacts)
- Electrical alarm collection inputs(10),specific user-defined alarm messages
- Local RS-232 port, TL1 protocol on front and rear panel
- Remote 10 BaseT
- Remote management via OSA SyncView New Generation Synchronization Management software supporting full FCAPS capability

Input Selection

- Priority table
- SSM value
- Performance Threshold Mask
- Manual selection

Performance Measurement

- Phase measurement on all inputs, GPS included
- 1ns resolution
- MTIE, TDEV, Ym curves computed locally
- Alarm thresholds, user settable

Tracking and Holdover

- DDS-based Tracking & Holdover functionality
- Stratum 1 reference with embedded GPS (or external Cesium) source
- Stratum 2 based on Rubidium holdover <2e-12/day (at 25°C)
- Stratum 3E based on OCXO SC-P3 holdover <1e-10/day (at 25°C)

Expansion Shelves*

- Up to 200 outputs per shelf, optional 1:1 protection
- Up to 4 Expansion Shelves for a total of 1000 outputs per node (dedicated redundant communication bus between master and expansion shelves)

Power

- **5548C TSG:** -48 VDC power (-40 to –60 VDC)
- Power cards are redundant and user changeable
- Current: master shelf 6A max

Outputs

- 20 outputs per module (2 groups of 10)
- Up to 200, optionally 1:1 protected, on 5548C TSG
- Output type configurable by group of 10 outputs

Simplified Maintenance

- Universal Input and universal Output cards
- Upgrade of all cards via SW download
- Dynamic inventory data accessible via management SW
- All cards software included in the same system release

Time Code Outputs*

- Up to 10 Time Code cards on TSG
- NTP, SNTP v4 (RFC 2030)
- Each time distribution module occupies one main output slot
- PTP - IEEE 1588 v2 on demand

Mechanical

- **5548C 6U TSG:** 19”/6U rack: 10.5”H x 19.0”W x 9.7”D
- **5548C 3U* mini TSG:** 19”/3U* rack: 5.25”H x 19.0”W x 9.7”D

Standards compliance

- ANSI T1.101 and T1.403
- Telcordia GR-2830/1244/378/253-CORE
- NEBS, CE

Standards compliance (continued)

- IETF RFC 2030 (SNTP v4), RFC 1305 (NTP)
- ITU-T G.703, G.811, G.812, G.704, G.781
- ETSI EN 300 462-6, -4

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