

# Epsilon Synchronization Supply Unit

## Model ESSU

- **Cost-optimized network synchronization solution**
- **G.811/G.812 module**
- **Flexible**
- **Fully redundant**
- **Fully manageable**
- **Integrated Rubidium/OCXO**
- **GPS reference**
- **SNMP manageable**



The Epsilon Synchronization Supply Unit is a fully modular and flexible SSU which can be customized to provide the most cost-effective solution to all network synchronization requirements, from Primary Reference Clock to Central/Transit/Local nodes. Based on ITU-T G.811/G.812 and ETSI EN 300 462-4/6 recommendations, with distributed power supplies and redundant hot swappable modules, including one or two integrated GPS references, the Epsilon SSU provides the highest level of reliability and service availability.

The Epsilon SSU, with embedded SNMP protocol, is designed to be fully manageable at the network level by the EpSync Manager which ensures full central supervision and control of all synchronization links and devices through a high performance Graphical User Interface. The combination of Epsilon SSUs and EpSync Manager as a turnkey solution allows operators to reach the highest standard of quality of service for their telecom networks.

### Optimized Configurations

Whether the purpose of the SSU is to build a Primary Reference Clock (PRC - G.811), or a Synchronization Transit Node (STN - G.812), or a Synchronization Local Node (SLN - Stratum 2/3E), the SSU configuration can be optimized to match exactly the application requirements with no extra cost for useless functions.

For instance, as shown in the block diagram, the simplest configuration can be built with only three modules for a cost-effective solution for simple Local Nodes with supervision capability:

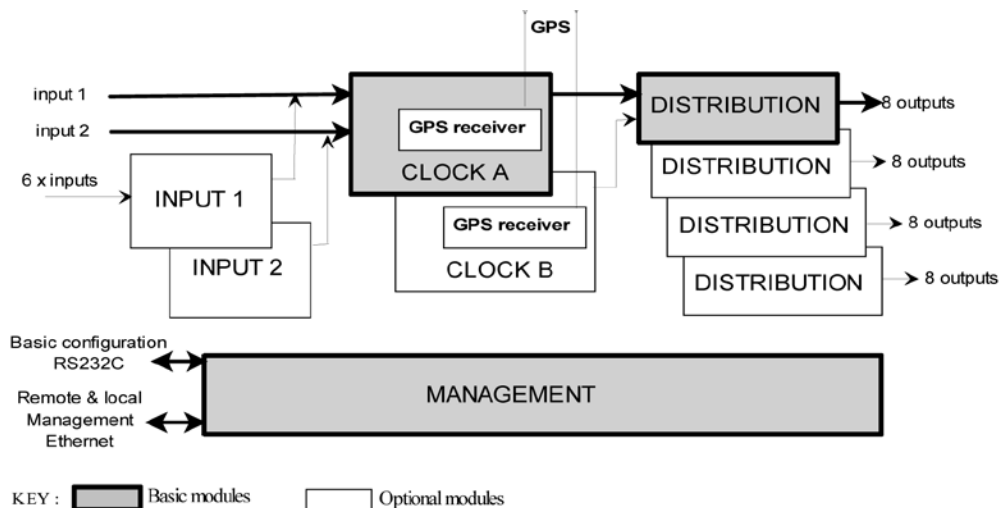
- 1 x Clock module with quartz oscillator
- 1 x Distribution Module
- Management Module

Alternatively, a full configuration is simple to configure

- 2 x redundant Input Modules
- 2 x redundant Clock Modules both equipped with high quality Rubidium or OCXO oscillators and GPS receivers.
- 4 x Distribution Modules providing up to 32 outputs
- Management Module

## Features

- Up to 6 reference inputs, fully protected with monitoring, selection, filtering, tracking and holdover on redundant modules
- Input jitter & wander tolerances compliant with G.811/G.812 and ETSI EN 300462-4/6 recommendations
- Up to 32 outputs in main rack, 1 + 1 protected
- Optional extension unit for another set of outputs
- Output frequency stability per G.811 when locked
- Holdover stability (at 25°C):
  - PRC/Stratum 1/with Rubidium
  - Transit Node/Stratum 2E with OCXO
  - Transit Node/Stratum 2 with OCXO
  - Local Node/Stratum 3 with OCXO
- No phase hits when source switching
- Embedded Sync Status Message (SSM) on 2.048 Mbit/s outputs for self healing networks
- Built-in test and continuous monitoring of modules, signals and performance
- SSU status with reference and module selections displayed through front panel LEDs
- Alarm interface through relay closures, with Urgent and Non Urgent severity
- Local and remote management over IP with standard SNMP/FTP protocol through high data rate Ethernet port
- RS-232C interface or Telnet protocol with ANSI terminal emulation for maintenance and installation purposes
- Web UI option (web server function with HTML pages)
- Dual -36 Vdc to -72 Vdc supplies
- Power requirements: < 150 W
- ETSI ETS 300-119/ANSI standard rack modules
- 441 x 275 x 365 mm<sup>3</sup> (W x D x H)
- Weight (full configuration): <15 kg



## Modules

### Input Module

- Single or redundant Input Module
- Input Module achieves input protection, individual source monitoring, pre filtering and selection
- Automatic source selection by continuous monitoring of MTIE and TDEV characteristics of the input lines
- Sync Status Message (SSM) taken into account if required on 2.048 Mbit/s sources

### Clock Module

- Single or redundant Clock Modules
- Each Clock Module accepts one GPS receiver optimized for synchronization applications with:
  - Time Receiver Autonomous Integrity Monitoring (T-RAIM), meaning that faulty GPS satellites are detected and excluded
  - Position hold, meaning that Time Solution is given by a single GPS satellite
  - Antenna cable compensation

- The Clock Module removes the jitter of input references and provides stable frequencies even in case of input loss
- Automatic switching to holdover mode in case of loss of GPS and input references: both frequency and Time of Day information are delivered autonomously (GPS option required for ToD)
- Reference tracking based on a smart predictive Kalman algorithm, that learns the oscillator behavior and so optimizes reaction time to correct frequency drifts due to temperature changes or oscillator aging.
- Automatic source selection by continuous monitoring of MTIE and TDEV characteristics of direct input lines, when no input modules fitted
- High resolution on both phase error measurements and voltage tuning of the oscillator yields an excellent frequency accuracy
- Internal oscillators of different technologies to meet specific holdover requirements: Rubidium, Oven Control Quartz Oscillator (OCXO)

### Distribution Module

- The SSU accepts up to 4 Distribution Modules providing up to 32 outputs
- Three kinds of Distribution Modules are available to meet different

format requirements

- 2 MHz Module: 8 x 2.048 MHz outputs for telecom
- 2 Mbit Module: 8 x 2.048 Mbit/s outputs for telecom

- Sync Status Message (SSM) management on 2.048 Mbit/s output if required
- Output buffer secured by 4 x paralleled amplifiers for maximum output reliability (1 + 1 protection)
- Balanced or unbalanced impedance (automatic configuration)

**Management Module**

**This module achieves full supervision of SSU modules:**

- SSU configuration
- Module configuration
- Alarm and fault configuration
- Alarm and fault history with SSUWin
- Performance monitoring, including TDEV and MTIE measurements
- Remote management capacity is available through high data rate RJ45/10; Base-T Ethernet interface

**Architecture**

**Four types of SSU modules:**

- Input (Qty = 0, 1 or 2)
- Clock (Qty = 1 or 2)
- Distribution (Qty = 1, 2, 3 or 4)
- Management (Qty = 1)

Hot-swapping of every module

Distributed -48 Vdc power supplies with DC/DC converters fitted on each module in order to increase reliability and modularity

No phase hits while switching signal reference or redundant module

Optional GPS receiver integrated into each Clock Module

**Input Reference**

**6 x input references on each Input Module:**

- 4 x 2.048 MHz
- 2 x 2.048 Mbit/s

**2 direct inputs to Clock Module optimizing cost for PRC application:**

- Input 1: 10 MHz or 2.048 MHz
- Input 2: 2.048 MHz

**2 x GPS inputs from active antennas (L1 - 1 575 MHz) to feed 2 x integrated GPS receivers**

**Environmental**

**Operating temperature:** 0° to 50°C

**Storage temperature:** -40° to 85°C

**Relative humidity:** 95% RH @ 40°C, non condensing

**CE certified:** EN 300 386/EN 55022/EN 60950

**MTB/Availability**

4.8 x 10<sup>7</sup> hours with redundant Rubidium modules

Distribution Module	2 MHz Module	2 Mbit/s Module	T & F Module		
Output Type	G703 - § 13	E1 G703 - § 9 - G704	Time / Frequency		
Rate	2.048 MHz	2.048 Mbit/s	10 MHz	1PPS	ToD
Impedance	75 Ω unbal or Ω 120 balanced	75 Ω unbal or Ω 120 balanced	50 Ω unbal	50 Ω unbal	Asynchronous RS-232C
Number of outputs/module	8	8	2	2	2
Number of modules in SSU rack	up to 4	up to 4	up to 4		
Number of modules in SSU rack with 2 outputs/connector	up to 7	up to 7	up to 7		
Number of modules in extension rack	up to 4 (more on request)	up to 4 (more on request)	up to 4 (more on request)		

Application	PRC - G.811	Transit and local node - G.812 (G.811 when locked)	
Oscillator Type	Rubidium	Double Oven OCXO	High Performance OCXO
Stability "Hold Over" (@ 25° C)	< ± 5 x 10 <sup>-11</sup> /month	1 x 10 <sup>-10</sup> /day	3 x 10 <sup>-10</sup> /day
Short term stability	< ± 1 x 10 <sup>-11</sup> /day	< ± 1 x 10 <sup>-10</sup> /100 sec	< ± 1 x 10 <sup>-10</sup> /100 sec
Pulling range	± 1.5 x 10 <sup>-8</sup> ± 20%	< ± 2 x 10 <sup>-8</sup>	< ± 3 x 10 <sup>-7</sup>
Switching over	< 10 ns	< 10 ns	< 10 ns
Accuracy in GPS tracking mode	< ± 1 x 10 <sup>-12</sup> aver / 24 h	< ± 2 x 10 <sup>-12</sup> aver / 24 h	< ± 2 x 10 <sup>-12</sup> aver / 24 h

Synchronizing Source	G703 - § 13	E1 - G703 - § 9 - G704	Sine Wave	GPS
Rate	2.048 MHz	2.048 Mbit/s	10 MHz	1PPS
Impedance	75 Ω unbal or 120 Ω balanced	75 Ω unbal or 120 Ω balanced	50 Ω unbalanced	
Number	4	2	2	2