Accurate Time & Frequency Time Server

GPS-Disciplined Rubidium

The **AR79/AS79** is a multi-function GNSS Disciplined Rubidium Atomic Clock, which provides accurate time & frequency. The AR79/AS79 incorporates numerous features into a single box, including a Rubidium Frequency Standard, an internal C/A code 12 channels GPS receiver and external 1PPS input.
The Rubidium Standard functions as a local oscillator and is phase-locked to the GPS or to external input. All outputs are derived from the Rubidium Clock, which maintains accurate time and frequency when the GNSS or other inputs are interrupted.

Key Features

Performance

- Frequency Accuracy : 1E-12
- 1PPS Accuracy: 20ns RMS
- Holdover: 1µs/24 hours, 1E-10/month, 5E-12/month (Option)

GNSS Receiver

- 12 channel C(A) code GPS receiver
- L1 Frequency 1575MHz C/A code
- Position Accuracy: Latitude, Longitude: < 6m (CEP 50%), Altitude: < 11m (CEP 50%)
- Acquisition Time for GPS receiver output: Warm start ≤ 45 second, Cold start ≤ 50 second (worst case)

Unit Interfaces

- 4x 100/1000/2500BaseX (SFP)
- 2x 10/100/1000BaseT RJ45
- 2x 1/2.5/10GBaseX (SFP+)
- Support SFP/SFP+: MM, SM, SFS, xWDM, Copper
- 1x RS232 (RJ45) Console
- GNSS Antenna
- 1PPS output, 10MHz output
- 1PPS Input (Option)
- TOD In (Option), TOD Out (Option)

Network Protocols

- IPv4/IPv6
- SNMP v1/v2/v3 extensive MIBs, Trap profile
- HTTP/HTTPS
- IPv6 Management
- TACACS, RADIUS, LDAP
- SYSLOG
- SSH-V2
- SMTP
- MD5

Time Server

- NTPv4
- 10,000 NTP request per second
- PTP - IEEE-1588 v2 (Option)
- 128 PTP requests per second (at unicast mode)
- 1,000 PTP requests per second (at multicast mode)

Time of Day

- TOD Format: Have Quick, IRIG-B (Option)
- Front Panel Display

Display

- LCD Front Panel display
- LED Indicator: Status LED's on the front panel

Power

- Dual AC Power supply for redundancy 90-260 VAC

Environmental

- Operation Temperature: -20°C to +65 °C
- Storage Temperature: -20°C to +70°C
- Humidity: Up to 95% at 35°C, non-condensing

Size

- 1U x 19" x 34.5 cm

Description

The AR79/AS79 extensively supports the evolving needs for broadband access services delivery, including high throughput, flexible management capabilities, and a high degree of scalability and flexibility to cater for future requirements and technology trends.
The AS79 offers advanced Quality of Service (QoS) features including classification and mapping based on layer 1 through layer 4 attributes, rate limiting per service, with highly flexible scheduling, queuing and shaping options.

All specs are @ 25°C, quiescent conditions at sea level ambient unless otherwise specified

Specifications

		Basic Configuration	Options (*)
Outputs	SMA Connectors	1 x 10MHz Sine Wave (10±2 dBm) (J10) 1 x 1PPS (TTL/50Ω) (J9)	1 x TOD out (IRIG B121) (J11)
Inputs	TNC Female	1 x GPS Antenna (J16)	----
	SMA Connector	----	1 x TOD In, Have Quick, IRIG-B (Option) (J13) 1 x 1PPS In (J12)
	ST Connector	----	1x TOD In IRIG-B (Option) (J13) (ST Multi-Mode (OM1) 62.5/125um)
LAN	2 x LAN interface 10/100/1000BaseT (RJ45) (J5,J6)		4 x LAN interface 100/1000/2500 BaseX (SFP) (J1-J4) 2 x LAN interface 1/2.5/10G BaseX (SFP) (J7-J8)
CLI	1 x Consol (RJ45) (J17)		----

Performance					
Mode of work		**Standard**		**Improved (option)**	
Time (1PPS)	1PPS accuracy	Discipline	20ns RMS	Contact factory	
		Free running	1µs / 24 hours (typical) After 24 hours of disciplining		
Frequency	Frequency Accuracy	≤ 1E-12 (Disciplined to GPS or to external 1PPS)			
	Long Term Stability (Free running Rubidium)	≤1E-10 / month	Contact factory		
	Short Term Stability (ADEV)	3E-11 @ 1s 5E-12 @ 100s	Contact factory		
	Temperature Stability	±3E-10 over -20°C to +65°C	Contact factory		
	Phase Noise (@ 10MHz)	≤-114dBc/Hz @ 10Hz ≤-140dBc/Hz @ 100Hz ≤-146dBc/Hz @ 1KHz ≤-147dBc/Hz @ 10KHz	**Improved**		**Ultimate**
			≤-113 dBc/Hz @ 10Hz ≤-141 dBc/Hz @ 100Hz ≤-152 dBc/Hz @ 1KHz ≤-156 dBc/Hz @ 10KHz Integrated phase noise (10Hz to 1MHz): ≤-94dBc		Contact factory
	Harmonics	≤ -45 dBc			
	Spurious	≤ -90 dBc @±100KHz			
	Warm-up time	Rubidium Lock < 4 minutes 5E-11 within < 60 minutes 1E-11 within < 4 hrs 1E-12 within < 24 hrs			

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GNSS C(A) Code Receiver	
GNSS Tracking	L1 frequency 1575.42 MHz C/A code (SPS), 72 tracking channels Options: Glonass, Galileo
Position Accuracy	Latitude, Longitude: < 6m (CEP 50%), Altitude: < 11m (CEP 50%)
GPS signal gain at antenna input (*)	23dB-35dB
GPS Antenna DC Voltage	5VDC (up to 100 mA)

(*) The gain at antenna input with respect to open sky reception.

Environmental	
Operating Temperature	-20°C to +65 °C
Storage Temperature	-20°C to +70°C
Humidity	Up to 95% at 35°C, non-condensing
Safety Standard	CE

Power Supply		
Power Supply	90-260 VAC 47/63 Hz x2	Options: DC power supply: 1.2 x 28VDC± 4V 2.2 x -48VDC 3.2 x 48VDC
Power Consumption	< 50W Warm-up < 30W Steady state	
Power Supply Redundancy (option)	Options for power supply redundancy: 1.Two power supply inputs – one for AC and the other for DC 2.Two DC power supply inputs	

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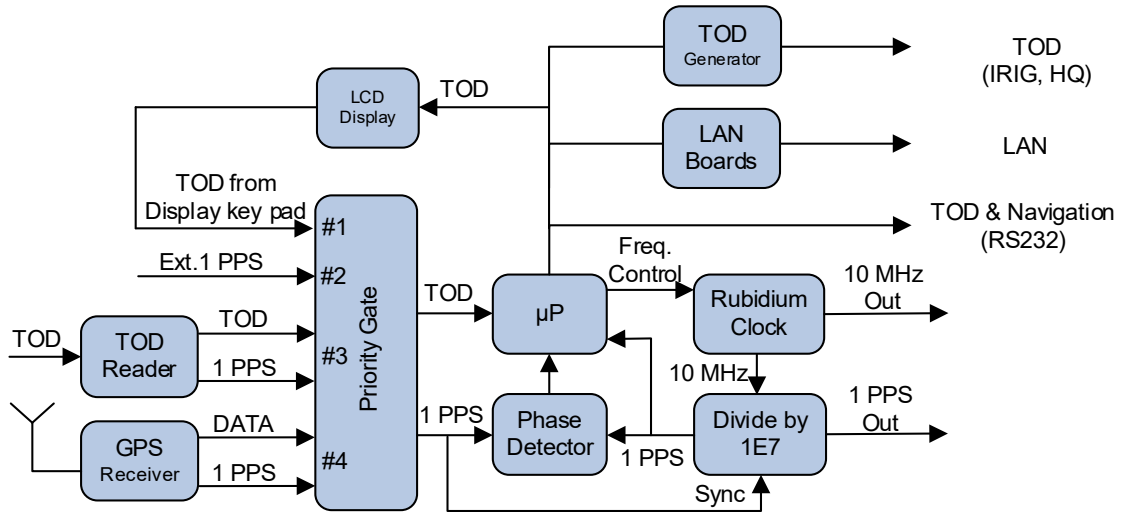
Principles of Operation

The following block diagram describes the operation of the AS79. The unit includes Rubidium Clock and accepts inputs from either internal GPS receiver or external 1PPS & TOD sources. All outputs are derived from the internal Rubidium Clock, which is phase-locked via a digital PLL to the internal GPS receiver or to one of the external inputs. This way, the Rubidium Clock follows the GPS long term accuracy and cleans the jitter and the noise on the short and medium terms. When the GPS reception is lost, for short or long periods of time, the Rubidium continues to maintain accurate time and frequency.



Front panel display & indications and GUI

Display	The LCD front panel display and buttons enable the user to view and configure most parameters. The displayed information includes the Time, Date, BIT, GPS parameters (antenna current, satellite status) and more. Configured parameters include time synchronizations source, 1PPS delay, outputs configuration and more. For details see user manual or contact factory.	
LED Indications	4 LEDs on the front panel: Power, Overall BIT, TOD Source, 1PPS / FREQ Source	
Graphic User Interface (GUI) and Console	GUI - provides access to system management via web o System configuration o System monitoring o System diagnostics o System maintenance	Console – provides access to initial system configuration via consul port o Network settings o CLI (Cisco like)

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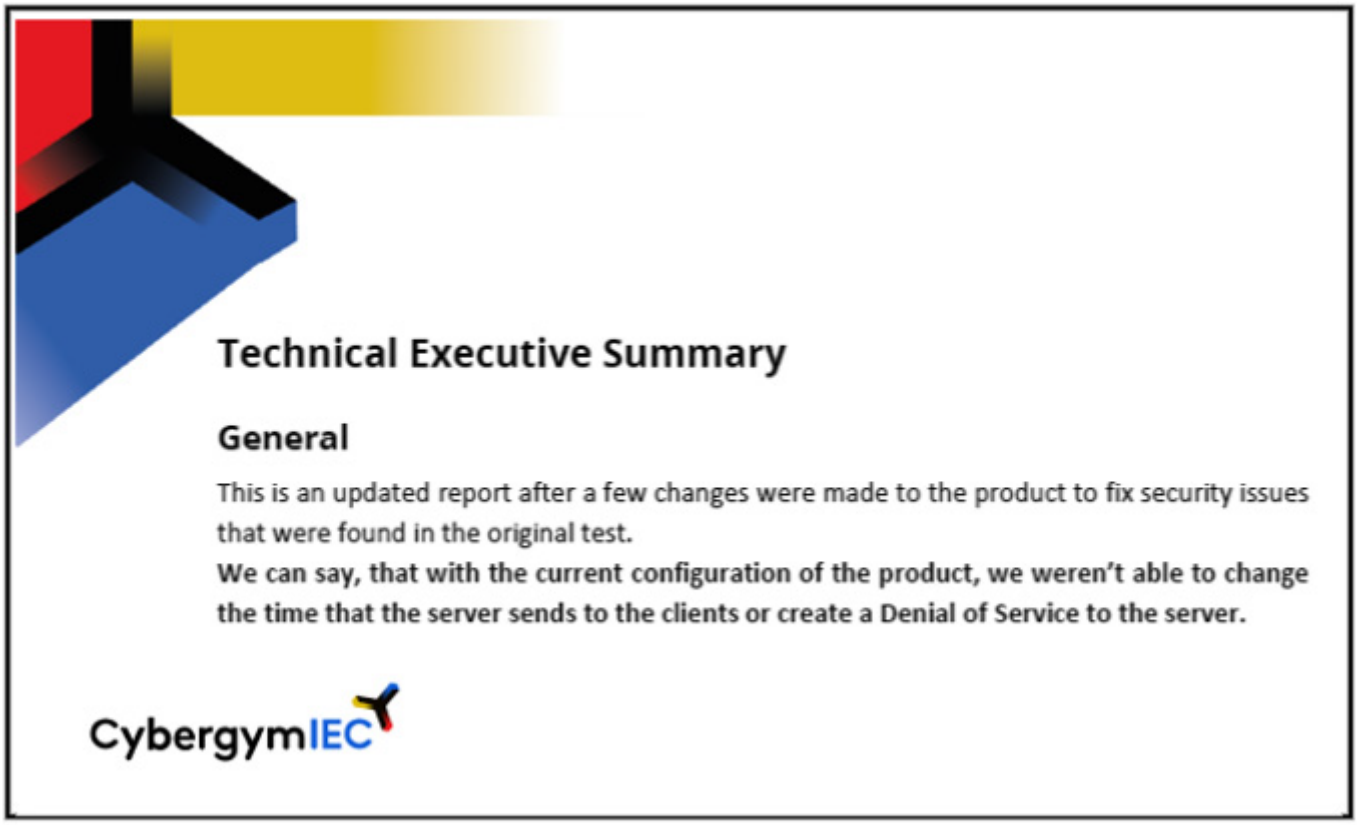
Cyber Security Features

In March 2022, the company CybergymIEC conducted a Penetration test for an AS79/AR79 Secure Rubidium GPS Time Server. The Penetration test was performed to minimize potential damage from cybercrime and to raise security recommendations before implementing the product.

CybergymIEC summarizes in its final report:



Technical Executive Summary

General

This is an updated report after a few changes were made to the product to fix security issues that were found in the original test.

We can say, that with the current configuration of the product, we weren't able to change the time that the server sends to the clients or create a Denial of Service to the server.

CybergymIEC

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Electrical ICD		
Connector	**Description**	**Standard Configuration**
J14	Power supply A	AC, Standard Inlet (IEC320)
J15	Power supply B	AC, Standard Inlet (IEC320)
J16	GPS antenna	TNC, Female
J17	Consul	RJ-45
J1 – J4	LAN	SFP
J5 – J6	LAN	RJ-45
J7 – J8	LAN	SFP
J9	1PPS out	SMA
J10	10MHz Out	SMA
J11	TOD Out	SMA
J12	Sync In	SMA
J13	Tod In	SMA

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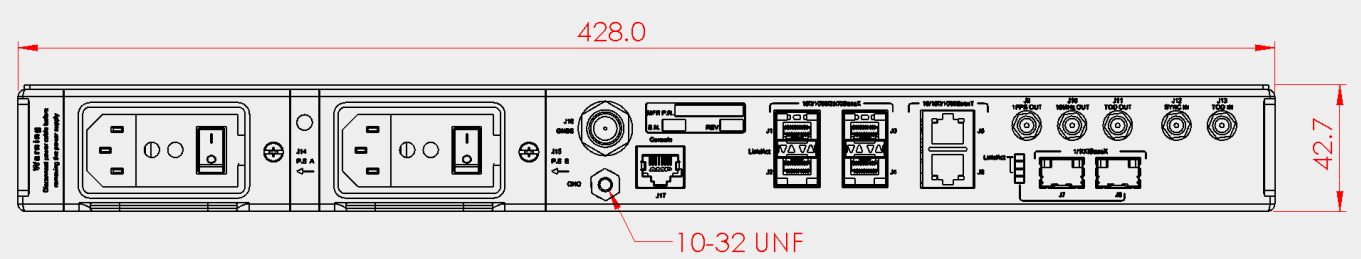
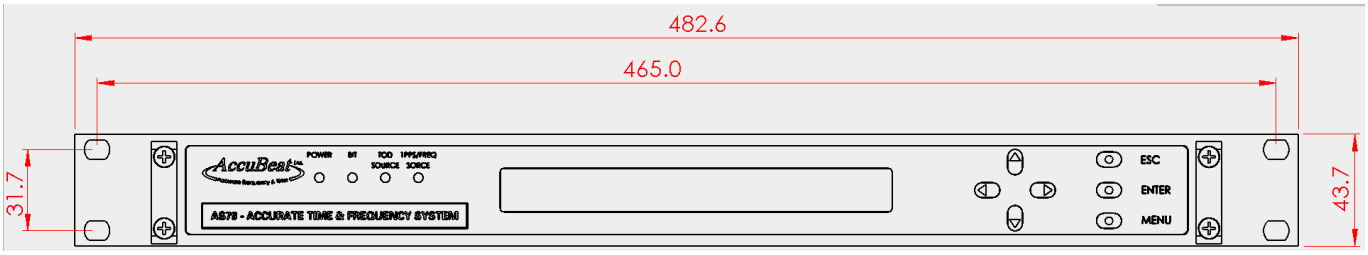
Mechanical ICD

Front panel



Back panel



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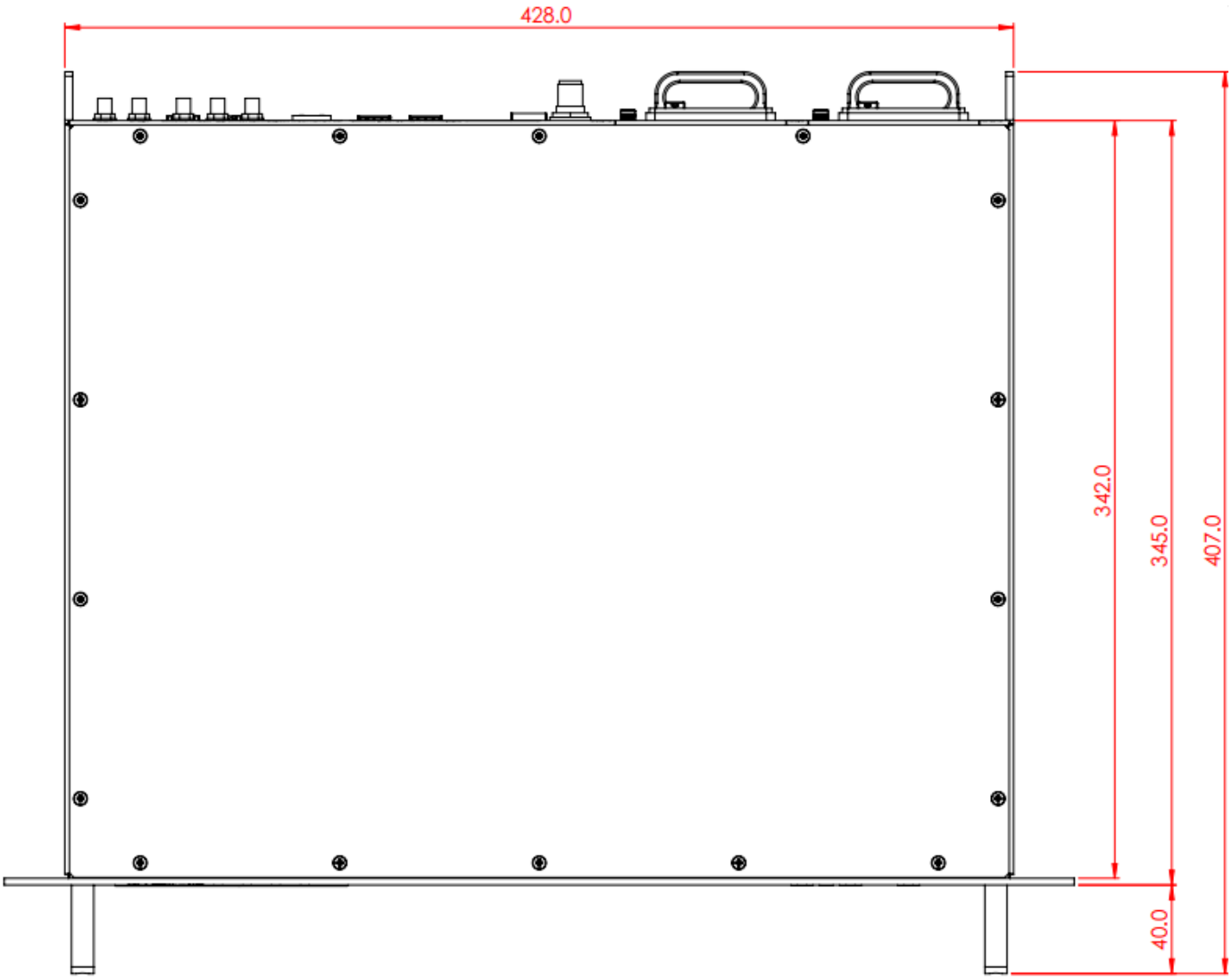
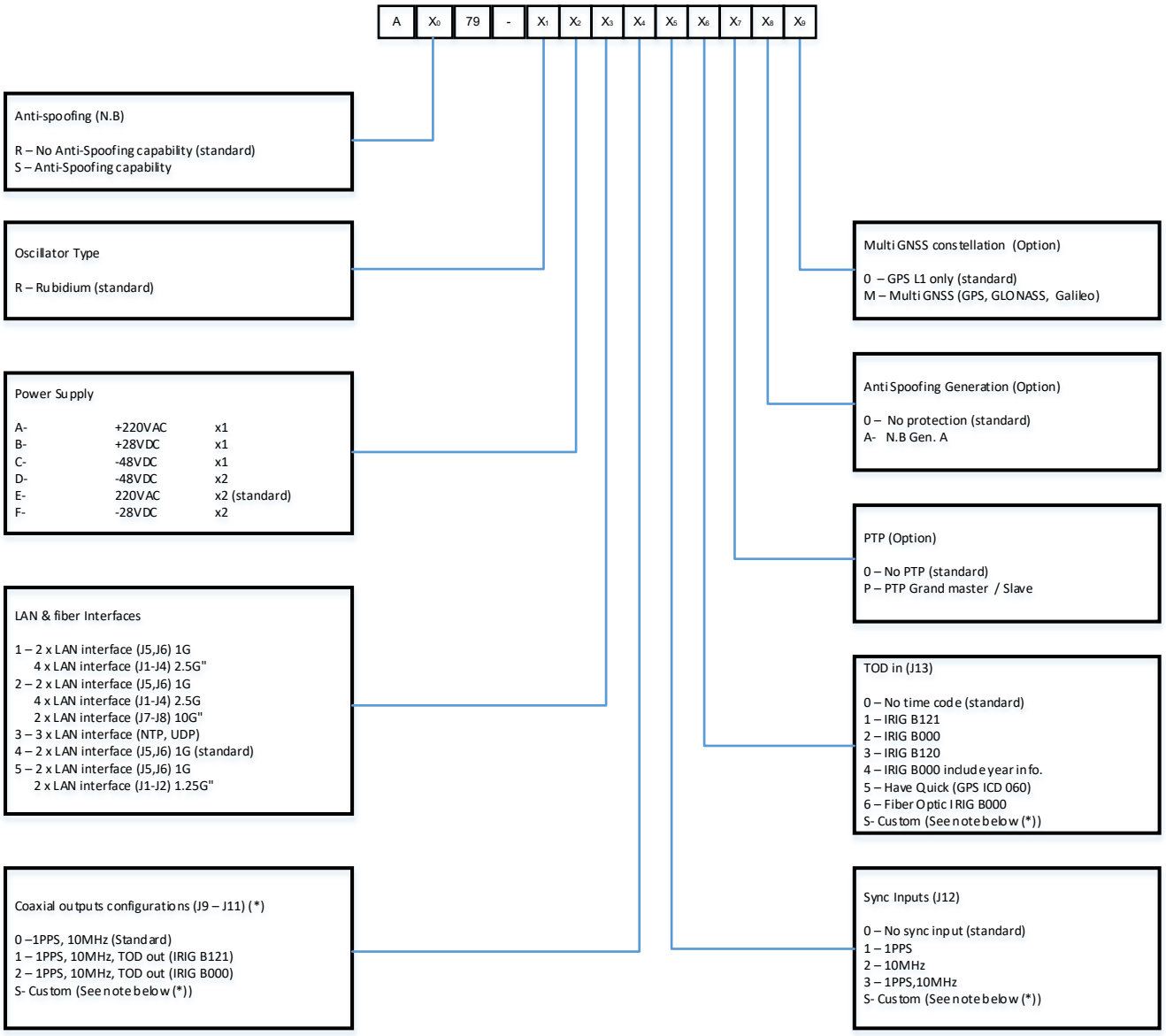


HOW TO ORDER:



Notes:

Standard order number: AS79-RE4000000