

# SyncServer S600/S650 Options, Upgrades and Antenna Accessories

Maximize Performance and Flexibility



## Options and Upgrades

- Security Protocol License
- Rubidium Atomic Oscillator upgrade
- OCXO Oscillator upgrade
- Dual Power Supplies
- Timing I/O Module (1 or 2)
- FlexPort™ Technology for Timing I/O modules
- Antenna Accessories
- Synchronization Software

Microsemi makes it easy to configure the SyncServer S600/S650 to meet specific application needs and requirements with a variety of hardware and software options. Whether the application requires specific NTP stratum behaviors, sustained signal quality controllable with oscillator upgrades, more flexibility in signal outputs, or just redundancy

features, Microsemi has excellent solutions for all use cases. If the user is not sure how to achieve what they want in terms of configuring choices, they can contact Microsemi's timing experts for advice and guidance for customized solutions that meet their needs.

## Security Protocol License with Security-Hardened NTP Reflector™/Firewall

Some applications require security enhancements above and beyond what might otherwise be acceptable. For this reason, the SyncServer S600/S650 can be seriously hardened from both the NTP operational perspective and the authentication perspective.

### Operational Hardening

The Security Protocol License includes the Security-Hardened NTP Reflector™ with hardware firewall functionality\*. The GbE line speed NTP Reflector™ with 100% hardware based NTP packet processing can handle in excess of 120,000 NTP requests per second (mode 3 NTP client packets only). This same hardware also acts as a CPU protecting firewall by bandwidth limiting all non-NTP traffic. In addition to the Reflector are denial-of-service (DoS) functions monitoring the packet flow. Abnormally high NTP or non-NTP traffic will initiate an SNMP trap. In a DoS attack the S600/S650 remains impervious to the level of network traffic that could be delivered as all packets are processed in hardware at line speed, though legitimate NTP client requests for time may be blocked elsewhere in the network due to the increased DoS flow.

### Authentication Hardening

Authentication—whether client, server or user access—is the next level in security hardening. The NTP Autokey functionality is a step up from MD5 when it is required to have the next level of NTP client-to-server authentication. For user authentication/permission to access the web interface, TACACS+, RADIUS, and LDAP are also included in the Security Protocol License.

\* NTP Reflector is part of the Security Protocol License and will appear in version 1.1 due April 2016.

## Rubidium Atomic Oscillator



Rubidium atomic clock oscillator upgrade improves not only the stability and ongoing accuracy of the SyncServer, but also its holdover accuracy, saving valuable time for the user. The standard SyncServer is equipped with a crystal oscillator that keeps the clock accurate to specifications while tracking GNSS. However, if the GNSS signal is lost, thereby placing the unit in holdover, the standard oscillator soon drifts away from perfect. Upgrading the oscillator significantly improves the clock accuracy during holdover.

Rubidium holdover accuracy is <1 microsecond for the first 24 hours and <3 microseconds after the first 3 days. The advantage of the rubidium oscillator is that if the GNSS signal is lost, the SyncServer continues to serve very accurate time and maintain a high level of clock stability. This allows support personnel plenty of time to correct the GNSS signal problem with little degradation or disruption in time synchronization accuracy.

## Oven Controlled Crystal Oscillator (OCXO)

Similar in application as the rubidium oscillator upgrade, the Oven Controlled Crystal Oscillator (OCXO) upgrade improves the holdover accuracy beyond the standard oscillator though not nearly as much as the rubidium oscillator. OCXO holdover accuracy is 25 microseconds for the first day. Depending on the level and duration of accuracy needed, the OCXO is a compromise between the standard oscillator and the rubidium oscillator.

### Oscillator Holdover Drift (1st 24 hours)

Standard	400 microseconds
OCXO	25 microseconds
Rubidium	<1 microsecond

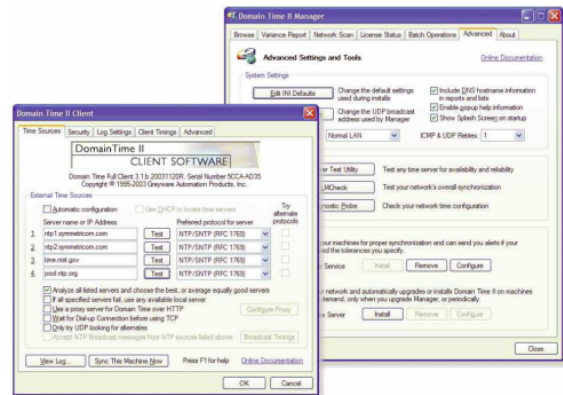
## Dual AC Power Supplies



The SyncServer S600/S650 is equipped with a very high quality power supply. But the reality of modern electronics is that power supplies can fail and for critical applications dual power supplies can add an extra measure of redundancy for SyncServer uptime assurance.

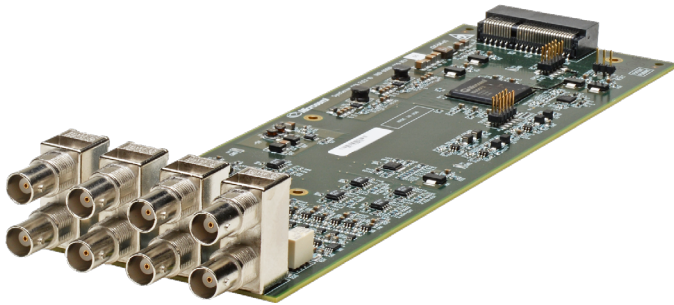
The dual AC power supplies provide hitless switching from one power supply to the other. The supplies are continuously monitored and an SNMP trap is sent in the event one of them fails. For extra level of assurance, the power cord(s) supplied with the SyncServers have locking rear IEC 60320 connectors to avoid accidental decoupling.

## Windows Time Synchronization Software



Network time synchronization software is an essential part of distributing time to network clients. Domain Time II software for Windows is a comprehensive NTP software solution that simplifies network time synchronization. Versatile time clients and software servers keep the network hierarchy synchronized to the SyncServer. Easy-to-use management tools simplify and automate many tasks related to keeping the clients up-to-date. Monitoring functions track synchronization across the network to notify the administrator of any problems. The result is a reliable time synchronization system that requires little management overhead, and provides tremendous value to the integrity of network operations and applications.

## S650 Timing I/O Module



The Timing I/O Module is an exceedingly versatile time and frequency input and output option. In the standard configuration, it supports the most popular input and output time codes, sine waves, and rates. In the table below, the user can see the standard configuration, and the configuration with the FlexPort™ option.

The standard configuration offers a broad yet fixed selection of signal I/O. J1 is dedicated to time code and rate inputs, J2 to sine wave inputs, and J3-J8 to mixed signal outputs. The standard Timing I/O Module configuration is 1PPS or IRIG B AM-In, 10 MHz-In, IRIG AM and IRIG DCLS-Out, 1PPS-Out and 10 MHz-Out. (See page 4 for Timing I/O Module specifications.)

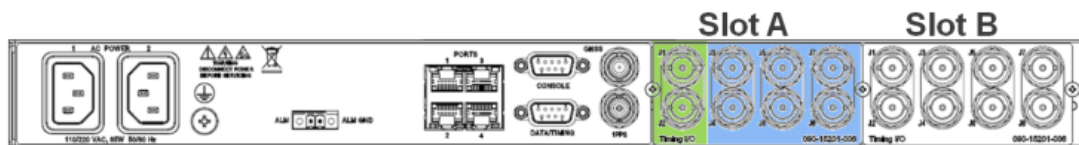
## FlexPort™ License for Timing I/O Modules

Microsemi's unique FlexPort™ Technology efficiently and cost-effectively adds innovative "any signal, any connector" technology, eliminating the wasted space inherent with legacy style fixed signal modules/BNCs.

The FlexPort™ Technology option enables the 6 output BNCs (J3-J8) to output any supported signal (time codes, sine waves, programmable rates, and so on.) on all configurable in real time via the secure web interface. Similarly, the 2 input BNCs (J1-J2) can support a wide variety of input signal types. This uniquely flexible BNC by BNC configuration makes very efficient and cost effective use of the 1U space available.

Two Timing I/O Modules doubles the number of supported input and output signals. Unlike legacy modules with fixed count BNCs outputting fixed signal types per module, with FlexPort™ Technology the user can have up to 12 BNCs (two Timing I/O Modules) outputting any combination of supported signal types.

This level of timing signal flexibility is unprecedented, and can even eliminate the need for additional signal distribution chassis as there is no degradation in the precise quality of the coherent output signals.



→ BNC Connectors		Input		Output					
↓ Signals		J1	J2	J3	J4	J5	J6	J7	J8
Standard	1PPS	●					●	off	off
	IRIG B AM	●		●				off	off
	IRIG B DCLS					●		off	off
	10 MHz		●		●			off	off
FlexPort	IRIG B AM/DCLS	■		■	■	■	■	■	■
	Selectable/Programmable Rates	■		■	■	■	■	■	■
	1/5/10 MHz Sine Waves		■	■	■	■	■	■	■

- = Fixed specific signal type
- = User configurable Time Codes, Selectable/Programmable Rates or Sine Waves

A single FlexPort™ license enables configuration flexibility on all installed Timing I/O modules.

**Note:** All Timing I/O modules are factory installed and must be ordered at the time of initial purchase. The FlexPort license can be added at any time.

## Timing I/O Module Signal Characteristics

Configuration	Input BNCs		Output BNCs					
	J1	J2	J3	J4	J5	J6	J7	J8
<b>Standard</b>	IRIG B AM 124 or 1PPS	10 MHz	IRIG B AM 124	10 MHz	IRIG B B004 DCLS	1PPS	off	off
<b>FlexPort Option</b>	IRIG B124 IRIG B004 IRIG B120 IRIG B000 IEEE-1344 1PPS 10MPPS	1 MHz 5 MHz 10 MHz	FlexPort J3-J8 Software Selectable Outputs per BNC (Configured via the web interface): a) Pulse: i) Fixed Rate: 10/5/1MPPS, 100/10/1/kPPS, 100/10/1/0.5PPS ii) Programmable Period: 100 ns to 2 sec, step size of 10 ns b) Timecode: IRIG B 000/004/1344 DCLS, 120/124/1344 AM c) Sine: 1/5/10 MHz					

IRIG B120/B124 are AM time codes, IRIG B000/B004 are DCLS time codes, IEEE -1344 is AM or DCLS.

Signal Levels	
IRIG-In	AM: Ratio 2:1 to 3.5:1 Amp: 1 V to 8 V p-p, into 50 Ω DCLS: <1.5 V for logic 0, >2 V for logic 1
IRIG-Out	AM: Ratio 10:3, Amp: 3.5 ± 0.5 Vpp, Zout 50 Ω DCLS: <0.8 V for logic 0, >2.4 V for logic 1, Zout 50 Ω for logic 0, >2.4 V for logic 1, Zout 50 Ω
1PPS-In	Rising edge active, TTL into 50 Ω
Rate/Pulse/1PPS-Out	Rising edge on-time, TTL into 50 Ω
1,5,10 MHz-In	Sine wave, 1 Vpp to 8 Vpp, into 50 Ω
1/5/10 MHz-Out	Sine wave 2.6 Vpp into 50 Ω
10 MPPS In	<1 V for logic 0, >2 V for logic 1, into 50 Ω

### Output Stability (10 MHz)

(measured on any 10 MHz output) module

Oscillator	1S	10S	100S	1kS	10kS
Standard	<1e <sup>-9</sup>	<2e <sup>-10</sup>	<1e <sup>-10</sup>	<1e <sup>-11</sup>	<1e <sup>-12</sup>
OCXO	<1e <sup>-9</sup>	<5e <sup>-11</sup>	<5e <sup>-11</sup>	<7e <sup>-12</sup>	<7e <sup>-13</sup>
Rubidium	<2e <sup>-10</sup>	<3e <sup>-11</sup>	<3e <sup>-11</sup>	<5e <sup>-12</sup>	<5e <sup>-13</sup>

## Outdoor Antenna Basics

Antenna cables and accessories enable versatile solutions that are easy to achieve. Inline GNSS amplifiers installed at the antenna are an easy way to extend cable runs from 225 feet to up to 900 feet, depending on cable type. Lightning arrestors provide valuable electrical shock protection to the SyncServer. Antenna cable splitters leverage a single antenna and cable for up to four GNSS receivers.

Ordering antenna components is a simple task. The most important thing the user needs to have is a rough idea of the total cable length needed between the SyncServer and the mounting location of the antenna. Any extra cable can be coiled to the side.

Preconfigured kits that include cable, antenna, and related mounting accessories are available. These kits vary by total cable length, and based on whether a lightning arrestor is required or not. For long cable runs (>225 ft.), the components are assembled individually.

To assist and simplify configuration, Microsemi has included an Excel-based antenna configurator on our website (near the link to this datasheet). The configurator helps the user determine the exact part numbers they need for the desired cable length and accessories.

**Important:** The antenna kit (part number 093-15202-001) includes a short SyncServer adapter cable with BNC(m)-N(f) connectors. All primary antenna cables use N(m) connectors on either end. A single cable must be used between the adapter cable and the next accessory (lightning arrestor, inline amplifier, or antenna). Lightning arrestors include a 25 ft. cable to connect to the next accessory (inline amplifier or antenna).

50-225 ft.  
Standard cable



225-450 ft.  
Standard cable +  
Inline Amplifier



450-900 ft.  
Low loss cable +  
Inline Amplifier



## Antenna Kits and Components

Description	Part Number
Kit: Total length: 50 ft, Cable: 50 ft; antenna kit	990-15202-050
Kit: Total length: 75 ft, Cable: 50 ft; lightning arrestor; Cable: 25 ft; antenna kit	990-15202-075
Kit: Total length: 100 ft, Cable: 100 ft;	990-15202-100
Kit: Total length: 125 ft, Cable: 100 ft; lightning arrestor; Cable: 25 ft; antenna kit	990-15202-125
Kit: Total length: 150 ft, Cable: 150 ft; antenna kit	990-15202-150
Kit: Total length: 175 ft, Cable: 150 ft; lightning arrestor; Cable: 25 ft; antenna kit	990-15202-175
Kit: Total length: 200 ft, Cable: 200 ft; antenna kit	990-15202-200
Kit: Total length: 225 ft, Cable: 200 ft; lightning arrestor; Cable: 25 ft; antenna kit	990-15202-225
250 ft. Antenna Cable	060-15202-250
350 ft. Antenna Cable	060-15202-350
450 ft. Antenna Cable	060-15202-450
500 ft. Low Loss Antenna Cable	060-15202-500
750 ft. Low Loss Antenna Cable	060-15202-750
900 ft. Low Loss Antenna Cable	060-15202-900
Kit: Antenna; Mounting Bracket; Adapter cable for chassis	093-15202-001
Inline Amplifier with adapter	093-15202-005
Kit: Lightning Arrestor with 25 ft. cable	093-15202-002
Kit: Lightning Arrestor with 25 ft. low loss cable	093-15202-003
Kit: 1:4 Splitter with two 3 ft. cables	093-15202-004

**Note:** Standard cable is LMR-240 or equivalent. Low loss cable is LMR-400 or equivalent.

## GNSS Antenna



The antenna used with the SyncServer S600/S650 is a high-gain (40dB) GNSS antenna covering the GPS L1, GLONASS L1, and SBAS (WAAS, EGNOS and MSAS) frequency band (1575 to 1606 MHz). The antenna has a three stage low-noise amplifier, with a mid-section SAW with a tight pre-filter to protect against saturation by high level sub-harmonics and L-Band signals making it excellent for timing applications. An L-bracket for pole mounting and 3-foot BNC(m) to N(f) cable is also included.

Technical Specification	
1 dB Bandwidth	31 MHz
10dB Return Loss Bandwidth	45 MHz
Antenna Gain	4.5 dBic
Axial Ratio	<4 dB @ 1590 MHz, 8 dB typical at band-edges
Filtered LNA Frequency Bandwidth	1575 to 1606 MHz
Gain	40 dB minimum
Gain	flatness +/- 2 dB, 1575 to 1606 MHz
Out-of-Band Rejection	
<1550 MHz	>50 dB
>1640 MHz	>70 dB
VSWR (at LNA output)	<1.5:1
Noise Figure	2.5 dB typical
Supply Voltage Range	+2.5 to 16 VDC nominal (12 VDC recommended maximum)
Supply Current	20 mA maximum at 85°C
Mechanical Size	66.5 mm diameter x 21 mm height
Operating Temp.	-40°C to +85°C
Weight	150 g
Environmental	IP67, CE, REACH, and RoHS compliant
Salt Fog / Spray	MIL-STD-810F Section 509.4

## GNSS Inline Amplifier



Cable length is a common cause for signal loss between the GNSS antenna and the GNSS receiver. As with any electromagnetic radio wave, GNSS signals become attenuated as they pass through an electrical cable. The amount of signal loss depends on the length and type of cable used. The inline amplifier attaches between the antenna and the antenna cable. It uses the same power as the antenna and does not require extra wiring.

### Key Features

- Extended cable length up to 900 feet depending on the cable type
- Fits inline with antenna cable
- No external power source needed
- Simple installation

Electrical Specification	
Nominal Gain	25 dB +/-0 dB typical
Pass Band Ripple	+/-2 dB
Impedance	50 Ohms
Noise Figure	2 dB typical.
Bandwidth	1.2 to 1.8 GHz
Input VSWR	1.5 typical / 2 maximum
Output VSWR	1.5 typical / 2 maximum
Reverse Isolation	>35 dB
Output 1dB	-10 dB
Output IP3	+5 dBm

Mechanical and Environmental Specification	
Mechanical Size	2.32" length x 0.787" diameter.
Connector	N-Type
Operating Temp.	Range -40°C to +85°C
Environmental	RoHS, REACH, and IP67

## GNSS Lightning Arrestor

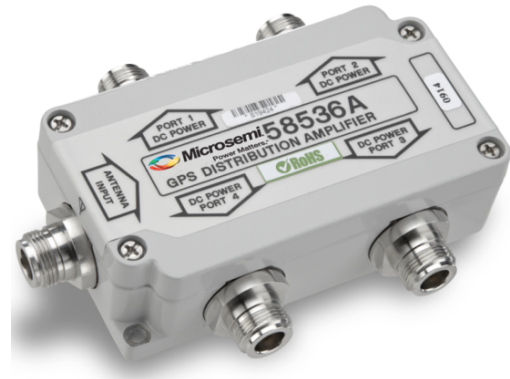


Lightning does not have to strike the antenna to significantly damage the antenna or the GNSS receiver. Damage is often due to the effects of a lightning strike on a nearby structure, not a direct strike on the antenna itself. Since lightning strikes may induce damaging voltages in the antenna system when striking nearby objects, attempt to locate the antenna away from lightning rods, towers, and other structures that attract lightning. Also, locate the GNSS antenna lower than any nearby structures that are likely to attract a strike.

Technical Specification	
Type	DC Pass
Mount Type	Bulkhead Mount
PIM Rated	N
Standards	CE Compliant, RoHS Compliant
Connector	N
Surge Side Connector	Bi-Directional N
Protected Side Connector	Bi-Directional N
Frequency Range	dc to 5 GHz
Turn On Voltage	150 Vdc (spark over)
RF Power	25 W
VSWR	≤1.2 dB to 1
Insertion Loss	≤0.1 dB
Protocol/Application	Gas tube, DC pass RF coaxial protection for dc to 5 GHz

The lightning arrestor also ships with 25 feet of either standard or low loss cable.

## GPS L1 4:1 Active Splitter



### Key Features

- 4 ports
- High isolation

### Key Benefits

- Can be conveniently cascaded without adding separate amplifiers and bias-tees between splitters
- Delivers precise GPS signals over a wide temperature range and in harsh environmental conditions
- Eliminates feedback and interaction between any GPS system connected to it.

Technical Specification	
Number of Output Ports	4
Input/output impedance	50 Ω
VSWR (typical)	Input and output 1.6 at L1
Bandwidth (-3 dB)	L1 (1575.42 MHz) ±20 MHz
Gain (antenna input to any output at L1)	0 dB ±3 dB
Noise figure	5 dB typical, at 25°C
Port-to-port isolation L1 +/-40 MHz	50 dB typical
DC power	+4.5 to +13 V DC
Damage threshold	18 V DC either polarity
Operating current	23 to 48 mA depending on voltage
Pass through current	450 mA
Group delay	40 ns typical
RF connectors	Female N-type

Complete specifications for this Microsemi Model 58536A GPS Splitter can be found on the Microsemi web site.

## Option Availability Matrix

Order Time	Option/Upgrade	S600	S650
Only at initial time of purchase	Rubidium Upgrade	●	●
	OCXO Upgrade	●	●
	Dual Power Supplies	●	●
	Timing I/O Module(s)		●
Anytime	Security Protocol License	●	●
	FlexPort™ License*		●
	Synchronization Software	●	●

\*Only applicable if one or two Timing I/O Modules are previously installed in the SyncServer S650 .

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