



Configuration Cable Hub

SYN-9490-[3,A,B,C,S,N]

MILITARY GRADE Configuration Cable Hub

-40°C to 70°C Operating Temperature	"N+M" Redundancy Technology	Expandable 15+ Unit Capacity	128 kW Parallel Power	3-Phase, Split-Phase, and Single-Phase Dedicated Hubs	SYN-9490-x
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DESIGNED & MANUFACTURED IN USA

SynQor’s Military-Grade Configuration Cable Hub units are designed for the extreme environmental and demanding electrical conditions of Military/Aerospace applications. SynQor’s Configuration Cable Hub incorporates field proven rugged packaging technologies. The use of Configuration Cable Hub enables the paralleling of up to 32 compatible best-in-class power systems. It is designed and manufactured in SynQor’s USA facilities to comply with a wide range of military standards.

The Configuration Cable Hub is only intended for use within the SynQor products as the primary configuration method for the product. Features include dedicated hubs for each system type, and easy paralleling of SynQor “N+M Redundancy” products.

Plug-and-play paralleling of up to 32 compatible units

Features

- Sealed, weather-proof, shock-proof construction
- For 3-Phase, Single-Phase, and Split-Phase systems
- Parallel 15 units with a single Configuration Cable Hub
- Chain 3x Configuration Cable Hubs for up to 32 units
- Compatible with all N+M Redundancy options from the UPS, MINV, MAC, MPC, and MPPS product families.
- Use easy to manufacture 1-to-1 cables, no longer need to set unit’s phase inside the cable
- Wide operating temperature: -40°C to +70°C
- MINV, MAC, MPPS combined power: 128 kW
- UPS, MPC combined power: 40 kW
- 1U high rack mount unit (17.00”W x 0.875”D x 1.73” H)
- Low weight: 1.65 lbs.

Specification Compliance

- SYN-9490 units (paired with compatible systems) are designed to meet:
- MIL-STD-810G - Environmental Engineering Considerations
 - MIL-STD-461F - Electromagnetic Interference

In-Line Manufacturing Process

- AS9100 and ISO 9001 certified facility
- Full component traceability

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Configuration Cable Hub

SYN-9490-[3,A,B,C,S,N]

Product Description

The SynQor Military-Grade Configuration Cable Hub is a paralleling hub that replaces complicated cable harnesses with a rugged 1U rack mount solution that automatically assigns each unit to the correct phase. Compatible with all SynQor's 'N+M Redundancy' systems, the Config Cable Hub is offered in six different versions: Three-phase, A-phase only, B-phase only, C-phase only, Split-phase, and N-phase only. For a full list of compatible units, please see the Compatible Units table below.

Previously, units required specific 'configuration cables' to assign their respective phase-shift in the bank. The cable provided high speed digital communication for current sharing, but also included internal shorts between pins to assign a particular phase. Instead, the Configuration Cable Hub assigns each phase inside the Hub itself, using only passive components. Now all units, even those in different phases, use the same 1-to-1 male-DB15 to female-DB15 cable, all of which plug directly into the Hub. For larger systems with more than 15 units, separate male-to-male jumper cables are available to chain together multiple Config Hubs.

SYN-9490-x is compatible with the following SynQor product families:	
UPS-1250-[S,H,M]-[1U,2U]-x-270-[M,R]	
UPS-1500-[S,H,M]-[1U,2S]-x-x-R	
UPS-3000-[S,H,M]-2U-x-x-R	
MINV-4000-1U-[28,270]-x-[F,R] ¹	
MAC-4000-1U-xxxx-[F,R] ¹	
MPC-1250-1[S,U]-x-P	
MPC-1500-1[S,U]-xxR	
MPC-3000-2U-xxR	
MPPS-4000-1U-x ²	

Not all combinations make valid part numbers, please contact SynQor for availability.
See the Product Summary web page for more options.

***Notes:**

- 1) Only the MINV and MAC are compatible with the Config Hub when using the "F" option. All families, except MPPS, are compatible with the Config Hub with the "R" option when selecting the AC Output Neutral Wire. See respective datasheets for details.
- 2) The MPPS uses SYN-9490-A to parallel up to 8 DC Output units, but does not include the 'R' option ordering code. Compared to the AC output systems, MPPS DC output has no concept of phase, but SYN-9490-A is the only hub that works with MPPS parallel operation.



Application Section

Compatible Product Families: Paralleling With and Without Redundancy

MAC and MINV's "F" Option: Expanded Paralleling

When the "F" option is selected for the AC Output Neutral Wire, the MAC and MINV families are compatible with the Configuration Cable Hub. With this option, up to 32 MAC's or MINV's units can be placed in parallel.

AC output current sharing among the paralleled units is accomplished with a high speed digital configuration cables. The units will share the total load current to within $\pm 2\%$, and for a split-phase or 3-phase system the AC voltages and AC currents will have phase balance within ± 2 degrees.

While up to 32 "F" option units can be placed in parallel with the Config Hub, there is no guarantee of redundancy. A failure of any one unit with the "F" option could cause the AC output bus to collapse. See respective unit datasheets for details.

MAC, MINV, UPS, and MPC's "R" Option: AC Output Electronic Breaker

Available to the MAC, MINV, UPS, and MPC product families, the "R" option also adds an electronic breaker to the AC output of the system to permit fault-tolerant, glitch-free parallel operation. All units with the "R" option are compatible with the Configuration Cable Hub.

With this option, when several units are connected in parallel at their AC outputs and one unit has an internal fault that might otherwise have pulled down the AC output bus, the electronic breaker will disconnect the failed unit so that the remaining paralleled units can continue to power the bus. This allows the system to be fault-tolerant. The disconnect occurs very quickly so that the AC output voltage will remain within its specified parameters as long as the remaining paralleled units can deliver the total load power. This allows the system to continue running glitch-free.

The electronic breaker is a single-pole breaker present in the hot-side AC output wire only. The neutral AC output wire is left floating from the chassis to facilitate the paralleling of units into various configurations with the Config Hub.

"R" Option Overview: N+M Redundancy

This "R" option is always compatible with the Configuration Cable Hub. It makes it possible to set up N+1, or more generally N+M, redundant systems with a total of up to 32 units. In such a system the failure of one unit (or M units) will not cause the overall system to fail. A failed unit can then be replaced to return the redundancy level to its original design. The replacement unit can be inserted into a live, operating system with proper precautions, but for safety reasons it is recommended that the system be turned off first.

Configuration Cables

Any system of 'N+M' redundancy units, compatible "F" option MINVs or MACs, or MPPSs, require a specific configuration cable or Config Hub to define the arrangement of units in the system. This configuration determines the phase shift for split-phase and 3-phase systems. The cable or Hub also provide high speed digital communication for current sharing on each phase.

Configuration cables are available for two parallel units and three parallel units in a single-phase system, two unit split-phase systems, and three unit three phase systems are available as standard products.

Alternatively, Configuration Cable Hubs replace the unique cables to set each phase. Instead, a 1-to-1 cable connects the unit to the Hub and sets the phase. Now all units in the system use the same cable, and the Hub is mounted into the same rack, allowing for units to be easily configured.

For example, a 3-phase system with 6x SynQor MINV-4000-1U-28-1-Rs could use a single SYN-9490-3 Hub to assign phases and create a redundant system. With 6x SYN-9501 accessory cables, each of the two Phase A units are plugged into any of the available Phase-A positions on the Config Hub [A1-A5]. The Phase B units are then plugged into any of the Phase B positions [B1-B5], and the Phase C units into the Phase C positions [C1-C5].



Application Section

Output Power Cable Connection

More generally, systems are formed by first connecting the neutral wires of all the individual units together. For single phase systems, the hot wires are also connected together to form a single bank of units. Split-phase systems are formed by connecting the hot output wires into two banks. One bank will have its output voltage phase-shifted 180° from the other. The phase-shift is determined by the configuration cable, or the Configuration Cable Hub.

Similarly, 3-phase systems are formed by grouping the hot output wires into three banks, each bank having its output voltage phase-shifted by 120°. Again, the phase shift is determined by the configuration cable hub or the cable itself. Since 3-phase systems are formed by connecting the neutral wires together and phase shifting the hot wires, the AC outputs must be wye-connected to form 3-phase systems. Delta connections of unit outputs is not supported. However, once a 3-phase system is formed, loads may be connected as wye or delta.

The diagrams on the following pages give examples of how multiple compatible units can be connected to create higher output power single-phase, split-phase, and 3-phase AC systems. Systems with the “R” option will have N+M redundancy as long as N units are sufficient for the maximum load power per phase. Note, again, that the maximum total number of units that can be arranged in any of these configurations is 32.

Configuration Cable Hub Versus Standard Cables

As described above, the Configuration Cable Hub and accessory cables remove the need for unique cables to identify the phase of the system. For example, 4 MPFS units in a 3-phase configuration could purchase the SYN-9490-3 Hub and 4x SYN-9501 cables, instead of the SYN-9344 cables. The Config Hub provides even greater improvements for larger systems, as difficult to manufacture phase-specific cable harnesses are replaced by simple 1-to-1 accessory cables and a shared Hub. For all systems greater than four units, Synqor recommends the use of the Configuration Cable Hub.

Usage Guidelines

1. Minimize the cable length between the configuration ports of any two systems in a parallel and/or 3-Phase/split phase network. It's recommended to not exceed total cable + hub length of 12.5ft for reliable and uninterrupted operation.
2. Avoid disconnecting the paralleling cable (SYN-XXXX) from the live system. Doing so introduces the possibility for the output to be interrupted. Procedure for disconnecting a parallel cable from a running system is as follows:
 - i) Disable the unit that is about to be disconnected.
 - ii) Remove the paralleling cable at the configuration cable hub end first.
 - iii) Remove the paralleling cable at the unit end.
3. Adding a unit to a live parallel system presents a shock hazard when connecting to the parallel output. To insert a unit into a system, all units should be disabled first, input power should be removed and the new unit should be connected as per the user guide. Input power can then be reapplied to the entire system.
4. More than 32 units must not be connected to a system. Only 32 units in a system will work in parallel/3-phase/split-phase, and the additional units will respond to the enable command, but deliver power asynchronously. This could cause the entire output AC bus shutdown.
5. Ensure cables are tightened properly. Loose cables may shut down the output.
6. Connecting any unit to the wrong hub is equivalent to connecting the unit to the wrong phase. This could cause one unit to latch its output off, or could cause the entire phase to collapse.

Hub	Cables Replaced
SYN-9490-A	SYN-9341
	SYN-9343
	SYN-9344
	SYN-9347
	SYN-9348
	SYN-9349
SYN-9490-3	SYN-9344
SYN-9490-N	SYN-9347



Configuration Cable Hub

SYN-9490-[3,A,B,C,S,N]

Application Section

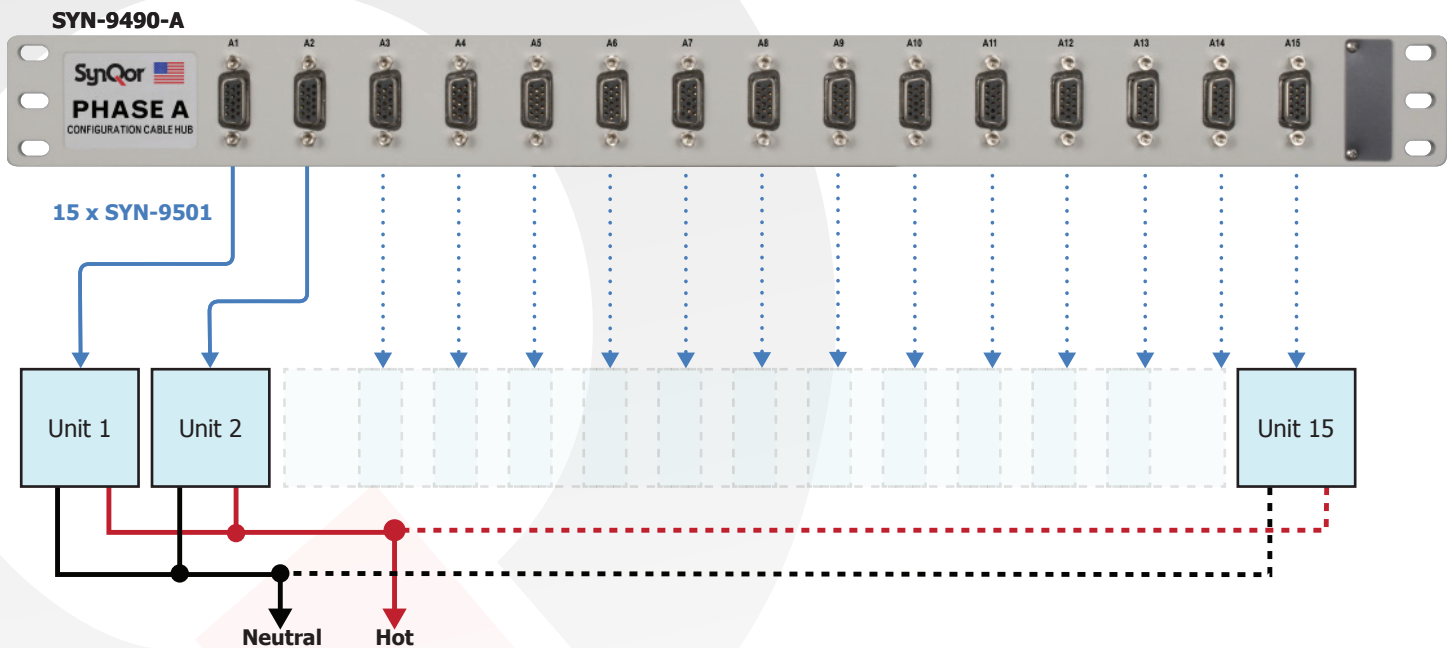
CABLE CONFIGURATIONS

Single Phase - Up to 15 units

1x SYN-9490-A, 15x SYN-9501 Cables

For single-phase systems with less than 15 total units, 1x A-Phase Config Hub and 1x Accessory Cable per unit is required. The hot wires and neutrals are tied to one another, respectively, to form a bank of N+M units. Each unit then uses one SYN-9501 cable to connect from the "Config" DB15 port of the unit into the Configuration Cable Hub.

Note: All 15 ports of the single-phase Configuration Cable Hub are identical.



* Configuration Cables
* AC Output

Single Phase Output Systems



**Configuration Cable
Hub**

SYN-9490-[3,A,B,C,S,N]

Application Section

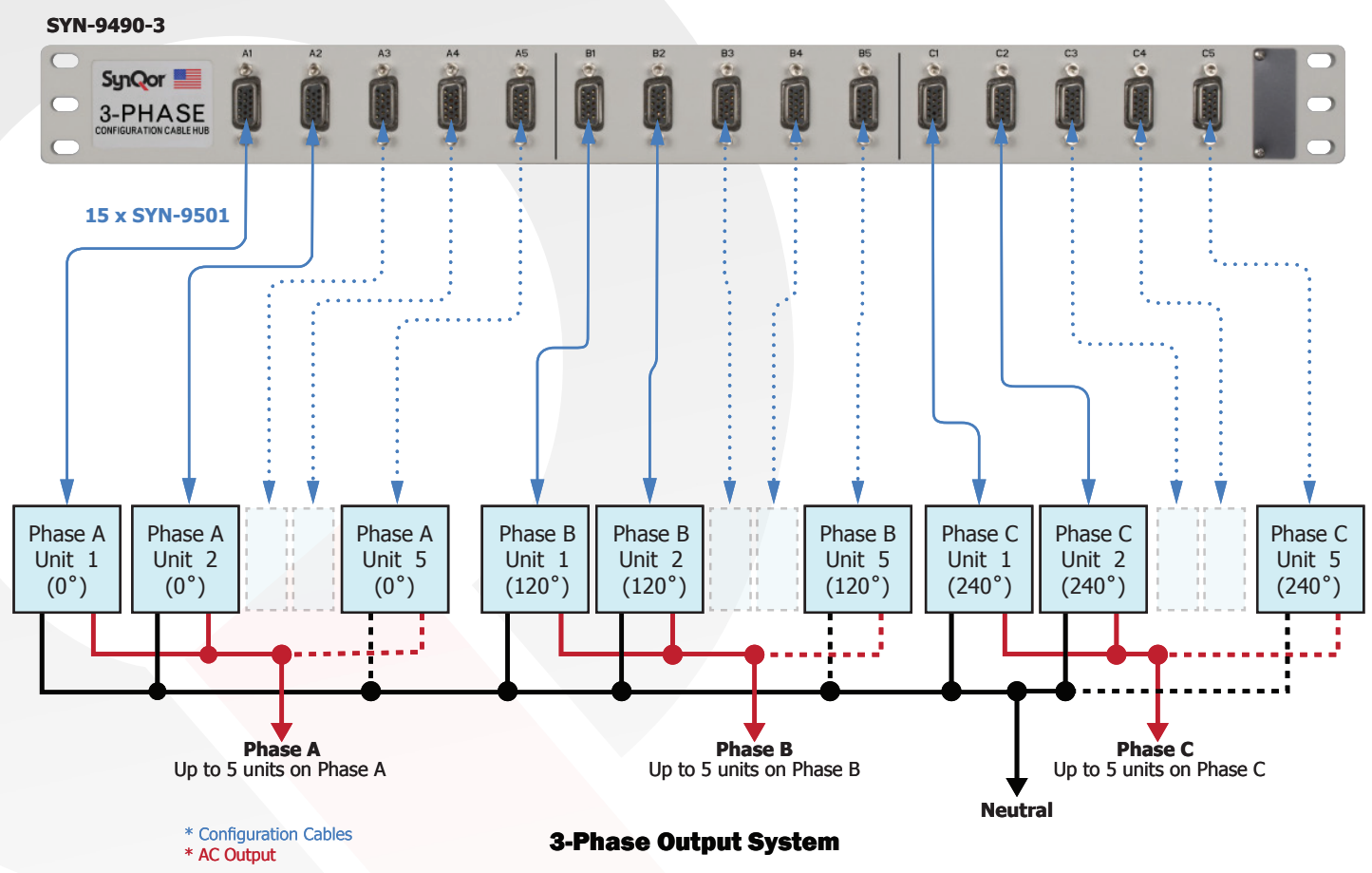
CABLE CONFIGURATIONS

3-Phase - Up to 15 units (5 per phase)

1x SYN-9490-3, 15x SYN-9501 Cables

For three-phase systems with less than 15 total units, 1x Three-Phase Config Hub and 1x Accessory Cable per unit is required. The hot wires of each phase, and the neutrals of all phases, are tied together, respectively, to form a bank of units in each phase. Each unit then uses one SYN-9501 cable to connect from the "Config" DB15 port of the unit into the Configuration Cable Hub's corresponding phase. A-phase corresponds to 0° degrees, B-phase to 120° degrees, and C-phase to 240° degrees.

Note: Within each phase of the Config Hub, all 5 positions are identical.



Application Section

CABLE CONFIGURATIONS

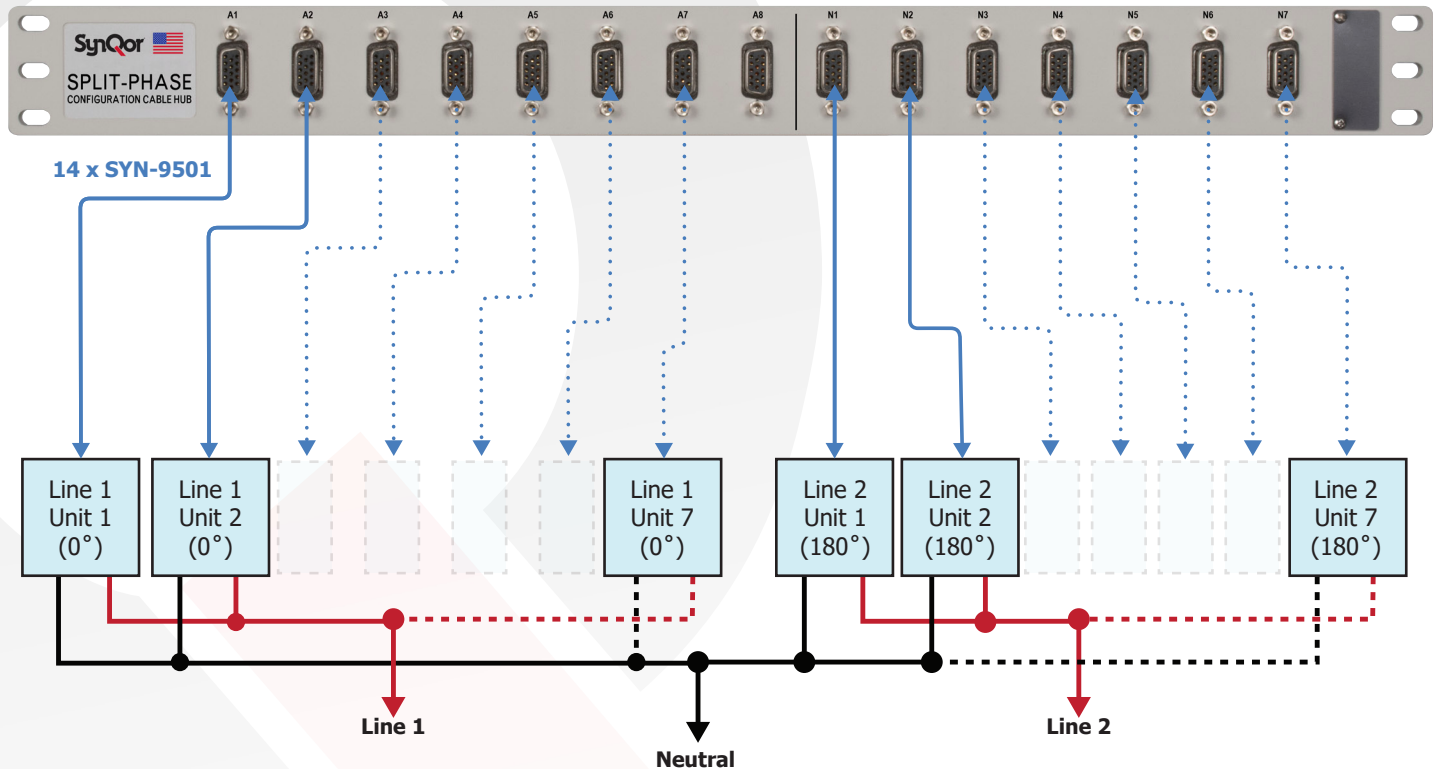
Split Phase - Up to 15 units (7 per phase)

1x SYN-9490-S, 14x SYN-9501 Cables

For split-phase systems with less than 15 total units, 1x Split-Phase Config Hub and 1x Accessory Cable per unit is required. The hot wires of each phase, and the neutrals of both phases are tied together, respectively, to form a bank of units in each phase. Each unit then uses one SYN-9501 cable to connect from the "Config" DB15 port of the unit into the Configuration Cable Hub's corresponding phase. A-phase corresponds to 0° degrees and N-phase to 180° degrees.

Note: The Line 1, 0° phase has one additional port, and within each phase all ports are identical. Thus, units may be connected to any of the 7 (or 8) available ports in their respective phase.

SYN-9490-S



* Configuration Cables
* AC Output

SPLIT-Phase Output Systems



Configuration Cable Hub

SYN-9490-[3,A,B,C,S,N]

Application Section

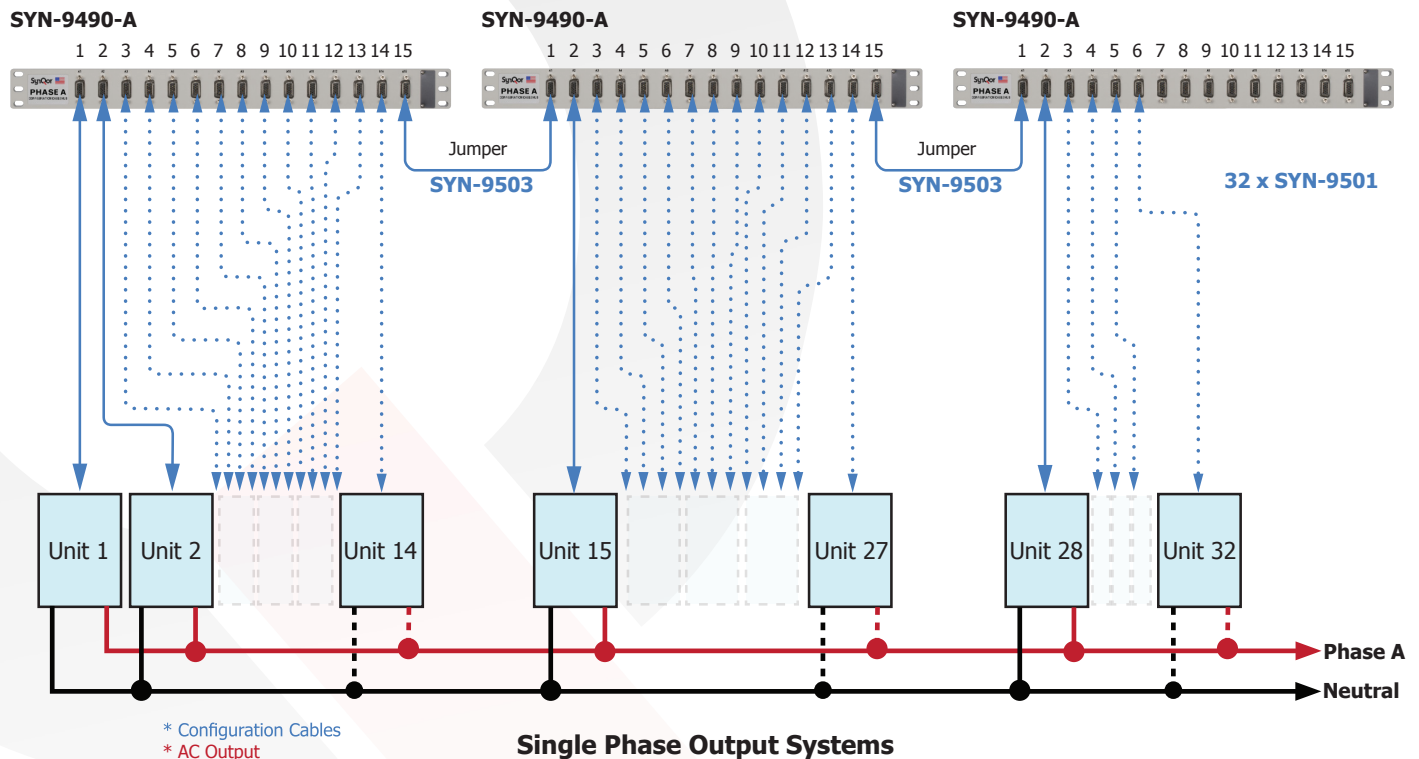
CABLE CONFIGURATIONS

Single Phase - Up to 32 units

3x SYN-9490-A, 32x SYN-9501 Cables, 2x SYN-9503 Jumper

For Single-Phase systems with more than 15 units, additional A-Phase Configuration Cable Hubs are required. Each unit requires 1x Accessory Cable per unit, as well as 2x Jumper Cables to connect the hubs to one another. The hot wires and neutrals are tied to one another, respectively, to form a bank of N+M units. Each unit then uses one SYN-9501 cable to connect from the "Config" DB15 port of the unit into the Configuration Cable Hub. Every unit also must communicate with all other units in the system. To achieve this, the SYN-9503 jumpers can be inserted into any available port to daisy chain one Config Hub to the next.

Note: Once the A-Phase only Configuration Cable Hubs are connected to one another, the remaining 41 ports of a single-phase system are identical. Thus, units in a single-phase system may be connected to any of the available ports.





Application Section

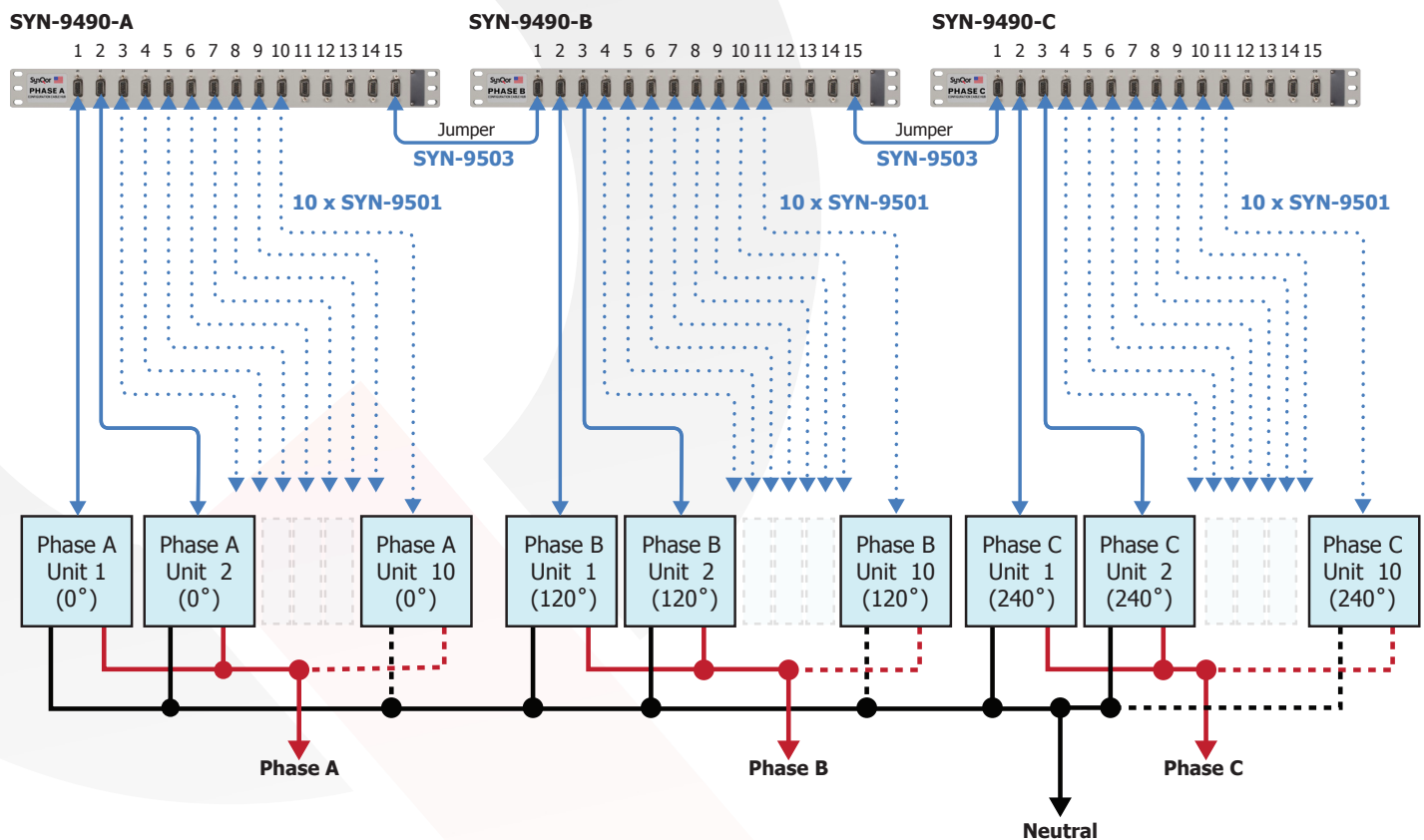
CABLE CONFIGURATIONS

3-Phase - Up to 30 units (10 per phase)

1x SYN-9490-A, 1x SYN-9490-B, 1x SYN-9490-C, 30x SYN-9501 Cables, 2x SYN-9503 Jumpers

For Three-Phase systems with more than 15 units, 1 A-Phase Hub, 1 B-Phase Hub, and 1 C-Phase Hub are required. Each unit requires 1x Accessory Cable, as well as 2x Jumper Cables to connect the hubs to one another. The hot wires of each phase, and the neutrals of all phases are tied together, respectively, to form a bank of units in each phase. Each unit then uses one SYN-9501 cable to connect from the "Config" DB15 port of the unit into the corresponding Configuration Cable Hub phase. Every unit also must communicate with all other units in the system. To achieve this, the SYN-9503 jumpers can be inserted into any available port to daisy chain one Config Hub to the next. A-phase corresponds to 0° degrees, B-phase to 120° degrees, and C-phase to 240° degrees.

Note: The ports within each phase are identical. Thus, units in each phase bank may be connected to any of the available ports of their respective phase's Config Hub.



* Configuration Cables
* AC Output

3-Phase Output Systems



Application Section

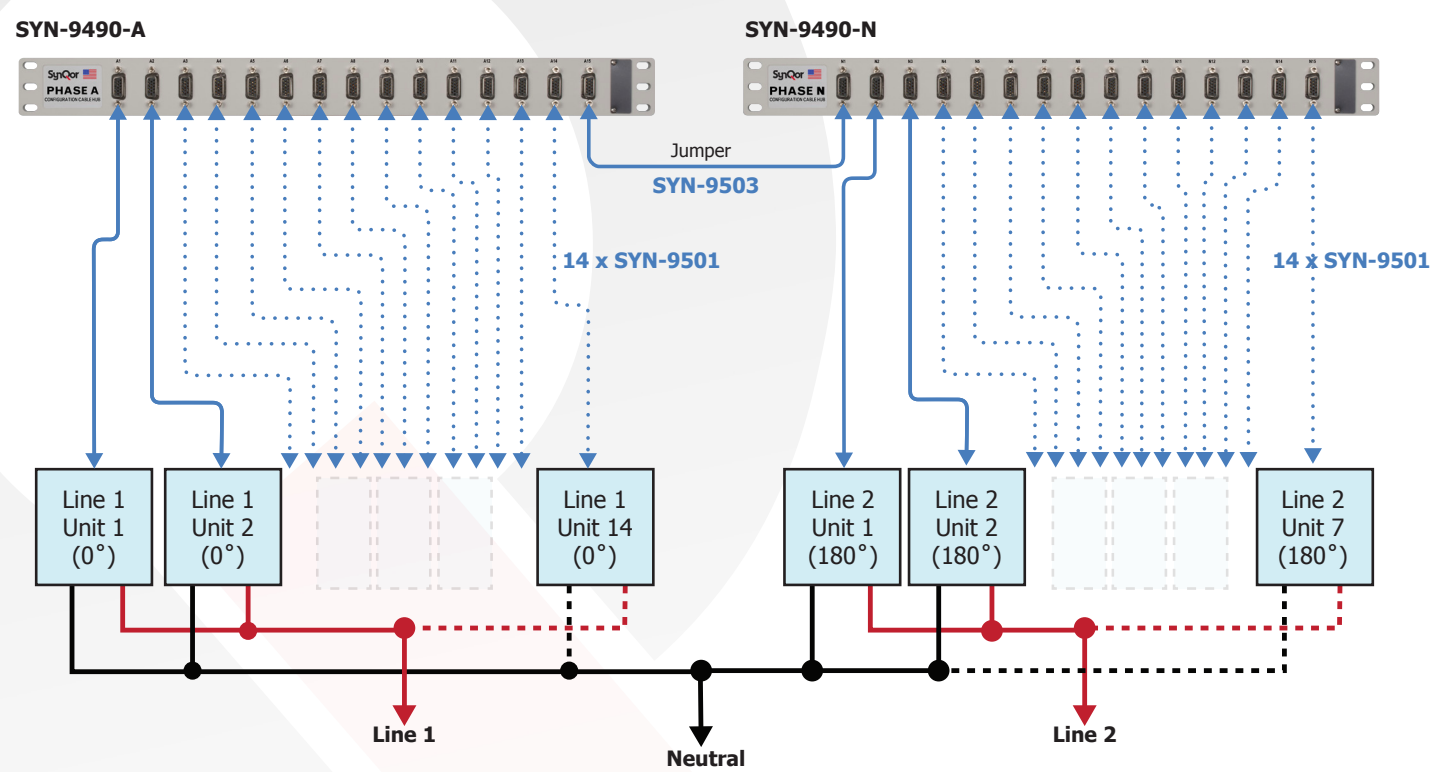
CABLE CONFIGURATIONS

Split Phase - Up to 28 units (14 per phase)

1x SYN-9490-A, 1x SYN-9490-N, 28x SYN-9501 Cables, 1x SYN-9503 Jumper

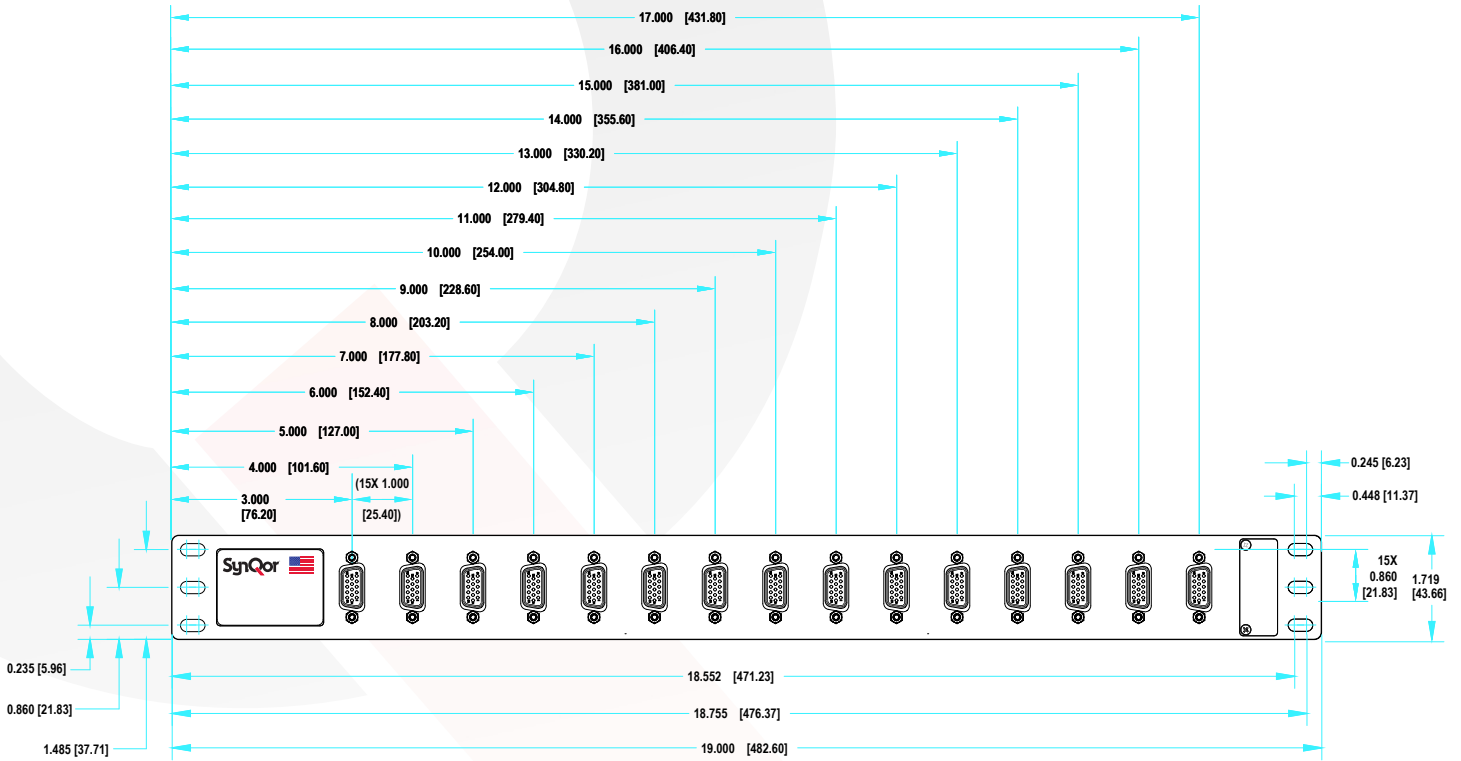
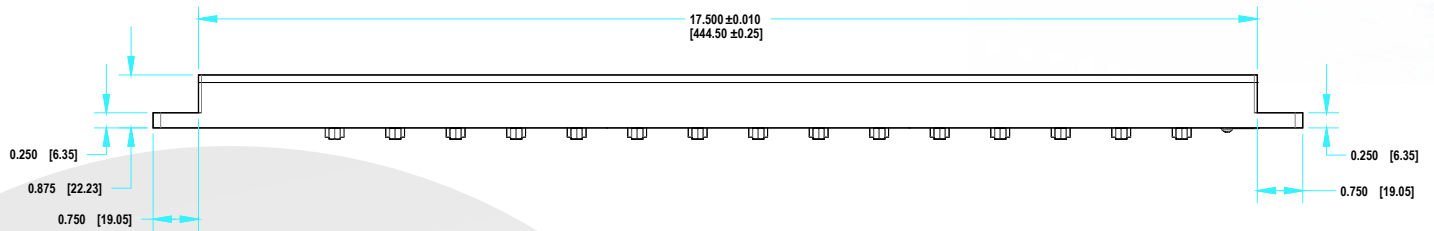
For Split-Phase systems with more than 15 units, 1 A-Phase Hub and 1 N-Phase Hub are required. Each unit requires 1x Accessory Cable, as well as 1x Jumper Cable to connect A and N Hubs to one another. The hot wires of each phase, and all the neutrals of both phases are tied together, respectively, to form a bank of units in each phase. Each unit then uses one SYN-9501 cable to connect from the "Config" DB15 port of the unit into the corresponding Configuration Cable Hub phase. One SYN-9503 jumper is also used to daisy chain the hubs together. A-phase corresponds to 0° degrees and N-phase to 180° degrees.

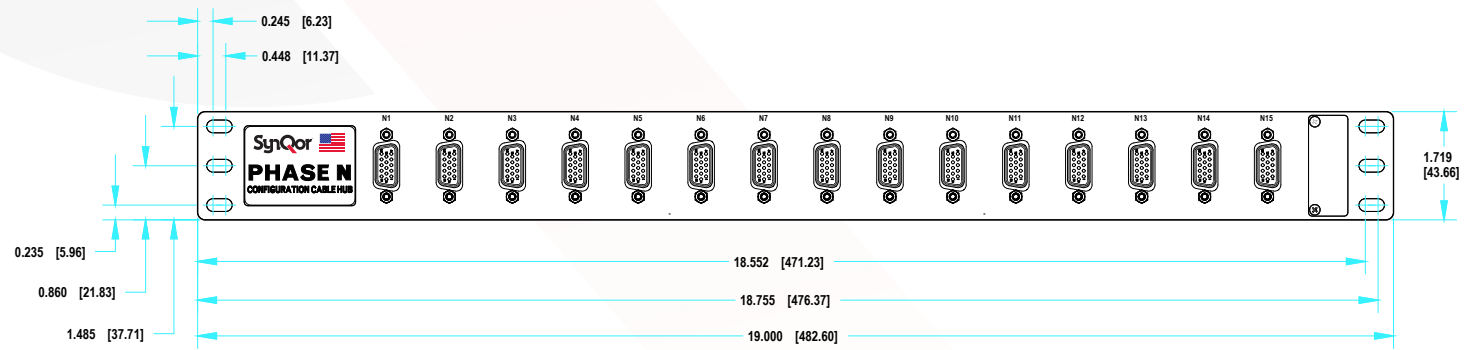
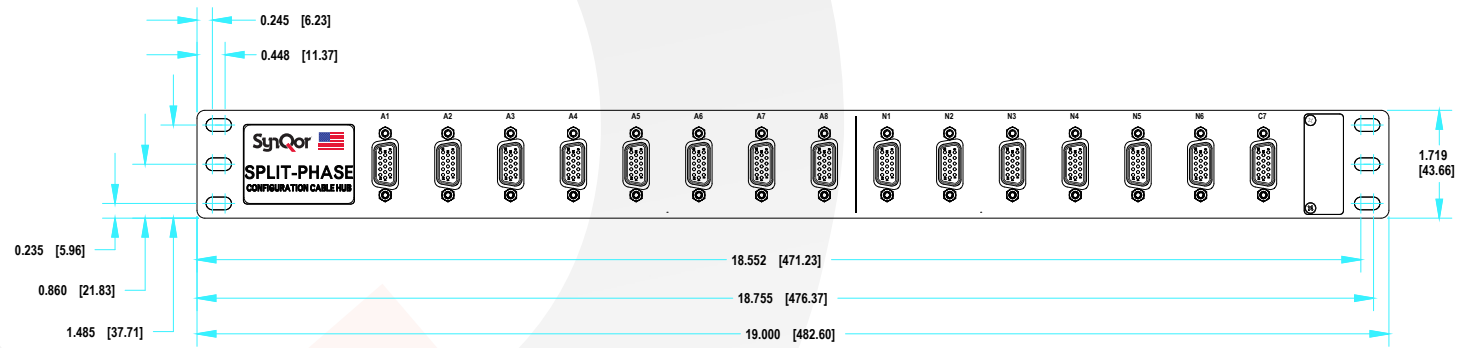
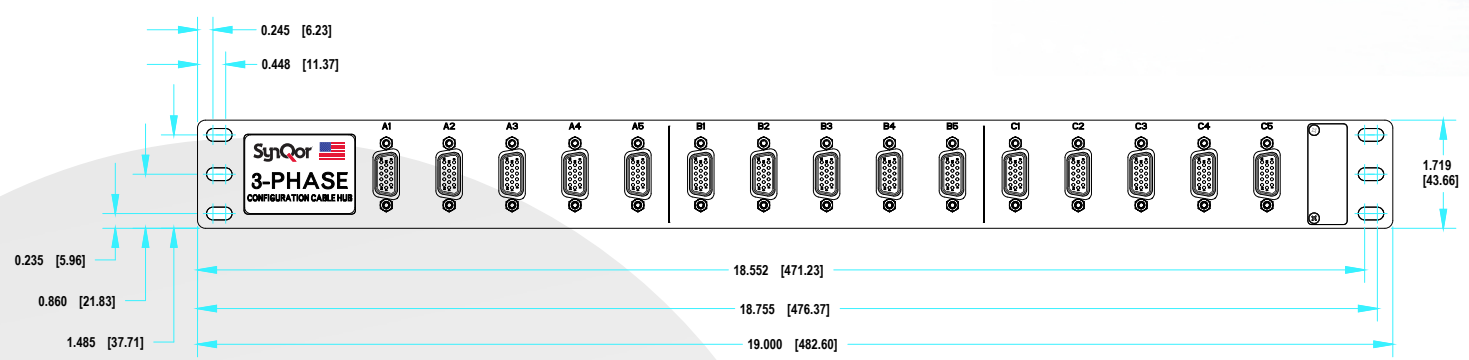
Note: The ports within each phase are identical. Thus, units in each phase bank may be connected to any of the available ports of their corresponding phase Config Hub. Systems also support up to 32 total units (16 per phase), but this requires additional Configuration Cable Hubs. Contact SynQor for application details.



* Configuration Cables
* AC Output

SPLIT-Phase Output Systems



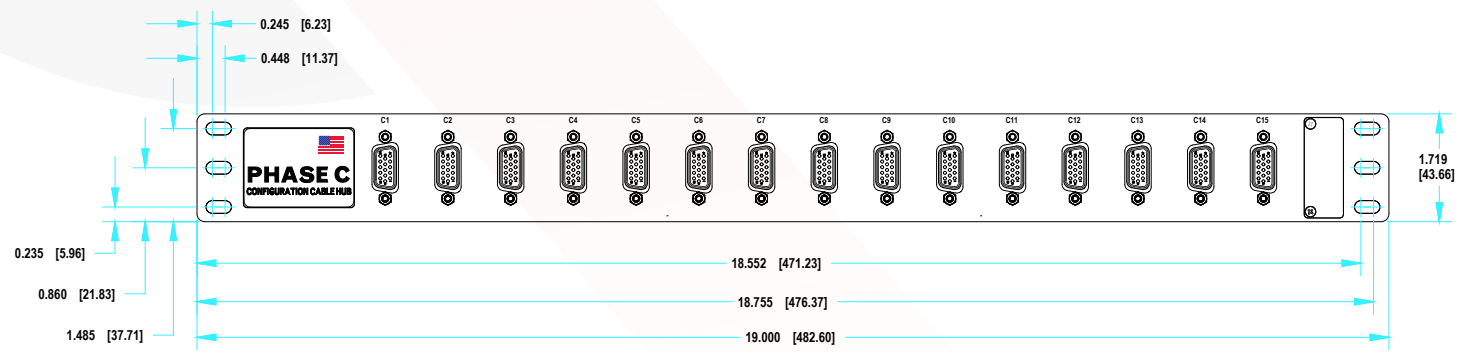
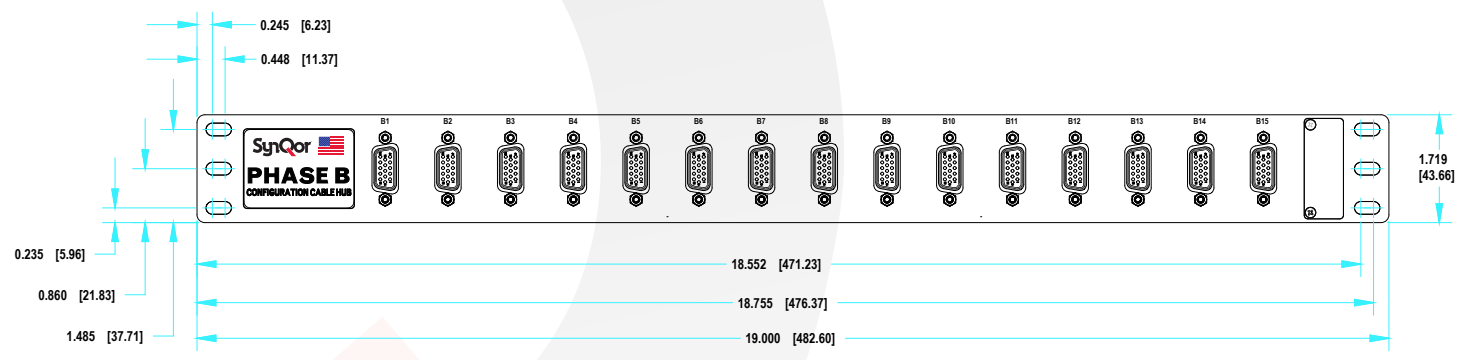
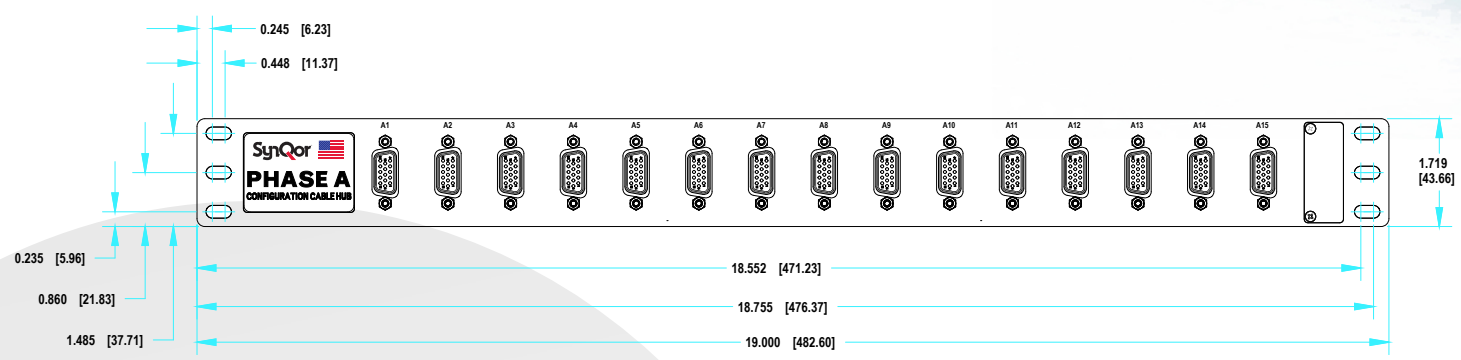




Configuration Cable Hub

SYN-9490-[3,A,B,C,S,N]

Mechanicals





Ordering Information

HUB	Configuration Cable Hub Options
SYN-9490-	A: Configuration Cable Hub Phase-A
	B: Configuration Cable Hub Phase-B
	C: Configuration Cable Hub Phase-C
	N: Configuration Cable Hub Phase-N
	3: Configuration Cable Hub Three-Phase
	S: Configuration Cable Hub Split-Phase

Please contact SynQor for availability.

Example: SYN-9490-3

Cable	Description
SYN-9501	3 ft Accessory: Config Cable Hub 1-1 Accessory Cable, 36 inches, male-female
SYN-9503	1.5 ft Jumper: Config Cable Hub 1-1 Jumper Cable, 18 inches, male-male
SYN-9505	1.5 ft Jumper: Config Cable Hub 1-1 Jumper Cable, 18 inches, male-female

Contact SynQor for further information and to order:

Phone: 1 (603) 541-4141

Web: www.synqor.com

E-mail: power@synqor.com

Address: 9 Northeastern Blvd., Suite 200, Salem, NH 03079 USA

WARRANTY

SynQor offers a 1 year limited warranty. Complete warranty information is listed on our website or is available upon request from SynQor.