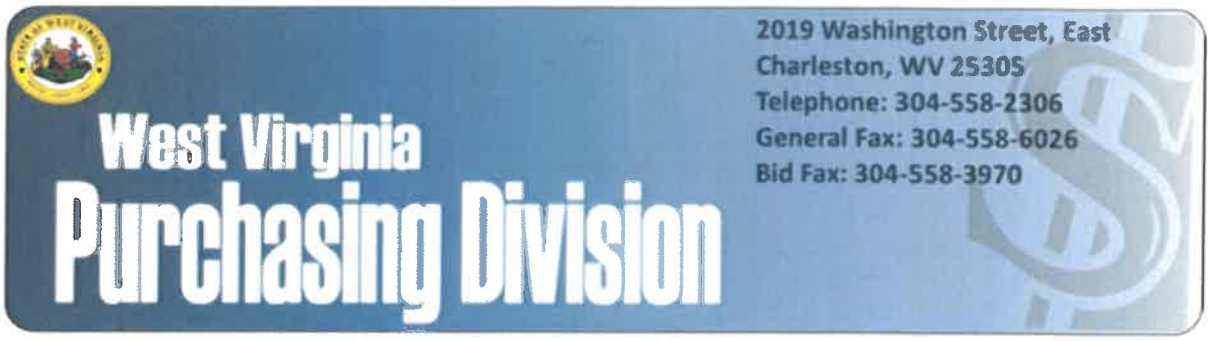
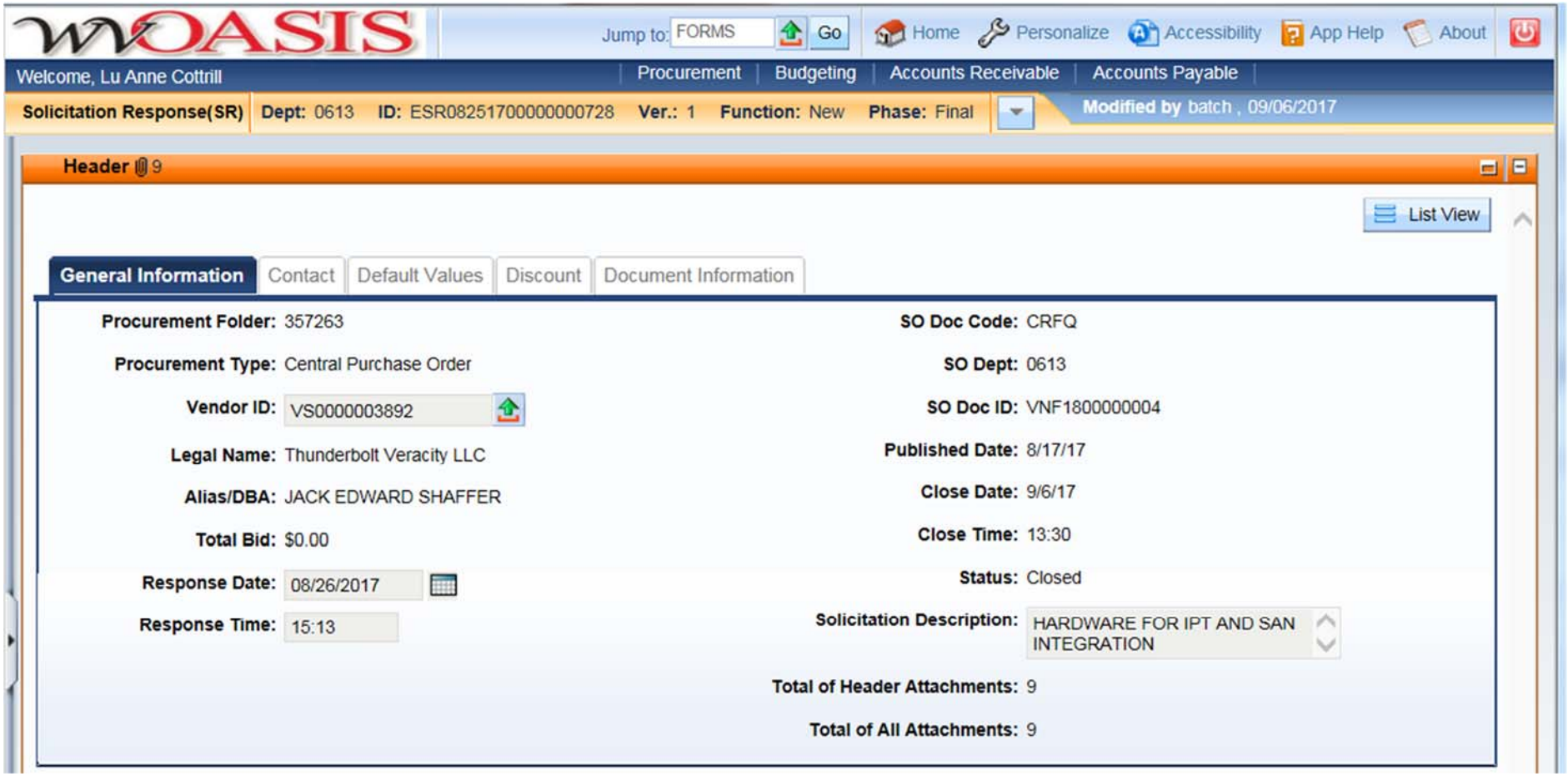


The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.


WVOASIS
Jump to: FORMS Go
Home
Personalize
Accessibility
App Help
About
Welcome, Lu Anne Cottrill
Procurement
Budgeting
Accounts Receivable
Accounts Payable
Solicitation Response(SR) Dept: 0613 ID: ESR08251700000000728 Ver.: 1 Function: New Phase: Final
Modified by batch , 09/06/2017
Header 9
List View
General Information
Contact
Default Values
Discount
Document Information
Procurement Folder: 357263
Procurement Type: Central Purchase Order
Vendor ID: VS0000003892
Legal Name: Thunderbolt Veracity LLC
Alias/DBA: JACK EDWARD SHAFFER
Total Bid: $0.00
Response Date: 08/26/2017
Response Time: 15:13
SO Doc Code: CRFQ
SO Dept: 0613
SO Doc ID: VNF1800000004
Published Date: 8/17/17
Close Date: 9/6/17
Close Time: 13:30
Status: Closed
Solicitation Description: HARDWARE FOR IPT AND SAN INTEGRATION
Total of Header Attachments: 9
Total of All Attachments: 9

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder : 357263
Solicitation Description : HARDWARE FOR IPT AND SAN INTEGRATION
Proc Type : Central Purchase Order

Date issued	Solicitation Closes	Solicitation Response	Version
	2017-09-06 13:30:00	SR 0613 ESR08251700000000728	1

VENDOR

VS0000003892
Thunderbolt Veracity LLC
JACK EDWARD SHAFFER

Solicitation Number: CRFQ 0613 VNF1800000004

Total Bid : $0.00 **Response Date:** 2017-08-26 **Response Time:** 15:13:01

Comments:

FOR INFORMATION CONTACT THE BUYER
Crystal Rink
(304) 558-2402
crystal.g.rink@wv.gov

Signature on File **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	CISCO ISR 4431 US BUNDLE, PVDM 4-64, UC LICENSE , CUBE 25	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	8G EUSB FLASH MEMOR FOR CISCO ISR 4430 OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	4G DRAM (2G+2G) FOR CISCO ISR 4400 OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	2G DRAM (1DIMM) FOR CISCO ISR 4400 DATA PLAN OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	SNTC-8X5XNBD CISCO ISR 4431 UC BU OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
6	CONSOLE CABLE 6 FT WITH USB TYPE A AND MINI-B OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
7	BLANK FACEPLATE FOR NIM SLOT ON CISO ISR 4400 OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
8	IP BASE LICENSE FOR CISCO ISR 4400 SERIES OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
9	PVDM4 64 CHANNEL TO 128 CHANNEL FACTORY UPGRADE OR	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
10	2 PORT MULTIFLEX TRUNK VOICE/CLEAR-CHANNEL DATE	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
11	AC POWER SUPPLY FOR CISCO ISR 4430 OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
12	COVER FOR EMPTY 2ND PWR SUPPLY SLOT CISCO ISR4430 OR	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
13	AC POWER CORD NORTH AMERICA C13 NEMA 5-15P,2.1M	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
14	YELLOW CABLE ETHERNET, STRAIGHT THROUGH RJ-45 6FT	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
15	UNIFIED BORDER ELEMENT ENTERPRISE LICENSE 25 SESS	25.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
16	UNIFIED COMMUNICATION LICENSE FOR CISCO ISR 4400 OR	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
17	CISCO ISR4400 SERIES IOS XE UNIVERSAL OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description :
ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAIL

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
18	COMMUNICATION MANAGER EXPRESS OR SRST- 25 SEATS OR	25.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description :
ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
19	CISCO SURVIVABLE REMOTE SITE TELEPHONY LICENSE OR EQUAL	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description :
ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
20	2 PORT NETWORK INTERFACE MODULE - FXO (UNIVERSAL) OR	1.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description :
ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
21	HP ARUBA 2920-48-G-POE+ 740W SWITCH OR EQUAL	12.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
22	PROLINE ARUBA SFP-SX-AU COMPATIBLE SFP TAA OR EQUAL	12.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
23	3.3 FT. STACKING CABLE FOR ARUBA/HP SWITCHES OR EQUAL	12.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43211601			

Extended Description : ALL ITEMS ARE "OR EQUAL"
PLEASE SEE ATTACHED SPECS FOR MORE DETAILS

HARDWARE FOR IPT AND SAN INTERGRATION

ITEM NUMBER	ITEM NEEDED	BRAND NAME/PART NUMBER	UNIT PRICE	AMOUNT NEEDED	TOTAL PRICE
3.1.1	CISCO ISR 4431 UC BUNDLE, PVDM4-64, UC LICENSE, CUBE 25 OR EQUAL	Cisco ISR 4431 UC Bundle, PVDM4-64, UC License, CUBE-25/ISR4431-V/K9	$ 8,372.00	1	$ 8,372.00
3.1.1.3	8G EUSB FLASH MEMORY FOR CISO ISR 4430 OR EQUAL	8G eUSB Flash Memory for Cisco ISR 4430/ MEM-FLSH-8G	$ -	1	$ -
3.1.1.3	4G DRAM (2G+2G) FOR CISCO ISR 4400 OR EQUAL	4G DRAM (2G+2G) for Cisco ISR 4400/ MEM-4400-4G	$ -	1	$ -
3.1.1.3	2G DRAM (1DIMM) FOR CISCO ISR 4400 DATA PLAN OR EQUAL	2G DRAM (1 DIMM) for Cisco ISR 4400 Data Plane/ MEM-4400-DP-2G	$ -	1	$ -
3.1.2	SNTC-8X5XNBD CISCO ISR 4431 UC Bu OR EQUAL	SMARTNET 8X5XNBD Cisco ISR 4431 UC Bu/ CON-SNT-ISR4431V	$ 1,204.00	1	$ 1,204.00
3.1.2.2	CONSOLE CABLE 6 FT. WITH USB TYPE A AND MINI B OR EQUAL	Console Cable 6 ft with USB Type A and mini-B/ CAB-CONSOLE-USB	$ 25.00	1	$ 25.00
3.1.2.3	BLANK FACEPLATE FOR NIM SLOT ON CISCO ISR 4400 OR EQUAL	Blank faceplate for NIM slot on Cisco ISR 4400/ NIM-BLANK	$ -	1	$ -
3.1.3	IP BASE LICENSE FOR CISCO ISR 4400 SERIES OR EQUAL	IP Base License for Cisco ISR 4400 Series/ SL-44-IPB-K9	$ -	1	$ -
3.1.4	PVDM4 64 CHANNEL TO 128 CHANNEL FACTORY UPGRADE OR EQUAL	PVDM4 64-channel to 128-channel factory upgrade/ PVDM4-64U128	$ 2,208.00	1	$ 2,208.00
3.1.4.2	2 PORT MULTIFLEX TRUNK VOICE/CLEAR CHANNEL DATE T1/E1 MODULE OR EQUAL	2 port Multiflex Trunk Voice/Clear-channel Data T1/E1 Module/ NIM-2MFT-T1/E1	$ 1,518.00	1	$ 1,518.00
3.1.5	AC POWER SUPPLY FOR CISCO ISR 4430 OR EQUAL	AC Power Supply for Cisco ISR 4430/ PWR-4430-AC	$ -	1	$ -
3.1.5.2	COVER FOR EMPTY 2ND POWR SUPPLY SLOT ON CISCO ISR 4430 OR EQUAL	Cover for empty 2nd Power Supply slot on Cisco ISR 4430/ PWR-COVER-4430	$ -	1	$ -
3.1.5.2	AC POWER CORD NORTH AMERICA C13, NEMA 5-15P, 2.1M OR EQUAL	AC Power Cord (North America) C13 NEMA 5-15P 2.1m/ CAB-AC	$ -	1	$ -
3.1.6	YELLOW CABLE FOR ETHERNET, STRAIGHT-THROUGH, RJ-45, 6 FT OR EQUAL	Yellow Cable for Ethernet, Straight-through, RJ-45, 6 feet/ CAB-ETH-S-RJ45	$ 18.00	1	$ 18.00
3.1.7	UNIFIED BORDER ELEMENT ENTERPRISE LICENSE 25 SESSIONS OR EQUAL	Unified Border Element Enterprise License - 25 sessions/ FL-CUBEE-25	$ 2,067.00	25	$ 51,675.00
3.1.8	UNIFIED COMMUNICATION LICENSE FOR CISCO ISR 4400 SERIES OR EQUAL	Unified Communication License for Cisco ISR 4400 Series/ SL-44-UC-K9	$ -	1	$ -
3.1.8	CISCO ISR 4400 SERIES IOS XE UNIVERSAL OR EQUAL	Cisco ISR 4400 Series IOS XE Universal/ SISR4400UK9-316S	$ -	1	$ -
3.1.8	COMMUNICATION MANAGER EXPRESS OR SRST 25 SEAT LICENSE OR EQUAL	Communication Manager Express or SRST - 25 seat license/ FL-CME-SRST-25	$ 449.00	25	$ 11,225.00
3.1.8.5	CISCO SURVIVABLE REMOTE SITE TELEPHONY LICENSE OR EQUAL	Cisco Survivable Remote Site Telephony License/ FL-SRST	$ -	1	$ -
3.1.9	2 PORT NETWORK INTERFACE MODULE - FXO (UNIVERSAL) OR EQUAL	2-port Network Interface Module - FXO (Universal)/ NIM-2FXO	$ 400.00	1	$ 400.00
3.1.9	HP ARUBA 2920-48G-POE+ 740W SWITCH OR EQUAL	Aruba 2920-48G-POE+ 740W Switch/ HPE-J9836A J9836A	$ 4,276.00	12	$ 51,312.00
3.1.9.1	PROLINE ARUBA SFP-SX-AU COMPATIBLE SFP TAA COMPLIANT TRANSCEIVER - SFP OR EQUAL	HP X121 1G SFP LC SX Transceiver/ HPE-J4858C J4858C	$ 266.00	12	$ 3,192.00
3.1.9.2	3.3FT STACKING CABLE FOR ARUBA/HP SWITCHES OR EQUAL	Aruba 2920 3.0m Stacking Cable/ HPE-J9736A J9736A	$ 244.00	12	$ 2,928.00
				TOTAL BID PRICE	$ 134,077.00

COMPANY NAME: Thunderbolt Veracity LLC

CONTACT PERSON: Jack E Shaffer

ADDRESS: 469 Horizon Ridge Rd., Belington, WV 26250

PHONE: 304 444 5614

EMAIL: info@thunderboltelectronics.com

FAX:

Form **W-9**
(Rev. December 2014)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

Print or type
See Specific Instructions on page 2.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.
[redacted]

2 Business name/disregarded entity name, if different from above
[redacted]

3 Check appropriate box for federal tax classification; check only **one** of the following seven boxes:
[redacted] Individual/sole proprietor or single-member LLC [redacted] C Corporation [redacted] S Corporation [redacted] Partnership [redacted] Trust/estate
[redacted] Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶
Note. For a single-member LLC that is disregarded, do not check LLC; check the appropriate box in the line above for the tax classification of the single-member owner.
[redacted] Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):
Exempt payee code (if any)
Exemption from FATCA reporting code (if any)
(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.)
[redacted]

Requester's name and address (optional)

6 City, state, and ZIP code
[redacted]

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the instructions for line 1 and the chart on page 4 for guidelines on whose number to enter.

Social security number
[redacted]

or

Employer identification number
[redacted]

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign Here | **Signature of U.S. person ▶** [redacted] **Date ▶** [redacted]

General Instructi[redacted]

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. Information about developments affecting Form W-9 (such as legislation enacted after we release it) is at *www.irs.gov/fw9*.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following:

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- [redacted]rm 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T [redacted]ion)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See *What is backup withholding?* on page 2.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting?* on page 2 for further information.

WV-10
Approved / Revised
08/01/15

State of West Virginia

VENDOR PREFERENCE CERTIFICATE

Certification and application is hereby made for Preference in accordance with ***West Virginia Code***, §5A-3-37. (Does not apply to construction contracts). ***West Virginia Code***, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the ***West Virginia Code***. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Vendor Preference, if applicable.

1. **Application is made for 2.5% vendor preference for the reason checked:**

☐ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

☐ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

☐ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or,**

2. **Application is made for 2.5% vendor preference for the reason checked:**

☐ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

3. **Application is made for 2.5% vendor preference for the reason checked:**

☐ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

4. **Application is made for 5% vendor preference for the reason checked:**

☐ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or,**

5. **Application is made for 3.5% vendor preference who is a veteran for the reason checked:**

☐ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or,**

6. **Application is made for 3.5% vendor preference who is a veteran for the reason checked:**

☐ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. **Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with *West Virginia Code* §5A-3-59 and *West Virginia Code of State Rules.***

☐ Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: Thunderbolt Veracity LLC/Thunderbolt Electr **Signed:** Jack Shaffer

Date: 1/21/2016 **Title:** Owner

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"**Debt**" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"**Employer default**" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"**Related party**" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Thunderbolt Veracity LLC

Authorized Signature: Jack E Shaffer Date: 8/15/2017

State of West Virginia

County of Barbour, to-wit:

Taken, subscribed, and sworn to before me this 15 day of August, 2017.

My Commission expires Oct. 16, 2018.

AFFIX SEAL HERE

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
SUNNY D. LAKE
75 Battle Street
Philippi, West Virginia 26416
My Commission Expires Oct. 16, 2018

NOTARY PUBLIC Sunny D Lake

Hewlett Packard Enterprise

Data sheet

Aruba 2920 Switch Series

Product overview

The Aruba 2920 Switch Series provides security, scalability, and ease of use for enterprise edge, SMB and branch office networks. A powerful ProVision ASIC delivers low latency, more packet buffering, and adaptive power consumption. This Basic Layer 3 switch series supports modular stacking, 10GbE, static and RIP routing, PoE+, ACLs, sFlow®, and IPv6. The Aruba 2920 Switch Series delivers a consistent wired/wireless user experience with unified management tools such as ClearPass Policy Manager and AirWave Network Management and is ready for software-defined networking (SDN) with OpenFlow support.

The Aruba 2920 Switch Series provides cost-effective pay as you grow modular stacking with a 2-port stacking module, support for up to four 10GBASE-T (or SFP+) uplinks and upgradeable power supplies so your network can quickly scale when needed. The robust Basic Layer 3 feature set requires no licensing and includes a limited lifetime warranty.

Key features

- Aruba Basic Layer 3 switch series with stacking, static & RIP routing, IPv6, ACLs, and sFlow
- Modular 10GbE uplinks (SFP+ and 10GBASE-T)
- Removable and upgradeable power supplies for up to 1440 W PoE+
- Software-defined networking (SDN) ready with OpenFlow support
- Supports ClearPass Policy Manager and AirWave Network Management

Features and benefits

Software-defined networking (SDN)

- OpenFlow

  Is a key technology that enables SDN by allowing separation of the data (packet forwarding) and control (routing decision) paths

Unified Wired and Wireless

- **New** ClearPass Policy Manager

  Supports unified wired and wireless policies using Aruba ClearPass Policy Manager

- HTTP redirect function

  Supports HPE Intelligent Management Center (IMC) bring your own device (BYOD) solution

- **New** Switch auto-configuration

  Automatically configures switch for rogue AP detection, add VLAN, and set PoE priority when Aruba AP is detected

Quality of service (QoS)

- Traffic prioritization (IEEE 802.1p)

  Allows real-time traffic classification into eight priority levels that are mapped to eight queues

- L4 prioritization

  Enables prioritization based on TCP/UDP port numbers

- Class of service (CoS)

  Sets the IEEE 802.1p priority tag based on the IP address, IP type of service (ToS), L3 protocol, TCP/UDP port number, source port, and DiffServ

- Rate limiting

  Establishes per-port ingress-enforced maximums and per-port per-queue minimums

- Large buffers

  Provide graceful congestion management

Connectivity

- Flexible 10 Gb/s Ethernet connectivity

  Up to four optional 10 Gigabit ports (SFP+ and/or 10GBASE-T)

- Optional two-port stacking module with up to 40 Gb/s per port

  Allows stacking of up to four switch units into a single virtual device

- Auto-MDIX

  Provides automatic adjustments for straight-through or crossover cables on all 10/100 and 10/100/1000 ports

- IPv6

  – IPv6 host

    Allows the switches to be managed and deployed at the edge of IPv6 networks

  – Dual stack (IPv4/IPv6)

    Provides the transition mechanism from IPv4 to IPv6; and supports connectivity for both protocols

– MLD snooping

Forwards IPv6 multicast traffic to the appropriate interface; and helps prevent IPv6 multicast traffic from flooding the network

– IPv6 ACL/QoS

Supports ACL and QoS for IPv6 network traffic

– IPv6 routing

Supports static and RIPng routing

– Security

Provides RA guard, DHCPv6 protection, dynamic IPv6 lockdown, and ND snooping

- IEEE 802.3at PoE+

Provides up to 30 W per port, allowing support of the latest PoE+-capable devices such as IP phones, wireless access points, and security cameras as well as any IEEE 802.3af-compliant end device; and mitigates the cost of additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments

- Pre-standard PoE support

Detects and provides power to pre-standard PoE devices

- Dual-personality functionality

Includes four 10/100/1000 ports or SFP slots for optional fiber connectivity such as Gigabit SX, LX, and LH or 100 FX

Performance

- Energy-efficient design

– 80 PLUS Silver Certified power supply

Increases power efficiency and savings

– Energy-efficient Ethernet (EEE) support

Reduces power consumption in accordance with IEEE 802.3az

- Aruba ProVision ASIC architecture

Is designed with the latest ProVision ASIC, providing very low latency, increased packet buffering, and adaptive power consumption

- Selectable queue configurations

Increases performance by selecting the number of queues and associated memory buffering that best meet the requirements of the network applications

Convergence

- IP multicast snooping (data-driven IGMP)

Mitigates flooding of IP multicast traffic automatically

- Media endpoint discovery (MED) enabled by the Link Layer Discovery Protocol (LLDP)

Defines a standard extension of LLDP that stores values for parameters such as QoS and VLAN to automatically configure network devices such as IP phones

- IEEE 802.1ab LLDP

Facilitates easy mapping, using network management applications with the LLDP automated device discovery protocol

- PoE and PoE+ allocations

  Support multiple methods—automatic, IEEE 802.3at dynamic, LLDP-MED fine grain, IEEE 802.3af device class, or user specified—to allocate and manage PoE/PoE+ power for more efficient energy use

- Local MAC authentication

  Assigns attributes such as VLAN and QoS, using a locally configured profile that can be a list of MAC prefixes

Resiliency and high availability

- Multiple spanning tree protocol (STP) and IEEE 802.1s

  Offers high link availability in multiple VLAN environments by allowing multiple spanning trees; and provides legacy support for IEEE 802.1d and IEEE 802.1w

- IEEE 802.3ad Link Aggregation Control Protocol (LACP) and Hewlett Packard Enterprise port trunking

  Support up to 60 static, dynamic, or distributed trunks active across a stack, with each trunk having up to eight links (ports) per static trunk; and offer support for trunking across stack members

- Ring and chain stacking topology

  Allows failure of a link or switch in a ring of stacked switches, while the remaining connected switches continue operation

- SmartLink

  Provides easy-to-configure link redundancy of active and standby links

Management

- **New** Zero-Touch Provisioning (ZTP)

  Uses settings in DHCP to enable ZTP with Aruba AirWave Network Management

- SNMPv1, v2, and v3

  Provide complete support of SNMP and an industry-standard management information base (MIB) as well as private extensions; SNMPv3 supports increased security using encryption

- Out-of-band Ethernet management port

  Enables management of a separate physical management network, keeping management traffic segmented from network data traffic

Manageability

- Dual flash images

  Provides independent primary and secondary operating system files for backup while upgrading

- Friendly port names

  Allows assignment of descriptive names to ports

- Find, fix, and inform

  Finds and fixes common network problems automatically, and then informs the administrator

- Multiple configuration files

  Are easily stored with a flash image

- Software updates

  Are offered as free downloads from the Web

- Remote monitoring (RMON), extended RMON (XRMON), and sFlow

  Provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events

- Troubleshooting

  Accelerates network problem solving with ingress and egress port monitoring

- Unidirectional link detection (UDLD)

  Supports Hewlett Packard Enterprise UDLD and DLDP protocols to monitor a cable between two switches and shut down the ports on both ends if the cable is broken.

L2 switching

- VLAN support and tagging

  Supports IEEE 802.1Q (4,094 VLAN IDs) and 256 VLANs simultaneously

- **New** GVRP and MVRP

  Enables automatic learning and dynamic assignment of VLANs

- Jumbo packet support

  Improves the performance of large data transfers; and supports frame sizes of up to 9,220 bytes

- IEEE 802.1v protocol VLANs

  Isolate select non-IPv4 protocols automatically into their own VLANs

- Rapid per-VLAN spanning tree (RPVST+)

  Allows each VLAN to build a separate spanning tree, improving link bandwidth usage in network environments with PVST+

L3 services

- DHCP server

  Centralizes and reduces the cost of IPv4 address management

L3 routing

- Static IP routing

  Provides manually configured routing; includes ECMP capability

- RIP

  Includes RIPv1, RIPv2, and RIPng routing

- 256 static and 2,048 RIP routes

  Facilitate segregation of user data, without adding external hardware

Security

- **New** Private VLAN

  Provides network security by restricting peer-to-peer communication to prevent a variety of malicious attacks; typically a switch port can only communicate with other ports in the same community and/or an uplink port, regardless of VLAN ID or destination MAC address

- Multiple user authentication methods

  – IEEE 802.1X

    Uses an IEEE 802.1X supplicant on the client, in conjunction with a RADIUS server, to authenticate in accordance with industry standards

– Web-based authentication

Provides a browser-based environment, similar to IEEE 802.1X, to authenticate clients that do not support the IEEE 802.1X supplicant

– MAC-based authentication

Authenticates the client with a RADIUS server, based on the client's MAC address

- Authentication flexibility

– Multiple IEEE 802.1X users per port

Provides authentication of multiple IEEE 802.1X users per port; and helps prevent a user from "piggybacking" on another user's IEEE 802.1X authentication

– Concurrent IEEE 802.1X, Web, and MAC authentication schemes per port

Allows a switch port to accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications

- Access Control Lists (ACLs)

Provide IP L3 filtering, based on the source/destination IP address/subnet and source/destination TCP/UDP port number

- Source-port filtering

Allows only specified ports to communicate with each other

- RADIUS/TACACS+

Eases switch management security administration by using a password authentication server

- IEEE 802.1X, MAC, or Web authentication

Provides concurrent network access control and Web authentication of up to 24 clients per port

- Secure shell (SSH)

Encrypts all transmitted data for secure remote CLI access over IP networks

- Secure Sockets Layer (SSL)

Encrypts all HTTP traffic, allowing secure access to the browser-based management GUI in the switch

- Port security

Allows access only to specified MAC addresses, which can be learned or specified by the administrator

- MAC address lockout

Helps prevent certain configured MAC addresses from connecting to the network

- Secure FTP

Allows secure file transfer to and from the switch; and protects against unwanted file downloads or unauthorized copying of a switch configuration file

- Switch management logon security

Helps secure switch CLI logon by optionally requiring either RADIUS or TACACS+ authentication

- Custom banner

Displays the security policy when users log in to the switch

- STP bridge protocol data units (BPDUs) port protection

Blocks BPDUs on ports that do not require BPDUs, mitigating forged BPDU attacks

- DHCP protection

  Blocks DHCP packets from unauthorized DHCP servers, mitigating denial-of-service attacks

- Dynamic ARP protection

  Blocks ARP broadcasts from unauthorized hosts, helping prevent eavesdropping or theft of network data

- STP root guard

  Protects the root bridge from malicious attacks or configuration mistakes

- Identity-driven ACL

  Enables implementation of a highly granular and flexible access security policy and VLAN assignment specific to each authenticated network user

- Per-port broadcast throttling

  Configures broadcast control selectively on heavy traffic port uplinks

Monitor and diagnostics

- Digital optical monitoring of SFP+ and 1000BASE-T transceivers

  Allows detailed monitoring of the transceiver settings and parameters

Warranty and support

- Limited Lifetime Warranty:

  See **hpe.com/networking/warrantysummary** for warranty and support information included with your product purchase.

- Software releases

  To find software for your product, visit **hpe.com/networking/support**; for details on the software releases available with your product purchase, visit **hpe.com/networking/warrantysummary**

Aruba 2920 Switch Series

Specifications

	Aruba 2920-24G Switch (J9726A)	**Aruba 2920-24G-PoE+ Switch (J9727A)**	**Aruba 2920-48G Switch (J9728A)**
Ports	20 RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/ 100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 dual-personality 10/100/ 1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T) 2 module slots 1 stacking module slot 1 dual-personality (RJ-45 or USB micro-B) 1 USB 1.1 1 RJ-45 out-of-band management port	20 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 dual-personality 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+) 2 module slots 1 stacking module slot 1 dual-personality (RJ-45 or USB micro-B) 1 USB 1.1 1 RJ-45 out-of-band management port	44 RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/ 100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 dual-personality 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T) 2 module slots 1 stacking module slot 1 dual-personality (RJ-45 or USB micro-B) 1 USB 1.1 1 RJ-45 out-of-band management port
Power supplies	1 power supply slot 1 minimum power supply required includes: 1 x J9739A (HPE X331 165W 100-240VAC to 12VDC Modular Power Supply) 11.57 lb (5.25 kg)	1 power supply slot 1 minimum power supply required includes: 1 x J9738A (HPE X332 575W 100-240VAC to 54VDC Modular Power Supply)	1 power supply slot 1 minimum power supply required includes: 1 x J9739A (HPE X331 165W 100-240VAC to 12VDC Modular Power Supply)
Physical characteristics Weight	17.42(w) x 13.23(d) x 1.75(h) in. (44.25 x 33.6 x 4.45 cm) (1U height) 11.57 lb (5.25 kg)	17.42(w) x 13.23(d) x 1.73(h) in. (44.25 x 33.6 x 4.4 cm) (1U height) 12.04 lb (5.46 kg)	17.42(w) x 13.23(d) x 1.73(h) in. (44.25 x 33.6 x 4.4 cm) (1U height) 11.95 lb (5.42 kg)
Memory and processor	Tri Core ARM1176 @ 625 MHz, 512 MB SDRAM, 1 GB flash MB; packet buffer size: 11.25 MB (6.75 MB dynamic egress + 4.5 MB ingress)	Tri Core ARM1176 @ 625 MHz, 512 MB SDRAM, 1 GB flash; packet buffer size: 11.25 MB (6.5 MB dynamic egress + 4.5 MB ingress)	Tri Core ARM1176 @ 625 MHz, 512 MB SDRAM, 1 GB flash; packet buffer size: 11.25 MB (6.75 MB dynamic egress + 4.5 MB ingress)

Aruba 2920 Switch Series

Specifications (continued)

	Aruba 2920-24G Switch (J9726A)	Aruba 2920-24G-PoE+ Switch (J9727A)	Aruba 2920-48G Switch (J9728A)
Performance			
100 Mb Latency	< 9.0 µs (FIFO 64-byte packets)	< 9.0 µs (FIFO 64-byte packets)	< 9.0 µs (FIFO 64-byte packets)
1000 Mb Latency	< 3.3 µs (FIFO 64-byte packets)	< 3.3 µs (FIFO 64-byte packets)	< 3.3 µs (FIFO 64-byte packets)
10 Gb/s Latency	< 3.3 µs (FIFO 64-byte packets)	< 3.3 µs (FIFO 64-byte packets)	< 3.2 µs (FIFO 64-byte packets)
Throughput	95.2 million pps	95.2 million pps	130.9 million pps
Switching capacity	128 Gb/s	128 Gb/s	176 Gb/s
Routing table size	2048 entries (IPv4), 256 entries (IPv6)	2048 entries (IPv4), 256 entries (IPv6)	2048 entries (IPv4), 256 entries (IPv6)
MAC address table size	16000 entries	16000 entries	16000 entries
Environment			
Operating temperature	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C)
Operating relative humidity	15% to 95%, noncondensing	15% to 95%, noncondensing	15% to 95%, noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 95%, noncondensing	15% to 95%, noncondensing	15% to 95%, noncondensing
Altitude	Up to 10,000 ft (3 km)	Up to 10,000 ft (3 km)	Up to 10,000 ft (3 km)
Acoustic	Power: 57 dB, Pressure: 41.4 dB	Power: 61 dB, Pressure: 44.9 dB	Power: 57 dB, Pressure: 41.8 dB
Electrical characteristics			
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
80plus.org Certification	Silver	Silver	Achieved Miercom Certified Green Award Silver
Maximum heat dissipation	198 BTU/hr (208.89 kJ/hr)	358 BTU/hr (377.69 kJ/hr)	239 BTU/hr (252.15 kJ/hr)
Voltage	100–240VAC	100–240VAC	100–240VAC
Maximum power rating	58 W	475 W	70 W
Idle power	26 W	42 W	27 W
PoE power		370 W	
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS). 370 W of PoE+ power is available using the internal default power supply.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.

Aruba 2920 Switch Series

Specifications (continued)

	Aruba 2920-24G Switch (J9726A)	Aruba 2920-24G-PoE+ Switch (J9727A)	Aruba 2920-48G Switch (J9728A)
Safety	CE Labeled; EN 60825-1 Safety of Laser Products-Part 1; FCC Part 15, Subpart B; GOST; EU RoHS Compliant; EN 55022 Class A; EN 55024: 1998; C-Tick; ICES-003, Class A; VCCI Class A; IEC 60950-1, Second Edition; IEC 60825-1; EN62479:2010; CSA C22.2 No. 60950-1-07 2nd Edition; EN 60950-1:2006+A11:2009+A1:2010 +A12:2011; IEC 60950-1 (ed.2): am1	CE Labeled; EN 60825-1 Safety of Laser Products-Part 1; FCC Part 15, Subpart B; GOST; EU RoHS Compliant; EN 55022 Class A; EN 55024: 1998; C-Tick; ICES-003, Class A; VCCI Class A; IEC 60825-1; IEC 60950-1, Second Edition; EN62479:2010; CSA C22.2 No. 60950-1-07 2nd Edition; EN 60950-1:2006+A11:2009+A1:2010 +A12:2011; IEC 60950-1 (ed.2): am1	CE Labeled; EN 60825-1 Safety of Laser Products-Part 1; FCC Part 15, Subpart B; GOST; EU RoHS Compliant; EN 55022 Class A; EN 55024: 1998; C-Tick; ICES-003, Class A; VCCI Class A; IEC 60825-1; IEC 60950-1, Second Edition; EN62479:2010; CSA C22.2 No. 60950-1-07 2nd Edition; EN 60950-1:2006+A11:2009+A1:2010 +A12:2011; IEC 60950-1 (ed.2): am1
Emissions	FCC part 15 Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC part 15 Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC part 15 Class A; VCCI Class A; EN 55022/CISPR 22 Class A
Immunity			
EN	EN 55024, CISPR 24	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3	IEC 61000-4-3	IEC 61000-4-3
EFT/Burst	IEC 61000-4-4	IEC 61000-4-4	IEC 61000-4-4
Surge	IEC 61000-4-5	IEC 61000-4-5	IEC 61000-4-5
Conducted	IEC 61000-4-6	IEC 61000-4-6	IEC 61000-4-6
Power frequency magnetic field	IEC 61000-4-8	IEC 61000-4-8	IEC 61000-4-8
Voltage dips and interruptions	IEC 61000-4-11	IEC 61000-4-11	IEC 61000-4-11
Harmonics	IEC 61000-3-2	IEC 61000-3-2	IEC 61000-3-2
Flicker	IEC 61000-3-3	IEC 61000-3-3	IEC 61000-3-3
Management	**AirWave Network Management** IMC—Intelligent Management Center; command-line interface; Web browser; configuration menu; out-of-band management (RJ-45 Ethernet); SNMP Manager; TELNET; RMON1; FTP; in-line and out-of-band; out-of-band management (serial RS-232C or Micro USB) AirWave Network Management	**AirWave Network Management** IMC—Intelligent Management Center; command-line interface; Web browser; configuration menu; out-of-band management (RJ-45 Ethernet); SNMP Manager; TELNET; RMON1; FTP; in-line and out-of-band; out-of-band management (serial RS-232C or Micro USB) AirWave Network Management	**AirWave Network Management** IMC—Intelligent Management Center; command-line interface; Web browser; configuration menu; out-of-band management (RJ-45 Ethernet); SNMP Manager; TELNET; RMON1; FTP; in-line and out-of-band; out-of-band management (serial RS-232C or Micro USB) AirWave Network Management
Services	Refer to the Hewlett Packard Enterprise website at **hpe.com/networking/services** for details on the service-level descriptions and product numbers. For details about services, and response times in your area, please contact your local Hewlett Packard Enterprise sales office.	Refer to the Hewlett Packard Enterprise website at **hpe.com/networking/services** for details on the service-level descriptions and product numbers. For details about services, and response times in your area, please contact your local Hewlett Packard Enterprise sales office.	Refer to the Hewlett Packard Enterprise website at **hpe.com/networking/services** for details on the service-level descriptions and product numbers. For details about services, and response times in your area, please contact your local Hewlett Packard Enterprise sales office.

Aruba 2920 Switch Series

Specifications (continued)

	Aruba 2920-48G-PoE+ Switch (J9729A)	**Aruba 2920-48G-PoE+ 740W Switch (J9836A)**
Ports	44 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 dual-personality 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+) 2 module slots 1 stacking module slot 1 dual-personality (RJ-45 or USB micro-B) 1 USB 1.1 1 RJ-45 out-of-band management port	44 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 dual-personality 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+) 2 module slots 1 stacking module slot 1 dual-personality (RJ-45 or USB micro-B) 1 USB 1.1 1 RJ-45 out-of-band management port
Power supplies	1 power supply slot 1 minimum power supply required includes: 1 x J9738A (HPE X332 575W 100-240VAC to 54VDC Modular Power Supply)	1 power supply slot 1 minimum power supply required includes: 1 x J9737A (HPE X332 1050W 110-240VAC to 54VDC Power Supply)
Physical characteristics		
	17.42(w) x 13.23(d) x 1.73(h) in. (44.25 x 33.6 x 4.39 cm) (1U height)	17.42(w) x 13.23(d) x 1.73(h) in. (44.25 x 33.6 x 4.39 cm) (1U height)
Weight	12.57 lb (5.7 kg)	12.86 lb (5.83 kg)
Memory and processor	Tri Core ARM1176 @ 625 MHz, 512 MB SDRAM, 1 GB flash; packet buffer size: 11.25 MB (6.75 MB dynamic egress + 4.5 MB ingress)	Tri Core ARM1176 @ 625 MHz, 512 MB SDRAM, 1 GB flash; packet buffer size: 11.25 MB (6.75 MB dynamic egress + 4.5 MB ingress)
Performance		
100 Mb Latency	< 9.0 µs (FIFO 64-byte packets)	< 9.0 µs (FIFO 64-byte packets)
1000 Mb Latency	< 3.2 µs (FIFO 64-byte packets)	< 3.2 µs (FIFO 64-byte packets)
10 Gb/s Latency	< 3.2 µs (FIFO 64-byte packets)	< 3.2 µs (FIFO 64-byte packets)
Throughput	130.9 million pps	130.9 million pps
Switching capacity	176 Gb/s	176 Gb/s
Routing table size	2048 entries (IPv4), 256 entries (IPv6)	2048 entries (IPv4), 256 entries (IPv6)
MAC address table size	16000 entries	16000 entries
Environment		
Operating temperature	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C)
Operating relative humidity	15% to 95%, noncondensing	15% to 95%, noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 95%, noncondensing	15% to 95%, noncondensing
Altitude	Up to 10,000 ft (3 km)	Up to 10,000 ft (3 km)
Acoustic	Power: 62 dB, Pressure: 45.2 dB	Power: 53dB, Pressure: 38.3 dB

Aruba 2920 Switch Series

Specifications (continued)

	Aruba 2920-48G-PoE+ Switch (J9729A)	Aruba 2920-48G-PoE+ 740W Switch (J9836A)
Electrical characteristics		
Frequency	50/60 Hz	50/60 Hz
80plus.org Certification	Silver	Gold
Maximum heat dissipation	399 BTU/hr (420.95 kJ/hr)	482 BTU/hr (508.51 kJ/hr)
Voltage	100–240VAC	110–240VAC
Maximum power rating	487 W	881 W
Idle power	46 W	52 W
PoE power	370 W	740 W
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS). 370 W of PoE+ power is available using the internal default power supply.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS). Idle power is the actual power consumption of the device with no ports connected. 740 W of PoE+ power is available using the internal default power supply.
Safety	CE Labeled; EN 60825-1 Safety of Laser Products-Part 1; FCC Part 15, Subpart B; GOST; EU RoHS Compliant; EN 55022 Class A; EN 55024: 1998; C-Tick; ICES-003, Class A; VCCI Class A; IEC 60950-1, Second Edition; IEC 60825-1; EN62479:2010; CSA C22.2 No. 60950-1-07 2nd Edition; EN 60950-1:2006+A11:2009+A1:2010+A12:2011; IEC 60950-1 (ed.2): am1	CE Labeled; EN 60825-1 Safety of Laser Products-Part 1; FCC Part 15, Subpart B; GOST; EU RoHS Compliant; EN 55022 Class A; EN 55024: 1998; C-Tick; ICES-003, Class A; VCCI Class A; IEC 60950-1, Second Edition; IEC 60825-1; EN62479:2010; CSA C22.2 No. 60950-1-07 2nd Edition; EN 60950-1:2006+A11:2009+A1:2010+A12:2011; IEC 60950-1 (ed.2): am1
Immunity		
EN	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3	IEC 61000-4-3
EFT/Burst	IEC 61000-4-4	IEC 61000-4-4
Surge	IEC 61000-4-5	IEC 61000-4-5
Conducted	IEC 61000-4-6	IEC 61000-4-6
Power frequency magnetic field	IEC 61000-4-8	IEC 61000-4-8
Voltage dips and interruptions	IEC 61000-4-11	IEC 61000-4-11
Harmonics	IEC 61000-3-2	IEC 61000-3-2
Flicker	IEC 61000-3-3	IEC 61000-3-3
Management	IMC—Intelligent Management Center; command-line interface; Web browser; configuration menu; out-of-band management (RJ-45 Ethernet); SNMP Manager; TELNET; RMON1; FTP; in-line and out-of-band; out-of-band management (serial RS-232C or Micro USB) AirWave Network Management	IMC—Intelligent Management Center; command-line interface; Web browser; configuration menu; out-of-band management (RJ-45 Ethernet); SNMP Manager; TELNET; RMON1; FTP; in-line and out-of-band; out-of-band management (serial RS-232C or Micro USB) AirWave Network Management
Services	Refer to the Hewlett Packard Enterprise website at **hpe.com/networking/services** for details on the service-level descriptions and product numbers. For details about services, and response times in your area, please contact your local Hewlett Packard Enterprise sales office.	Refer to the Hewlett Packard Enterprise website at **hpe.com/networking/services** for details on the service-level descriptions and product numbers. For details about services, and response times in your area, please contact your local Hewlett Packard Enterprise sales office.

STANDARDS AND PROTOCOLS
(applies to all products in series)

Denial of service protection		CPU DoS Protection	
Device management	IEEE 802.1AX-2008 Link Aggregation IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.3ab 1000BASE-T IEEE 802.3ad Link Aggregation Control Protocol (LACP) IEEE 802.3af Power over Ethernet IEEE 802.3at PoE+ IEEE 802.3az Energy Efficient Ethernet IEEE 802.3x Flow Control RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 868 Time Protocol RFC 951 BOOTP RFC 1058 RIPv1	RFC 1256 ICMP Router Discovery Protocol (IRDP) RFC 1350 TFTP Protocol (revision 2) RFC 1519 CIDR RFC 1542 BOOTP Extensions RFC 1918 Address Allocation for Private Internet RFC 2030 Simple Network Time Protocol (SNTP) v4 RFC 2131 DHCP RFC 2236 IGMP Snooping RFC 2453 RIPv2 RFC 2865 Remote Authentication Dial In User Service (RADIUS) RFC 2866 RADIUS Accounting RFC 3046 DHCP Relay Agent Information Option RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP) RFC 3413 Simple Network Management Protocol (SNMP) Applications	RFC 3414 User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3) RFC 3415 View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP) RFC 3416 Protocol Operations for SNMP RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP) RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP) RFC 3576 Ext to RADIUS (CoA only) RFC 4541 Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches RFC 4675 RADIUS VLAN & Priority RFC 4861 Neighbor Discovery for IP version 6 (IPv6) RFC 4862 IPv6 Stateless Address Autoconfiguration UDLD (Uni-directional Link Detection) RFC 5905 NTP Client
IP multicast	RFC 1112 IGMP	RFC 2236 IGMPv2 RFC 2710 Multicast Listener Discovery (MLD) for IPv6	RFC 3376 IGMPv3
IPv6	RFC 1981 IPv6 Path MTU Discovery RFC 2080 RIPng RFC 2081 RIPng Protocol Applicability RFC 2082 RIP-2 MD5 RFC 2460 IPv6 Specification RFC 2464 Transmission of IPv6 over Ethernet Networks RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (ping only) RFC 2925 Remote Operations MIB (ping only) RFC 3019 MLDv1 MIB	RFC 3315 DHCPv6 (client and relay) RFC 3484 Default Address Selection for IPv6 RFC 3513 IPv6 Addressing Architecture RFC 3596 DNS Extension for IPv6 RFC 3810 MLDv2 (host joins only) RFC 4022 MIB for TCP RFC 4113 MIB for UDP RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection	RFC 4291 IP Version 6 Addressing Architecture RFC 4293 MIB for IP RFC 4419 Key Exchange for SSH RFC 4443 ICMPv6 RFC 4541 IGMP & MLD Snooping Switch RFC 4861 IPv6 Neighbor Discovery RFC 4862 IPv6 Stateless Address Autoconfiguration RFC 5095 Deprecation of Type 0 Routing Headers in IPv6 RFC 6620 FCFS SAVI draft-ietf-savi-mix

STANDARDS AND PROTOCOLS
(applies to all products in series)

MIBs	IEEE 802.1ap (MSTP and STP MIB's only) RFC 1155 Structure and ID of Management Information for TCP/IP Internets RFC 1156 (TCP/IP MIB) RFC 1157 A Simple Network Management Protocol (SNMP) RFC 1213 MIB II RFC 1493 Bridge MIB RFC 1724 RIPv2 MIB RFC 2021 RMONv2 MIB RFC 2578 Structure of Management Information Version 2 (SMIv2)	RFC 2579 Textual Conventions for SMIv2 RFC 2580 Conformance Statements for SMIv2 RFC 2613 SMON MIB RFC 2618 RADIUS Client MIB RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2737 Entity MIB (Version 2) RFC 2819 RMON MIB	RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB RFC 2933 IGMP MIB RFC 3414 SNMP-User based-SM MIB RFC 3415 SNMP-View based-ACM MIB RFC 3417 Simple Network Management Protocol (SNMP) over IEEE 802 Networks RFC 3418 MIB for SNMPv3 RFC 4836 Managed Objects for 802.3 Medium Attachment Units (MAU)
Network management	IEEE 802.1ab Link Layer Discovery Protocol (LLDP) RFC 1155 Structure of Management Information RFC 1157 SNMPv1 RFC 2021 Remote Network Monitoring Management Information Base Version 2 using SMIv2 RFC 2576 Coexistence between SNMP versions RFC 2578 Structure of Management Information Version 2 (SMIv2)	RFC 2579 Textual Conventions for SMIv2 RFC 2580 Conformance Statements for SMIv2 RFC 2819 Four groups of RMON: 1 (statistics), 2 (history) RFC 2819 Remote Network Monitoring Management Information Base 3 (alarm) and 9 (events) RFC 2856 Textual Conventions for Additional High Capacity Data Types RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations RFC 3164 BSD Syslog Protocol	RFC 3176 sFlow RFC 3411 SNMP Management Frameworks RFC 3412 SNMPv3 Message Processing RFC 3414 SNMPv3 User-based Security Model (USM) RFC 3415 SNMPv3 View-based Access Control Model (VACM) RFC 5424 Syslog Protocol ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2c/v3 XRMON
QoS/CoS	IEEE 802.1P (CoS)	RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2597 DiffServ Assured Forwarding (AF)	RFC 2598 DiffServ Expedited Forwarding (EF) Ingress Rate Limiting
Security	IEEE 802.1X:Port-Based Network Access Control RFC 1321 The MD5 Message-Digest Algorithm RFC 1334 PPP Authentication Protocols (PAP) RFC 1492 An Access Control Protocol, Sometimes Called RFC 1492 TACACS+ RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP) RFC 2082 RIP-2 MD5 Authentication RFC 2104 Keyed-Hashing for Message Authentication RFC 2138 RADIUS Authentication RFC 2139 RADIUS Accounting RFC 2246 Transport Layer Security (TLS) RFC 2548 Microsoft® Vendor-specific RADIUS Attributes RFC 2618 RADIUS Authentication Client MIB	RFC 2620 RADIUS Accounting Client MIB RFC 2716 PPP EAP TLS Authentication Protocol RFC 2818 HTTP Over TLS RFC 2865 RADIUS (client only) RFC 2865 RADIUS Authentication RFC 2866 RADIUS Accounting RFC 2867 RADIUS Accounting Modifications for Tunnel Protocol Support Protocol (EAP) RFC 2868 RADIUS Attributes for Tunnel Protocol Support RFC 2869 RADIUS Extensions RFC 2882 NAS Requirements: Extended RADIUS Practices RFC 3162 RADIUS and IPv6 Secure Sockets Layer (SSL) RFC 3576 Dynamic Authorization Extensions to RADIUS	RFC 3579 RADIUS support for Extensible Authentication RFC 3580 IEEE 802.1X RADIUS RFC 3580 IEEE 802.1X Remote Authentication Dial In User Service (RADIUS) Usage Guidelines RFC 4576 RADIUS Attributes Access Control Lists (ACLs) draft-grant-tacacs-02 (TACACS) Guest VLAN for 802.1X MAC Authentication MAC Lockdown MAC Lockout Port Security SSHv2 Secure Shell TACACS Web Authentication

Aruba 2920 Switch Series accessories

Modules	Aruba 2920 2-Port 10GbE SFP+ Module (J9731A) Aruba 2920 2-port 10GBASE-T Module (J9732A) Aruba 2920 2-Port Stacking Module (J9733A)
Transceivers	HPE X121 1G SFP LC SX Transceiver (J4858C) HPE X121 1G SFP LC LX Transceiver (J4859C) HPE X122 1G SFP LC BX-D Transceiver (J9142B) HPE X122 1G SFP LC BX-U Transceiver (J9143B) HPE X121 1G SFP LC LH Transceiver (J4860C) HPE X121 1G SFP RJ45 T Transceiver (J8177C) HPE X111 100M SFP LC FX Transceiver (J9054C) HPE X112 100M SFP LC BX-D Transceiver (J9099B) HPE X112 100M SFP LC BX-U Transceiver (J9100B) HPE X132 10G SFP+ LC SR Transceiver (J9150A) HPE X132 10G SFP+ LC LR Transceiver (J9151A) HPE X132 10G SFP+ LC LRM Transceiver (J9152A) HPE X132 10G SFP+ LC ER Transceiver (J9153A) HPE X242 10G SFP+ to SFP+ 1m Direct Attach Copper Cable (J9281B) HPE X242 10G SFP+ to SFP+ 3m Direct Attach Copper Cable (J9283B) HPE X242 10G SFP+ to SFP+ 7m Direct Attach Copper Cable (J9285B) HPE X242 10G SFP+ to SFP+ 10m Direct Attach Copper Cable (J9286B) HPE X242 10G SFP+ to SFP+ 15m Direct Attach Copper Cable (J9287B) HPE X244 10G XFP to SFP+ 1m Direct Attach Copper Cable (J9300A) HPE X244 10G XFP to SFP+ 3m Direct Attach Copper Cable (J9301A) HPE X244 10G XFP to SFP+ 5m Direct Attach Copper Cable (J9302A)
Cables	HPE 0.5 m Multimode OM3 LC/LC Optical Cable (AJ833A) HPE 1 m Multimode OM3 LC/LC Optical Cable (AJ834A) HPE 2 m Multimode OM3 LC/LC Optical Cable (AJ835A) HPE 5 m Multimode OM3 LC/LC Optical Cable (AJ836A) HPE 15 m Multimode OM3 LC/LC Optical Cable (AJ837A) HPE 30 m Multimode OM3 LC/LC Optical Cable (AJ838A) HPE 50 m Multimode OM3 LC/LC Optical Cable (AJ839A) HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable (QK732A) HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable (QK733A) HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable (QK734A) HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable (QK735A) HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable (QK736A) HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable (QK737A) HPE 2920 0.5m Stacking Cable (J9734A) HPE 2920 1.0m Stacking Cable (J9735A) HPE 2920 3.0m Stacking Cable (J9736A) HPE 640 External/Redundant Power Supply 1m Cable (J9806A)

Power Supply	Aruba 640 Redundant/External Power Supply Shelf (J9805A)
Mounting Kit	HPE X410 1U Universal 4-post Rack Mounting Kit (J9583A)
Aruba 2920-24G Switch (J9726A)	HPE X331 165W 100-240VAC to 12VDC Modular Power Supply (J9739A)
Aruba 2920-24G-PoE+ Switch (J9727A)	HPE X332 575W 100-240VAC to 54VDC Modular Power Supply (J9738A) HPE X332 1050W 110-240VAC to 54VDC Power Supply (J9737A)
Aruba 2920-48G Switch (J9728A)	HPE X331 165W 100-240VAC to 12VDC Modular Power Supply (J9739A)
Aruba 2920-48G-PoE+ Switch (J9729A)	HPE X332 575W 100-240VAC to 54VDC Modular Power Supply (J9738A) HPE X332 1050W 110-240VAC to 54VDC Power Supply (J9737A)
Aruba 2920-48G-PoE+ 740W Switch (J9836A)	HPE X332 575W 100-240VAC to 54VDC Modular Power Supply (J9738A) HPE X332 1050W 110-240VAC to 54VDC Power Supply (J9737A)

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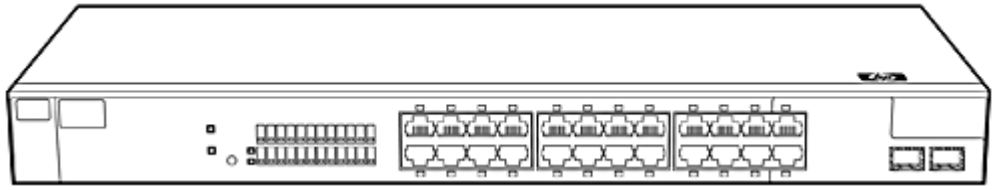
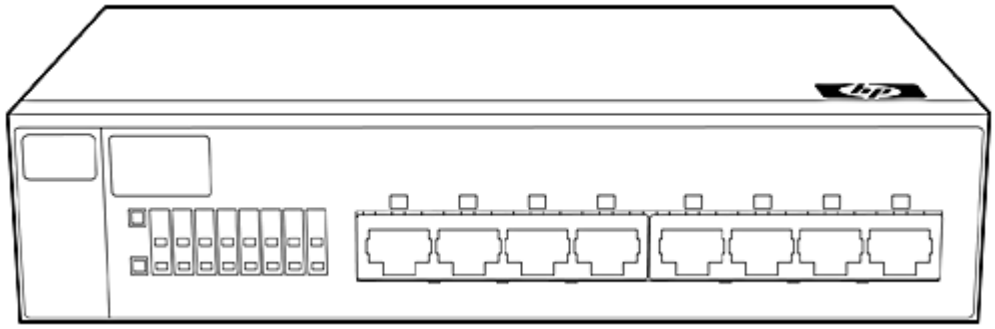
4AA4-5213ENW, January 2016, Rev. 8

QuickSpecs

Overview



HP ProCurve Switch 1800-24G



HP ProCurve Switch 1800-8G

Models

HP ProCurve Switch 1800-8G	J9029A
HP ProCurve Switch 1800-24G	J9028B

Key features

- Web-managed Layer 2 Gigabit switch
- 8- and 24-port models
- Fanless switch for silent operation
- Two dual-personality mini-GBIC slots (J9028B)
- Industry-leading warranty

Introduction

The HP ProCurve Switch 1800 Series consists of two Gigabit, fanless, Web-managed switches that are ideal for deployment in open offices that require silent operation. The HP ProCurve Switch 1800-24G is a 24-port 10/100/1000 switch with two dual-personality ports for RJ-45 10/100/1000 or mini-GBIC fiber Gigabit connectivity. The HP ProCurve Switch 1800-8G is a small form factor, 8-port 10/100/1000 switch. The ProCurve Switch 1800 Series enables increased network capabilities and control versus unmanaged switches, with support for fundamental networking protocols such as trunking and VLANs. Both switches are managed through an intuitive Web interface. The ProCurve Switch 1800 Series is ideal for businesses making the transition from unmanaged connectivity to managed networks without added cost or complexity.

Features and Benefits

Connectivity

- **Jumbo packet support**: to improve performance of large data transfers

Overview

Resiliency and high availability

- IEEE 802.3ad Link Aggregation Control Protocol (LACP): provides link-level redundancy with support for up to 4 trunks on the HP ProCurve Switch 1800-8G and 12 trunks on the HP ProCurve Switch 1800-24G, each with up to 8 links (ports) per trunk

Layer 2 switching

- VLAN support and tagging: support up to 64 port-based VLANs and dynamic configuration of IEEE 802.1Q VLAN tagging, providing security between workgroups

Security

- Management password: provides security so that only authorized access to the Web browser interface is allowed

Quality of Service (QoS)

- Traffic prioritization: honors priority of traffic based on 802.1p to deliver data to devices based on the priority and type of traffic
- Broadcast control: allows limitation of broadcast traffic rate to cut down on unwanted broadcast traffic on the network

Manageability

- Intuitive Web interface: enables simple management via an easy-to-use Web browser interface for switch configuration, monitoring, and administration
- Integration with ProCurve Manager: enables discovery and mapping via ProCurve Manager, available as a free download from the Web
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP): automated device discovery protocol for easy mapping by network management applications

Monitor and diagnostics

- Port mirroring: enables traffic on a port to be simultaneously sent to a network analyzer for monitoring

Ease of use

- Comprehensive LED display with per-port indicators: provides an at-a-glance view of status, activity, speed, and full-duplex operation
- ProCurve/IEEE Auto-MDIX: automatically adjusts for straight-through or crossover cables on all 10/100/1000 ports

Flexibility

- Small form factor: ideal for desktop use; space-efficient for deployment flexibility (1800-8G only)
- Designed with no fan: enables quiet operation for deployment in open spaces

Warranty and support*

- ProCurve Lifetime Warranty: for as long as you own the product, with next-business-day advance replacement (available in most countries).
- Electronic and telephone support: limited electronic and telephone support is available from HP. Refer to the HP Web site at: www.procurve.com/support for details on the support provided and the period during which support is available.
- Software releases: refer to the HP Web site at: www.procurve.com/support for details on the software releases provided and the period during which software releases are available.

Overview

* For as long as you own the product, with next-business-day advance replacement (available in most countries). The following hardware products and their related series modules have a one-year hardware warranty with extensions available: HP ProCurve Routing Switch 9300m Series, HP ProCurve Switch 8100fl Series, and HP ProCurve Network Access Controller 800. The following hardware mobility products have a one-year hardware limited warranty with extensions available: HP ProCurve M111 Client Bridge, HP ProCurve MSM3xx-R Access Points, HP ProCurve MSM7xx Mobility and Access Controllers, HP ProCurve RF Manager IDS/IPS Systems, HP ProCurve MSM Power Supplies, and HP ProCurve 1-Port Power Injector. Standalone software, upgrades, or licenses may have a different warranty duration. For details, refer to the ProCurve Software License, Warranty, and Support booklet at: http://www.procurve.com/warranty.

HP ProCurve Switch 1800 Series accessories

HP ProCurve Manager 2.3	-

HP ProCurve Switch 1800 Series accessories

HP ProCurve Gigabit-SX-LC Mini-GBIC	J4858C
HP ProCurve Gigabit-LX-LC Mini-GBIC	J4859C
HP ProCurve Gigabit-LH-LC Mini-GBIC	J4860C
NEW HP ProCurve 1000-BX-D SFP-LC Mini-GBIC	J9142B
NEW HP ProCurve 1000-BX-U SFP-LC Mini-GBIC	J9143B

Services

ProCurve Switch 1800-8G	3-year, 4-hour onsite, 13x5 coverage for hardware	UE256E
	3-year, 4-hour onsite, 24x7 coverage for hardware	UE257E
	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support	UE258E
	3-year, 24x7 SW phone support, software updates	UE260E
ProCurve Switch 1800-24G	3-year, 4-hour onsite, 13x5 coverage for hardware	U4683E
	3-year, 4-hour onsite, 24x7 coverage for hardware	U4835E
	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support	U6321E
	3-year, 24x7 SW phone support, software updates	UF792E

Technical Specifications

HP ProCurve Switch 1800-24G (J9028B)	Ports	22 auto-sensing 10/100/1000 ports (IEEE 802.3 Type 10Base-T, IEEE 802.3u Type 100Base-TX, IEEE 802.3ab Type 1000Base-T); Media Type: IEEE Auto-MDIX; Duplex: 10Base-T/100Base-TX: half or full; 1000Base-T: full only	
		2 dual-personality ports; each port can be used as either an RJ-45 10/100/1000 port (IEEE 802.3 Type 10Base-T; IEEE 802.3u Type 100Base-TX; IEEE 802.3ab 1000Base-T Gigabit Ethernet) or an open mini-GBIC slot (for use with mini-GBIC transceivers)	
	Dimensions	6.74(d) x 17.42(w) x 1.73(h) in. (17.12 x 44.25 x 4.39 cm) (1U height)	
	Weight	4.32 lb. (1.96 kg), Fully loaded	
	Memory and processor	2 MB flash, 64 KB SDRAM, 2 MB RAM/ROM capacity; packet buffer size: 500 KB	
	Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included)	
	Performance	100 Mb Latency	<4.7 µs (64-byte packets)
		1000 Mb Latency	<3.0 µs (64-byte packets)
		Throughput	up to 35.7 million pps (64-byte packets)
		Switching capcity	48 Gbps
		MAC addresstable size	8,000 entries
	Environment	Operating temperature	32°F to 104°F (0°C to 40°C)
		Operating relative humidity	10% to 90% @ 104°F (40°C), non-condensing
		Non-operating/ Storage temperature	-40°F to 158°F (-40°C to 70°C)
		Non-operating/ Storage relative humidity	10% to 90% @ 149°F (65°C), non-condensing
		Altitude	up to 10000 ft. (3 km)
		Acoustic	Power: 0 dB no fan
	Electrical characteristics	Maximum heat dissipation	92 BTU/hr (97 kJ/hr)
		Voltage	100-127 / 200-240 VAC
		Current	0.8 / 0.4 A
		Power consumption	27 W
		Frequency	50 / 60 Hz
		NOTES: Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.	
	Safety	CSA 22.2 No. 60950; EN 60950/IEC 60950; UL 60950	
	Emissions	FCC Rules Part 15, Subpart B Class A; EN 55022; VCCI; ICES-003 (Canada)	
	Immunity	EN	EN 55024, CISPR 24
		ESD	EN 61000-4-2
		Radiated	EN 61000-4-3

	EFT/Burst	EN 61000-4-4
	Surge	EN 61000-4-5
	Conducted	EN 61000-4-6
	Power frequency magnetic field	EN 61000-4-8
	Voltage dips and interruptions	EN 61000-4-11
	Harmonics	EN 61000-3-2
	Flicker	EN 61000-3-3
Management	HP ProCurve Manager; Web browser	
Services	3-year, 4-hour onsite, 13x5 coverage for hardware (U4683E) 3-year, 4-hour onsite, 24x7 coverage for hardware (U4835E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (U6321E) 3-year, 24x7 SW phone support, software updates (UF792E) Installation with minimum configuration, system-based pricing (U4826E) Installation with HP-provided configuration, system-based pricing (U4830E) Refer to the HP Web site at: www.procurve.com/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	
Standards and protocols	General Protocols IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.3ad Link Aggregation Control Protocol (LACP) IEEE 802.3x Flow Control RFC 1534 DHCP/BOOTP Interoperation Network Management IEEE 802.1AB Link Layer Discovery Protocol (LLDP)	
Notes	Use only supported genuine ProCurve mini-GBICs with your switch.	

HP ProCurve Switch 1800-8G (J9029A)	Ports	8 auto-sensing 10/100/1000 ports (IEEE 802.3 Type 10Base-T, IEEE 802.3u Type 100Base-TX, IEEE 802.3ab Type 1000Base-T); Media Type: IEEE Auto-MDIX; Duplex: 10Base-T/100Base-TX: half or full; 1000Base-T: full only
	Dimensions	4.58(d) x 7.73(w) x 1.73(h) in. (11.63 x 19.63 x 4.39 cm) (1U height)
	Weight	1.19 lb. (0.54 kg), Fully loaded
	Memory and processor	1 MB flash, 64 KB SDRAM, 1 MB RAM/ROM capacity; packet buffer size: 144 KB
	Mounting	Horizontal surface mounting only

Technical Specifications

Performance	100 Mb Latency	<3.9 µs (64-byte packets)
	1000 Mb Latency	<2.1 µs (64-byte packets)
	Throughput	up to 11.9 million pps (64-byte packets)
	Switching capcity	16 Gbps
	MAC addresstable size	8,000 entries
Environment	Operating temperature	32°F to 104°F (0°C to 40°C)
	Operating relative humidity	10% to 90% @ 104°F (40°C), non-condensing
	Non-operating/ Storage temperature	-40°F to 158°F (-40°C to 70°C)
	Non-operating/ Storage relative humidity	10% to 90% @ 149°F (65°C), non-condensing
	Altitude	up to 10000 ft. (3 km)
	Acoustic	Power: 0 dB no fan
Electrical characteristics	Maximum heat dissipation	61 BTU/hr (64 kJ/hr)
	Voltage	100-240 VAC
	Current	0.5 A
	Power consumption	18 W
	Frequency	60 Hz
	Notes	Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. The exact input voltage and frequency rating are determined by the specific power adapter part number ordered. Please select the correct power adapter country option.
Safety	CSA 22.2 No. 60950; EN 60950/IEC 60950; UL 60950	
Emissions	FCC Rules Part 15, Subpart B Class A; EN 55022; VCCI; ICES-003 (Canada)	
Immunity	EN	EN 55024, CISPR 24
	ESD	EN 61000-4-2
	Radiated	EN 61000-4-3
	EFT/Burst	EN 61000-4-4
	Surge	EN 61000-4-5
	Conducted	EN 61000-4-6
	Power frequency magnetic field	EN 61000-4-8
	Voltage dips and interruptions	EN 61000-4-11
	Harmonics	EN 61000-3-2
	Flicker	EN 61000-3-3

Management	HP ProCurve Manager; Web browser
Services	3-year, 4-hour onsite, 13x5 coverage for hardware (UE256E) 3-year, 4-hour onsite, 24x7 coverage for hardware (UE257E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (UE258E) 3-year, 24x7 SW phone support, software updates (UE260E) Installation with minimum configuration, system-based pricing (U4826E) Installation with HP-provided configuration, system-based pricing (U4830E) Refer to the HP Web site at: www.procurve.com/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.
Standards and protocols	General Protocols IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.3ad Link Aggregation Control Protocol (LACP) IEEE 802.3x Flow Control RFC 1534 DHCP/BOOTP Interoperation Network Management IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
Notes	Use only supported genuine ProCurve mini-GBICs with your switch.

To learn more, visit www.hp.com/go/procurve

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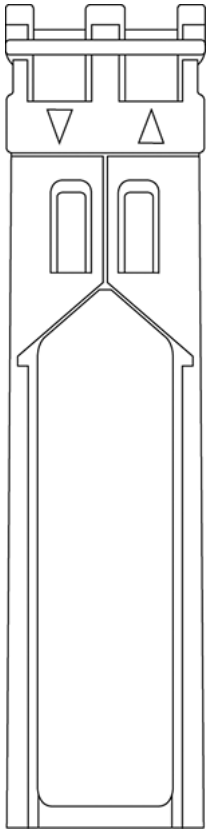
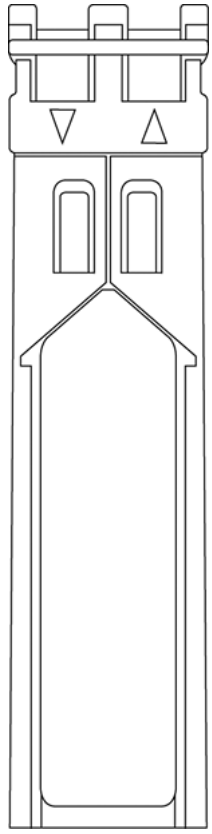
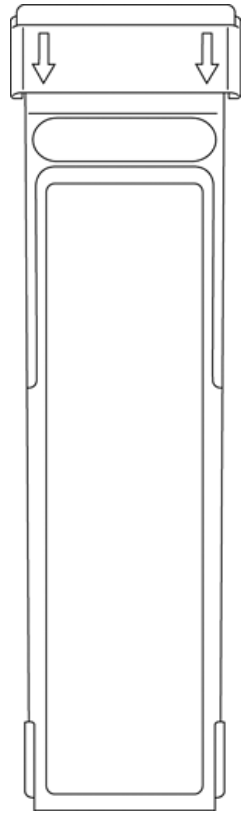
Overview



HP X121 1G SFP LC SX Transceiver



HP X121 1G SFP LC LX Transceiver



HP X121 1G SFP LC LH Transceiver

Models

HP X121 1G SFP LC SX Transceiver	J4858C
HP X121 1G SFP LC LX Transceiver	J4859C
HP X121 1G SFP LC LH Transceiver	J4860C

Technical Specifications

HP X121 1G SFP LC SX Transceiver (J4858C)

A small form-factor pluggable (SFP) Gigabit SX transceiver that provides a full-duplex Gigabit solution up to 550 m on multimode fiber.

Ports	1 LC 1000BASE-SX port; Duplex: full only
Physical characteristics	Dimensions: 2.24(d) x 0.54(w) x 0.48(h) in. (5.69 x 1.37 x 1.22 cm) Weight: 0.04 lb. (0.02 kg) Transceiver form factor: SFP
Environment	Operating temperature: 32°F to 158°F (0°C to 70°C) Operating relative humidity: 5% to 85%, noncondensing Nonoperating/Storage temperature: -40°F to 203°F (-40°C to 85°C) Altitude: up to 10,000 ft. (3 km)
Electrical characteristics	Power consumption typical: 0.4 W Power consumption maximum: 0.7 W
Cabling	Type: • 62.5/125 µm or 50/125 µm (core/cladding) diameter, graded-index, low metal content, multimode fiber optic, complying with ITU-T G.651 and ISO/IEC 793-2 Type A1b or A1a, respectively; Maximum distance: • 2-220 m (62.5 µm core diameter, 160 MHz*km bandwidth • 2-275 m (62.5 µm core diameter, 200 MHz*km bandwidth • 2-500 m (50 µm core diameter, 400 MHz*km bandwidth) • 2-550 m (50 µm core diameter, 500 MHz*km bandwidth) Cable length: 2-550m Fiber type: Multi Mode
Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

HP X121 1G SFP LC LX Transceiver (J4859C)

HP X121 1G SFP LC LX Transceiver: An SFP format gigabit transceiver with LC connectors using LX technology.

Ports	1 LC 1000BASE-LX port (IEEE 802.3z Type 1000BASE-LX); Duplex: full only
Physical characteristics	Dimensions: 2.24(d) x 0.54(w) x 0.486(h) in. (5.69 x 1.37 x 1.23 cm) Weight:0.04 lb. (0.02 kg)
Environment	Operating temperature: 32°F to 158°F (0°C to 70°C) Operating relative humidity: 0% to 85%, noncondensing Nonoperating/Storage temperature: -40°F to 212°F (-40°C to 100°C) Altitude: up to 10,000 ft. (3 km)
Cabling	Type: • Either single mode or multimode; 62.5/125 µm or 50/125 µm (core/cladding) diameter, graded-index, low metal content, multimode fiber optic, complying with ITU-T G.651 and ISO/IEC 793-2 Type A1b or A1a, respectively; Low metal content, single-mode fiber-optic, complying with ITU-T G.652 and ISO/IEC 793-2 Type B1; Maximum distance: • 2-550 m (multimode 62.5 µm core diameter, 500 MHz*km bandwidth) • 2-550 m (multimode 50 µm core diameter, 400 MHz*km bandwidth)

Technical Specifications

		• 2-550 m (multimode 50 µm core diameter, 500 MHz*km bandwidth) • 2-10,000 m (single-mode fiber)
	Notes	A mode conditioning patch cord may be needed in some multimode fiber installations. Wavelength: 1310nm Power Consumption: < 500mW Typical
	Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.
HP X121 1G SFP LC LH Transceiver (J4860C) A small form-factor pluggable (SFP) Gigabit LH transceiver that provides a full-duplex Gigabit solution up to 70 km on single-mode fiber.	Ports	1 LC 1000BASE-LH port (no IEEE standard exists for 1550 nm optics); Duplex: full only
	Physical characteristics	Dimensions: 2.17(d) x 0.60(w) x 0.46(h) in. (5.5 x 1.53 x 1.18 cm) Weight: 0.04 lb. (0.02 kg)
	Environment	Operating temperature: -40°F to 185°F (-40°C to 85°C) Operating relative humidity: 0% to 95% @ 77°F (25°C), noncondensing Nonoperating/Storage temperature: -40°F to 185°F (-40°C to 85°C) Altitude: up to 10,000 ft. (3 km)
	Cabling	Cable type: • Low metal content, single-mode fiber-optic, complying with ITU-T G.652 and ISO/IEC 793-2 Type B1; Maximum distance: • 10-70,000 m (single-mode fiber)
	Notes	Power consumption is 0.8 watts typical with 1 watt maximum at 100% utilization. For distances less than 20 km, a 10 dB attenuator must be used. For distances between 20 km and 40 km, a 5 dB attenuator must be used. Attenuators can be purchased from most cable vendors.
	Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

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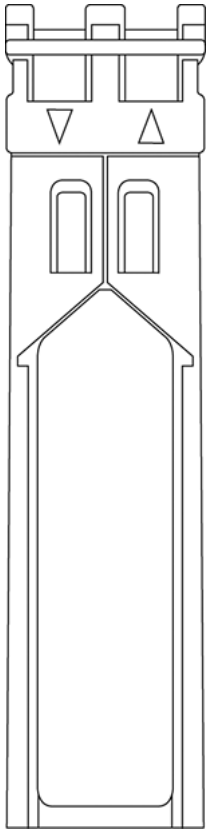
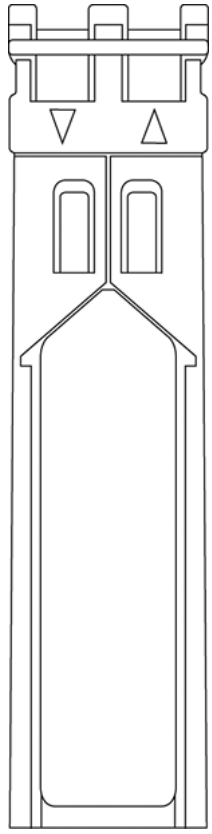
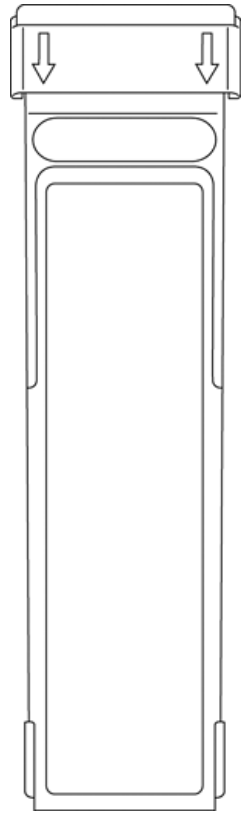
Overview



HP X121 1G SFP LC SX Transceiver



HP X121 1G SFP LC LX Transceiver



HP X121 1G SFP LC LH Transceiver

Models

HP X121 1G SFP LC SX Transceiver	J4858C
HP X121 1G SFP LC LX Transceiver	J4859C
HP X121 1G SFP LC LH Transceiver	J4860C

Technical Specifications

HP X121 1G SFP LC SX Transceiver (J4858C)

A small form-factor pluggable (SFP) Gigabit SX transceiver that provides a full-duplex Gigabit solution up to 550 m on multimode fiber.

Ports	1 LC 1000BASE-SX port; Duplex: full only
Physical characteristics	Dimensions: 2.24(d) x 0.54(w) x 0.48(h) in. (5.69 x 1.37 x 1.22 cm) Weight: 0.04 lb. (0.02 kg) Transceiver form factor: SFP
Environment	Operating temperature: 32°F to 158°F (0°C to 70°C) Operating relative humidity: 5% to 85%, noncondensing Nonoperating/Storage temperature: -40°F to 203°F (-40°C to 85°C) Altitude: up to 10,000 ft. (3 km)
Electrical characteristics	Power consumption typical: 0.4 W Power consumption maximum: 0.7 W
Cabling	Type: • 62.5/125 µm or 50/125 µm (core/cladding) diameter, graded-index, low metal content, multimode fiber optic, complying with ITU-T G.651 and ISO/IEC 793-2 Type A1b or A1a, respectively; Maximum distance: • 2-220 m (62.5 µm core diameter, 160 MHz*km bandwidth • 2-275 m (62.5 µm core diameter, 200 MHz*km bandwidth • 2-500 m (50 µm core diameter, 400 MHz*km bandwidth) • 2-550 m (50 µm core diameter, 500 MHz*km bandwidth) Cable length: 2-550m Fiber type: Multi Mode
Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

HP X121 1G SFP LC LX Transceiver (J4859C)

HP X121 1G SFP LC LX Transceiver: An SFP format gigabit transceiver with LC connectors using LX technology.

Ports	1 LC 1000BASE-LX port (IEEE 802.3z Type 1000BASE-LX); Duplex: full only
Physical characteristics	Dimensions: 2.24(d) x 0.54(w) x 0.486(h) in. (5.69 x 1.37 x 1.23 cm) Weight:0.04 lb. (0.02 kg)
Environment	Operating temperature: 32°F to 158°F (0°C to 70°C) Operating relative humidity: 0% to 85%, noncondensing Nonoperating/Storage temperature: -40°F to 212°F (-40°C to 100°C) Altitude: up to 10,000 ft. (3 km)
Cabling	Type: • Either single mode or multimode; 62.5/125 µm or 50/125 µm (core/cladding) diameter, graded-index, low metal content, multimode fiber optic, complying with ITU-T G.651 and ISO/IEC 793-2 Type A1b or A1a, respectively; Low metal content, single-mode fiber-optic, complying with ITU-T G.652 and ISO/IEC 793-2 Type B1; Maximum distance: • 2-550 m (multimode 62.5 µm core diameter, 500 MHz*km bandwidth) • 2-550 m (multimode 50 µm core diameter, 400 MHz*km bandwidth)

Technical Specifications

		• 2-550 m (multimode 50 µm core diameter, 500 MHz*km bandwidth) • 2-10,000 m (single-mode fiber)
	Notes	A mode conditioning patch cord may be needed in some multimode fiber installations. Wavelength: 1310nm Power Consumption: < 500mW Typical
	Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.
HP X121 1G SFP LC LH Transceiver (J4860C) A small form-factor pluggable (SFP) Gigabit LH transceiver that provides a full-duplex Gigabit solution up to 70 km on single-mode fiber.	Ports	1 LC 1000BASE-LH port (no IEEE standard exists for 1550 nm optics); Duplex: full only
	Physical characteristics	Dimensions: 2.17(d) x 0.60(w) x 0.46(h) in. (5.5 x 1.53 x 1.18 cm) Weight: 0.04 lb. (0.02 kg)
	Environment	Operating temperature: -40°F to 185°F (-40°C to 85°C) Operating relative humidity: 0% to 95% @ 77°F (25°C), noncondensing Nonoperating/Storage temperature: -40°F to 185°F (-40°C to 85°C) Altitude: up to 10,000 ft. (3 km)
	Cabling	Cable type: • Low metal content, single-mode fiber-optic, complying with ITU-T G.652 and ISO/IEC 793-2 Type B1; Maximum distance: • 10-70,000 m (single-mode fiber)
	Notes	Power consumption is 0.8 watts typical with 1 watt maximum at 100% utilization. For distances less than 20 km, a 10 dB attenuator must be used. For distances between 20 km and 40 km, a 5 dB attenuator must be used. Attenuators can be purchased from most cable vendors.
	Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

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SMARTNET Service Level Summary	
SMARTNET The difference is in response time of replacement parts:	**SMARTNET Onsite levels include all parts, labor and material required for hardware maintenance. Again, the difference is in response time.**
SMARTnet 8x5xNBD (SNT) - Next-business-day delivery of advance replacement parts, provided the request is received prior to 3pm local time.	SMARTnet Onsite 8x5xNBD (CS) - Next-business-day onsite service with parts (Monday through Friday, excluding Cisco-observed holidays) for onsite hardware maintenance, provided the call was placed with Cisco before 3pm local time.
SMARTnet 8x5x4 (SNTE) - Four business-hour response time for advanced replacement parts from 9am to 5pm local time, Monday through Friday, excluding Cisco observed holidays.	SMARTnet Onsite 8x5x4 (C4S) - Four-hour business response time for onsite service coverage with parts from 9am to 5pm local time Monday through Friday, excluding Cisco observed holidays
SMARTnet 24x7x4 (SNTP) - Four-hour response time for advance replacement parts 24 hours a day, 7 days a week, including Cisco observed holidays.	SMARTnet Onsite 24x7x4 (C4P) - Four-hour onsite service and parts, 24 hours a day, 365 days a year, including Cisco and locally observed holidays for onsite hardware maintenance.
SMARTnet 24x7x2 (S2P) - Two-hour response time for advance replacement parts 24 hours a day, 7 Days a week, including Cisco observed holidays.	SMARTnet Onsite 24x7x2 (C2P) - Two-hour onsite service and parts, 24 hours a day, 365 days a year, including Cisco and locally observed holidays for onsite hardware maintenance.
All levels of SMARTnet include the following:	
*Telephone callback within one hour by the Cisco Technical Assistance Center (TAC) for all hardware, configuration, and software problems, from 9am to 5 pm local time, Monday through Friday, excluding Cisco-observed holidays	
*24-hour, 7-day priority 1 and 2 telephone support	
*Critical problem escalation	
*E-Mail inquiries and responses	
*Software updates via CCO	
*One set of new manuals with each software update, or CD documentation for each unit under contract, upon request	
*Registered access to CCO, 24 hours a day, 7 days a week	