POSITRON
Access Solutions

FS-GIGA

Quick Installation Guide

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FS-GIGA
Installation and User's Guide

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Chapter 1

FS-GIGA

1.1 Introduction

Positron Access Solutions' next generation FS-GIGA FlexStream Remote Unit (RU) enables the transport of high quality, ultra-high bandwidth Carrier Ethernet business services and Metro/Macro Mobile backhaul services over bonded copper pairs. The FS-GIGA is compliant with the MEF CE 2.0 specification and provides up to 800 Mbps of bandwidth on 8 bonded VDSL2 pair with vectoring and 1 Gbps on Ethernet (Electrical and Optical). The hardened unit is fully compliant to VDSL2/ADLS2+ standards, supporting multi-channel PTM bonding and standards based vectoring.

Note: Read Chapter 5 Safety and Warnings before proceeding.

1.2 Installation

1.2.1 FS-GIGA Series Remote Unit Connections

Remote Unit Power Connection

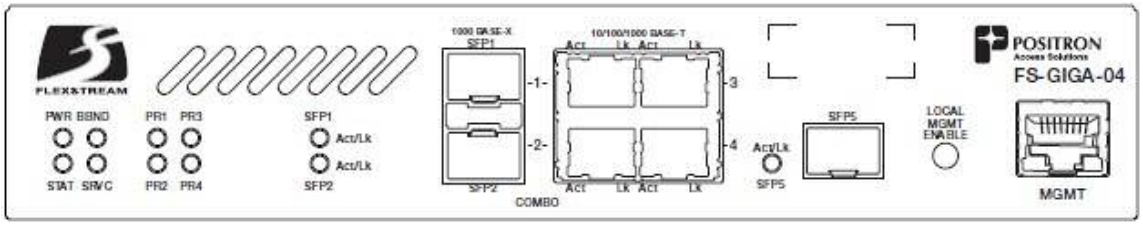
The FS-GIGA-04 and FS-GIGA-08 Remote Units (RU) require local -48Vdc power. For a stand-alone power supply, see Chapter 7 for more information.

Ethernet Data Connections

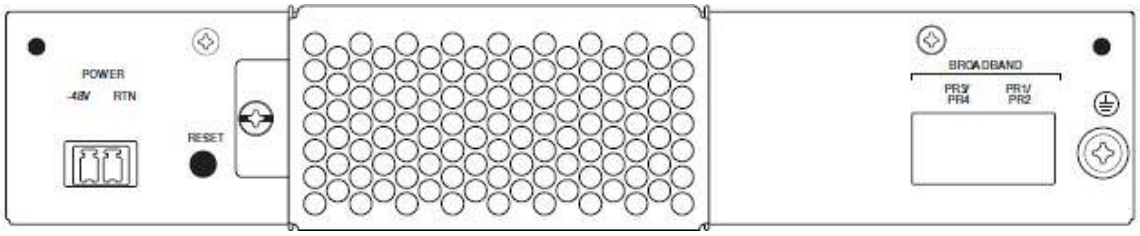
Attach Ethernet data cables to any of the 4 10/100/1000BaseT ports on the front panel or insert an SFP module in the front panel SFP (3x) slot. Note: Ports 1-2 are combo ports, SFP or RJ-45 can be used.

Multi-Pair Span (xDSL) Connection

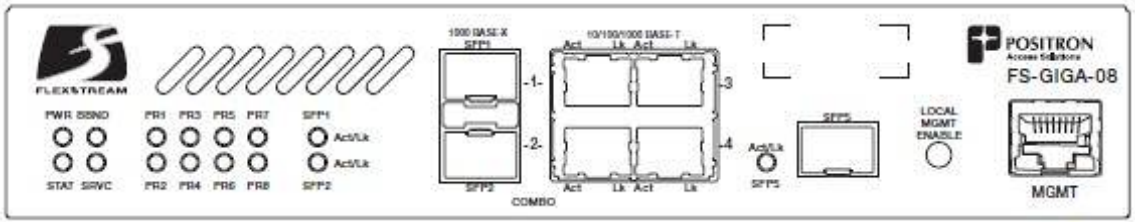
The Multi-Pair Span connectors are used to connect the FS-GIGA RU to the outside plant pairs. The FS-GIGA-04 uses 2 RJ-11 connectors (each containing 2 pairs); the FS-GIGA-08 uses 4 RJ-11 connectors (each containing 2 pairs).



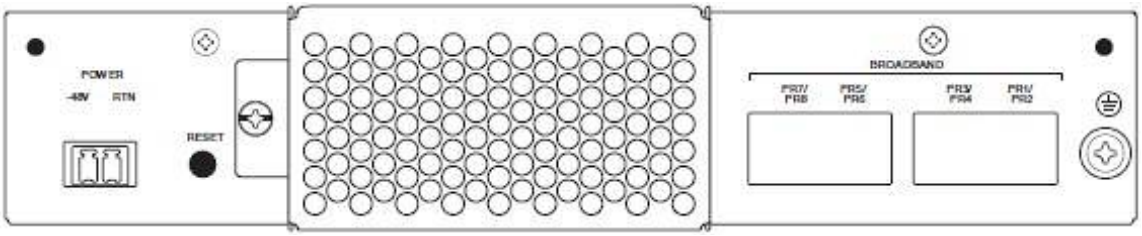
FS-GIGA-04 Remote Unit Front View



FS-GIGA-04 Remote Unit Rear View



FS-GIGA-08 Remote Unit Front View



FS-GIGA-08 Remote Unit Rear View

FS-GIGA Series RU Front Panel Indicators

LED	Condition	Function
Status	Solid Green Solid Yellow Solid Red	Normal Minor Alarm Active Critical or Major Alarm Active
Power	Off Solid Green	No Power Unit has Power
BBND	Off Solid Green	Bonding group down Bonding group in showtime with at least one pair up.
SRVC	Off Solid Green	Future use
PAIR STATUS	Off Solid Green Flashing Green Solid Red	Pair Is Disabled Pair is Up Pair is Acquiring Pair LOS/Open Circuit/Short
10/100/1000BASE-T Act	Off Green	No Data Data
10/100/1000BASE-T LK	Off Green	Ethernet Link is Down Ethernet Link is Up
SFP	Off Green	SFP Link is Down SFP Link is Up

FS-GIGA Series RU Front Panel features

Item	Function
MGMT	RJ-45 connector for secure SSH/CLI or WEB Interface access.
LOCAL MGMT ENABLE	Push-Button to temporarily override the Out-Of-Band configured FS-GIGA IP Address. When you push the LOCAL MGMT ENABLE button, a static Web page will display the configured IP address. To access the static web page, connect your web browser at the default IP address 192.168.10.2. The information will be available for 1 minute after pushing the LOCAL MGMT ENABLE button.

FS-GIGA Family RU Rear Panel features

Item	Function
POWER CONNECTOR	A 2 position connector provides power to the unit for local powering. The mating connector is capable of supporting 12 to 18 gauge wires.
Broadband	2 RJ-11 connectors for the FS-GIGA-04 Compact Remote Units 4 RJ-11 connectors for the FS-GIGA-08 Compact Remote Units
EARTH GROUND LUG	Must be directly connected to earth ground to ensure proper operation of the Line Protection circuitry
VDSL2 SHIELD LUG	Provides a return current path for the VDSL2 shield.
RESET	>2 seconds < 10 seconds = cold reboot > 10 seconds = cold reboot with factory defaults.

Chapter 2

WEB Management

2.1 Introduction

The FS-GIGA can be securely managed by CLI or by WEB using a standard WEB browser like Internet Explorer, Chrome, Opera or Firefox.

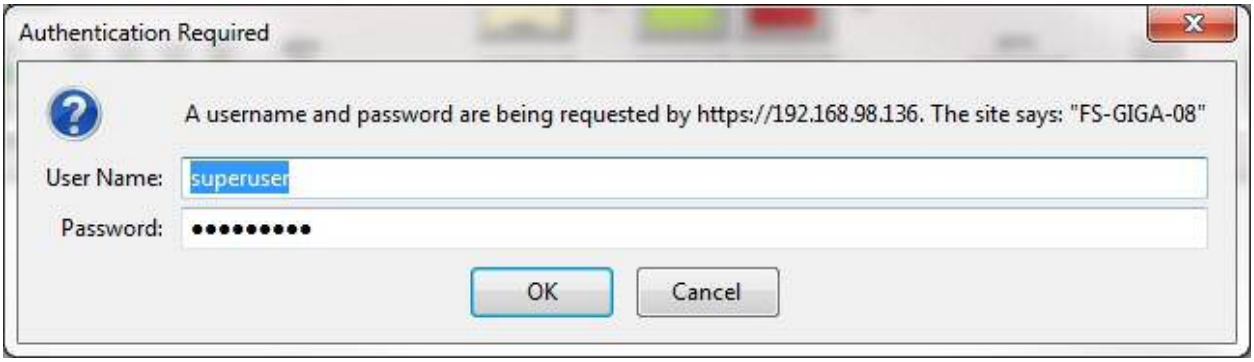
2.2 System Management

2.2.1 Logging into the WEB UI

Enter the system's IP Address into the Web browser and you will see a screen similar to the following:

The default configuration values of the FS-GIGA are listed in the table below:

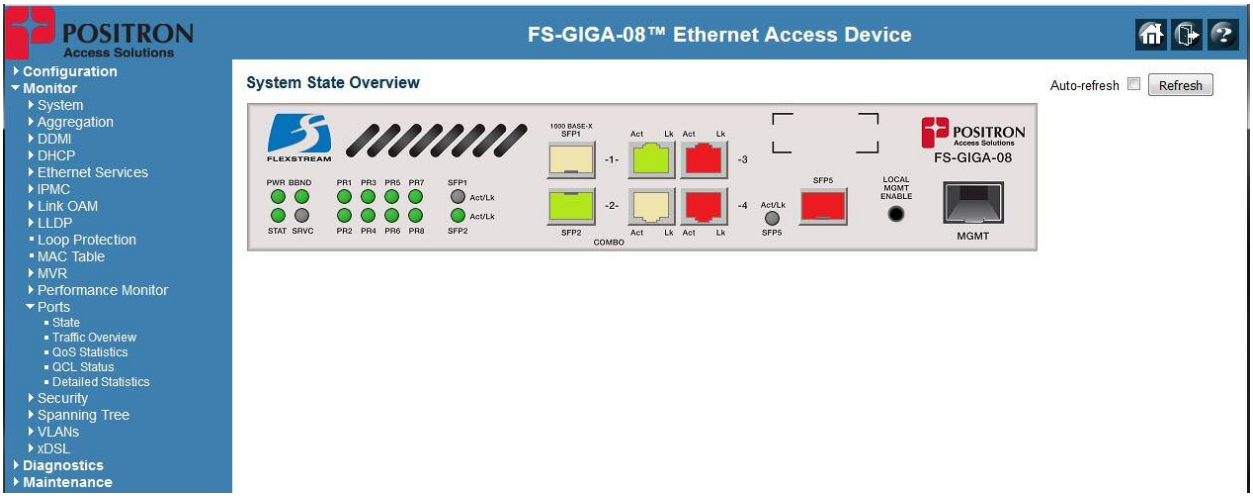
IP Address	192.168.10.2
Subnet Mask	255.255.255.0
Username	superuser
Password	superuser



Enter a Username and Password for the FS-GIGA system. The default Username is **superuser** and the default password is **superuser**. Click **Login**.

2.2.2 System

The System monitor page provides a front panel representation of the FS-GIGA system.



For complete detail on web management, please refer to the FS-GIGA User's Guide.

Chapter 3

Technical and Regulatory Specifications

3.1 FS-GIGA Series Compact Remote Unit Technical Specifications

System

- Bandwidth on 8 VDSL2 bonded pairs (with vectoring):
  - Up to 800 Mbps Downstream
  - Up to 400 Mbps Symmetric
- Resiliency: Carrier grade automatic pair failure protection
- BER: 10^{-7}

Interfaces

Ethernet

- Interfaces: 5 usable client ports
  - 4 RJ45 10/100/1000BaseT (Auto Negotiating, Auto MDIX)
  - 3 SFP 1000BaseX

  (Note: ports 1-2 are combo ports: SFP or Electrical)
- Compliance: IEEE 802.3

Outside Plant Pairs

- Technology: VDSL2 (G.993.2), ADSL2+ (G.992.5), and G.Vector (G.993.5)
- Number of pairs: Up to 8
- Sealing current: Meets 50V/100mA per pair
- T1.417 (Spectral) Compliant

Management interface

- 10/100/1000BaseT RJ45 (IEEE 802.3)

Layer 2 Features

- VLAN Tagging: IEEE 802.1q support
- Stacked VLAN Tagging
- Priorities: IEEE 802.1p, Port, or DiffServ
- Dynamic Bridging: 8K MAC addresses

Environmental

- Operating temperature: -40 to +65°C
- Storage temperature: -40 to +85°C
- Relative humidity: Up to 95%, non-condensing

Electrical Specifications

- Local Power Input: -48 Vdc, (FS-GIGA-08, FS-GIGA-08-OUT)
- Local Power Input; 120Vac/240Vac (FS-GIGA-08-OUT-AC)
- Max Heat Dissipation: 35 Watts
- Sealing Current

Mechanical

- Chassis Dimensions:
    - FS-GIGA-08: 1.60" (41 mm)H x 8.5" (216 mm) W x 11.9" (302 mm) D
    - FS-GIGA-08-OUT: 1.76" (45 mm) H x 8.5" (216 mm) W x 12.3" (312 mm) D
    - FS-GIGA-08-OUT-AC: 4.0" (102 mm) H x 11.5" (292 mm) W x 16.25" (413 mm) D
- Weights:
    - FS-GIGA-08 3.75lbs (1.7 kg).
    - FS-GIGA-08-OUT: 3.85lbs (1.75 Kg)
    - FS-GIGA-08-OUT-AC: 17.3bs (7.9 Kg). Does not include the 2 pole mount brackets @ 2.15lbs (1Kg) each.

Front Panel Indicators

- Status, Power, BBND, SFP. ETH link/activity.
- xDSL Outside Plant Pair Status (up to 8)

Network Management

- WEB UI, CLI

3.2 Regulatory Compliance

FCC Declaration of Conformance

The FS-GIGA models comply with part 15 of the FCC Rules. Operation is subject to the following two conditions (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15 Class A Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates; uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

In order to maintain compliance with FCC regulations shielded Ethernet (CAT-5/5E or CAT-6) cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio & television reception.

Industry Canada

The FS-GIGA models comply with ICES-003 of the Industry Canada Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Les modèles FS-GIGA sont conformes à la norme NMB-003 d'Industrie Canada. Leur fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Europe - EU Declaration of Conformity

The FS-GIGA models comply with the essential requirements of the EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU:

CSA C22.2#60950-1: Issued: 2007/03/27 Ed: 2 (R2012) Information Technology Equipment Safety Part 1: General Requirements; Amd. 1: 2011, Amd. 2: 2014

UL 60950-1: Issued: 2007/03/27 Ed: 2 Rev: 2014/10/14 Information Technology Equipment Safety Part 1: General Requirements

IEC 60950-1: Issued: 2013/05/28 Ed: 2.2 Information Technology Equipment - Safety - Part 1: General Requirements; Consolidated Edition. Ed. 2: 2005

EN 55022: 2010: Information technology equipment - Radio disturbance characteristics Limits and methods of measurement

EN 55024: 2010: Information technology equipment - Immunity characteristics - Limits and methods of Measurement

EN 55032: 2012: Electromagnetic compatibility of multimedia equipment - Emission Requirements

English	Hereby, Positron Access solutions Corp., declares that the FS-GIGA models are in compliance with the essential requirements and other relevant provisions of Directive 2014/30/EU and 2014/35/EU.

Français	Par la présente Positron Access solutions Corp., déclare que les modèles FS-GIGA sont conformes aux exigences essentielles et aux autres dispositions pertinentes selon les normes 2014/30/EU and 2014/35/EU.

Safety

The FS-GIGA models conforms to IEC 60950-1/UL 60950-1/CSA C22.2 #60950-1 standards.

Les modèles FS-GIGA sont conformes aux normes IEC 60950-1/UL 60950-1/CAN C22.2 #60950-1.

Chapter 4

Maintenance

4.1 Filters

The FS-GIGA wall mount (outdoor) is fan-less and does not have filter.

The FS-GIGA rackmount does have fans and filter. The filter for the FS-GIGA should be replaced every six months. Care should be taken when replacing filters to ensure collected dust on the filters does not enter into the equipment. Ordering information can be found at the end of this document.

Chapter 5

Safety and Warnings

Safety and Warnings

To ensure your safety when servicing and installing this equipment, please take the following precautions:

A 2A UL listed fuse/circuit breaker must be installed ahead of this unit in the end use building installation.

A fuse panel must be installed near the unit in accordance with the National Electrical Code so that it is accessible to the operator.

A fuse panel must be provided as part of the building installation wiring in order to provide a UL required disconnect point.

The FS-GIGA products accept 48Vdc for powering. The 48Vdc voltage range must be between -42.5Vdc to -56.5Vdc.

Be careful when installing or modifying telephone lines; dangerous voltages can be present. It is unsafe to install telephone wiring during a lightning storm.

Only qualified personnel should service this system.

The equipment must be connected to a protective ground in accordance with the instructions provided in this manual. Improper grounding may result in an electrical shock.

Follow local grounding practice to ensure a good frame ground connection. The frame ground is required for secondary voltage protection.

For performance and safety reasons, only power supplies listed for use with telephone equipment by a locally recognized organization should be used with this equipment.

All wiring external to the product should follow the local wiring codes.

Use of this product in a manner other than defined in this installation guide may cause damage to equipment or injury to personnel.

If a problem has been isolated to this unit, do not attempt to repair. The unit’s components are not user serviceable and therefore must not be replaced. Please return the unit to Positron Access Solutions for repair.

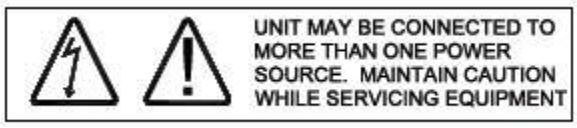
All fuses on the unit are located in non accessible areas and are not field serviceable. Please return the unit to Positron Access Solutions for repair.

Observe local practice electrostatic discharge precautions when handling electronic equipment. Do not hold electronic plugs by their edge. Do not touch components or circuitry. Use a grounding wrist strap attached to a grounding connection point. Use only ESD-protective packaging materials when transporting equipment.

Care should be taken when installing in a closed or multi-unit rack environment to ensure that the maximum operating ambient temperature of 65°C (149°F) is not exceeded.

Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

Connect the unit only to a properly rated supply circuit. Reliable earthing (grounding) of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).



During installation and service do not connect to a live power source. Ensure that fuses are removed from the fuse panel.

This product is intended for installation in Restricted Access Locations only.

Mounting of equipment in a rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

The Positron Multi Pair span interface is designed to coordinate with a standard 350 Vdc (230 Vdc in Europe) gas discharge tube protector. Carbon block protectors shall not be used.

WARNING: The intra-building ports (Electrical Ethernet – RJ-45) of the equipment are suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building ports of the equipment MUST NOT be metallically connected to interfaces which connect to the OSP or its wiring. These interfaces are designed for use as intra-building Interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

THIS PRODUCT IS SUITABLE FOR MOUNTING ON OR ABOVE CONCRETE OR OTHER NON-CONDUCTIVE SURFACE ONLY.

Chapter 6

Warranty and Customer Service

Positron Access Solutions will replace or repair this product within the warranty period if it does not meet its published specifications or fails while in service. Warranty information can be found on the Positron Access Solutions customer web portal: http://portal.positronaccess.com/

Positron Sales Pricing/Availability
US and Canada: 1-888-577-5254
International: +1-514-345-2220

Positron Technical Support
Pre-Sales Applications/Post-Sales Technical Assistance:
+ 1 (951) 272-9100
7days/week, 24 hours/day

Positron Repair
Return for Repair/Upgrade:
+ 1 (951) 272-9100
http://ticketmaster.positronaccess.com/

Repair and Return Address
Contact Customer Service prior to returning equipment to Positron.

Chapter 7

Positron Products

Equipment Name	Description
FS-GIGA-08	FS-GIGA-08 rackmount with fans (8-pair VDSL)
FS-GIGA-08-OUT	FS-GIGA-08 wallmount (8-pair VDSL)
FS-GIGA-PWR	AC to -48v DC power supply for FS-GIGA rackmount
FS-GIGA-FB19	19" brackets for FS-GIGA-08 rackmount
FS-GIGA-FB23	23" brackets for FS-GIGA-08 rackmount
FS-GIGA-FFL6	6-pack of air filters for FS-GIGA-08 rackmount
FS-GIGA-FAN	Fan replacement kit for FS-GIGA-08 rackmount

Appendix A:

System xDSL Error Information

XSPAN Errors	Description
CRC Error	A CRC is a way of identifying if data was received error free. Transmitted data is divided into blocks that are appended with 1 or 2 CRC bytes that are derived from the original data. The receiver re-computes the CRC bytes from the received data and if there is a mismatch, it signifies that there was a mismatch between the transmitted and received data.
xDSL ES	An Errored Second is any second in which any pair in the PTM bonding group incurs a CRC error
xDSL SES	A Severely Errored Second is any second in which the cumulative number of CRC errors of all the pairs in the PTM bonding group exceeds 18*N, where N is the number of pairs in the PTM bonding group that are in data mode.
xDSL UAS	An Unavailable Second is and second in which all the pairs in the PTM bonding group are in LOS or have experienced 10 SES's in a row (in which case 10 SES shall be subtracted from the UAS total).
Pair CS	Any second during which a correctable error occurred, i.e. an error occurred during transmission, but the Reed Solomon (RS) error protection mechanism was able to detect and correct it.
Pair ES	An Errored Second is any second during which at least one CRC error
Pair SES	A Severely Errored Second is any second interval during which more than 18 CRC errors occurred.
Pair UAS	An Unavailable Second is a second where the previous 10 or more consecutive seconds were SES, or if the Pair is not in data mode.
Pair LEFTRS	Used only when G.INP is enabled. The number of seconds that experienced a Low Error Free Throughput Rate, i.e. seconds during which the Error Free Throughput dropped below the configured threshold.