Positron Access Solutions - BRX-XLR

Broadband Reach Extender – Extra Long Reach

Installation and Activation Guidelines

September 2017

Publication Information

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Publication date: September 2017
Printed in Canada

Published By
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Disclaimer Notice
Although Positron Access Solutions Corp. has made every effort to ensure the accuracy of the information contained herein, this document is subject to change.

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1 BRX-XLR General Description

The Broadband Reach Extender – Extra Long Reach (BRX-XLR) is a fully integrated solution that extends the reach of deployed ADSL / ADSL2+ DSLAMs or MSANs to deliver higher bandwidth services to underserved or unserved markets. For example, it extends the reach of a 10 Mbps downstream service from 9,100 feet (2.8 km) to 12,500 feet (3.8 km) on 26 AWG / 0.40 mm gauge copper, an increase of almost 40%, and the same level of increase is achieved for larger size cables. Furthermore, this 40% increase in reach results in an estimated 100% increase in CSA (Customer Serving Area) since the area served is proportional to the square of the linear distance.

Another way to look at the benefits of this same function is that a client that is situated at 12,500 feet (3.8 km) from the DSLAM, on a 26 AWG (0.40 mm) copper pair will see the downstream bandwidth increase from approximately 5 Mbps to over 10 Mbps. Over longer distances, the bandwidth improvement ratio is between 2 to 5 times. It is important to note that these benefits are obtained without the need to change the DSLAM or the user CPE. By significantly increasing the effective bandwidth and reach of existing xDSL lines, operators can deliver true broadband speeds to each of its subscribers, even those located in remote areas or currently located too far from the DSLAM to receive any service.

2 BRX-XLR Main Advantages

- Extends the ADSL/ADSL2/ADSL2+ Customer Serving Area (CSA) up to 100%
- Improves effective bandwidth typically by a ratio of 2 to 5 for ADSL/ADSL2/ADSL2+ loops
- No extra power required. The BRX-XLR uses less than 2mA from the -48V sealing current from the POTS line
- Flexible multi-pair Shelf design allows more subscribers to be added in the future
- Turnkey pedestal option available
- Auto calibration, no software to configure or dip switch
- Easy to install, deploy and maintain

3 Product Documentation

The following documents are available for clients for the BRX-XLR product line on the Positron Access Solutions customer portal:

- BRX-XLR User Guide
- BRX-XLR Installation and Test Procedure (used for field trials)
- BRX-XLR Installation Guide (1-pager inserted in product packaging)
- BRX-XLR Checklist (1-pager inserted in product packaging)
- Emerson CAD12 Cable Closures: Description and Installation Manual
- BRX-XLR Deployment Planning Process
- BRX-XLR Troubleshooting Techniques
- BRX-XLR Placement Instructions
- BRX-XLR Product Selection Guide
- BRX-XLR FAQ

To access and download any such document, simply sign up on the Positron Access Solutions Portal at http://www.positronaccess.com/Portal.php and request access to the Portal. You will then receive a username and password.

4 BRX-XLR Product Packaging

The BRX-XLR product line from Positron Access Solutions offers multiple packaging options for 1, 2, 8, 24 and 48-pair assemblies. The following are images of the various packages available:

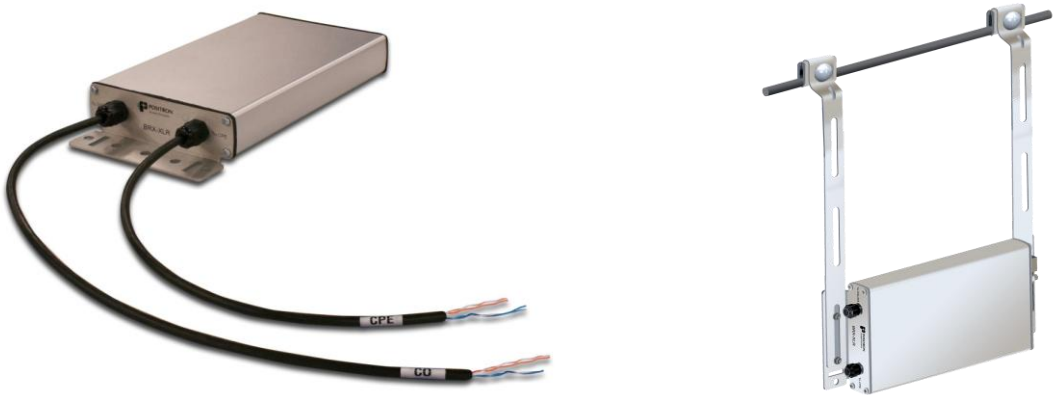

Figure 1: Images of BRX-XLR-2 (Out of the box and Strand Mounted)

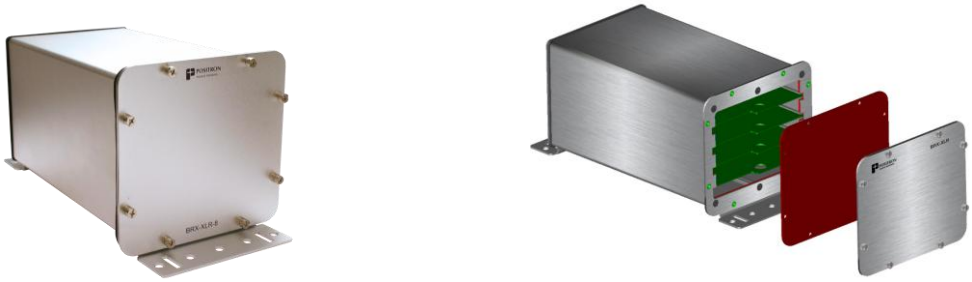

Figure 2: BRX-XLR-8

BRX-XLR-48-1SXP ***BRX-XLR-24-1SXP*** ***BRX-XLR-24***

Figure 3: BRX-XLR Pedestal (48 pair and 24 pair) and a 24-pair standalone enclosure

5 Installation and Operating Guidelines

5.1 General Requirements for the Outside Plant (OSP)

The BRX-XLR is designed to be installed and operated as per the same guidelines and standard operating procedures used for typical ADSL and ADSL2+ lines.

- **Qualify/Condition the Line:** the BRX-XLR only requires the same level of copper loops qualification and conditioning used for typical ADSL/ADSL2/ADSL2+ installations in accordance with standard operator guidelines
- **Loaded/Non-loaded Loops.** Loops should not have loading coils although the BRX-XLR can operate with xDSL-compliant loading coils
- **Bridge Taps**: all bridge taps should be removed for optimum performance
- **Insulation Resistance:** Tip-Ring, Tip-Ground and Ring-Ground Insulation Resistance should be greater than 5 Meg-Ohms
- **Longitudinal Balance.** Longitudinal balance should be greater than or equal to 60 dB
- **System Ground:** ensure proper ground per local company policies and practices
- **Loop Resistance:** the actual loop resistance between the DSLAM and the BRX-XLR should be verified at the time of the splicing
- **No Split Pairs:** ensure that the path does not have “split pairs” (tip on one pair and ring on the other) as it will induce plenty of crosstalk.

You should follow established standards for pair validation. The following check list can also be used to validate the pair(s):

Test & Pass / Fail Criteria	Results
Power Influence - ≤ 80 dBrnC	
Noise - ≤ 20 dBrnC	
Tip to Ground, ≤ |1.0 VDC	
Tip to Ring: 0 VDC	
Tip to Ground: < 5 VAC (should match Ring to Ground AC Voltage)	
Ring to Ground: : < 5 VAC (should match Tip to Ground AC Voltage)	
Tip to Ground Insulation Resistance Ohms ≥ 5 MΩ	
Ring to Ground Insulation Resistance Ohms ≥ 5 MΩ	
Tip to Ring Insulation Resistance Ohms ≥ 5 MΩ	
Longitudinal Balance ≥ 60 dB	
Load coils - If required, only use SMART Loading Coils	
Bridge Tap: No bridge tap should be found	
Important Note: Please make sure the Test Set is set to ADSL Mode	

Table 1 – Pre-installation checklist

5.2 POTS / Voice Lines

Voice (POTS) signal, when present, is transparently handled by the BRX-XLR. The BRX-XLR incorporates a POTS splitter function to allow the POTS traffic to flow normally while the ADSL2+/ADSL signals are amplified to obtain the best possible performance over the Outside Plant (OSP).

5.3 Equipment Connection Diagram

The BRX-XLR is typically deployed adjacent to an existing splice point facilitating the selection of the xDSL pairs that require amplification or not.

The following diagram illustrates how the BRX-XLR can be inserted between a DSLAM or MSAN and the subscribers it serves. Looking at the diagram below, the BRX-XLR is typically installed at 5,000-10,000 feet (1.5 to 3 km) from the DSLAM and provides increased bandwidth to a remote subscriber located up to 20,000 feet away (6 km) on a 26 AWG (0.40 mm) copper loop and even further on higher gauge loops.

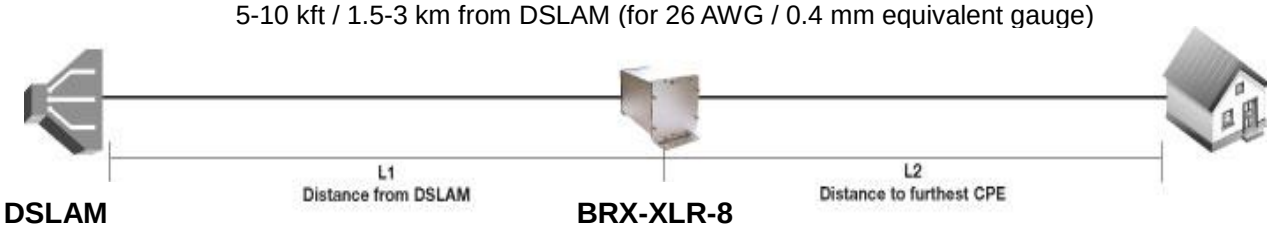

Figure 4: BRX-XLR-8 connection diagram

The BRX-XLR needs to be powered from the POTS sealing current (-48V) originating from the DSLAM or the Central Office (CO). This is illustrated by Figure 5 below:

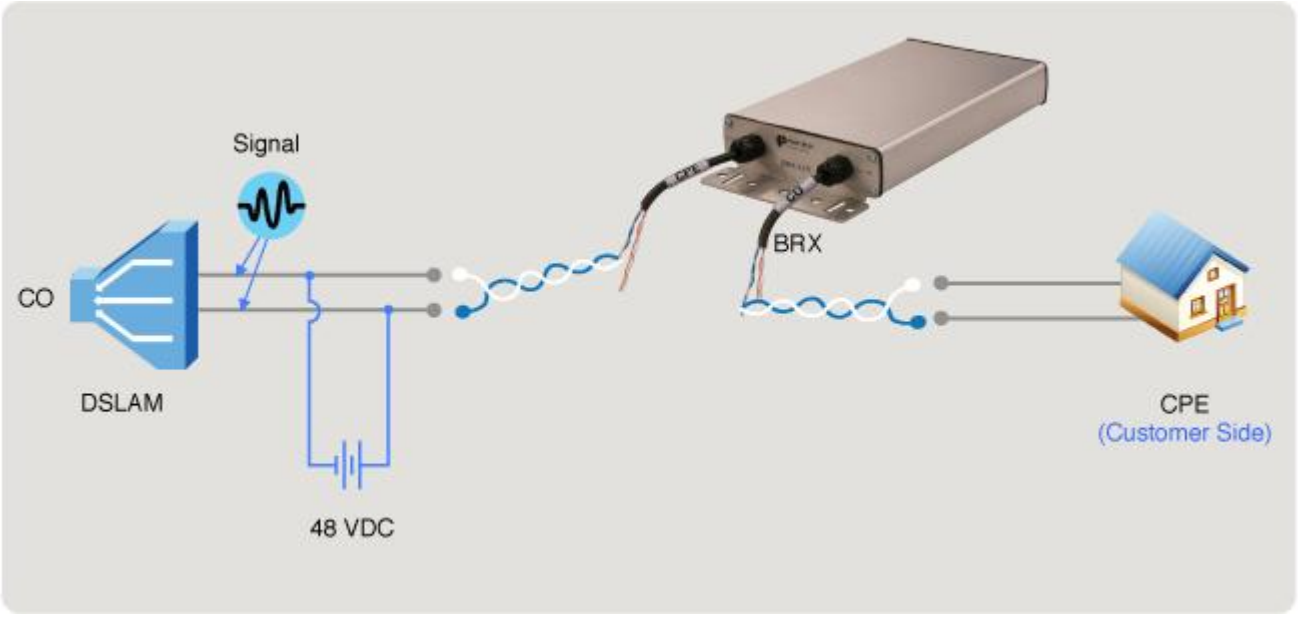

Figure 5: Using Sealing Current to power the BRX-XLR

6 Installation Procedure

6.1 Unpack

When unpacking the equipment, be sure to check the contents of the packaging for completeness against your purchase order. Notify your supplier immediately if any items are missing.

Note: Please save packing material. All equipment returned must be packed with the original packing material.

Be sure to inspect the equipment for shipping damage, including bent or loose hardware, and broken connectors. If the equipment appears to have been damaged in transit, please contact your delivery company.

6.2 BRX-XLR-2 2-pair Standalone Unit Installation

The BRX-XLR-2 is a standalone unit enclosed in an IP65/NEMA4x weather resistant enclosure. Please refer to the diagram below for a summary of the device.

NOTE: *the BRX-XLR-1 shares the same enclosure and installation instructions as the BRX-XLR-2.*

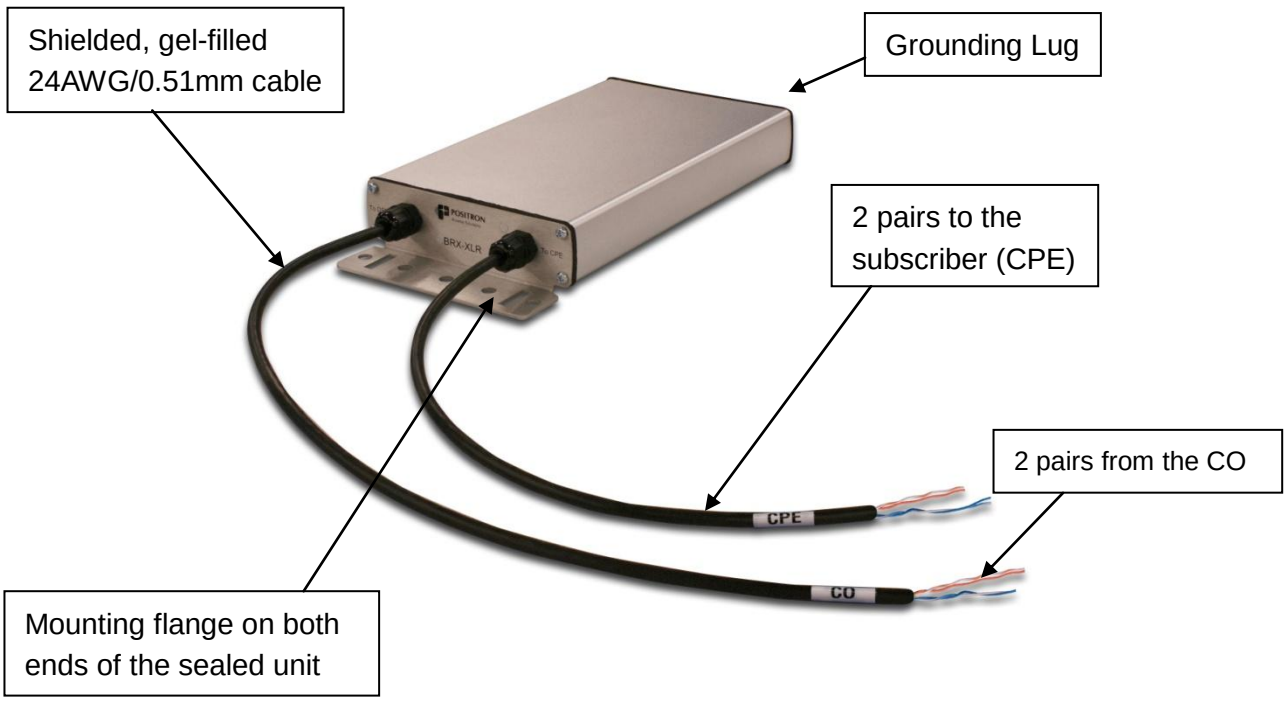

Figure 6: BRX-XLR-1 and -2 components

Step-by-step instructions:

Step 1: select the location where the BRX-XLR-1 or -2 will be inserted as per the BRX-XLR Placement Guidelines document.
Step 2: connect the grounding lug of the unit to a proper ground (usually available near a splice point).
Step 3: connect one of the CO pairs to a pair from the DSLAM
Step 4: connect the corresponding CPE pair to the pair to the subscriber home

In steps 3 and 4, when connecting the pairs of the BRX-XLR-2, care should be taken to match the pair numbers as per the color codes in the table below:

Line #	Cable Pair Colors
1	white - blue
2	white - orange

Table 2 - Twisted-pair Connection Description

NOTE: After step 4, the DSLAM and the CPE will retrain the circuit and bring up the ADSL2+ / ADSL link with the higher bandwidth

The BRX enclosures come with additional optional kits to facilitate mounting on a pole or to strand-mount the device (in-between 2 telephone poles).

6.2.1 BRX Pole-Mounting Feature

Although the BRX enclosures can easily be screwed into a standard telephone pole, a pole-mounting feature is also included in the standard mounting flange of the 1, 2, and 8-pr models. Indeed, if pole-mounting is desired, simply insert a metallic or plastic strap into the rectangular slots (0.2” x 0.8” / 5 mm x 20.3 mm) in the mounting flange at both ends of the BRX enclosures and secure around the pole as per the diagram below.

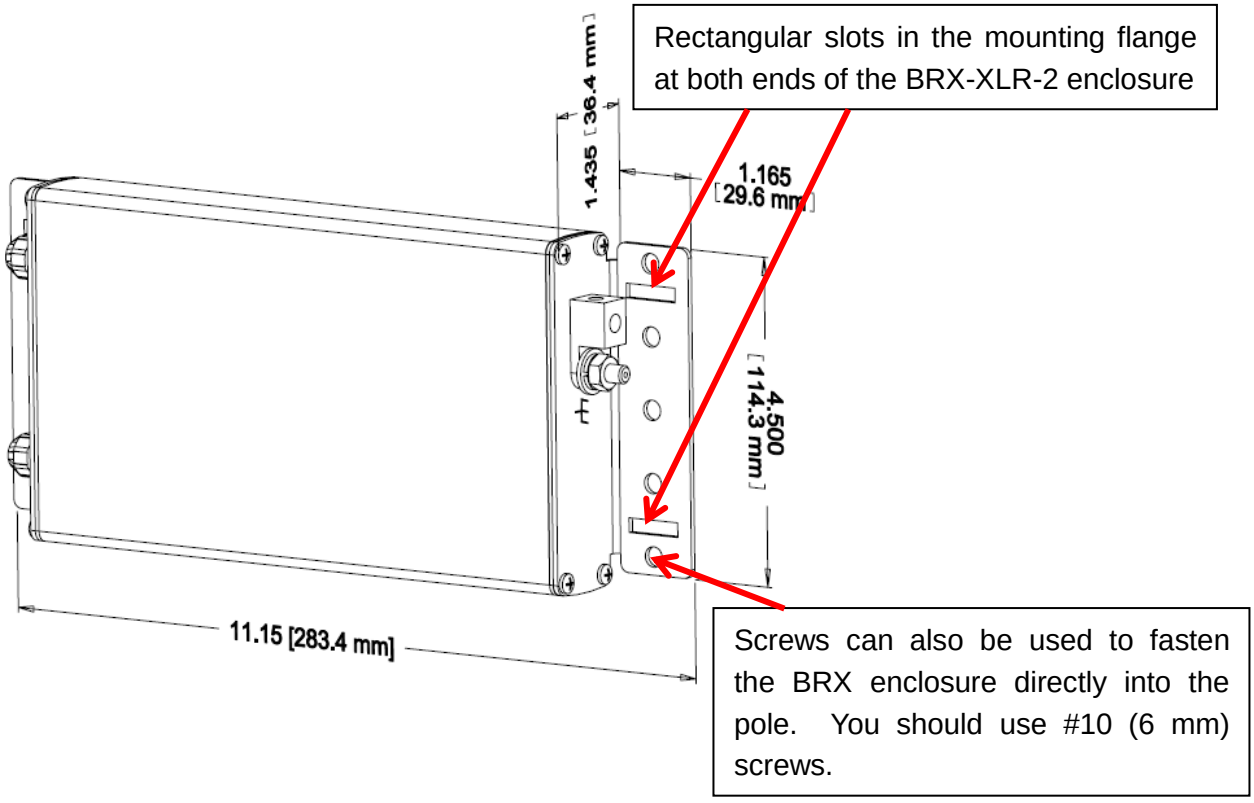

Figure 7: Pole-Mounting feature for BRX-XLR-2

6.2.2 BRX Strand-Mounting Option

A Strand Mounting Kit is available for the 1, 2 and 8-pair BRX units. When installing the BRX-STRAND-KIT, all you need to do is simply use the supplied nuts and bolts to affix the strand mount bracket into the circular slots in the mounting flange at both ends of the BRX enclosure as per the diagram below. You can use any of the slots to adjust the strand mount bracket to clear any cables or devices already present.

- **Span** between the strand and the BRX unit can vary from 3-9” (76 – 228 mm)
- **Strand Diameter** can range from ¼” (6.6 mm) to 3/8” (10 mm)
- **Bracket Material:** stamped from 5052 H34 Aluminum
- **Mounting Bolt:** Grade 2 steel and hot dip galvanized (as per ASTM A153)

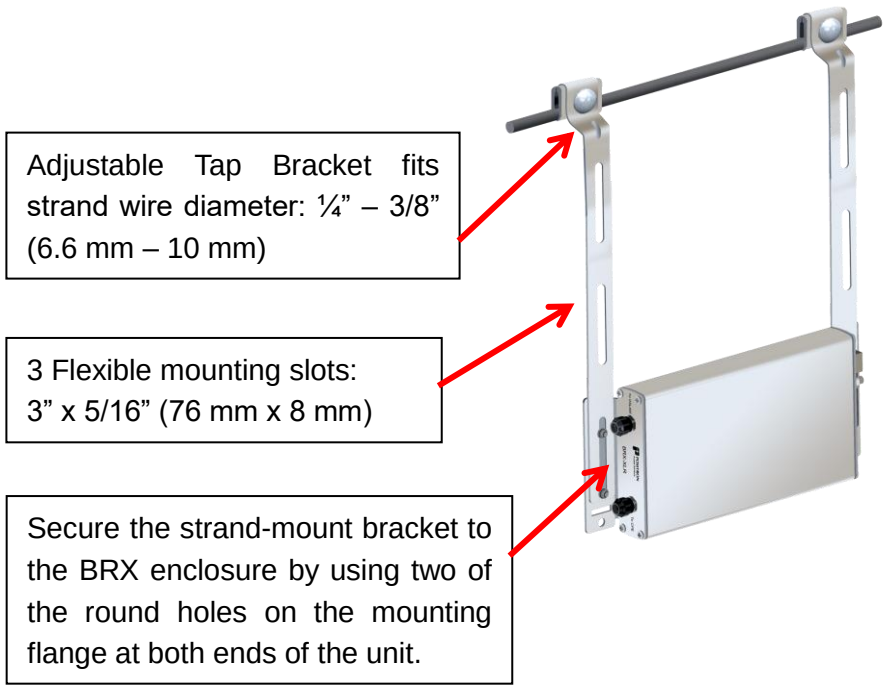

Figure 8: Strand-Mount Kit option for BRX-XLR-2

6.3 8-pair Enclosure Installation

To serve areas where more than 2 pairs need amplification, the BRX-XLR-8 comes equipped with an IP-65 enclosure and houses four (4) two-pair modules (as per image on the right below) for a total of eight (8) subscriber loops. Each BRX-XLR-M card has solid-state primary lightning protection for both pairs. In cases where more than 2 but less than 8 pairs are required, it is possible to order an empty enclosure (BRX-8C) and the required number of 2-pair modules (BRX-XLR-M) that are required. Any empty slots in the BRX-8C may be filled with BRX-BYPASS-TEST modules to allow for the pre-wiring of all the pairs in and out of the BRX-8C enclosure.

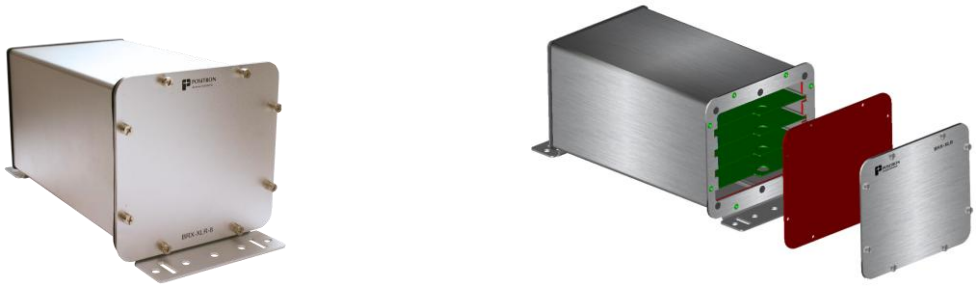

Figure 9: BRX-XLR-8

Install BRX-XLR-8 unit as per instructions in section 8.1 below. The following color codes are used for the pairs:

BRX-XLR-8 Slot #	Channel #	Line #	Cable Pair Colors
1	1	1	white - blue
	2	2	white - orange
2	1	3	white - green
	2	4	white - brown
3	1	5	red - blue
	2	6	red - orange
4	1	7	red - green
	2	8	red - brown

Table 3: BRX-XLR-8 color coding

The BRX-XLR-8 can also be installed pole-mounted or strand-mounted using the same accessories as with the BRX-XLR-2 described above.

6.4 24-pair Chassis

To house more than 8 pairs, a 24-pair chassis called the BRX-24S is available. It houses up to twelve (12) BRX-XLR-M two-pair modules and accommodates a 13th slot to house a BRX-BYPASS-TEST module to help with diagnostics (discussed later).

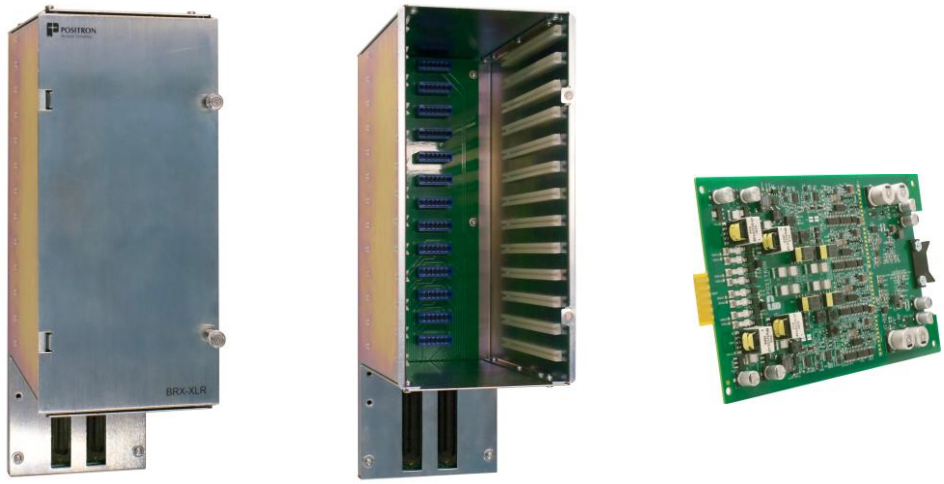

Figure 10: 24-pair chassis (BRX-24S) with and without cover and a 2-pair module (BRX-XLR-M)

The BRX-24S can be installed in the BRX-24C IP65 enclosure (making it a BRX-24-CS) or in 3rd party pedestal assemblies. For instance, the BRX-XLR-24-1S pedestal holds one BRX-24S while the BRX-XLR-48-1S holds two BRX-24S.

6.5 24 and 48-pair Pedestal Installation

The BRX-24S can be housed in many standard pedestals. The 24-pair BRX-XLR-24-1Sxx pedestal supplied by Positron has a number of available options described in the BRX-XLR Product Selection Guide. To simplify this document, the installation instructions will be provided for full configurations. The base component (not optional) is called the BRX-XLR-24-1S. This is based on an Emerson CAD-12 Pedestal equipped with one (1) factory installed 24-pair shelf (BRX-24S) factory-installed with 12 BRX-XLR-M 2-pair ADSL2+ amplification modules (24 pairs) as shown in Figure 11 below. At the bottom of the BRX-24S are two standard RJ-21 (champ 50) connectors (aka Amphenol connectors). The leftmost connector is used to connect the pairs toward the CPE devices. The rightmost connector is used to connect the pairs from the DSLAM.

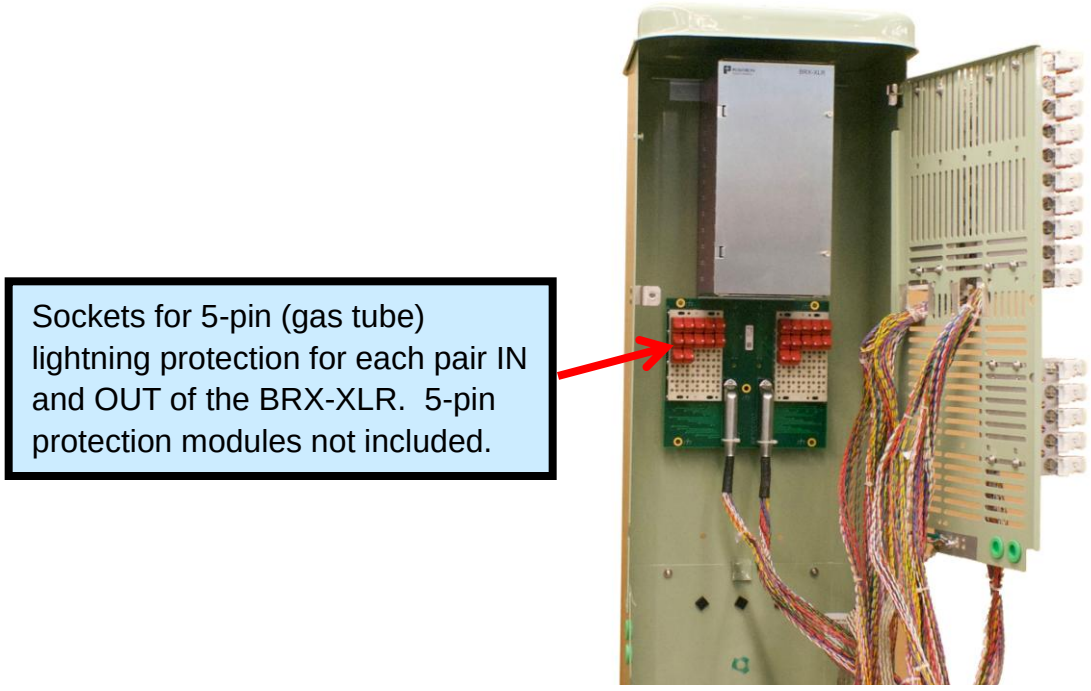

Figure 11: Cabinet Interior pre-wired with 5-pin Protector Modules installed for 12 BRX pairs

The BRX-XLR-24-1S when ordered with a cross-connect unit (-XC) and the assembly (-1ASSM) options already comes with internal cabling connecting the BRX-24S shelf to the cross-connect unit (made up to standard 3M 2810 connectors) on the bottom part of the front panel identified as “BRX Pairs”. Figure 12 illustrates the 100 x 100 pair cross-connect configuration which supports a 100-pair binder IN and OUT of the BRX-XLR-24-1S pedestal serving a 48-pair BRX-XLR configuration (with two BRX-24S shelves). Unlike the BRX-XLR-24-1S configuration that uses a more compact BRX-50PR-PROT 50-pair protection panel, the 48-pair version (BRX-XLR48-1S) uses two 50 pairs protection modules mounted on the back of the inner front panel as seen on the left-hand side of Figure 12. Looking more closely at the cross-connect (top section), there are 50 or 100 pairs (identified as FROM DSLAM and FROM CPE) of cables that are wired from the back of the 3M 2810 connectors to one 3M MS^2 connector for each 25 pairs to ease the installation process in the field (the maximum configuration of 100 pairs is shown in Figure 12).

6.6 Pre-wiring the Cross-Connect Module of the BRX-XLR-24-1S / BRX-XLR-48-1S Pedestal Assemblies

To speed up the field installation and testing process, it is recommended that Operator staff pre-wire the cross-connect portion of the pedestal assembly in-house. This involves cross connecting ALL pairs in the FROM DSLAM field to their FROM CPE counterpart via the 3M 2810 connectors in the top cross-connect modules identified as “Binder Pairs”. The purpose of this action is to initially bypass the BRX-XLR modules and allow the field tech to rapidly verify that the connections to the pedestal are reliable.

Two Cross-Connect options are offered at the present time, one for the 24-pair pedestal which accommodates binder cables up to 50 pairs and one for the 48-pair pedestal which accommodates up to 100 pairs. The labels on the front panel describe the pair assignment, as follows:

BRX-XLR-24-1S with 50 Pair Cross Connect

	From DSLAM	From CPE
BINDER Pairs	1 - 50	51 - 100
BRX Pairs	1 - 25	26 - 50

BRX-XLR-48-1S with 100 Pair Cross Connect

	From DSLAM	From CPE
BINDER Pairs	1 - 100 Left	1 - 100 Right
BRX Pairs	1 - 50 Left	1 - 50 Right

The 5-pin protector modules for both the DSLAM and CPE sides shall be installed at this time. Note that for the 48-pair version, the location of protector block is behind the inner front panel (see Figure 12) whereas for the 24-pair version it is located under the BRX-24S shelf (see Figure 11).

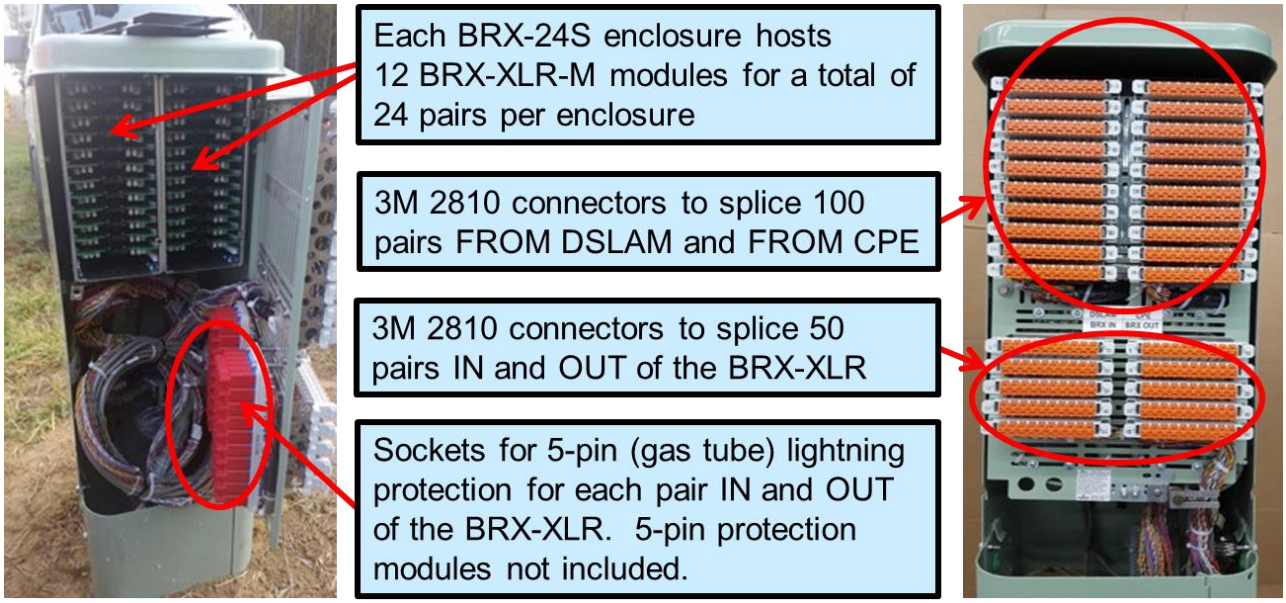

Figure 12: BRX-XLR-48-1SXP configuration shown with 100 pairs FROM DSLAM / FROM CPE for cross-connection to subscriber loops and 48 amplified pairs for connection to two BRX-24S shelves

6.7 Finishing the On-site Installation of the BRX-XLR-24-1S / BRX-XLR-48-1S Pedestal Assemblies

Once on site, the first step is to install the base of the pedestal. The installation instructions for the pedestal can be found in the document entitled “CAD4, CAD6, CAD8, CAD12 Cable Closures: Description and Installation Manual (631-200-006), Revision C” from Vertex Energy Systems, a Positron Access Solutions supplier of the base pedestal.

Once the base of the pedestal is installed, follow the sequence below to complete the installation process:

- **STEP 1**: Secure the top portion of the BRX-XLR-24-1SXP / BRX-XLR-48-1SXP as per Installation Manual.
- **STEP 2**: Verify that the BRX-XLR-M and the BRX-BYPASS-TEST modules are properly seated in the BRX-24S chassis.
- **STEP 3**: If using the optional external gas-tube protection module(s), verify that each 5-pin gas tube is properly seated in their sockets.
- **STEP 4**: Attach the ground wire to the top part of the pedestal.

- **STEP 5**: Verify that the cross-connect modules have been pre-wired as per section 6.6 such that ALL cross-connect pairs in the FROM DSLAM field are connected to their FROM CPE counterpart via the cross-connect modules.
- **STEP 6**: Connect the 3M MS^2 connectors (see Figure 13) from the cross connect modules to each 25-pair cable in the binder from the DSLAM (see Note below).
- **STEP 7**: Connect the 3M MS^2 connectors from the cross connect modules to each 25-pair cable in the binder toward the CPE devices.

NOTE: To minimize downtime, it is highly recommended to perform steps 6 and 7 in 25-pair increments and perform the testing/installation validation described in section 8.2 after every such 25-pair.

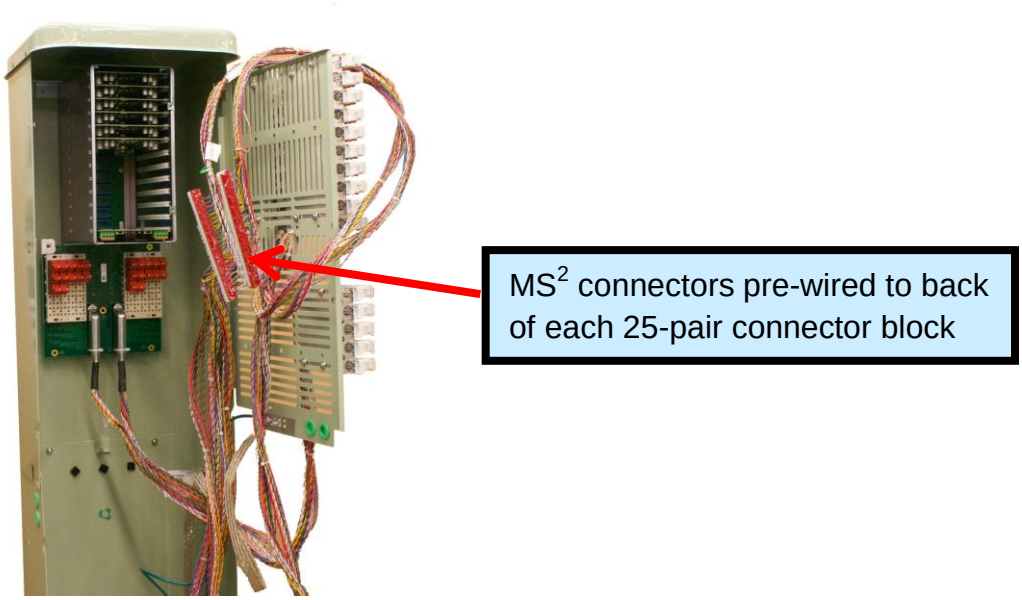

Figure 13: View of 3M MS^2 connectors to attach binder pairs from the DSLAM and CPE devices

6.8 BRX-24-C (outdoor IP65 cabinet) Installation

The BRX-24-C enclosure (see Figure 14) is rated IP65 for outdoor use and can be screwed directly on a wall or on a standard telephone pole. You can use standard screws (3/8" / 10 mm) to secure the enclosure.

Enclosure dimensions:
9.2”W x 23”H x 10.25”D
(23.5cm x 58.5cm x 26cm)

Figure 14: BRX-24-C enclosure configured as a BRX-XLR-24

A pole mounting kit (BRX-24-POLE-KIT) is available for pole diameters ranging from 9-12 inches (228 – 305 mm). When using the BRX-24-POLE-KIT, simply install the pole mount bracket onto the mounting flange of the BRX-24-C with the set of bolts included. You can then use standard screws (3/8” / 10 mm) to secure the enclosure onto the pole. **NOTE:** Please make sure to select appropriate screws that can support the weight of a fully loaded BRX-XLR-24 unit (approximately 30 lbs./13.6 kg).

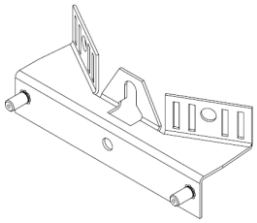

Figure 15: Optional BRX-24-POLE-KIT for Pole Mount Installation

The optional BRX-24-POLE-KIT can be used to fasten the BRX-24-C enclosure directly onto the pole. You should use 3/8” (10 mm) screws into the 3 mounting holes of the BRX-24-POLE-KIT bracket attached to the top and bottom flanges.

NOTE: the BRX-24-POLE-KIT bracket can accommodate metallic or plastic straps up to 1” (25.4 mm) wide.

Figure 16: Pole-Mounted BRX-24-C unit

7 BRX-BYPASS-TEST Module

To assist with testing, the BRX-BYPASS-TEST module fits into any slot of the 8, 24 or 48-pair BRX devices and contains two ports. Each port of the module can be set either in BYPASS or in TEST mode with the use of a selection switch for each pair. These two selection switches are on the front of the unit. Each port has a Status LED that indicates the presence of a -48VDC sealing current on the pair.

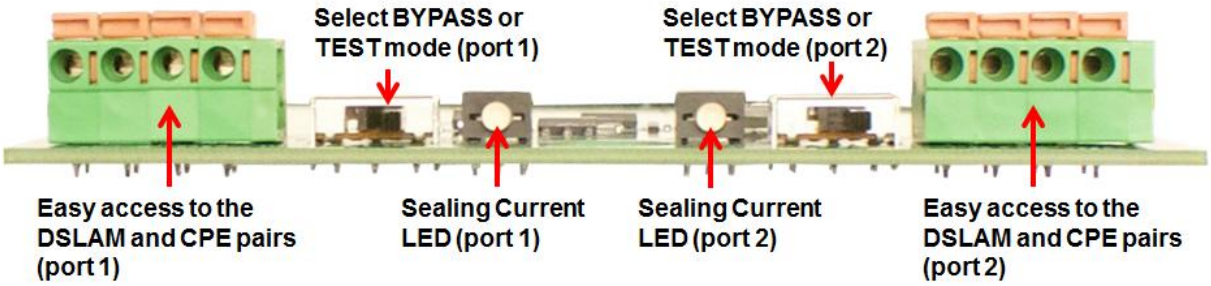

Figure 17: Front View of a BRX-BYPASS-TEST module

8 Bringing up the Service: Testing / Installation Validation

It is recommended to follow the procedures below for 8, 24 and 48 pair installations, respectively.

8.1 8-pair Enclosure Wiring and Validation

It is recommended to follow the procedure below to minimize the downtime for subscribers. The BRX-BYPASS-TEST module can be used temporarily as follows:

- **Step 1:** Connect the grounding lug of the unit to a proper ground (usually available near the splice point).
- **Step 2:** Insert a BRX-BYPASS-TEST module in slot 1 and ensure that both switches are in BYPASS mode.
- **Step 3:** Connect the first two pairs to be amplified to the first two pairs of the BRX-XLR-8. Make sure to match the DSLAM pair number to the CPE pair number.
- **Step 4:** Test for continuity between the DSLAM pair and CPE pair at the splice point. If the circuits are active, the LEDs on the BRX-BYPASS-TEST module will be ON to confirm that the sealing current is present on both lines. If either circuit is not active, the continuity testing will confirm whether the connections are reliable.
- **Step 5:** Replace the BRX-BYPASS-TEST module with a BRX-XLR-M module.

- **Step 6: T**he DSLAM and CPE will now retrain the circuit and bring up the ADSL2+ / ADSL link with the amplified bandwidth. Note that the performance may be limited (or capped) by a setting in the DSLAM configuration.

- **Step 7:** repeat steps 2 to 6 for the other three slots of the BRX-XLR-8 enclosure.

8.2 24 and 48-Pair Pedestal Testing

Positron recommends that you follow the following procedure to quickly restore the original ADSL2+ service to each subscriber during the cutover process and then migrate them one at a time.

- **STEP 1:** Once the MS^2 connections have been made as per section 6.7, all pairs can be buzzed for continuity from the existing splice point to ensure that the original connectivity to each subscriber has been restored. This will confirm that the MS^2 connections to the binder pairs are good for all lines whether they were previously active or not.

- **STEP 2:** Once each pair is confirmed OK for ALL 25-pair binders, each subscriber pair to be amplified can be transferred to a BRX-XLR circuit via the bottom connector blocks identified as “BRX Pairs”.

After each pair is transferred in step 2, the DSLAM and the CPE will retrain the circuit and bring up the DSL link with the higher bandwidth. Note that the performance may be limited (or capped) by a setting in the DSLAM configuration.

9 Recommended DSLAM Profile Settings for ADSL2+ and ADSL

To get the most out of the BRX-XLR amplification and offer stable performances in ADSL2+ and ADSL mode, Positron recommends that the DSLAM profile be configured as per the following two sub-sections.

9.1 Recommended DSLAM Settings for ADSL2+ Profile

Looking at the recommended ADSL2+ settings, the most critical settings are: Path Latency, Impulse Noise Protection (INP) and Target SNR.

- **Path Latency** shall be set to **Interleaved** to enable Forward Error Correction (FEC) and improve the resiliency by enabling Impulse Noise Protection (INP).
- **Impulse Noise Protection:** shall be set to **2 symbols in the downstream** path and to **1 symbol in the upstream** path
- **Target SNR:** shall be set to **6 dB**. Setting a higher target SNR is usually not necessary with the recommended Path Latency and INP settings.

Setting	**ADSL2+ PROFILE**	
Transmission System	G.992-5	
Trellis Coding	Enabled	
Reed Solomon	Enabled	
S=1/2	Enabled	
SRA	Enabled	
SRA Downshift Interval	30 seconds	
SRA Upshift Interval	30 seconds	
PARAMETER	**DOWNSTREAM**	**UPSTREAM**
Maximum Bitrate	32000 Kbps	1024 Kbps
Minimum Bitrate	32 Kbps	32 Kbps
Maximum Delay	20 msec	20 msec
Path Latency	Interleaved	Interleaved
Impulse Noise Protection (INP)	2	1
Maximum SNR Margin	30.0 dB	30.0 dB
Target SNR Margin	6.0 dB	6.0 dB
Minimum SNR Margin	3.0 dB	3.0 dB
SNR Margin Upshift	9.0 dB	9.0 dB
SNR Margin Downshift	3.0 dB	3.0 dB
Bit Swapping	Enabled	Enabled

Table 3 –Recommended ADSL2+ Test Set Profile

9.2 Recommended DSLAM Settings for ADSL Profile

The recommended ADSL settings are the same as ADSL2+. The most critical settings are: Path Latency, Impulse Noise Protection (INP) and Target SNR.

- **Path Latency** shall be set to **Interleaved** to enable Forward Error Correction (FEC) and improve the resiliency by enabling Impulse Noise Protection (INP).
- **Impulse Noise Protection:** shall be set to **2 symbols in the downstream** path and to **1 symbol in the upstream** path
- **Target SNR:** shall be set to **6 dB**. Setting a higher target SNR is usually not necessary with the recommended Path Latency and INP settings.

Setting	**ADSL PROFILE**	
Transmission System	G.992-1	
Trellis Coding	Enabled	
Reed Solomon	Enabled	
S=1/2	Enabled	
SRA	Disabled	
SRA Downshift Interval	30 seconds	
SRA Upshift Interval	30 seconds	
PARAMETER	**DOWNSTREAM**	**UPSTREAM**
Maximum Bitrate	8192 Kbps	1024 Kbps
Minimum Bitrate	32 Kbps	32 Kbps
Maximum Delay	20 msec	20 msec
Path Latency	Interleaved	Interleaved
Impulse Noise Protection (INP)	2	1
Maximum SNR Margin	30.0 dB	30.0 dB
Target SNR Margin	6.0 dB	6.0 dB
Minimum SNR Margin	3.0 dB	3.0 dB
SNR Margin Upshift	9.0 dB	9.0 dB
SNR Margin Downshift	3.0 dB	3.0 dB
Bit Swapping	Enabled	Enabled

Table 4 –Recommended ADSL Profile

10 Troubleshooting Techniques

Positron recommends the following troubleshooting techniques. While a generic approach can be used, a method optimized for each type of BRX-XLR enclosure is found below.

10.1 8-pair Enclosure Troubleshooting

When troubleshooting an xDSL pair amplified via a BRX-XLR-8, there are two possible options on how to leverage a BRX-BYPASS-TEST module.

- **Option #1:** One of the four slots is vacant and unused in the BRX-XLR-8 enclosure and it can be used to hold the BRX-BYPASS-TEST module. This is useful when it is easy to temporarily splice the pair to test to this module without impacting the other pairs served by the BRX-XLR-8.
- **Option #2:** There is no available slot and the BRX-XLR-M module handling the pair should be temporarily replaced by a BRX-BYPASS-TEST module. In this situation, the other pair that is working fine should have the switch set to the BYPASS mode to allow the DSLAM and CPE to quickly retrain and offer a non-amplified service during the troubleshooting process.
- **Option #3:** If you cannot use a BRX-BYPASS-TEST module as per option #1 or #2 above, please follow the steps in section 10.1.2 below.

10.1.1 Using a BRX-BYPASS-TEST module

Follow these steps to use a BRX-BYPASS-TEST module to quickly troubleshoot pairs exhibiting issues:

- **Verify the presence of the -48Vdc Sealing Current:**
  - **STEP 1:** Make sure both switches of the BRX-BYPASS-TEST module are set to BYPASS mode
  - **STEP2:** Replace the suspect card with the BRX-BYPASS-TEST module
    - **NOTE:** The pair under test as well as its neighbor are now in BYPASS mode, directly connecting the DSLAM directly to the CPE without any amplification
  - **STEP 3:** Verify that the LED on the suspect pair of the BRX-BYPASS-TEST module is ON to indicate the presence of the -48Vdc sealing current. If the LED is OFF, verify

that the source of the sealing current for this pair is properly connected. Once the LED is ON, proceed with the next step.

- **Verify that the pair between the DSLAM and CPE is OK:**
  - **STEP 4:** Keeping the BRX-BYPASS-TEST port in BYPASS mode, confirm that the DSLAM and CPE can train and bring-up and maintain a stable DSL circuit.
    - If the pair trains properly, first verify physical integrity of the connections to the BRX-XLR-M module. If those are OK, then proceed to replace the suspect BRX-XLR-M module by a new one and redirect the signal pairs back to their original position (i.e. reverse steps 2 and 3 above). Confirm that the problem has been resolved.
    - Otherwise, it the pair does not train properly, proceed with the next step.
- **Verify the physical integrity of the loop:**
  - **STEP 5:** Place the switch of the BRX-BYPASS-TEST for the pair to troubleshoot to TEST mode. This will allow you to probe the L1 Segment of the pair toward the DSLAM and the L2 segment of the pair toward the CPE.
    - Using a DSL test set, verify the integrity of the L1 and L2 segment for the presence of a Short, Open or other physical failure of the pair.
    - If a problem is identified, proceed with the repair, set the switch to BYPASS mode and confirm that the DSLAM and CPE can now train. It the pair can now train properly, reconnect the pair to its original position (to the BRX-XLR-M module) and verify that the DSLAM and CPE can now train and that the xDSL signal is amplified.

10.1.2 Not using a BRX-BYPASS-TEST module

In case it is not possible to make use of the BRX-BYPASS-TEST module, such as when the other pair sharing the BRX-XLR-M module must not be impacted, an xDSL test set should be used as per the following procedure:

- **Verify the presence of the -48Vdc Sealing Current:**
    - **STEP 1:** Use a multi-meter or a DSL test set to confirm there is a sealing current. If there is no sealing current, verify that the source of the sealing current for this pair is properly connected. Once sealing current is present, proceed with the next step.
- **Verify that the pair between the DSLAM and CPE is OK:**
    - **STEP 2:** modify the splicing of the pair to bypass the BRX-XLR and confirm that the DSLAM and CPE can train and bring-up and maintain a stable DSL circuit.
        - If the pair trains properly, first verify physical integrity of the connections to the BRX-XLR-M module. If those are OK, then proceed to replace the suspect BRX-XLR-M module by a new one. Confirm that the problem has been resolved.
        - If the pair does not train properly, proceed with the next step.
- **Verify the physical integrity of the loop:**
        - STEP 3: Open the splice point for the pair to expose TIP and RING for the pair toward the DSLAM (L1 segment) and to the CPE (L2 segment).
        - Using a DSL test set, verify the integrity of the L1 and L2 segment for the presence of a Short, Open or other physical failure of the pair.
        - If a problem is identified, proceed with the repair, re-connect the pair and confirm that the DSLAM and CPE can now train. It the pair can now train properly, reconnect the pair through the BRX-XLR and verify that the DSLAM and CPE can now train and that the xDSL signal is amplified.

10.2 24 and 48 Pair Pedestal Troubleshooting

When troubleshooting a pair in a BRX-XLR-24-1SXP or BRX-XLR-48-1SXP pedestal, it is recommended to insert a BRX-BYPASS-TEST module in the 13th (bottom) slot of the 24-pair chassis if it is not already in position. Either chassis can be used if there are two (i.e. for the 48-port version). **Note:** this slot 13 corresponds to pair 25 of the RJ-21 (Amphenol) connector therefore only port 1 (on the left-side) of the BRX-BYPASS-TEST module is active when used in this position. Having ready-access to the BRX-BYPASS-TEST is a convenient way to troubleshoot an individual pair without impacting the other pairs in the binder.
From the connector block, this “pair 25” can be accessed in the “BRX Pairs” section as follows:

- For the 24-pair version: pair 25 of the FROM DSLAM field and pair 50 of the FROM CPE field.
- For the 48-pair version: pair 25 of the FROM DSLAM field and pair 25 of the FROM CPE field to access a card in slot 13 of the first shelf.
- For the 48-pair version: pair 50 of the FROM DSLAM field and pair 50 of the FROM CPE field to access a card in slot 13 of the second shelf.

Follow these steps to quickly troubleshoot pairs exhibiting issues:

- **Verify the presence of the -48Vdc Sealing Current:**
    - **STEP 1:** Make sure the switch of the BRX-BYPASS-TEST module for pair 1 is set to BYPASS mode
    - **STEP2:** Move the FROM DSLAM pair from its original BRX Pair to BRX Pair #25 (or #50 if the BRX-BYPASS-TEST module is in a second BRX shelf)
    - **STEP 3:** Move the FROM CPE pair from its original BRX Pair to BRX Pair #50 if for a 24-pair unit. For a 48-pair unit, connect to Pair #25 on the right-hand side if the BYPASS module is in the first shelf or on Pair #50 if it is in the second shelf.
    - **NOTE:** The pair to test is now in BYPASS mode, directly connecting the DSLAM to the CPE without any amplification
    - **STEP 4:** Verify that the LED on port 1 of the BRX-BYPASS-TEST module is ON to indicate the presence of the -48Vdc sealing current. If the LED is OFF, verify that the source of the sealing current for this pair is properly connected. Once the LED is ON, proceed with the next step.
- **Verify that the pair between the DSLAM and CPE is OK:**
    - **STEP 5:** Keeping the BRX-BYPASS-TEST port in BYPASS mode, confirm that the DSLAM and CPE can train and bring-up and maintain a stable DSL circuit.
        - If the pair trains properly, first verify physical integrity of the connections to the BRX-XLR-M module. If OK, then proceed to replace the suspect BRX-XLR-M module by a new one and redirect the signal pairs back to their original position

(i.e. reverse steps 2 and 3 above). Confirm that the problem has been resolved.

- Otherwise, if the pair does not train properly, proceed with the next step.

- **Verify the physical integrity of the loop:**
  - **STEP 6:** Place the switch of the BRX-BYPASS-TEST port 1 to TEST mode. This will allow you to probe the L1 Segment of the pair toward the DSLAM and the L2 segment of the pair toward the CPE.
    - Using a DSL test set, verify the integrity of the L1 and L2 segment for the presence of a Short, Open or other physical failure of the pair.
    - If a problem is identified, proceed with the repair, set the switch to BYPASS mode and confirm that the DSLAM and CPE can now train. It the pair can now train properly, reconnect the pair to its original position (to the BRX-XLR-M module) and verify that the DSLAM and CPE can now train and that the xDSL signal is amplified.

If any technical issues arise in the Testing and Validation sections above, please refer to the Positron document entitled: “BRX-XLR Troubleshooting Techniques” for more details and assistance. If that is not sufficient, please do not hesitate to contact Positron Access Solutions technical support at 1-888-258-4669 Option 5 (TAC/24/7).