Positron Access Solutions - BRX-XLR

Broadband Reach Extender – Extra Long Reach

Deployment Planning Process

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Disclaimer Notice
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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 lineal 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 up to 100% the ADSL/ADSL2/ADSL2+ Customer Serving Area (CSA)
- 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 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 Troubleshooting Techniques
- BRX-XLR Placement Instructions
- 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   Maximum Distances supported for 5 Mbps and 10 Mbps DSL service

The following table provides the maximum distance extension to support a 10 Mbps downstream target bandwidth on a single copper pair for the three most popular cable sizes.

Maximum Distance for 10 Mbps Service with 1-Pair						
Cable Gauge		Without BRX-XLR		With BRX-XLR		% Increase	
AWG	mm	k feet	km	k feet	km	Distance	Serving Area
26	0.40	9.1	2.8	12.5	3.8		
24	0.51	12.5	3.8	17.0	5.2	38%	91%
22	0.64	16.8	5.1	23.0	7.0		

Table 1: Maximum Distance for 10 Mbps Service with 1-pair

Similarly, the following table provides the maximum distance extension to support a 5 Mbps downstream target bandwidth on a single copper pair for the three most popular cable sizes. The same distances can provide a 10 Mbps service over two pairs.

Maximum Distance for 5 Mbps Service with 1-Pair or 10 Mbps with 2-Pairs						
Cable Gauge		Without BRX-XLR		With BRX-XLR		% Increase	
AWG	mm	k feet	km	k feet	km	Distance	Serving Area
26	0.40	12.5	3.8	17.0	5.2		
24	0.51	16.8	5.1	23.0	7.0	38%	91%
22	0.64	22.5	6.9	31.0	9.4		

Table 2: Maximum Distance for 5 Mbps Service with 1-pair or 10 Mbps with 2-pairs

5 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:

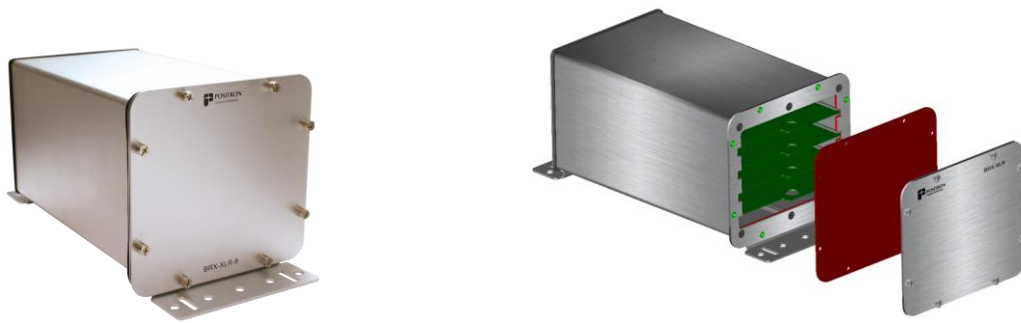Figure 1: Images of BRX-XLR-2 (Out of the box and Strand Mounted)

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

6 Product Selection Guideline

It is the goal of every operator to optimize operational performance by maximizing the number of subscribers that can have access to higher tier services while optimizing operational efficiency by minimizing the overall number of BRX-XLR enclosures to maintain. The priority is therefore the planning and deployment of higher capacity BRX-XLR enclosures (8, 24 and up to 48 pairs) that can serve a larger number of subscribers from a single location. Based on the typical subscriber density for longer loop lengths, it is anticipated that most deployments will be served from 24-pair pedestals with the cross connect option and external protection module, namely BRX-XLR-24-1SXP (see Ordering of Components section below).

6.1 Product Selection Process

To determine what size assemblies are required, the planner must go through a very thorough process for each DSLAM:

> **STEP 1**: Determine how many clients are beyond the range limit of the 10Mbps service. Use operator's existing loop inventory database to determine all such clients.

> **STEP 2**: Prepare a spreadsheet with detailed information for each subscriber requiring amplification: PED, phone#, Name, Address, Current DSL service, and overall Footage (in equivalent 24 AWG) from the DSLAM.

> **STEP 3**: Identify all available splice points that can be used as a potential location for the BRX-XLR along the route with a focus on splice points between 45% to 75% of the longest loop length in the bundle. The cable bundle size at each of these splice points shall be recorded. This will help identify situations where pair bonding is possible or not.

> **STEP 4**: Generate stick drawings for each subscriber cluster.

> **STEP 5**: Use the BRX-XLR Calculator tool and follow the Positron BRX-XLR Placement Instructions document to determine the optimal placement for the BRX-XLR assembly to deliver the minimum target bandwidth for each subscriber in the cluster.

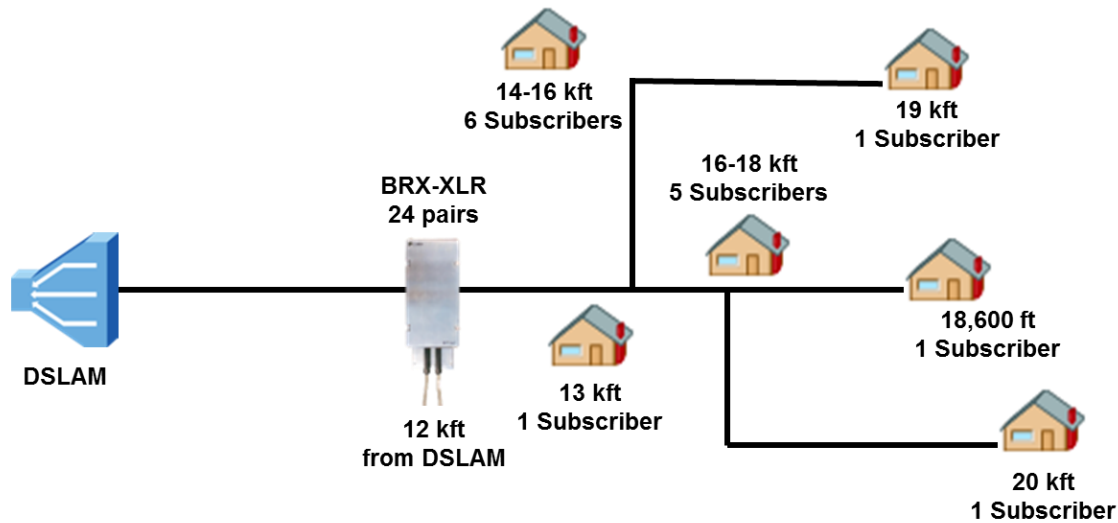A typical deployment will look like the image in Figure 4 below:

Figure 4: Image of Typical Deployment of 24-pair pedestal

6.2 When to Use the BRX-XLR-8

Nonetheless, there are situations where it will be beneficial to use one or more BRX-XLR-8 8-pair enclosures instead of, or in addition to, a 24-pair pedestal.

The following two situations are examples of where to use the BRX-XLR-8:

CASE 1 - No more than 8 pairs to amplify: The number of subscriber pairs in a cluster identified as benefiting from amplification is no more than eight in which case it is best to use the lower cost BRX-XLR-8 (8-pair) enclosure. Note that this assessment must consider the possibility that spare pairs may be used to offer a 2-pair bonded service to all subscribers.

CASE 2 - Cluster of Subscribers split into two distinct groups: Sometimes, the optimal placement determined for a BRX-XLR-24-1SXP 24-pair pedestal (based on the BRX-XLR Placement Instructions document) is such that it is not well positioned to serve a subset of the subscribers either because they would be too close or too far from the recommended location. In this case, it may be best to split the cluster into two sub-sections and plan for the deployment of two BRX-XLR assemblies to achieve the optimal coverage and performance. Please refer to Figure 5 below as an example of this situation.
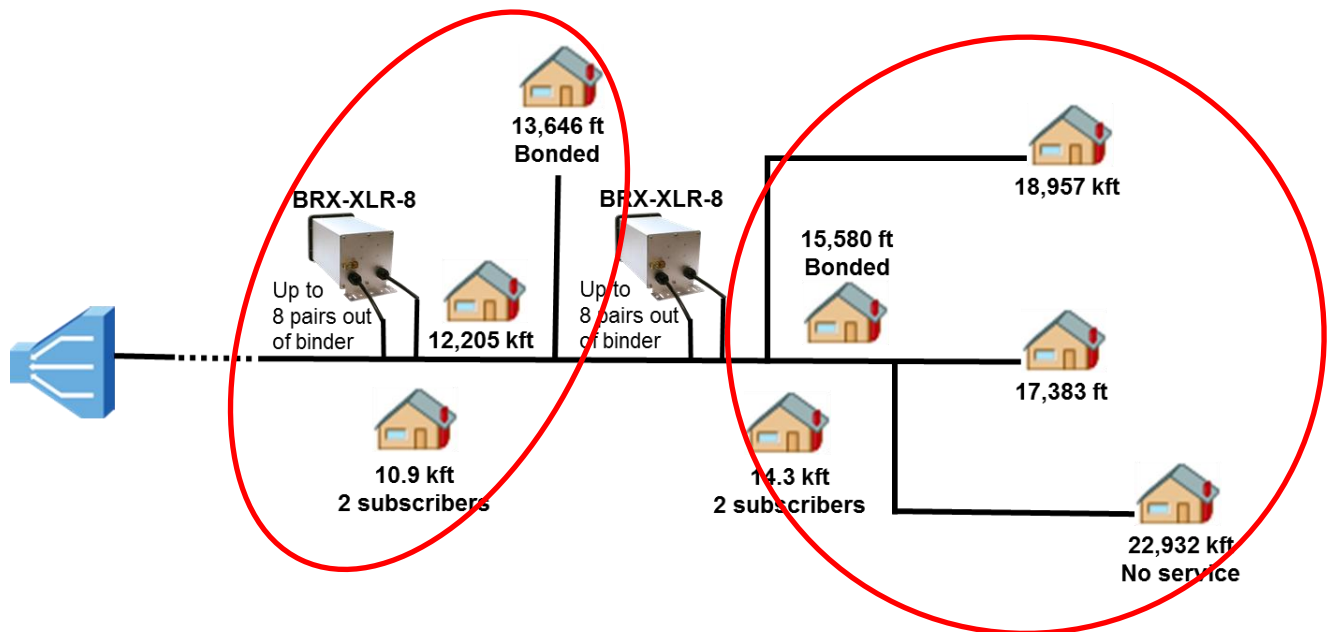
Figure 5: Using a pair of BRX-XLR-8 to serve two sub-sections of subscribers

6.3 Additional Notes

1) Any determination of the BRX-XLR assembly size as per above guidelines shall take under consideration any potential future expansion plans for the region.

2) Once a BRX-XLR enclosure has been selected and positioned according to the BRX-XLR Placement Instructions document, it is important to determine if ALL the subscribers downstream will benefit from the amplification circuitry. Any subscriber that is located within **2,000 feet** from the BRX-XLR would be better served by a BRX-BYPASS-TEST card (set to Bypass mode) instead of an amplifier (see BRX-BYPASS-TEST Module description below). An example of this would be the first subscriber past the BRX-XLR in Figure 4 that is located at 13kft from the DSLAM and only 1,000 feet away from the BRX-XLR.

6.3.1 BRX-BYPASS-TEST Module

The BRX-BYPASS-TEST module fits into any slot of the 8 or 24-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 select 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.
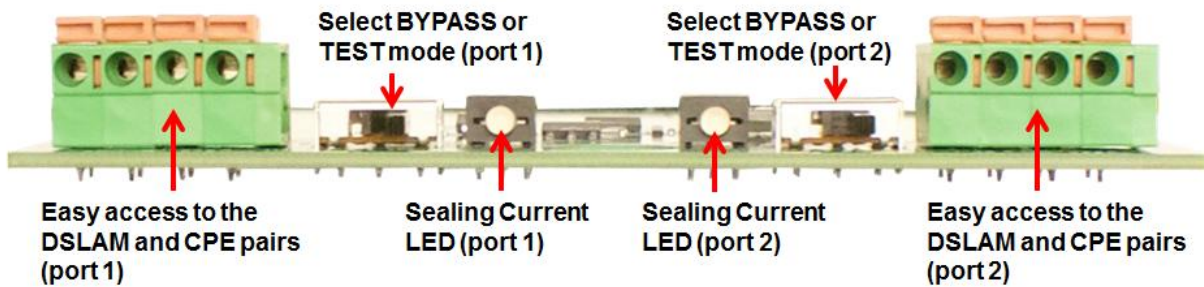
Figure 6: Front View of a BRX-BYPASS-TEST module

6.4   Ordering of Components

The 24-pair BRX-XLR-24-1Sxx pedestal has a number of available options. First, 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 7. 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.
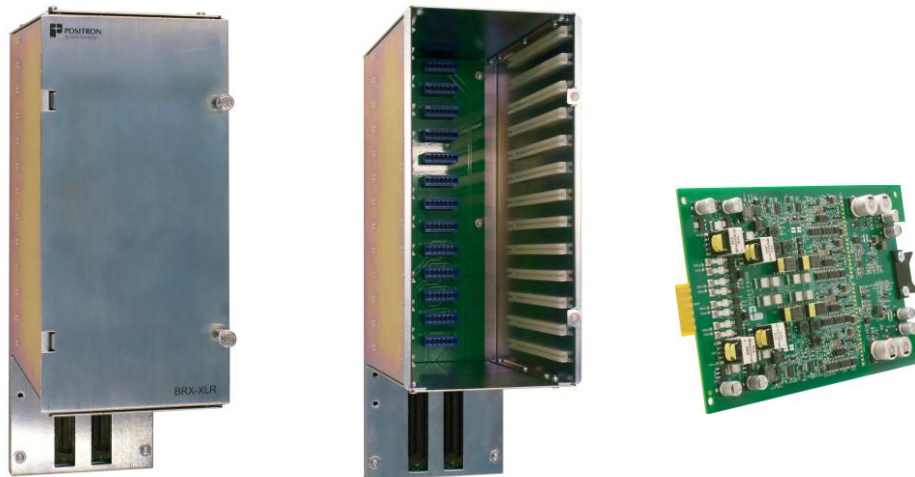
Figure 7: 24-pair chassis (BRX-24S) with and without cover and a 2-pair module (BRX-XLR-M)

The next step in the product configuration process is to select the number of pairs in and out of the binder feeding the pedestal since it will determine the size of the cross-connect element. As per company guidelines (**Note:** need input from Operator here to determine whether an external protection panel is desired), the BRX-50PR-PROT-PANEL (used to hold the external gas tube protection that complements the solid-state primary protection on each BRX-XLR-M 2-pair module) is always installed. To select the proper configuration of the BRX-XLR-24-1SXP pedestal, you shall:

- **STEP 1**: determine the number of pairs that require immediate amplification. A BRX-XLR-M module serves 2 pairs at a time.

- **STEP 2**: Plan for the remaining slots of the BRX-XLR-24-1Sxx pedestal to be filled with BRX-BYPASS-TEST modules. This will allow you to prewire the entire pedestal and validate that the non-amplified pairs are working properly. There is an LED per pair that will turn on to indicate that a sealing current is present and ready to power a BRX-XLR-M module when needed.

- **STEP 3**: Select the required Cross-Connect option that matches the number of pairs in the binder. The available options are:

  o BRX-50PR-XC: a 50 x 50 Pair cross-connect unit that terminates a 50-pair binder and can connect any pairs (both IN and OUT) to any of the BRX-XL-M modules.

  o BRX-100PR-XC: a 100 x 100 Pair cross-connect unit that terminates a 50 or 100-pair binder and can connect any pairs (both IN and OUT) to any of the BRX-XLR-M modules.

- **STEP 4**: BRX-50PR-PROT-PANEL (Mandatory): the 50–pair gas tube protection panel is factory installed at the base of the BRX-24S shelf and houses up to fifty (50) 5-pin gas tube protection modules (gas-tubes to be supplied by Operator).

- **STEP 5**: BRX-XLR-24-1ASSM: This option instructs Positron to factory assemble the selected options on the pedestal prior to shipment.

When there are not more than 8 pairs to amplify, the ordering code is: **BRX-XLR-8**. This product comes equipped with the IP-65 enclosure and four 2-pair BRX-XLR-M modules factory installed. Each BRX-XLR-M card has primary lightning protection for both pairs. In cases where more than 2 but less than 8 pairs are required, it is also 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 of the pairs in and out of the BRX-8C enclosure.

7   Physical Installation of BRX-XLR-24 Pedestal Assembly

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 of standard 3M 2810 connectors) seen on the front panel and identified as "BRX Pairs". Figure 8 illustrates the 100 x 100 pair cross-connect configuration which supports a 100-pair binder in and out of the BRX-XLR-48-1S 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 50-pair protection panel, the 48-pair version (BRX-XLR-48-1S) uses protection modules installed on the back of the inner front panel as seen in Figure 8. Looking more closely at the cross-connect (top section), there are 50 or 100 pairs (both IN and OUT) of cables that are wired from the back of the 3M 2810 connectors to one 3M MS^2 connector for each 25 pairs (both IN and OUT) to ease the installation process in the field (the maximum configuration of 100 pairs is shown in Figure 8).

7.1   Pre-wiring the Cross-Connect Module of the BRX-XLR-24 Pedestal Assembly

To speed up the field installation process, it is recommended that Operator staff pre-wire the cross-connect portion of the pedestal assembly in-house. This involves cross connecting the binder pairs that need amplification.   This is achieved by connecting each subscriber pairs that have been selected for amplification from the top cross-connect module (binder pairs in and out of the pedestal) to the next free BRX pairs using the same type of 3M 2810 connectors. The pair assignment for the BRX is as follows:

- **Pairs from the DSLAM:** use connectors 1 through 25 to connect the pairs from the DSLAM (sometimes referred to as BRX-IN pairs).

- **Pairs toward the CPE devices:** use connectors 26 through 50 with pair 1 from the DSLAM (BRX IN) matching pair 26 toward the CPE (BRX OUT) and so on.

Note: need input from Operator here for describing how to get this information.

The 5-pin protector modules for both the DSLAM/CO 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 8) whereas for the 24-pair version it is located under the BRX-24S shelf (see Figure 9).

Each BRX-24S enclosure hosts 12 BRX-XLR-M modules for a total of 24 pairs per enclosure

3M 2810 connectors to splice 100 pairs FROM DSLAM and FROM CPE

3M 2810 connectors to splice 50 pairs IN and OUT of the BRX-XLR

Sockets for 5-pin (gas tube) lightning protection for each pair IN and OUT of the BRX-XLR. 5-pin protection modules not included.

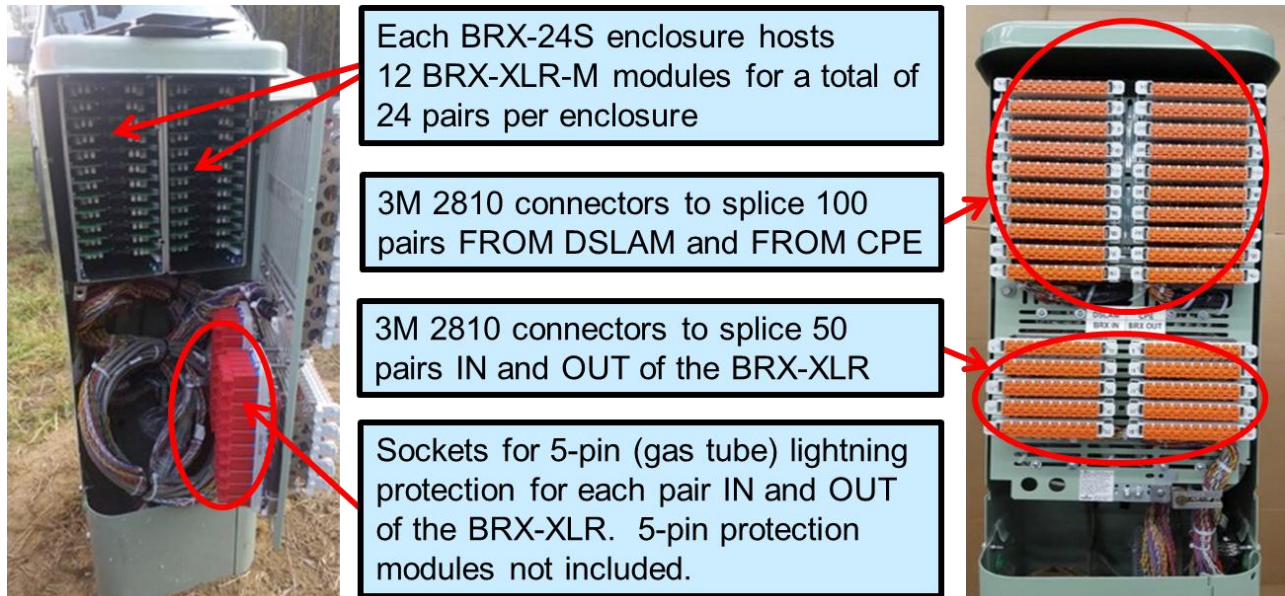Figure 8: BRX-XLR-48-1SXP configuration shown with 100 pairs IN/OUT for cross-connection to subscriber loops and 50 amplified pairs IN/OUT for connection to two BRX-24S shelves

Sockets for 5-pin (gas tube) lightning protection for each pair IN and OUT of the BRX-XLR. 5-pin protection modules not included.
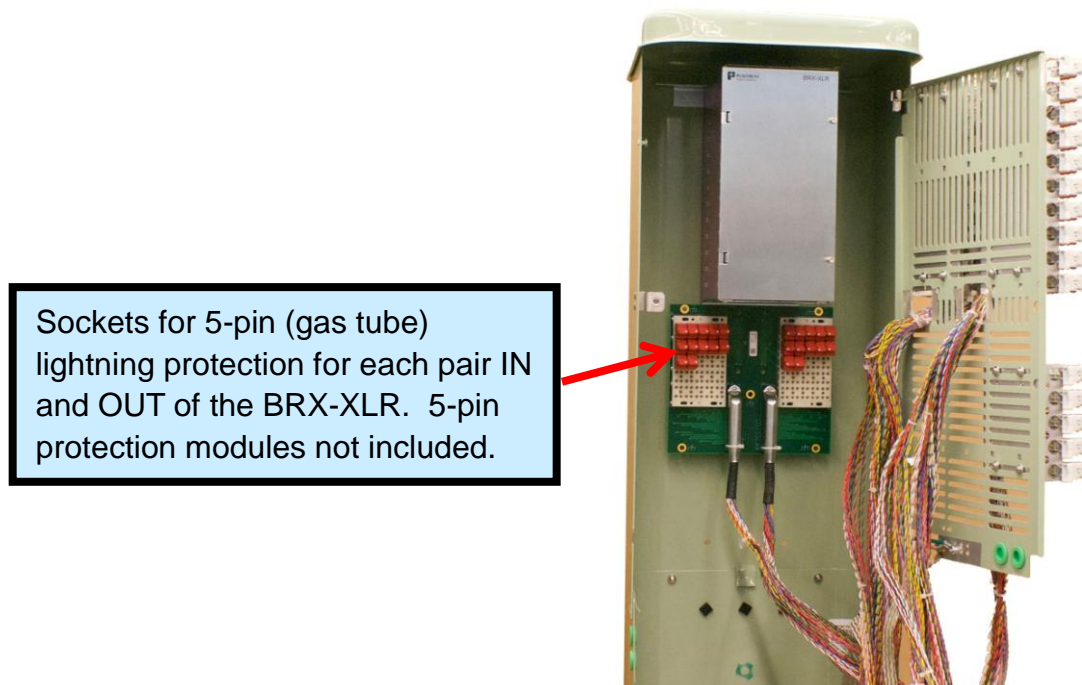
Figure 9: Cabinet Interior pre-wired with 5-pin Protector Modules installed for 12 BRX IN/OUT pairs

7.2 Finishing the On-site Installation of the BRX-XLR-24 Pedestal Assembly

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, Positron Access Solutions supplier.

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 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**: Verify that each 5-pin gas tube is properly seated in their slots.

- **STEP 4**: Attach the ground wire to the top part of the pedestal.

- **STEP 5**: Connect the 3M MS^2 connectors (see Figure 10) from the cross connect modules to each 25-pair cable in the binder from the DSLAM.

- **STEP 6**: Connect the 3M MS^2 connectors from the cross connect modules to each 25-pair cable in the binder toward the CPE devices.

NOTE: Each of the pairs between the DSLAM and the CPE devices will now retrain and bring back the services that were interrupted during the above process.
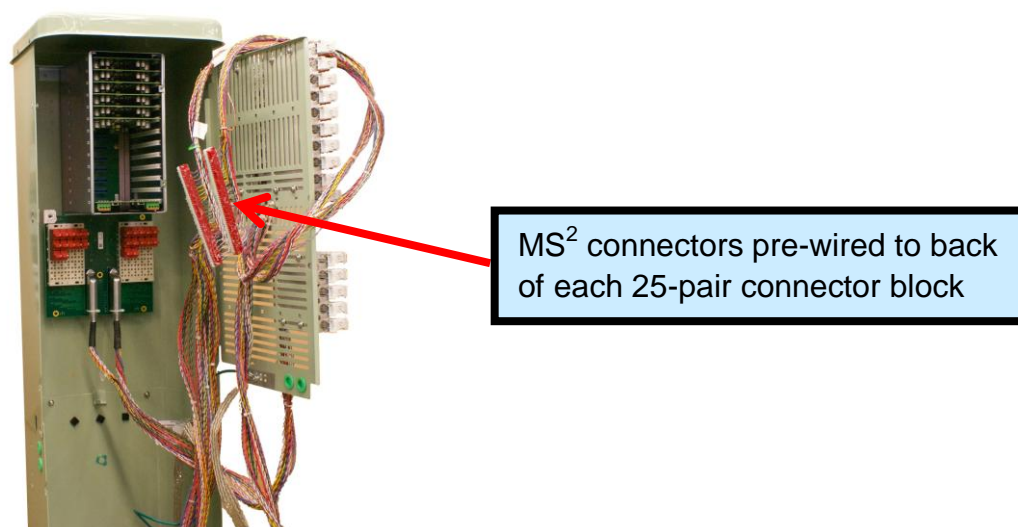

MS^2 connectors pre-wired to back of each 25-pair connector block

Figure 10: View of 3M MS^2 connectors to attach binder pairs from the DSLAM and CPE devices

8 Bringing up the Service: Testing / Installation Validation

To minimize downtime, it is important to validate that all the connections made are valid after every combination (IN and OUT) of 25-pair connectors has been connected to the MS^2 connectors. It is recommended to follow the procedures below for 24-pair and 8-pair installations, respectively.

8.1 24-Pair Pedestal Testing

Positron strongly recommends that Operator follows the following procedure to quickly restore the original ADSL2+ service to each subscriber and then migrate them one at a time.

- **STEP 1: pre-wire** ALL cross-connect pairs one-to-one between DSLAM and CPE connectors via the cross-connect module (initially bypassing the BRX-XLR ports). Once the MS^2 connections have been made, all pairs can be buzzed for continuity from the existing splice point and the original service to each subscriber can be quickly restored. This will confirm that the MS^2 connections to the binder pairs are good.

- **STEP 2:** Once each pair is confirmed OK, each subscriber pair to be amplified can be transferred to the BRX-XLR connectors and verified.

8.2 8-pair Enclosure Wiring and Validation

For the BRX-XLR-8, 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 of the unit 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. The LED will be ON to confirm that the sealing current is present. If the circuit is not active, the continuity testing will confirm that 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.

9 Recommended DSLAM Profile Settings for ADSL2+ and ADSL

NOTE to Operator: can you please confirm you are OK with the following DSLAM settings?

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) are the 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 2 –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) are the 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 3 –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 24-Pair Pedestal Troubleshooting

When troubleshooting a pair in a BRX-XLR-24-1SXP 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. **Note:** 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. Having ready-access to the BRX-BYPASS-TEST on pair 25 is a convenient way to troubleshoot an individual pair without impacting the other pairs in the binder.

Follow these steps to quickly troubleshoot pairs exhibiting issues:

- **Verify the presence of the -48 Vdc Sealing Current:**

  o **STEP 1:** Make sure the switch of the BRX-BYPASS-TEST module for pair 1 is set to BYPASS mode

  o **STEP 2:** Move the BRX-IN (DSLAM side) pair to BRX-XLR cross connect port #25

  o **STEP 3:** Move the BRX-OUT (CPE side) pair to BRX-XLR cross connect port #50

  o **NOTE:** The pair to test is now in BYPASS mode, directly connecting the DSLAM directly to the CPE without any amplification

  o **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:**

  o **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.

    ▪ 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.

10.2 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 that 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.

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 neighbour 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.

    - If 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.

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:**

    o **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:**

    o **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:**

    o **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.

If any technical issues arise in the Testing and Validation sections above, please refer to the Positron document entitled: "BRX-XLR Troubleshooting Techniques" for 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).