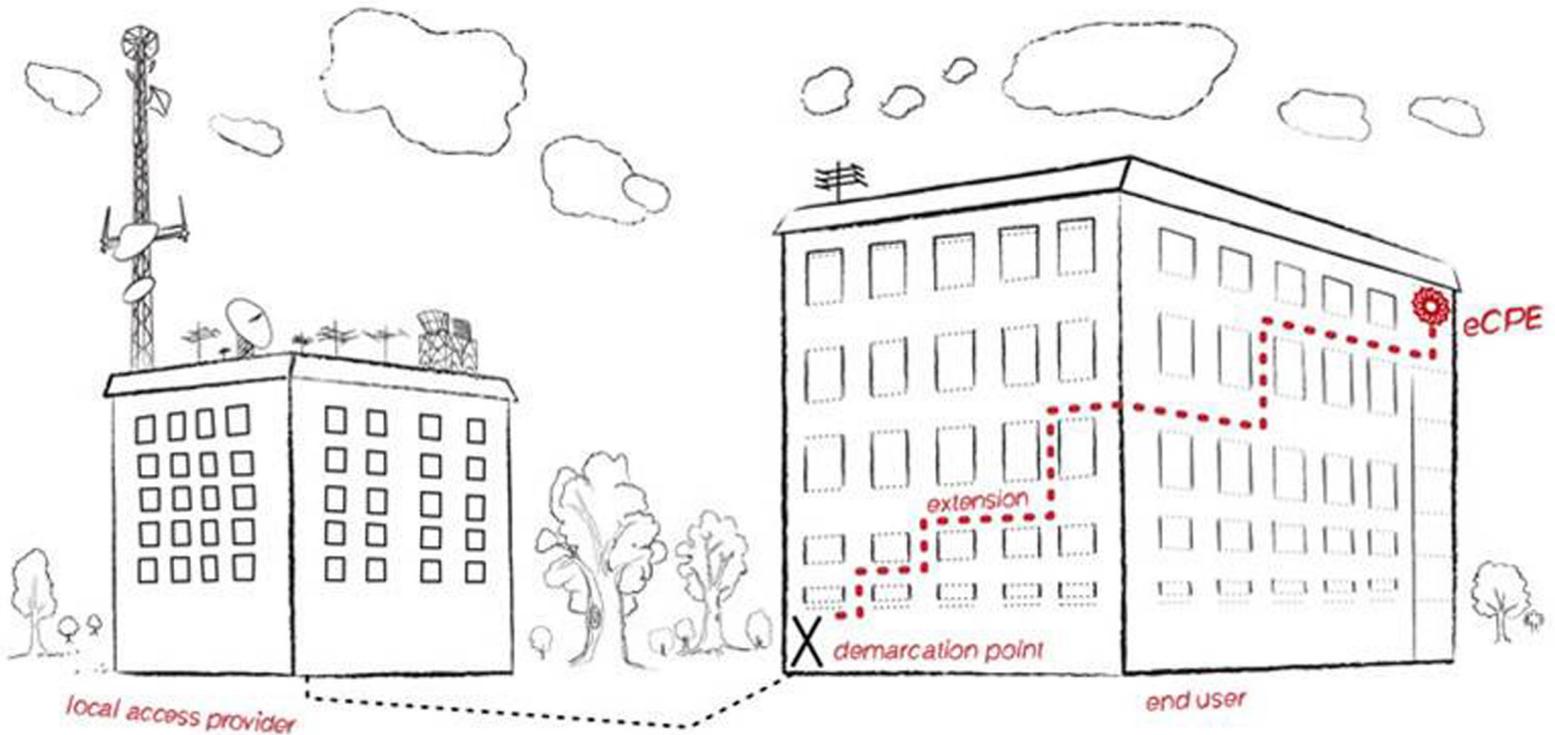




DEMARC extension NationwideSM

A Brand of Concert Technologies



The Demarc Extension and its Critical Role in Enterprise Network Telecommunications Infrastructure

A Concert Technologies White Paper

Table of Contents

Executive Summary	p. 1
What is a Demarc Extension?	p. 2
Demarc Extension Service Options	p. 2
History of the Demarc Extension	p. 2
Loss of Standardization	p. 3
Confusion in the Industry: Who is Involved with a Demarc Extension?	p. 4
IP Technology and the Demarc Extension	p. 4
What the Customer Wants	p. 4
Enterprise Demarc Extension Chart	p. 4
Labeling	p. 5
Demarc Extension Installation Problems	p. 5
Demarc Pre-Wire Testing	p. 6
Circuit Testing	p. 6
Circuit Down - It's an Inside Wiring Problem	p. 7
Demarc Extension Warranty	p. 7
Summary	p. 8
Demarc Extension Terminology	p. 8
About Concert Technologies	p. 9
About Demarc Extension Nationwide	p. 9



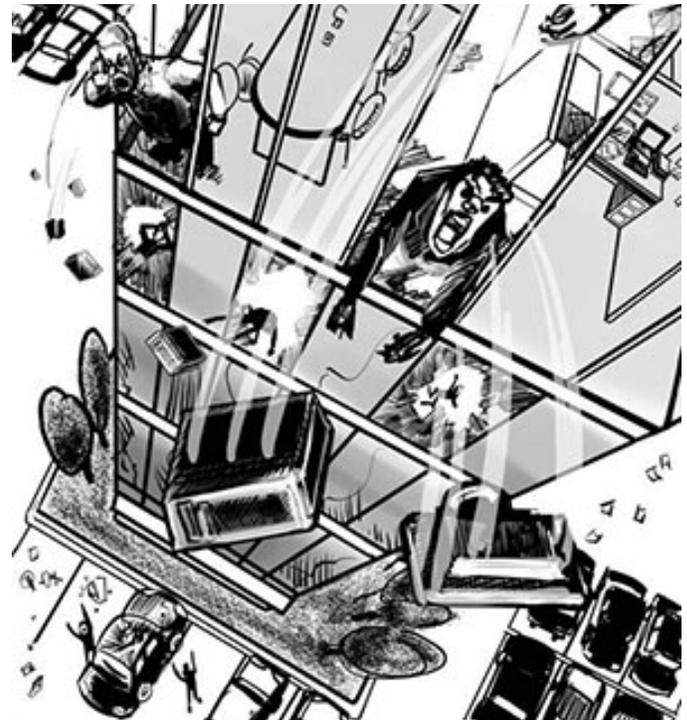
Executive Summary

Thousands of telecommunications circuits are delivered and serviced weekly in facilities across the nation, causing a major impact on how business is conducted. Extending the demarcation point from where a telecom circuit is delivered at the minimum point of entry of a facility to another space within the facility, typically where the edge Customer Premises Equipment is located, is mandated by federal regulations. The federal mandate requires all local access providers to install a demarcation point to provide for operational control or ownership to change hands between the local access provider and the subscriber, typically the end user.



The importance of a demarc extension can be understood by comparison to a typical cabling channel that connects the computer at an employee's desk back to an Ethernet switch located in a telecom room, which provides connectivity to the company network. If that employee experiences issues with the cabling connection to the network, they cannot communicate until the cabling channel issue is resolved. This issue puts only that single employee out of business while their colleagues can still continue business unaffected.

When a demarc extension is not working, or worse—experiences intermittent problems, all of the computer users within an office are unable to communicate to the outside world. With the internet and other forms of communications, such as voice and video playing a large role in daily business life, it can be catastrophic when access is denied. However, little attention is given to the importance of this necessary element to a network until it is not working and the finger-pointing begins.



Since the deregulation efforts, this extension of the demarcation point, known as the holy grail of cabling, has contained several drawbacks. Some of the key problems are the loss of the standardization that was maintained by the local access providers prior to deregulations and the confusion over responsibility, service, and warranties for the extension of this cabling and components.

The lack of national leadership for standardization, poor installation practices and confusion over demarc extension responsibilities in the market have negatively impacted the industry. This has subsequently caused delayed service

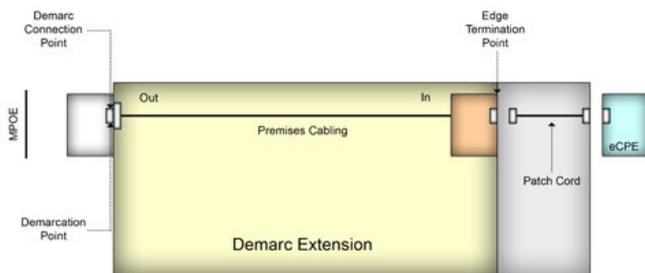
deliveries, unwarranted revisits and excessive finger-pointing for the timely connection and critical access of internet and communication services for facilities throughout the United States and the world.

This white paper will provide guidance on the single most important cabling channel in a facility and the major impact it can have on a business and its customers. You will learn that this cabling is not addressed under standards, such as the Commercial Building Telecommunications Standard ANSI/TIA-568-C.1, how to avoid the confusion over responsibility, mitigating your risk, distance limitation and much more.

What is a Demarc Extension?

A demarc extension is defined as:

“The transmission path originating from the interface of the access provider’s side of a telecommunications circuit Demarcation Point within a premise and ending at the termination point prior to the interface of the edge Customer Premises Equipment. This may include in-segment equipment, media converters and patch cords as required to complete the circuit’s transmission path to the eCPE.”



[See diagrams](#) for additional demarc extension configurations.

Demarc extensions are often trivialized and overlooked before installation of network services. Due to this, it can become the main point of contention when a circuit is not working properly or has not been delivered on time. Therefore, because of the critical role it plays in network services, the demarc extension can have major impacts to business operations when not working properly.

Demarc Extension Service Options

Due to the confusion in the industry over standards, methodologies and servicing responsibility, it can be difficult for the end user to decide how to proceed with the installation of a demarc extension. Below is an example of some options available from various companies regarding the installation.

“The Critical Role of the Demarc Extension: We offer two alternatives for wiring extension work, subject to your pre-approval. Under the first alternative, we will hire a contractor on your behalf and bill you for the costs. Under the second alternative, our Carrier Partner will do the extended wiring work for you, and you will be billed by us for the Carrier Partner’s fees. You can also choose to perform the extension wiring work yourself by hiring your own contractor. Please note that there are situations in which a Carrier Partner may not do any wiring from the Demarcation point.”

History of the Demarc Extension

The demarc extension is governed by the AHJ (authority having jurisdiction) and part 68 of the FCC’s regulations by which cabling and edge Customer Premises Equipment (eCPE) which interfaces to the Local Access Provider Network, also referred to as the Public Switched Telephone Network (PSTN).

The CPE governed includes eCPE; such as routers, DSU/CSUs and modems; in-segment equipment, such as extenders and repeaters; as well as the cabling and media converters used to connect such equipment to the local access provider’s network at the demarcation point.

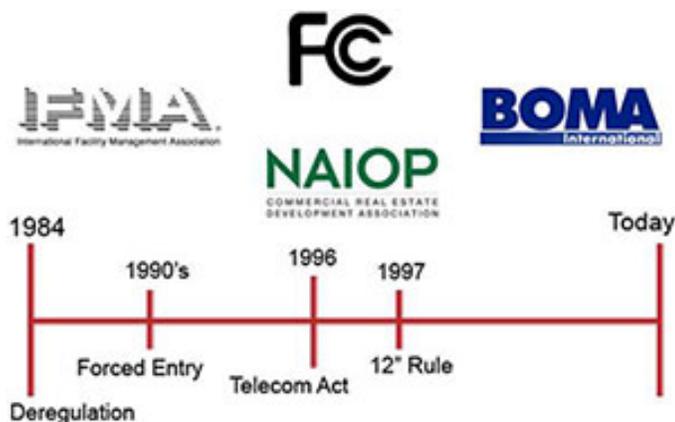
1984 - Although Part 68 came into effect in 1975, it was not until the 1984 Deregulation of the telecommunication industry that the demarcation point was established. However, like most deregulation efforts, that of the demarc extension has experienced several shortcomings. One of the key drawbacks is the loss of the standardization that was maintained by the local access providers prior to deregulations

and the confusion over responsibility for the demarc extension.

1990 - In August 1990, the FCC amended the definition of the demarcation point partially due to the industry confusion over the location(s) within multi-unit premises and commercial buildings. This also sparked the issue of **Forced Entry** among building owners. This amendment ensured that the demarcation point would be near the point where the cabling entered the customer’s premises, known as the Minimum Point of Entry (MPOE). This enacted the 12 inch rule which states:

“The demarcation point may be located within 12 inches of the point at which the wiring enters the customer’s premises. However, this still allowed local access providers reasonable and nondiscriminatory standard operating practices for the location of the demarcation point.”

1997- In June 1997, the FCC clarified the wording of the 12 inch rule by adding the following: “or as near thereto as practicable.” This minimized the location issues for the demarcation point within the premises.

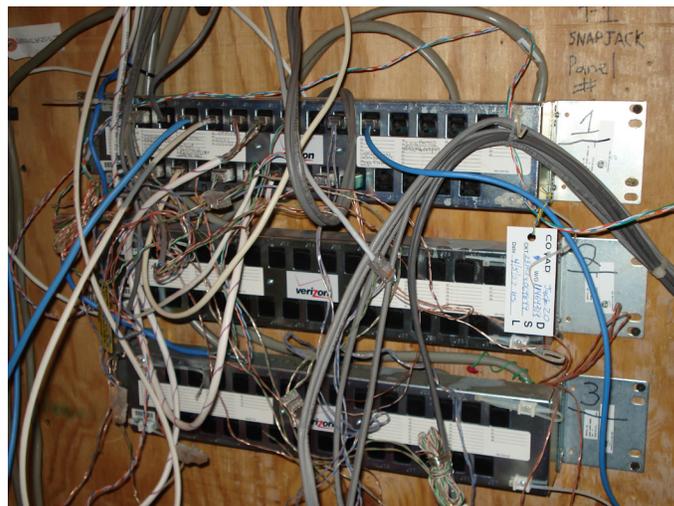


Loss of Standardization

The Information Technology Systems (ITS) trade association, **BICSI**, has indicated the following in their CO-OSP (Customer-Owned Outside Plant) Design Manual:

“Like most deregulation efforts, that of the CO-OSP also contains several drawbacks. One is the loss of the standardization that was maintained by Service Providers (SPs) prior to deregulation. This problem has been and continues to be addressed...”

Sub-par installation practices have resulted from the lack of standardization and understanding for the most important cabling within a premise, the demarc extension.



Upon further examination, the **ANSI/TIA-568C.1** Commercial Building Telecommunications Cabling Standard addresses the horizontal and backbone subsystems but does not address the critical demarc extension.

Survey	Survey Point
Concert Technologies conducted a survey of 239 nationwide contractors in January 2010.	75% of respondents did not know of any standards for a demarc extension.

For current updated information on changes in demarc extension standards, it is recommended to view the current version of this white paper at www.demarcextension.com.

Confusion in the Industry: Who is Involved with a Demarc Extension?

Due to the interfacing of the demarc extension to the local access provider's side of the demarcation point for the circuit to be extended to the eCPE, it is important to understand the makeup of the channel of responsibility for the circuit, which through the connection, includes the demarc extension. Numerous parties can be involved:

- End User/Subscriber
- Carrier
- Local Access Provider
- Master Agent, Sub Agent
- Solution Provider
- Demarc Extension Contractor

IP Technology and the Demarc Extension

With the rapid growth of IP technology, there is a greater demand to access the internet, causing a high demand for circuits and consequently, demarc extensions. The following is a list of some categories where impacting circuits and demarc extensions have seen increased growth:

- WAN
- Security
- Life Safety
- Video Conferencing
- VOIP
- Energy Controls
- Cloud Computing

Federal law requires that every telecom circuit entering a premise must have a point of separation (demarcation point) between the local access provider's network and that of the customer (end user). This requires that every telecom circuit to have a demarc extension.

What the Customer Wants

- More circuits and higher bandwidth to accommodate the customer's need to access the internet
- Departmental Control in enterprise networks are forcing end users to have separate circuits due to the importance of the circuit to that department. For example, the IT department has a circuit for VoIP and the Security department has a circuit for access control and cameras.
- Redundancy has now become necessary due to the major impact a down circuit resulting from a faulty demarc extension can have on an organization.
- Easy fault isolation has become a necessity to determine demarc extension or circuit issues.
- Less finger-pointing from the confusion of diagnosing an inside wiring issue versus a circuit issue.
- Work to be performed at a reasonable cost with experienced personnel
- Quick Response when circuit is down

Truck rolls can be reduced, along with associated project time and cost, by employing a company that can provide skilled field technicians to install the cabling, in-segment equipment, connect and test the eCPE. See the [Local Multi-Service Deployment Method](#)

Enterprise Demarc Extension Chart

This chart provides general guidance when reviewing requirements for several types of enterprise telecom circuits.

Circuit Type	Cable Type	Distance Limit	Speed	Sample Hand Off Type	Sample Edge Termination Point
T1	2 Pair STP 4 Pair UTP*	655 Ft	1.544 Mbps	Smart Jack	RJ 48X
DS3	DS3 Dual COAX	440 Ft	44.763 Mbps (28 T-1)	BNC Panel	BNC
OC3	Fiber Single Mode	Unlimited for premise	155 Mbps (100 T-1)	Fiber Panel	SC,LC,ST,FC

T1, 4-Pair UTP cabling distances can vary amongst cable manufacturers

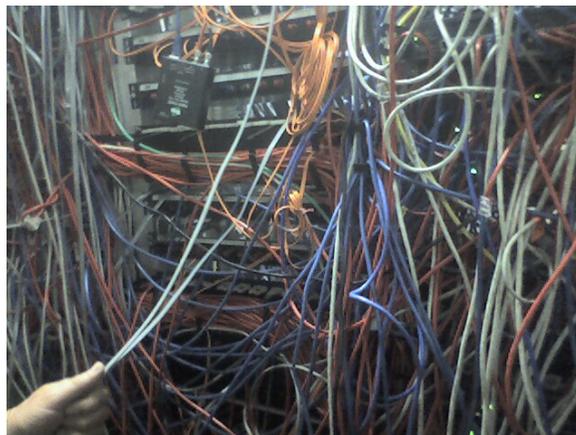
Labeling



It is important to label all connections and interconnection points throughout the demarc extension. This will minimize servicing time, a critical factor in fault isolation and circuit restoration.

In addition to following proper labeling standards as presented in the [TIA 606](#) standard, additional consideration should be given for installing a demarc extension to accelerate the servicing of that demarc extension and circuit.

- All labeling is required to be mechanically printed on a permanent label or legibly hand-written with a permanent marker.
- The Demarcation Point shall be labeled with the local Access provider's circuit identification number (ID), carrier ID number and vendor cable ID number.
- The edge termination point shall be labeled with the local access provider's circuit ID, carrier ID number and vendor cable ID number.
- All cross-connections, interconnections, and intraconnections shall be labeled with a minimum of the vendor cable ID number.
- Additional labeling standards based on customer requirements may be imposed.



Improper labeling of the telecom circuit can be like finding a needle in a haystack, wasting the technician's time and resulting in tag and locate tickets and postponing the delivery of the circuit and demarc extension.

Demarc Extension Installation Problems

- Access – Since most customer eCPE will be located in a different space within a facility from where the demarcation point is located, accessing different areas of the building will be necessary to route cabling and equipment for the demarc extension. At a minimum, this can involve accessing multiple telecom closets and other tenant(s) spaces.

Survey Point

54% of respondents found the number one issue when installing a demarc extension to be access to the space (telecom rooms, closets, etc.)

- Coordination with the many parties involved will be necessary to provide the quickest installation of a demarc extension. Two of the key parties to be addressed are the carrier and local access provider for installation and testing purposes. Scheduling the demarc extension should be based on the local access provider's firm order commitment date (FOC date), when the local loop portion of the circuit will be dropped at the site by local access provider.

- A tag and locate ticket must be applied when the circuit for which the demarc extension is required can not be found or properly identified.
- Congested pathways can impact the installation of cabling, this typically occurs in core holes of stacked telecom closets. Technicians must also face the challenge of fire stopping in core holes due to the neglect of previous installers routing cables through core holes and other building penetrations.

Survey Point	Survey Point
When installing a demarc extension in a riser closet, over 75% of contractors found the core holes to be congested.	Over 77% found inadequate fire stopping in the core holes.

- Capacity for riser pairs to extend the circuit within a building may be exhausted due to unavailable pairs, typically because previous cross connects have not been removed when service was concluded.
- The use of unmanaged and unskilled field technicians to install and/or test demarc extensions and circuits.

Demarc Pre-Wire Testing

Testing of the cabling prior to interfacing into the local access provider's side of the demarcation point is necessary to determine the cabling channel's quality. There are two types of channel testing:



	Low Level	High Level
T1	Pair Tester	Field Tester with Store and Print
DS3	Coax Tester	Field Tester with Store and Print
OC3	Light Source & Power Meter	Field Tester with Store and Print

See Demarc Pre-Wire Diagram

1. High level testing involves the use of a category test set, which has the capabilities to store and print test results as validation to the quality of the cabling channel.
2. Low level testing, which involves continuity for copper cabling and decibel losses for fiber cabling. This does not provide the storing of data or printout capabilities.

When performing low level cabling tests, it is recommended to provide a test form to the on-site tech to complete for your records. This will provide documentation and a reference point as to the condition of the demarc pre-wire at time of installation, when the telecom circuit is down.

Circuit Testing

The requirement of a demarc extension is to interface into local access provider's side of the demarcation point. In order to extend the circuit to the customer's eCPE, it is important for the installer to test the circuit at the point before the eCPE or with the eCPE installed for functionality of the circuit after the demarc extension has been interfaced into the circuit and completed.

There are three types of tests that can be provided:

1. High level circuit testing, which may require expensive test gear and trained personnel to operate the test equipment, this is typically not particle or cost effective for the contractor unless they install hundreds or thousands of demarc extensions yearly.

Survey Point
Only 21% of contractors surveyed reported they installed 100 or more demarc extensions in 2009.

2. Low level loop-back testing, which involves the looping back of the signal to the local access provider and/or carrier.

3. eCPE testing can be used when equipment is available and permission is granted by the customer. This provides assurance for the operation of both the circuit and eCPE.

Testing is a vital stage, as carriers are required to deliver larger volumes of circuits daily for which provisioning efforts can be extreme. Therefore, there are many circumstances that exist in provisioning that can impact delivery of a circuit. One example is the circuit's status being designated as 'blind acceptance' with the local access provider, in which case its operation is not completely verified at the time of delivery. In such cases, provisioning issues may not be apparent until the day of circuit initiation at the site location.

Truck rolls are reduced and the immediate isolation of the issue for rapid resolution is facilitated by having a managed field technician on site with the ability and knowledge to test circuits while installing a demarc extension.

Circuit Down – It's an inside wiring problem

When multiple entities are involved with a circuit, finger-pointing is unavoidable when there is an issue with that circuit. There are a few things that can be done to avoid this confusion.

First, test from the interface side of the access provider's demarcation point to isolate the telecom circuit from the demarc extension, in this case, technically the **demarc pre-wire**. This will eliminate the circuit issue resulting from an inside wiring issue.

Second, if the circuit testing is not conclusive, it is recommended to remove the eCPE from the end of the demarc extension and interface it into the demarcation point on the access provider's side and test directly into the circuit.

Finally, patch cord testing is recommended. A demarc extension is a complete channel, which can include patch cords or cross connects. However, due to installer responsibilities, patch cords may be the requirement of another party and must be noted upon testing of the demarc extension by testing with and without a patch cord. This will provide accelerated fault isolation if the circuit is not working properly upon another party supplying patch cords at circuit turn up.

On occasion, transmission and receive pairs may be reversed at the local access provider's demarcation point. Due to time restraints and scheduling issues, some installers of the demarc extension will replace the patch cord to reverse the polarity to correct the problem. It is important if cross-over or reversing patch cords are used to indicate clearly in documentation and on the patch cord itself to prevent future problems.

Demarc Extension Warranty

Warranties of a demarc extension are typically not comparable to that of structured cabling systems, which come in 15, 20, 25 years or longer. Demarc extension warranties typically come in substantially shorter periods of 30, 60, 90 days or one year. Depending on which entity performs the work, the warranty may end at the time the circuit is accepted.

Examples from actual warranties:

"A demarc extension purchased from XXX Company is not under warranty after the circuit is activated and accepted by the customer."

"The extended coax cable and termination equipment will belong to the customer and will not be maintained by XXX. Installation, equipment and cabling will be covered under a 30 day warranty. After 30 days the extended wiring becomes the customer issue."

“Testing is not normally accomplished across the demarc extension. Even if XXX technicians installed the demarc extension, there is a warranty period normally lasting between 30 to 60 days from the initial install date. The demarc extension is considered to be a customer responsibility.”

24/7 maintenance & support on the demarc extension is essential due to the impact of a telecom circuit not working or even worse, intermittently not working has on an organization’s operations.

Summary

In summary, the demarc extension is the most important channel of cabling for a network at the end user’s premises. As so the following points must be taken into consideration:

- The demarc extension must not be trivialized, as it is a segment of the telecom circuit that is critical to the operation of an organization.
- Multiple entities involved can lead to confusion when a circuit goes down and the demarc extension is perceived to be at fault. You should clearly understand all of the entities involved with providing service for the telecom circuit and have key phone numbers available.
- Make sure a set of installation standards are set for the installation and testing of the demarc extension. This will prevent improper cabling and equipment installation that may not result with problems until after a circuit and demarc extension has been delivered and accepted.
- The growth of IP technology will cause an increase in telecom circuits being delivered and each circuit will need to be accompanied by a demarc extension.
- Labeling should follow the TIA 606 standard with additional identifiers of the Carrier’s ID# and the Access Provider’s ID# located at the demarcation point and edge termination point of the demarc extension.
- Avoid the confusion over the responsibility when resolving an inside wiring issue by going

directly to the demarcation point and disengaging the demarc extension from the local access providers side and testing the circuit.

Demarc Extension Terminology

Due to confusion in the industry, the lack of set standards, and the critical role that demarc extensions and eCPE play in end user business operations, terminology has been developed to address these issues. In conjunction with labeling standards and diagrams, the defined terminology will provide firms with the ability to easily communicate demarc extension installation and maintenance information to field and office personnel in a clear and unified fashion.

Demarc Connection Point

The end user connection that interfaces into the local access provider’s demarcation point. May require a patch cord or cross-connect cable. [See Diagrams](#)

Demarc Extension

The transmission path originating from the interface of the access provider’s side of a telecommunications circuit Demarcation Point within a premise and ending at the termination point prior to the interface of the edge Customer Premises Equipment. This may include in-segment equipment, media converters and patch cords as required to complete the circuit’s transmission path to the edge CPE. [See Diagrams](#)

Demarc Pre-wire

The transmission path that originates at the End User Demarc Termination Point and ends at the Edge Termination Point. It does not interface into the Demarcation Point via the Demarc Connection Point and is therefore not a Demarc Extension. [See Demarc Pre-Wire Diagram](#)

eCPE (edge Customer Premises Equipment)

The initial piece of CPE (Customer Premises Equipment) that is located at the separation point

between the demarc extension and the end user's internal network. The 'e' denotes the exact location of this equipment, at the edge of the end user's circuit and avoids reference complications when other CPE is used in a demarc extension and/or at a facility. This equipment is typically a CSU/DSU, Router or Modem. [See Diagrams](#)

Edge Termination Point

The connection at the edge of the demarc extension that interfaces with the eCPE. This does not include a patch cord, which may be required for connection with eCPE or Media Converters. [See Diagrams](#)

End User Demarc Termination Point

A component of the Demarc Pre-wire, the end user termination point that does not interface into the local access provider's demarcation point. [See Demarc Pre-Wire Diagram](#)

Forced Entry

The local access provider is allowed mandatory access to install a demarcation point within a building's premises despite the building owners' preference for a specific telecommunications company.

Form Order Confirmation Date (FOC Date)

An FOC is a confirmation that a telephone company or local access provider received an order from a customer, has processed it, and has provided a due date back.

MPOP Extension

The transmission path to extend services delivered outside a premise to the MPOP, or Minimum Point of Presence. In some cases, due to construction and other circumstances, the local access provider will deliver circuits outside of the premise, which requires additional construction and cabling to extend the circuit to the MPOE and construct the demarcation point. [See MPOP Extension Diagram](#)

Segment

Defines the location(s) of media used in a demarc extension. A segment is a single continuous cable that is terminated at each end. The initial segment (segment 1) originates at the demarc connection point and the final segment ends at the edge termination point. Segments may include patch cords or cross-connects. [See Diagrams](#)

About Concert Technologies

This paper was authored by Dennis Mazaris, President and Founder of Concert Technologies. Since 1995, Concert Technologies has offered rapid delivery of multi-site, multi-service, multi-technology rollouts on both a national and global scale. Our Maestro Technology Rollout System®, the world's first unified system, is based on the proven methodologies that span our extensive experience of providing professional rollout services.

About Demarc Extension Nationwide

Demarc Extension Nationwide is a brand of Concert Technologies and was developed as the telecommunications industry leader of nationwide installation services and education of the demarc extension. In addition to providing these nationwide installation and maintenance services, the brand sets the standards and supplies the necessary information to facilitate the understanding of specifications and installation practices for demarc extensions.

For more information:

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