BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

ARB 584

In the Matter of COVAD COMMUNICATIONS COMPANY Petition for Arbitration of an Interconnection Agreement with Qwest Corporation	)	DIRECT TESTMONY OF MICHAEL ZULEVIC ON BEHALF OF COVAD

DIRECT TESTIMONY OF MICHAEL ZULEVIC (Non-Confidential Version)

FILED ON BEHALF OF
DIECA COMMUNICATIONS, INC.
D/B/A COVAD COMMUNICATIONS COMPANY

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I. QUALIFICATIONS

Q. MR. ZULEVIC, PLEASE INTRODUCE YOURSELF TO THE COMMISSION.

A. My name is Michael Zulevic and I am currently employed as a consultant by Covad Communications Company ("Covad"). Until July 12, 2004, I was employed by Covad as the Director of External Affairs for the Qwest region. My business address is 22801 Entwhistle Road E., Buckley, Washington 98321.

Q. MR. ZULEVIC, WOULD YOU PLEASE PROVIDE A BRIEF DESCRIPTION OF YOUR JOB RESPONSIBILITES AND EXPERIENCE?

A. Yes, Covad has retained me as a consultant to complete the work associated with the renegotiation of our Interconnection Agreement with Qwest Communications. While employed by Covad as Director of External Affairs, I was responsible for resolving business issues between Covad and its vendor, Qwest. This responsibility included driving resolution on operational, OSS, and billing problems, and negotiating with Qwest so that Covad can pursue meaningful business opportunities in this market. I worked with Qwest to resolve operational, OSS, and billing issues on a business-to-business level, in the change management process, at industry workshops, and in interconnection agreement negotiations. In working on these issues, I interfaced with internal Covad groups dedicated to provisioning Covad service, including services using stand-alone loops (2-wire analog and non-loaded loops and T-1 loops), line shared loops, and line split loops.

In my position immediately preceding my last role at Covad, my responsibilities included the deployment of Covad's line sharing equipment across the country. I was responsible for the architecture negotiations over the first-ever line sharing agreement with U S WEST (or any ILEC, for that matter) in the country. During the architecture

negotiations, I helped to design the network architecture that is now in place. I have also been involved with the network design negotiations with other ILECs, including BellSouth, Verizon, Sprint, and SBC.

Prior to joining Covad, I was employed by U S WEST (now Qwest) for 30 years, most recently as Manager, Depreciation and Analysis for the last few years I was employed by US WEST. Prior to that, I worked in Network and Technology Services ("NTS") for several years, providing technical support to U S WEST interconnection negotiation and implementation teams. While working in these two capacities, I provided testimony on technical issues in support of arbitration cases and/or cost dockets in Minnesota, Iowa, Montana, Washington, Oregon, Arizona, New Mexico, Nebraska, Utah, Wyoming, and Idaho. Prior to joining the NTS group, I was responsible for providing technical support for the U S WEST capital recovery program in the areas of switching, transport, and loop. I also worked as a Central Office Technician and Central Office Supervisor at U S WEST.

In addition to the extensive experience described above, I also have worked as a Switch and Transport Fundamental Planning Engineer, where I represented Fundamental Planning as a member of the ONA/Collocation Technical Team; Circuit Administration Trunk Engineer, specializing in switched access services; and Custom Network Design and Implementation Engineer working with the design and implementation of private networks for major customers.

II. INTRODUCTION: SUMMARY OF TESTIMONY AND NEGOTIATIONS EFFORT

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my Direct Testimony is to describe two of the issues that were not resolved during Covad's many hours of negotiations with Qwest. I note that as recently as late September one of the issues Covad filed in its Petition for Arbitration with Qwest – whether Covad is entitled to efficient collocation space assignment practices from Qwest was resolved to the satisfaction of Covad (Issue 4). And since then, Issue 6 - Should Qwest allow a single Local Service Request (LSR) to be submitted for a migration of line split or loop split services -- was also resolved to Covad's satisfaction. As a result, Covad is withdrawing these issues from its Petition. There are, however, additional issues that have not been resolved between the parties that are also the subject of this arbitration. Those issues, the issues not addressed by me, will be addressed in the testimony of Elizabeth Balvin.

The issues I address in my Direct Testimony are issues I sincerely believe are critical to Covad's ability to compete in Oregon. The issues are as follows:

> Issue 1 – Should Qwest be permitted to retire copper facilities serving Covad's end users in a way that causes them to lose service?
>
> Issue 5 – Should Qwest provide regeneration between CLEC collocations, and can Qwest charge Covad for regeneration costs on terms and conditions and at rates that differ from those that apply to ILEC to CLEC cross-connect regeneration?

Q. PLEASE DESCRIBE YOUR INVOLVEMENT IN THE NEGOTIATION OF THE NEW INTERCONNECTION AGREEMENT WITH QWEST.

A. I served as lead negotiator for Covad during the entirety of our negotiations with Qwest regarding our new interconnection agreement for the state of Oregon. In my capacity as the lead negotiator, I served as our primary point of contact for Qwest for all issues and discussions around the negotiations, and also was responsible for identifying and pulling

together the necessary Covad internal resources to negotiate efficiently, effectively, and in good faith with Qwest.

Q. PLEASE PROVIDE A SUMMARY OF THE NEGOTIATIONS.

A. Covad initiated negotiations by a letter dated January 31, 2003. Since that time, Covad and Qwest have agreed to numerous extensions, agreeing that the negotiation request date for Oregon would be January 31, 2004. From December 31, 2003, through today, Covad and Qwest have engaged in weekly, and at times twice a week, negotiations in an effort to arrive at a new interconnection agreement to replace the original agreement which has been in place since 1999. The majority of the negotiation sessions have been conducted via teleconference, however both negotiation teams did meet "face-to-face" on one occasion at the Covad Denver office and as recently in Minnesota during the arbitration hearing there in September. Additionally, some individual "face-to-face" meetings between subject matter experts did occur in an effort to move specific issues closer to resolution.

The original list of some 72 issues has now been reduced to six (6) (including sub-issues), and both Covad and Qwest continue to meet, as necessary, in an attempt to resolve the remaining issues prior to the hearing in this arbitration. Further, in the spirit of attempting to reach compromise, Covad has continued to revise its proposals in the hope of reaching some common ground with Qwest on the remaining issues. Many issues critical to the Covad business plan have been resolved. However, the parties have been unable to arrive at agreement on other issues.

Covad believes that both parties conducted negotiations in the spirit of mutual respect, and attempted in good faith to resolve every issue possible without having to

resort to arbitration. The following issues were not negotiated to resolution and must therefore be submitted for arbitrated resolution.

III. ARBITRATION ISSUES

ISSUE 1: COPPER RETIREMENT: SHOULD QWEST BE PERMITTED TO RETIRE COPPER FACILITIES SERVING COVAD'S END USERS IN A WAY THAT CAUSES THEM TO LOSE SERVICE?

Q. PLEASE PROVIDE SOME BACKGROUND ON THE COPPER RETIREMENT ISSUE.

A. Most homes and businesses in America are connected to the telephone network by a pair of twisted copper wires. This "last mile" connection is also called the local loop. In the simplest case, these loops connect a customer to a central office ("CO") where phone lines over a wide area are aggregated and the connection is made to the network backbone that delivers calls all over the world. This existing telephone network is truly ubiquitous – it reaches nearly every home and business in America and constitutes the quintessential bottleneck facility that cannot be replicated today on the same scale and scope at any cost. According to the FCC's ARMIS report, the book value of the total ILEC plant in service at the end of 2002 was over $388 billion. No company, not even the ILECs, could raise that kind of capital to duplicate a ubiquitous loop network.

Q. HOW DOES THIS PLAY INTO COVAD'S BUSINESS OF PROVIDING DSL SERVICE?

A. Digital subscriber line ("DSL") service works by breaking up data into chunks and sending these chunks through 4 kHz "channels" on the local loop at frequencies above that used for voice service. In the absence of placing cost-prohibitive equipment at a mid-point on the copper loop (i.e., remote DSLAMs), the entire span of the local loop from the CO to the end user must be copper if Covad wants to provide any form of DSL

service.[1] In other words, if Covad cannot access a local loop comprised completely of copper, then it cannot provide service to its end user customers.

Q. HASN'T IT ALWAYS BEEN THE CASE THAT COVAD HAS REQUIRED ACCESS TO AN ALL-COPPER LOOP?

A. No. Until the Federal Communications Commission ("FCC") issued its Triennial Review Order ("TRO"), Covad (or any other CLEC) could provide DSL service to end users over hybrid copper-fiber loops if a packet switching functionality – an ILEC DSLAM -- existed on that line. However, with the TRO, the FCC made an abrupt about-face, and ruled that CLECs no longer had unbundled access to any type of packet switching functionality placed by an ILEC on a hybrid copper-fiber loop. Further, the FCC also determined in the TRO that the ILECs were not required to provide unbundled access to hybrid copper-fiber loops, regardless of whether there is any type of ILEC packet-switching functionality on that loop. So, today, Covad can only provide its DSL service to customers over loops that are all copper from the end user's home or business to the serving central office.

Q. WHY IS COPPER RETIREMENT NOW SUCH A BIG ISSUE?

A. The answer to that question is two-fold. As I mentioned above, per the TRO, Covad can now only access the Qwest legacy copper network. And even as Covad's access to the phone network is strictly limited to the copper loop plant, the size of that copper network and the number of customers to whom we have access shrinks on a daily basis as Qwest and the other Bells modernize their networks by placing fiber.

Q. PLEASE PROVIDE MORE DETAIL AROUND THIS NETWORK MODERNIZATION.

A. Certainly. Fiber, or fiber-optic lines, are strands of high-quality glass that carry digital data by way of light signals. Because of cost, competitive pressures, and regulatory

[1] Covad provides several different "flavors" of DSL – ADSL, SDSL, IDSL and T1 service.

advantages, all of the ILECs, including Qwest, are upgrading their networks to replace copper with fiber.

With respect to the cost issue, while it is expensive to lay fiber, the maintenance costs for fiber cable are much lower than they are for copper, resulting in long-term cost savings once fiber and the associated equipment is in place. As for competitive issues, fiber optic lines can provide a tremendous amount of bandwidth. Installing fiber can allow Qwest to provide voice, data, and video services over a single loop (although that actually appears not to be the case, as I discuss below). This capability allows Qwest to compete with the cable companies for virtually all the services cable customers generally subscribe to. As for the regulatory issues, as I discussed above, whenever Qwest replaces any or the entirety of a copper pipe with fiber, it does not have to provide access to competitors.

Q. COPPER RETIRMENT IS ALSO A CONSUMER ISSUE, ISN'T IT?

A. Absolutely. As I already mentioned, the size of the copper network to which Covad has access – and as a consequence the number of current and potential customers to whom we have access – is diminished daily. Looking at it from the perspective of new consumers looking for a service provider, they have no choice in providers where Qwest has retired copper and replaced it with fiber – the consumers' only option is to go with Qwest (or, perhaps, the incumbent cable company). And for consumers who have already opted to go with a competitor, when Qwest replaces copper with fiber, it forces that consumer to go with a provider that it does not and did not want as its service provider. Consequently, not only must the Commission decide how to manage copper retirement because of the impact on competitors, but also it faces an important policy decision of how it will protect and preserve consumer choice.

Q. WHEN YOU DISCUSS THE RETIREMENT OF COPPER AND REPLACEMENT WITH FIBER, ARE YOU TALKING ABOUT FIBER TO THE HOME ("FTTH"), OR SOMETHING ELSE?

A. The Covad proposal is now strictly limited to the situation in which Qwest has retired copper feeder and the end result is something other than an FTTH loop, per the TRO, or a fiber to the curb ("FTTC") loop, per the FCC's recent FTTC Reconsideration Order.[2] By this I mean the Covad proposal on copper retirement applies only when the "end result" after the Qwest deployment is either a hybrid loop – a loop that is comprised of both fiber and copper media (i.e. fiber runs from the central office to a field distribution interface, and the length of copper from the FCI to the customer premise is copper and exceeds 500 feet) or mixed copper media (i.e. an all copper loop, but different segments of the copper loop have different gauges or transmission characteristics). Our proposal does not include the scenario in which copper is retired and an FTTH or a FTTC loop is deployed by Qwest. While the principle underlying Covad's proposal has not changed, we believe that the language that should be incorporated into the interconnection agreement should reflect the fact that the FCC has accorded the same treatment to FTTC loops as was accorded to FTTH loops in the TRO, and also should make clear that such fiber deployment must be for the purpose of actually providing enhanced broadband services to mass market customers. Accordingly, I set out below Covad's revised copper retirement language:

> 9.1.15 In the event Qwest decides to retire a copper loop, copper feeder, or copper Subloop and replaces it with fiber, Qwest will: (a) provide notice of such planned retirement on its website (www.qwest.com/disclosures); and (ii) provide e-mail notice of such planned retirement to CLECs; and (iii) provide public notice of such planned replacement to the FCC. The e-mail

[2] *In the Matter of the Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability*; CC Docket Nos. 01-338, 96-98 and 98-147, Order on Reconsideration (rel. Oct. 18, 2004), ("FTTC Reconsideration Order").

notice provided to each CLEC shall include the following information: city and state; wire center; planned retirement date; the FDI address; a listing of all impacted addresses in the DA; a listing of all of CLEC's customer impacted addresses; old and new cable media, including transmission characteristics; circuit identification information; and cable and pair information.

9.1.15.1 Continuity of Service During Copper Retirement. This section applies where Qwest retires copper feeder cable and the resultant loop is comprised of either (1) mixed copper media (i.e. copper cable of different gauges or transmission characteristics); or (2) mixed copper and fiber media (i.e. a hybrid copper-fiber loop) (collectively, "hybrid loops") over which Qwest itself could provide a retail DSL service. This section does not apply where the resultant loop is a fiber to the home (FTTH) loop or a fiber to the curb (FTTC) loop (a fiber transmission facility connecting to copper distribution plant that is not more than 500 feet from the customer's premises) serving mass market or residential End User Customers.

9.1.15.1.1 When Qwest retires copper feeder for loops serving CLEC-served End User Customers or the CLEC at the time such retirement is implemented, Qwest shall adhere to all regulatory and legal requirements pertaining to changes in the Qwest network. Qwest will not retire copper facilities serving CLEC's End User Customers or CLEC, at any time prior to discontinuance by CLEC or CLEC's End User Customer of the service being provided by CLEC, without first provisioning an alternative service over any available, compatible facility (i.e. copper or fiber) to CLEC or CLEC End User Customer. Such alternative service shall be provisioned in a manner that does not degrade the service or increase the cost to CLEC or End User Customers of CLEC. Disputes over copper retirement shall be subject to the Dispute Resolution provisions of this Interconnection Agreement.

Along with its proposed language in Section 9.1.15, Covad struck its proposed language for Section 9.2.1.2.3.1, which included within its scope not only the hybrid loops but FTTH and FTTC loops as well. Covad decided that this was the appropriate way to address the copper retirement scenario since Qwest has taken the view (which Covad opposed), time and again, that Section 9.2.1.2.3.1 applies only to FTTH loops.

Q. ARE THERE ANY OTHER LIMITATIONS IN THE COVAD LANGUAGE OF WHICH THE COMMISSION SHOULD BE AWARE?

A. Yes. While, typically, when parties talk about parity, they discuss that issue in the context of an ILEC – here Qwest – treating its retail and wholesale customers in the same fashion. As I use it here, though, the Covad proposal provides for parity of treatment of Qwest and Covad DSL customers. That is, the Covad proposal applies (1) when the resultant loop is not an FTTH or FTTC loop; and (2) Qwest itself would be able to provide a retail service over the loop(s) deployed. In that way, the Covad proposal ensures that its customers will continue to receive service only where Qwest's own customers impacted by copper retirement would also continue to receive service. Further, the Covad proposal ensures that Qwest need not deploy equipment solely to support Covad customers if it had not already planned on deploying such equipment in order to accommodate its own customers.

Q. DOES IT MATTER LEGALLY IF COVAD'S PROPOSED LANGUAGE APPLIES JUST TO THE HYBRID FIBER-COPPER LOOPS?

A. It absolutely does. While the Triennial Review Order ("TRO") discusses an ILEC's rights with respect to unbundling and the retirement of copper if and when it deploys an FTTH loop (and a similar discussion occurred in the FTTC Reconsideration Order with respect to FTTC loops), the TRO does not afford the same treatment to ILECs when the resulting loop is only a hybrid loop. For instance, the FCC established an abbreviated notice period for FTTH-related retirements, but not hybrid loop-related retirements. The FCC also decided to forbear from applying the access obligations set forth in section 271 of the Act to FTTH and FTTC loops, but did not do so for hybrid loops. The TRO and the FTTC Reconsideration Order thus do not appear to provide Qwest with the same degree or scope of protection relative to copper retirement in the hybrid scenario as opposed to the FTTH or FTTC loop scenario.

Q. IS COVAD'S ADVOCACY ON COPPER RETIRMENT DRIVEN BY ITS CONCERNS ABOUT OBTAINING NEW CUSTOMERS SERVED ON A

HYBRID LOOP AS WELL AS EXISTING CUSTOMERS WHO ARE IMPACTED BECAUSE THE COPPER ON THEIR EXISTING LOOP IS BEING REPLACED BY FIBER?

A. The sole issue we are addressing in this arbitration relative to copper retirement is how to address the impact on *existing* Covad customers whose copper loops are being replaced with a hybrid copper-fiber loop. In other words, the language we proposed, and which I set out above, is strictly limited to impacts on existing customers, and is designed solely to allow those customers to continue to receive Covad service at no increase in price or decrease in service quality until the customer chooses to disconnect his/her Covad service.

You can see very clearly from the language in Section 9.1.15 what is *not* Covad's position, and what we are *not* trying to do. Covad is *not* preventing or trying to prevent Qwest from undertaking routine network modifications or any fiber upgrades or copper retirement resulting in hybrid loops. Covad is *not* trying to force Qwest to keep copper or build copper where there is fiber placement. Covad is *not* trying to create a method or process for adding customers where apparently not permitted to do so per the TRO and the FTTC Reconsideration Order. The sole goal of Covad's proposed IA language and position on the copper retirement issue is to preserve Covad's existing customer base that might otherwise be impacted by copper retirement.

Q. PLEASE PROVIDE AN EXAMPLE OF HOW COVAD'S PROPOSED LANGUAGE WOULD OPERATE.

A. Sure. The concern, addressed by this issue, is limited in scope. The situation will only arise when Qwest finds it has a copper cable that has become a significant maintenance problem. It may be a 3600 pair *feeder* cable in Minnesota or Oregon that consistently gets wet, year after year, during the rainy season. Or it may be a 4200 pair *feeder* in

Arizona or New Mexico that has finally succumbed to many years of desert heat. These problems, brought on by the elements, ultimately result in significant customer service degradation and a constant increase in costs to Qwest for repair. In today's world, the final resolution is often replacement of the entire copper *feeder* cable with fiber and the placement of fiber fed digital loop carrier in the field. In these cases, the entire *feeder* cable must be replaced, leaving no copper option for services currently in place. Under Qwest's proposed language, in the case where Covad DSL customers are currently being served by these copper facilities, the only option would be for Covad to disconnect the services of these customers. Under the Covad proposal, for the impacted customers – and let's say there are five -- those customers would continue to receive Covad service at no increase in cost or decrease in service quality until they choose to leave Covad, so long as Qwest is also capable of serving its own DSL customers over the new facilities.

Covad's proposal allows it to retain those existing customers and, importantly, it also preserves an individual customer's choice in providers until that customer changes providers. This is a particularly important point, because that customer chose Covad and is not choosing to leave Covad at time of the copper retirement. The customer should not be forced to leave Covad – or any other DSL provider -- before s/he otherwise chooses to do so simply because of acts of Qwest over which neither the customer nor Covad have any control and which the FCC has deemed not to warrant any kind of protection or special consideration.

Q. DOESN'T THE USE OF GENERAL LANGUAGE LIKE "ALTERNATIVE SERVICE" CREATE SOME CONFUSION ABOUT THE COVAD PROPOSAL?

A. I don't know how it could. In the first place, Covad proposed this language several months ago. Presumably, had Qwest found it at all confusing, it would have told Covad

so, and proceeded to ask some questions in order to eliminate that confusion. Instead, Qwest made no comment on the Covad language and, in fact, refused to discuss it at all. So, if there is any confusion whatsoever on Qwest's part regarding Covad's copper retirement proposal, it is entirely of Qwest's own doing either because of its failure to negotiate this language or its failure to discuss or pursue any questions it might have with Covad's proposed language.

Moreover, I am uncertain whether Qwest would even want further additional specificity within the interconnection agreement itself. Because the appropriate service option for each impacted end user customer may vary, I think it would be unwise and fool-hardy to try and nail down one particular service option. Such an approach might chain Qwest to one service option when another service might prove to be a better alternative. Further, pinpointing one service option as "the" alternative service that Qwest must provide ignores the fact that technologies and products are changing and what might be available or work today, might not work – or even be available as a product from Qwest -- tomorrow. Flexibility in identifying an alternative service is by far the better approach given the product and technology changes our industry has seen to date.

Q. PLEASE EXPLAIN WHY THERE IS NO REASON FOR ANY SUPPOSED CONCERNS REGARDING THE PURPORTED AMBIGUITY OF COVAD'S "ALTERNATIVE SERVICE" PROPOSAL.

A. The two critical characteristics of any alternative service, service quality and price stability, are clearly defined. Contrary to Qwest's protestations otherwise, clear and obvious metrics exist to determine whether a given customer's service is "degraded" by the move to an alternative service: availability of the connection, and the speed of that

connection, measured in kilobits per second (kbps). Qwest's professed ignorance as to what Covad's proposal means is questionable at best, given its adamant refusal to discuss during negotiations any of these terms and the multitude of situations in which language in interconnection agreements has obvious, though not precisely explained, implications.

One need not look far to find an example- Qwest's own proposal regarding copper retirement contains equally general language when it states that "Qwest and CLEC will jointly coordinate the transition of current working facilities to the new working facilities so that service interruption is held to a minimum." This language can be read to mean that Qwest will provide access to fiber feeder and distribution facilities, even FTTH loops, or it can be read to mean that Qwest will provide something less. Also, what constitutes "minimum" service disruption under Qwest's proposal? This language is open to a certain level of interpretation, perhaps even a greater level than Covad's proposed language.

Q. DOES COVAD HAVE ANY SPECIFIC IDEAS IN MIND REGARDING THE ALTERNATIVE SERVICE THAT WOULD BE PROVIDED BY QWEST?

A. Notwithstanding our desire to provide Qwest with as much flexibility as possible, one service option that comes to my mind is one that Qwest already makes available on a volume basis. Specifically, Qwest has a product offering out, called the Qwest DSL Volume Plan Agreement --- or "VISP" service offering, which I have attached to my testimony as Covad/101. With this product offering, a CLEC is able to provide just broadband service (as opposed to the combined voice and data product Qwest has proposed and which I discuss below) to customers even where those customers are served over a hybrid copper-fiber loop. Consequently, this is a product that most likely would meet Covad's service and product requirements (although not the pricing requirements,

given the pricing contained in the VISP agreement), and which has already been developed, defined and implemented by Qwest.

Q. WHAT ABOUT POTENTIAL ALTERNATIVES QWEST HAS PROPOSED IN OTHER INTERCONNECTION ARBITRATION PROCEEDINGS?

A. As I understand Qwest's testimony in prior arbitration proceedings, Qwest has identified two products that potentially may serve as alternatives – the Qwest Choice DSL product and the Qwest "naked DSL" product. As proposed by Qwest, however, neither of these serves as a sufficient alternative.

Among many other reasons, resale of the Choice DSL product is not a viable alternative to Covad because the Choice DSL product, by definition and confirmed by Qwest in the Minnesota interconnection agreement arbitration, is the provision of both analog voice and DSL service over the same line. In the first place, Covad is not an analog voice provider and is not equipped (from a network, expertise or contractual right perspective) to provide or support analog or residential voice service. Even more problematic, because the voice service likely would be a Covad branded voice service, Covad would have to first persuade the customer to change voice providers (from Qwest to Covad) before it would be capable of reselling the Choice DSL service. Obviously, this creates a significant barrier to use of the Choice DSL product because the customer may not want to change voice providers. Equally important, given the pricing packages that Qwest makes available when customers get both local and long distance service from Qwest, Covad could not match the Qwest service offering since it does not provide any type of analog or residential long distance service, and it certainly cannot match the local service rates Qwest can offer by virtue of the bundle. The net result is that there are

insurmountable barriers to the successful use of the Choice DSL product –even without factoring in the price that Qwest wants Covad to pay for this service.

The "naked DSL" product is equally unsatisfactory as an alternative, albeit for different reasons or problems that exist at this moment. First, based on Qwest's news releases, naked DSL is a "second line" product – meaning that it is not provided over the primary line, but must be provisioned on a dedicated, standalone, second line. As the Commission knows, a spare second line running to the premise is not always available, nor – particularly in a state like Oregon – might that second line be capable of supporting broadband service. Beyond that, however, it is impossible to determine anything about the "naked DSL" product from the Qwest website. While Qwest has provided some pricing information regarding the "naked DSL" product to Covad, that pricing information only demonstrates that naked DSL is not an economically viable alternative.

Q. QWEST HAS COMPLAINED ELSEWHERE THAT THE COVAD PROPOSAL WILL FORCE QWEST TO INCUR SUBSTANTIAL, BUT COMPLETELY UNDEFINED AND UNQUANTIFIED COSTS. PLEASE RESPOND.

A. Absolutely. Qwest has raised concerns elsewhere that the Covad proposal would result in Qwest incurring costs far beyond what it reasonably could or should be required to bear. As an initial matter, while Qwest has made this claim quite loudly, it also admitted in the Colorado arbitration that it had made no attempt to quantify these costs or undertake any kind of study to accurately or even adequately capture what these costs are, or what the magnitude of such costs might be. In other words, while Qwest claims concern about costs, to date we haven't seen any evidence of them or why or how Qwest would not recover its costs.

Qwest also claims that providing any kind of alternative service would result in Qwest sustaining additional costs in order to develop a product to meet Covad's needs. Of course, as I discuss above, Qwest offers and supports a product that very likely would meet Covad's needs (assuming the pricing conditions of no increase in cost to Covad or its end user customer are met) so such costs just wouldn't materialize.

Finally, Qwest claims that the Covad proposal would force Qwest to support the cost of maintaining two loops – the fiber feeder it has deployed as well as copper facilities to support Covad's "alternative service." That cost, however, would only be sustained by Qwest if it made an economically irrational decision. By this I mean that Qwest certainly could interpret its requirement to provide an alternative service as one that requires it to maintain copper loop plant that it otherwise would have retired. Conversely, of course, Qwest could interpret it in a number of other ways, which would meet Covad's needs and not require Qwest to maintain copper plant it otherwise would have retired. That choice is Qwest's, and it should not in any way be construed as a barrier to Qwest providing an alternative service where and when it retires fiber feeder. Finally, of course, because the Covad proposal would not require Qwest to deploy equipment that it would not otherwise deploy in order to provide DSL to its own retail customers, there is no issue as to equipment costs that Qwest would not otherwise incur.

Q. WHY DOESN'T QWEST'S PROPOSAL ACHIEVE THE SAME OUTCOME THAT COVAD'S PROPOSAL ACCOMPLISHES?

A. Well, as an initial matter, Qwest has made no proposal where fiber deployment results in hybrid fiber-copper loops. In other words, Qwest's commitment to keeping copper in the ground where technically feasible or to complying with state specific obligations that might impact its copper retirement activity as set forth in Section 9.2.1.2.3.2 is limited to

the situation in which Qwest deploys FTTH loops. To date, Qwest has refused to make a similar commitment to maintaining copper where technically feasible or complying with state law requirements when Qwest deploys hybrid fiber-copper loops.

Q. DOES QWEST'S REFUSAL TO COMMIT TO ANY KIND OF PROVISION REGARDING MAINTENANCE OF COPPER WHERE FIBER FEEDER IS DEPLOYED CONCERN YOU?

A. It absolutely does. By refusing to extend its commitments to the situation in which hybrid loops are deployed, Qwest is creating for itself an opportunity to take (not win) customers that very specifically chose NOT to have Qwest as their DSL provider. The possibility that Qwest might misuse its fiber upgrades causes me a great deal of concern, particularly given the Qwest pattern of conduct of delaying Covad market entry but expediting its own when Covad was rolling out its line sharing network and the FCC's clear recognition at paragraph 277 of the TRO that fiber deployment could be misused by incumbent LECs to create barriers to a competitive presence.

Q. WHAT HAPPENS TO COVAD'S CENTRAL OFFICE-BASED COLLOCATION EQUIPMENT WHEN QWEST DEPLOYS FIBER?

A. As more and more fiber feeder replaces copper, fewer and fewer potential customers will be in reach of Covad's central office based DSL, which will result in the progressive stranding of Covad's collocated investment. This is not an inconsequential point. Today, in order to collocate in a single Oregon central office, Covad incurs between approximately*** **BEGIN CONFIDENTIAL $XXXXXX and $XXXXXX END CONFIDENTIAL** *** in non-recurring collocation costs and between approximately *** **BEGIN CONFIDENTIAL $XXXXXX and $XXXXX END CONFIDENTIAL**

*** per month in recurring charges.[3] In addition, Covad will lose the benefit of the investment it made in placing its equipment in the CO to the tune of, on average, *** **BEGIN CONFIDENTIAL** between **$XXXXXXX and $XXXXXXX END CONFIDENTIAL** *** Additionally, Covad has ordered and paid for transport (approximately *** **BEGIN CONFIDENTIAL $XXXXXX END CONFIDENTIAL** *** in nonrecurring charges per DS1 and an average of *** **BEGIN CONFIDENTIAL $XXXXX END CONFIDENTIAL** *** per month in recurring charges per DS1; Covad has incurred approximately *** **BEGIN CONFIDENTIAL $XXXXXX END CONFIDENTIAL** ***in nonrecurring charges per DS3 and *** **BEGIN CONFIDENTIAL $XXXXXX per month END CONFIDENTIAL** *** in recurring charges per DS3) and UNEs to provide service to those customers, all of which Covad will ultimately lose under the Qwest proposal.

Covad is not passively sitting around waiting for Qwest to force customers off of our network and strand our investment in central office-based collocation spaces and equipment. To the contrary, Covad is working to develop alternative ways to provide service to our customers. Notwithstanding these efforts, it is not appropriate for Qwest to have the unilateral ability to disconnect existing Covad customers under the guise of technological development.

At the end of the day, while Qwest may complain about its supposed investment disincentive (which, as I discuss below, is an illusory concern), it is Covad that suffers the monetary harm because it loses the value of its central office investment.

Q. IN DESCRIBING THE COVAD PROPOSAL IN ACTION, YOU STATED THAT ONLY A HANDFUL OF CUSTOMERS WOULD BE IMPACTED. HOW DO YOU ARRIVE AT THAT CONCLUSION?

A. By two different methods. First, Qwest is and has been replacing copper with fiber. To date, those activities have not impacted Covad so we reasonably assume that the impact will not be huge, just that there will be some impact. The second way I arrive at that conclusion is based on our experience in other ILEC regions. In the BellSouth region, which is of comparable size in terms of Covad's customer base to the Qwest region, *** **BEGIN CONFIDENTIAL XX END CONFIDENTIAL** *** Covad customers have been impacted by copper retirement with fiber replacement as of April 2004. Notably, BellSouth has been far more aggressive than Qwest in replacing copper with fiber, and more than 40% of the BellSouth remote terminals are served by fiber – whereas it appears that only approximately 20% of Qwest's remote terminals are served by fiber. Importantly, Covad filed copper retirement complaints in each of the BellSouth states where customers were impacted, and was able to successfully settle those complaints in a fashion that allowed those customers to continue to receive the same service they were receiving before the retirement.[4]

Q. IF IT IS ONLY A HANDFUL OF CUSTOMERS, WHY SHOULD THE COMMISSION OR COVAD CARE ABOUT THESE CUSTOMERS?

A. While four or five customers may be something Qwest is willing to ignore every time it retires a copper feeder cable, Covad is not. And certainly, the number of impacted customers increases with increased fiber deployment resulting in the retirement of copper feeder cable. Covad is committed to delivering to each and every one of its end users outstanding service. Covad's commitment is not just to provide the service that the end user wants, but also to ensure that the end user's entire experience with Covad, from ordering through disconnection, is a positive experience and that the end users get what they want – excellent service *from Covad*. Because of its commitment to service and end

[4] The precise terms of the settlements are confidential. However, Covad is permitted to disclose the fact that the complaints were settled successfully and that, as a result of the settlement, the customers continued to receive the same services they were receiving prior to the copper retirement.

user satisfaction, Covad does not just dismiss the predicament of a few customers because they are just a few.

The Commission, too, does not ignore the predicament of a few consumers just because there are a few rather than hundreds or thousands. If anything, the Commission has evinced an overwhelming interest in making sure that each and every consumer in Oregon is treated with respect and that providers over whom the Commission exercises authority are responsive to their customers. Just because only a few consumers may be impacted does not mean that they do not deserve to have choices. If anything, it is where only a few of the "little guys" are impacted that customer choice is most important.

Q. DOES THE COVAD PROPOSAL DISINCENT COVAD FROM INVESTING IN ITS OWN NETWORK?

A. No, it doesn't. As the Commission knows, Covad is a facilities-based provider. As of August 2001, Covad had invested over $1.4 billion to build out its nationwide network, and since that time Covad has spent tens of millions of dollars more to maintain and upgrade its already world-class network and operating support systems ("OSS"). Covad collocates its own equipment in numerous Qwest central offices in Oregon and throughout six other states in the Qwest region (Covad is Qwest's largest collocation customer). Covad relies solely on its own equipment and network to provide service to customers in Oregon, except when it must utilize dedicated interoffice transport leased from Qwest in some circumstances and as well as that quintessential bottleneck facility, the local loop. Because of its business plan, Covad utilizes its own network wherever and whenever the technological and economic circumstances make it possible. But, because it makes no sense to invest in a remote DSLAM simply to serve a handful of customers for a limited time period, Covad would not make that investment decision.

Q. QWEST HAS SUGGESTED ELSEWHERE THAT COVAD'S PROPOSAL WOULD REDUCE QWEST'S INCENTIVE TO DEPLOY FIBER FACILITIES. DO YOU AGREE WITH THIS STATEMENT?

A. Absolutely not. The potential impact to Qwest, should Covad prevail on this issue, would be so minimal that any possibility of impacting a multi-million dollar investment decision is overstated, if not unfounded.

Q. PLEASE EXPLAIN.

A. Covad is primarily a wholesale provider of DSL services. Our business partners, who provide the retail service, have a nationwide marketing focus. At times, the focus may be at a state level, but never at a wire center or neighborhood level (the neighborhood level is referred to by telecom providers as a distribution area, or DA). Because of this fact, many DAs will have few, if any, end user customers with Covad DSL service. Our customer base is not concentrated in any one DA, but instead, randomly distributed over all DAs served by wire centers where Covad is collocated. The likelihood of more than a handful of Covad end user customers being impacted by a fiber replacement is so highly remote that any attempt to argue that multi-million dollar investment decision would be made on this basis is suspect in my mind.

Equally important, as Qwest has acknowledged, a key factor in determining whether to deploy fiber is the cost to maintain the existing copper. It is a well known, and oft-repeated statement in the telecommunications industry, that the savings enjoyed as a result of lower maintenance costs ensures that a fiber deployment will pay for itself in 3-5 years. Further, since Covad's proposal requires little or no additional expenditures in the form of equipment, no legitimate argument can be made that Covad's proposal will decrease Qwest's incentive to deploy fiber.

Q. IF FIVE COVAD END USER CUSTOMERS WERE GOING TO BE IMPACTED BY ONE FIBER CABLE REPLACEMENT PROJECT, WHAT WOULD BE THE APPROXIMATE FINANCIAL IMPACT TO QWEST?

A. Assuming an industry average churn rate (the length of time a typical customer retains their DSL service) of two years, the difference in price between Qwest wholesale and retail revenue is about $100.00 per month for all 5 customers, the impact would be about $2,400.00. This is hardly enough to impact a decision as to whether or not to deploy fiber to hundreds, if not thousands, of existing Qwest customers.

Q. CAN YOU SEE ANY POSSIBLE WAY THAT COVAD'S PROPOSAL WOULD REDUCE QWEST'S INCENTIVE TO DEPLOY FIBER?

A. Not in the least. Again, Covad's customers are so widely dispersed within the Qwest network that impacts will be minimal, and certainly not significant enough to discourage Qwest from deploying fiber cable. If Covad were a retail provider of DSL, with established relationships with customers within a specific neighborhood, higher concentrations of customers would be more likely. However, unlike Qwest or the incumbent cable provider, Covad is not provided this opportunity to target market to a specific neighborhood customer base.

Moreover, as I discussed above, I can envision at least one way in which Qwest could provide an alternative service over any of the facilities available to an existing Covad end user customer that would not change in any respect Qwest's investment calculation or result in Qwest incurring any costs over and above what it would otherwise incur when it decided to retire copper feeder and replace it with fiber. Nor would this method (the VISP product) require Qwest to maintain copper it would not otherwise maintain, or provide any type of access to fiber facility beyond that required to provide

service to existing Covad customers until they choose to disconnect their service. Of course, notwithstanding what I can envision, Covad will commit to working with Qwest to developing an alternative service for Covad's impacted existing customers that will not increase Qwest's costs beyond the costs it would otherwise incur in deploying fiber feeder and the associated electronics in the first place.

Q. EXPLAIN WHY COVAD'S PROPOSAL ACTUALLY BENEFITS QWEST.

A. Under Covad's proposal, Qwest continues to receive revenue from Covad as it continues to provide service to the customer. If Covad is not allowed to retain that customer, then Qwest is not assured of any revenue whatsoever from that customer. In other words, if Qwest forces Covad to cut off service to its customer, the customer then has the option of choosing Qwest for its broadband service, or perhaps choosing the cable company for broadband and video service. The customer is free to choose the cable company, and if he or she does so, Qwest will receive no revenue whatsoever. At least under Covad's proposal, Qwest will continue to recover its costs and make a reasonable profit without any additional expenses.

Q. PLEASE EXPLAIN WHY THE DEPLOYMENT OF FIBER DOES NOT LEAD TO ANY CONSUMER BENEFIT IN THE COPPER RETIREMENT SCENARIO WITH WHICH COVAD IS CONCERNED.

A. Fiber deployment does not necessarily result in any meaningful consumer benefit. In the first place, we are not talking about a situation in which the consumer does not already have broadband. To the contrary, in the copper retirement scenario we are talking about, the consumer already has broadband from Covad. The deployment of fiber thus doesn't result in any bridging of the "digital divide" since none exists in the scenario Covad is concerned about. This is an important point because, historically, the desire to incent

broadband deployment (whether via copper or fiber) has been driven by the desire to provide all consumers with access to broadband. That traditional justification for creating a deployment incentive simply does not exist here. The consumer already has broadband from a provider of their choice.

More importantly, Qwest's fiber deployment has not been designed to actually facilitate the provision of broadband services – enhanced or otherwise. In fact, Qwest has deployed fiber in at least one state for no purpose other than to support voice service, as Covad/102 shows. And given what I know about the network architecture that Qwest has chosen for purposes of supporting voice and DSL service, the deployment of fiber alone in no way ensures that end users on the end of an all fiber or hybrid copper-fiber loop can or will receive anything other than plain old telephone service ("POTS"). In other words, while Qwest regularly can and does deploy fiber and the equipment necessary to connect effectively to copper distribution loops, unless Qwest specifically opts to deploy additional equipment capable of supporting DSL service, Qwest's standard fiber deployment is really only designed to support growth and additional needs for POTS and POTS lines, and not DSL or enhanced broadband capabilities like video. Additionally, because Qwest's fiber deployment is not made with a specific requirement that the copper distribution loops be of length that can support DSL, much less video services, Qwest's fiber deployment is very much oriented towards relieving POTS capacity demands and not to providing broadband services – enhanced (i.e., video) or otherwise (i.e., DSL).

To the extent that Qwest's fiber deployment is broadband capable, it appears to be the rare exception, rather than the rule that the fiber Qwest has deployed can provide any service other than what's already available over the all copper loop running between the

customer premises and the central office. Finally, given DSL technology that will be available in 4-10 months, all copper loops will also be able to support video services, thereby eliminating entirely any service advantage that Qwest might gain (which is not a given, as I just explained) by virtue of its fiber deployment.

Q. QWEST HAS TALKED ELSEWHERE ABOUT THE FACT THAT ITS FIBER DEPLOYMENT MAY BE CAPABLE OF SUPPORTING BROADBAND SERVICES, DEPENDING ON THE TYPE OF CUSTOMER PREMISES EQUIPMENT THAT THE CUSTOMER HAS. DOES THIS CHANGE YOUR OPINION ABOUT QWEST'S FIBER DEPLOYMENT?

A. No, it doesn't. The primary reason that it doesn't change my opinion is that, whenever loop capabilities are contingent on the type of CPE a customer has, you are automatically talking about a business customer. As is clear from the TRO as well as the FCC's FTTC Reconsideration Order, the FCC is not concerned about broadband access and capabilities available to business customers (presumably because those customers will always get what they want since they yield the highest margins for telecom providers). Rather, the FCC made clear it wanted to incent the deployment of fiber and enhanced broadband services to residential customers. So, Qwest's attempt to bolster the supposed broadband capabilities of its fiber deployment is misleading, since such fiber is serving business and not residential customers.

Q. DO YOU TAKE ISSUE WITH QWEST'S COPPER RETIREMENT NOTICE PROCESS?

A. It is clear to us that Qwest's notice process is deficient.

Q. WHY IS THE QWEST NOTICE PROCESS DEFICIENT?

A. As I understand it, while Qwest will provide notice of all copper retirement activity, including copper retirement resulting in hybrid fiber-copper loops, the notice that Qwest is providing is inadequate to fully inform Covad that its customers will be impacted. Right now, the Qwest notice simply lists the state, the wire center, the planned retirement date, the DA number, the FDI address and the replaced/replacing transmission media, as you can see from the attached Covad/103. This is absolutely insufficient to allow a CLEC to determine whether a particular copper retirement will impact its customer base. Equally important, there is nothing on the notification, whether in the form of a contact number or a URL that would allow a CLEC to seek whatever additional information Qwest might have relative to the impact of the copper retirement on the existing customer base.

Q. WHAT KIND OF INFORMATION MUST QWEST PROVIDE IN ORDER TO ALLOW COVAD (AND ANY OTHER CLEC) TO DETERMINE WHETHER A COPPER RETIREMENT IS CUSTOMER IMPACTING?

A. Covad believes that the following information must be provided to Covad in order for it to determine whether the copper retirement is customer impacting:

*City and State

*Wire center

*Retirement Date

*FDI address

*Listing of all impacted addresses in the DA

*Listing of all Covad customer impacted addresses

*Old and new cable media, including transmission characteristics

*Circuit identification number

*Cable and pair information

Q. DO YOU BELIEVE IT IS REASONABLE TO REQUIRE QWEST TO PROVIDE THIS INFORMATION TO CLECS?

A. Absolutely. In the first place, with the exception of the FDI address and the cable transmission characteristics, we pulled this listing of information based on what BellSouth provides Covad every time it retires copper and there is an impact on Covad's existing customer base. Specifically, BellSouth provides Covad with a list of specific Covad customers that may be impacted by a specific retirement. An example of both the general and specific notices BellSouth provides Covad are attached to my testimony as Covad/104. If BellSouth can provide this information, certainly Qwest can as well. As for the two additional pieces of information, FDI address and the cable transmission characteristics, Qwest appears already to be able to provide that information so it should not be problematic at all to continue providing that information.

Second, based on a recent copper retirement notification from Qwest, it appears that Qwest is equally capable of discerning whether there are any specific CLEC-customer impacts. Specifically, pursuant to a September 21, 2004 network notification, attached hereto as Covad/105, Qwest was able to determine with a Colorado copper retirement that "there are no impacts to the CLEC community." When asked by Covad how Qwest was able to make this determination, a Qwest representative responded that "cable counts impacted by the change were reviewed for working CLEC circuits." *See* Covad/106. Qwest reiterated during the Utah arbitration hearing between Qwest and Covad that it first checks to see the types of services impacted by a copper retirement and, if it is a service that is not necessarily compatible with fiber, it can take the

additional step of looking to see who the provider of that service is. *See* Utah Public Service Commission Docket #04-2277-02, *In the Matter of: the Petition of DIECA Communications, Inc., d/b/a Covad Communications Company, for Arbitration to Resolve Issues Relating to an Interconnection Agreement with Qwest Corporation*, Hearing Transcript, Vol. I at 137. A copy of this portion of the hearing transcript is attached to my testimony as Covad/109.

Based on this information, it appears clear that Qwest is more than capable of making an individualized finding of whether specific Covad customers would be impacted by a copper retirement. Despite that capability, Qwest is refusing to make it available to Covad. The result is an anti-competitive situation in which Qwest not only has the capability of targeting and taking Covad customers, but also rendering Covad unable to at least make the disconnection of its own customer a smooth experience for that customer.

Q. IS QWEST REQUIRED TO PROVIDE THE INFORMATION YOU DISCUSS ABOVE?

A. Yes. The FCC's network change rules, located at 47 C.F.R. § 51.327, set forth the minimum standards for network change notifications. These include an ILEC determination of the "reasonably foreseeable impact" of a planned change.

Q. IN WHAT WAYS DOES QWEST'S PROPOSAL FAIL TO MEET THIS REQUIREMENT?

A. Qwest's proposal does not contain anything that can be characterized as a determination of the "reasonably foreseeable impact" of a copper retirement project. It is simply an announcement of a change with some vague information that must be researched. Only after hours of research can Covad determine exactly what addresses are impacted by the

retirement, and whether the retirement impacts Covad's customers. In other words, Qwest's current notice shifts the burden of determining the "reasonably foreseeable impact" of a retirement onto Covad.

ISSUE 5 - REGENERATION: SHOULD QWEST PROVIDE REGENERATION BETWEEN CLEC COLLOCATIONS, AND WHAT, IF ANYTHING, SHOULD QWEST BE ALLOWED TO CHARGE COVAD FOR REGENERATION?

(Sections 8.2.1.23.1.4 [proposed], 8.3.1.9 [proposed], and 9.1.10 [deleted])

Q. PLEASE PROVIDE SOME CONTEXT FOR THE REGENERATION ISSUE.

A. Regeneration is, quite simply, the reconstruction or "boosting" of a digital signal so that it meets the ANSI standards (ANSI T1.102) for a particular type of loop or service. For example, if by the time a DS1 digital signal travels from one collocation space to another collocation space in the central office ("CO") it does not meet the DS1 signal requirements, then that DS1 signal must be boosted back to the appropriate level. So, in a nutshell, the regeneration issue deals with the situation in which a boosting of the signal is required in order to provision a high capacity circuit between two collocations spaces (either a single CLEC's two spaces or the collocation spaces of two different CLECs) *within* a Qwest CO. Importantly, for purposes of my testimony on this issue, the need for regeneration arises when the collocation spaces are so far apart in the CO that the signal must be boosted – or regenerated – so that it meets the applicable technical specifications when it reaches the second collocation space.

Q. UNDER WHAT CIRCUMSTANCES WOULD REGENERATION BE REQUIRED?

A. There are two scenarios in which the CLEC to CLEC cross-connect regeneration issue arises. In the first scenario, Covad is connecting to the collocation space of another CLEC for purposes of handing off traffic from the Covad network to the other CLEC's

network. More often than not, given differences in timing as to when each CLEC collocated and the type of collocation arrangement selected (caged, cageless, or virtual), the two CLEC's collocation spaces would not be contiguous and instead would be located in areas of the CO separated from each other as determined by Qwest when it assigned these collocation spaces, as I discussed more fully below.

The second scenario is one in which Covad collocated in a central office and, at some later date, determined it needed additional space. In this latter scenario, if no space contiguous to the original collocation is available, then the second Covad collocation space would be located at some distance, determined by Qwest, away from its original collocation space.

Under the Qwest proposal, should the subsequent Covad collocation space be located far away from the existing Covad collocation, or should either the original or subsequent Covad collocation spaces be located away from another CLEC it is doing business with, Covad (and/or the other CLEC) would need to order a "finished service" from the Qwest tariff or incur the cost of placing regeneration equipment either mid span or at both collocation arrangements, to boost the signal between the collocation arrangements.

Q. ARE THERE SITUATIONS OTHER THAN CLEC TO CLEC CROSS-CONNECTIONS WHERE QWEST PROVIDES CENTRAL OFFICE REGENERATION?

A. Yes. Qwest provides regeneration, where it is required by ANSI standards, for interconnection to Qwest's unbundled network elements (i.e., ILEC-CLEC regeneration), and between separate collocations of the same CLEC. For instance, if Covad were to order a dedicated transport circuit between two Qwest central offices, and regeneration

were required between Qwest's frame and Covad's collocation in one of the central offices, Qwest currently provides that regeneration and it is called ILEC-to-CLEC regeneration. Qwest treats ILEC-to-CLEC regeneration as a wholesale product, and costs and prices it on a TELRIC basis.

Q. WHAT DOES QWEST CHARGE FOR ILEC TO CLEC REGENERATION?

A. Qwest does not currently charge for ILEC to CLEC regeneration. In cost dockets over the past several years, some state commissions have approved charges, and others have not. Regardless of the outcome in individual states, it does not appear that Qwest has ever assessed a regeneration charge. Qwest of course will argue that we're just trying to get CLEC regeneration for free. The problem with that argument is that any inability to charge for regeneration is strictly the fault of Qwest. It was given the opportunity to make its case as to the appropriateness and amount of an ILEC-CLEC regeneration charge, and implement that charge, and failed to do so. Qwest cannot pass off its failure to Covad.

Q. YOU MENTIONED PREVIOUSLY THAT THE NEED FOR REGENERATION IS DRIVEN BY CABLE LENGTHS. ARE THERE STANDARDS TO DETERMINE MAXIMUM CABLE LENGTHS?

A. There are. The ANSI standards state that the maximum cable length for a DS1 signal is 655 feet, and the maximum cable length for a DS3 signal is 450 feet. I have included a

Q. ARE THERE ASSUMPTIONS RELATED TO ACHIEVING THESE MAXIMUM DISTANCES?

A. Yes. The ANSI standard assumes that (1) the highest quality cable is used, and (2) the cable is continuous (no intermediate cross-connects). If these assumptions are not met, the maximum length is significantly diminished. In other words, if these assumptions are

not met, the need for regeneration may arise on a DS1 cable that is far less than 655 feet and on a DS3 cable that is far less than 450 feet. I have attached a copy of these standards to my testimony as Covad/110.

Q. MR. NORMAN, QWEST'S WITNESS ON THIS ISSUE, RECENTLY TESTIFIED IN COLORADO THAT THE TRUE MAXIMUM DISTANCE FOR DS3 CONNECTIONS IS 927 FEET, AND NOT 450 FEET AS SET FORTH IN THE ANSI STANDARDS. DO YOU AGREE?

A. No. Mr. Norman is wrong. It appears that he has taken a passage of the ANSI standards out of context, then drawn unsupported and illogical conclusions that defy the laws of physics to support that claim.

Q. PLEASE EXPLAIN.

A. Mr. Norman relied on the following statement, made on page 30 of the ANSI standards, in section B.2.5:

> Typical engineering rules constrain cabling to and from equipment to the DSX-3 cross-connect to up to 450 feet of 75 ohm coaxial cable with tinned copper shield (WE Co 728 A cable or equivalent).

Mr. Norman then leaps to the conclusion that if the maximum distance on one side of the DSX panel is 450 feet, that the distance on the other side of the DSX panel can also be 450 feet. That is complete nonsense. Unless the signal is regenerated at the DSX panel, as sound engineering would require, the signal will be lost at 450 feet, if not sooner.

The real meaning of the passage above is that 450 feet is the maximum distance a DS3 signal can travel to the DSX panel without being lost. Once it is there, engineering calculations have to be made to determine whether the signal can reach its ultimate destination without requiring regeneration. Once the circuit is cross connected at the

DSX panel, additional dB loss occurs, which shortens the distance the signal can travel to less than 450 feet. This has to be taken into account as well when engineering the connection between the DSX panel and the destination equipment. In other words, contrary to Mr. Norman's belief, cross-connection at the DSX panel or any other frame equipment in the central office actually *reduces* the distance the signal may travel to *less than* 450 feet. It does not increase it.

Mr. Norman's statements are the equivalent, in physics terms, of saying that a person out of shouting distance from another person can make themselves heard if another person is located somewhere between them. Common sense tells us that the existence of that third person, in and of itself, makes no difference. Unless that person relays (regenerates) the message, they have no impact. Essentially, Qwest is acting as the third person, and is refusing to relay the message.

Q. IS IT LIKELY THAT THESE MAXIMUM CABLE LENGTHS WILL BE EXCEEDED AND REGENERATION REQUIRED WHEN CONNECTING CLEC COLLOCATION ARRANGEMENTS?

A. Yes. Although excessive cable lengths will occur most often in larger, multi-floor central offices where demand for these circuits will be greatest, long cable runs may also occur in single floor central offices due to the engineering requirements surrounding cable placement.

Q. PLEASE EXPLAIN.

A. When engineering a cable route within a central office, a number of factors that impact the length of cable needed must be considered. In a multi-floor environment, a major impact is the distance to a riser cable opening in either the floor or ceiling. Due to fire safety concerns, cable riser openings are very limited and there may be a need to engineer

a cable run well in excess of 100 feet in order to reach the riser opening. Another engineering requirement is to run "like" cable on the same ladder racking (ladder racking is connected to the ceiling in a central office and used for carrying various types of cable within the central office). For example, transmission cable used to carry DS1 and DS3 signal level circuits cannot be placed on racking used to carry power or fiber optic cable. Other engineering requirements, such as load weighting restrictions for the ladder racking, can also impact the route needed to be used for placing cable. Due to these engineering requirements, it is quite possible to require regeneration on DS1 or DS3 signal level circuits installed between a collocation and a second collocation that is directly above it on the next floor. Several hundred feet of cable could easily be required on each floor even though the collocations are physically only 10 feet apart.

Q. ARE DS1 AND DS3 SIGNAL LEVEL CIRCUITS COMMONLY USED BY COVAD AND OTHER CLECS?

A. Yes. Individual customer circuits (DS0 level) are aggregated onto high capacity DS1 and DS3 signal level circuits for transport to various points in the network. These are the two most commonly used circuit levels by Covad as we have both types in almost all of our collocation arrangements.

Q. WHAT THEN, SPECIFICALLY, IS THE PARTIES' DISAGREEMENT ON THIS REGENERATION ISSUE?

A. The parties' disagreement with respect to this issue is relatively clear. Covad believes it should be able to order regeneration of a CLEC-to-CLEC cross connect on the same terms and conditions it is able to order regeneration for any other interconnection product, such as an unbundled loop, a transport circuit or, specifically as in this case,

an ILEC-to-CLEC cross connect. I set out below Covad's proposed language on the regeneration issue:

> 8.2.1.23.1.4 CLEC is responsible for the end-to-end service design that uses ICDF Cross Connection to ensure that the resulting service meets its Customer's needs. This is accomplished by CLEC using the Design Layout Record (DLR) for the service connection. Depending on the distance parameters of the combination, regeneration may be required. Qwest shall assess charges for CLEC to CLEC regeneration, if any, on the same terms and conditions, and at the same rates as for ILEC to CLEC regeneration.
>
> 8.3.1.9 Channel Regeneration Charge. Required when the distance from CLEC's leased physical space (for Caged or Cageless Physical Collocation) or from the collocated equipment (for Virtual Collocation) to the Qwest network ("ILEC to CLEC regeneration"), to CLEC's non-contiguous Collocation space ("CLEC to CLEC regeneration"), or to the Collocation space of another CLEC ("CLEC to CLEC regeneration") is of sufficient length to require regeneration based on the ANSI Standard for cable distance limitations. Channel Regeneration Charges shall not apply until the Commission approves a wholesale Channel Regeneration Charge. After approval of such charge, Channel Regeneration Charges shall be assessed for ILEC to CLEC and CLEC to CLEC regeneration on the same terms and conditions, and at the same rates. If CLEC requests Channel Regeneration in spite of the fact that it is not required to meet ANSI standards, Qwest will provide such regeneration and CLEC will pay the Channel Regeneration Charge described herein.

Qwest believes it is not required to provide a wholesale regeneration product at a TELRIC price (as opposed to a retail tariff finished service) for CLEC-to-CLEC cross connects.

Q. PLEASE EXPLAIN WHY APPLICATION OF COVAD'S PROPOSAL IS FAIR AND WILL RESULT IN EQUAL TREATMENT OF ALL CLECS.

A. Just as with ILEC-CLEC cross-connect regeneration, CLEC to CLEC cross-connect regeneration is a function of distance and time. It is a function of distance because as a

signal travels across a cable, the signal strength weakens and thus may require regeneration, or boosting, to maintain the appropriate technical parameters. It is a function of time because two CLECs that collocated in 1999 in contiguous or adjacent space and who have a cross-connect may not require regeneration, but a cross-connect between one of the 1999 collocators and a 2004 collocator several floors and linear feet away may require regeneration. Note that the 2004 collocator likely will be placed in a location farther away than a 1999 collocator because all of the collocation spaces near the 1999 collocator where taken by other CLECs that collocated prior to the 2004 CLEC.

In the case of Qwest and the 2004 collocator, regeneration would currently be provided at no charge. However, the same does not hold true if the 2004 collocator wishes to cross-connect with the 1999 collocator. In the latter scenario, the collocator requesting regeneration would have to pay for it, which results in that collocator being penalized in the form of additional costs from which Qwest remains free. The other CLEC likely would feel the cost impact, since it is virtually assured that the requesting CLEC would pass on at least some of the regeneration costs to its CLEC partner. That is an unfair, discriminatory result and should not be permitted by the Commission.

Q. WHY SHOULD QWEST BE REQUIRED TO PROVIDE REGENERATION UNDER THE SAME TERMS AND CONDITIONS AND AT THE SAME RATES AS AN ILEC TO CLEC CROSS CONNECT?

A. As an initial matter, Qwest must perform CLEC to CLEC cross-connects as required by FCC rules. 47 C.F.R. §51.323(h) states:

> An incumbent LEC shall provide, at the request of a collocating telecommunications carrier, a connection between the equipment in the collocated spaces of two or more telecommunications carriers, except to the extent the incumbent LEC permits the carriers to provide the requested connection for themselves... Where technically feasible, the incumbent LEC shall provide the

> connection using copper, dark fiber, lit fiber, or other transmission medium, as requested by the collocating telecommunications carrier.

Further, as the FCC stated in its Fourth Report and Order,

> We find that pursuant to Section 201 that it would be unjust and unreasonable for an incumbent LEC to refuse to provision cross-connects between collocated competitive LECs. We also find that, in the alternative, such a refusal would be unjust, unreasonable and discriminatory within the meaning of Section 251(c)(6).[5]

Contrary to Qwest's assertions, these FCC findings and rules do not create a "regeneration exception" but rather provide that Qwest may either permit CLECs to make their own cross connection arrangements, or it must provide the cross connection, upon request. In the case of cross connections requiring regeneration, it is often impossible for CLECs to provide this regeneration themselves, and usually would require an inefficient engineering configuration even if such regeneration were possible from existing collocation space. Consequently, this regeneration issue is not whether Qwest must provide CLEC to CLEC cross-connects (Qwest surely has to agree that it must do so), but rather whether Qwest must provide regeneration for that CLEC to CLEC cross-connect in order to ensure that the signal traveling from one CLEC collocation space to a different collocation space maintains the appropriate specifications. I believe that law, logic, and technical issues dictate that Qwest is under an obligation to provide CLEC to CLEC regeneration on the same terms and conditions as for ILEC to CLEC regeneration.

Q. WHAT LAW AND LOGIC ARE YOU RELYING UPON?

A. While I am not a lawyer, my understanding is that the FCC's Fourth Report and Order, which I cited above and discuss more fully below, makes very clear what Qwest's

obligations are with respect to CLEC to CLEC cross-connects and, by extension, CLEC to CLEC regeneration. In the Fourth Report and Order, the FCC reconfirmed the fact that ILECs must provision cross-connects for CLECs[6] or, at a minimum, allow CLECs to self-provision those cross-connects.[7]

More importantly, for purposes of resolving the regeneration dispute (Issue 5), the FCC made clear that this legal requirement to provision CLEC cross-connects was made pursuant to Section 251(c)(6) of the Act. What this means from a decisional perspective is key. Section 251(c)(6) is the section of the Act that addresses collocation and which affirmatively requires that ILECs permit CLECs to collocate in a central office in order to interconnect with other carriers and to access UNEs. There is no doubt that ILEC to CLEC cross-connects are designed specifically to meet these statutory purposes. And since the FCC grounded its authority to require CLEC to CLEC cross-connects in Section 251(c)(6), CLEC to CLEC cross-connects likewise are designed to fill the same purposes and must have all the same attributes and properties, such as regeneration, that an ILEC to CLEC cross-connect would have.

A fundamental fact underlying regeneration is that it is generally provided to ensure that carriers can actually interconnect and access UNEs at applicable industry standards. As a consequence, since CLEC to CLEC cross-connects serve the identical

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[5] *In the Matter of Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket No. 98-147, FCC 01-204, Fourth Report and Order (2001) at ¶ 59.

[6] *Id.*

[7] Interestingly, the entirely of the FCC's discussion on this issue was not whether allowing CLECs to provision cross-connects themselves relieved ILECs of the obligation to provision cross-connects for CLECs (which is what Qwest suggests) but rather addressed the fact that the FCC could not *require* ILECs to permit CLECs to self-provision CLEC to CLEC cross-connects. Regardless of whether Qwest can avoid provisioning the cross-connect itself by allowing CLECs to self-provision a cross-connect, the FCC's conclusion that Section 251 gave it the authority to require Qwest to provision CLEC to CLEC cross-connects ultimately means that any such cross-connect must be practically, realistically and technically the same as an ILEC to CLEC cross-connect. If not, then Qwest has failed to comply with the non-discrimination requirements of Section 251. In real world terms, this means that the

purpose as an ILEC to CLEC cross-connect, they should be supplied with regeneration (just as an ILEC to CLEC cross-connect is) when necessary to ensure appropriate technical signals on the same rates, terms and conditions.

Congress and the FCC left no room for question on this point. Because a Section 251(c)(6) obligation carries with it the obligation that Qwest act in a non-discriminatory manner when provisioning collocation elements such as cross-connects, Qwest cannot provide a particular service, like regeneration, for one Section 251(c)(6) cross-connect (here, ILEC to CLEC cross-connects) and then refuse to provide regeneration on the same rates, terms and conditions for another type of Section 251(c)(6) cross-connect (here, CLEC to CLEC cross-connects). To find otherwise would result in collocation, interconnection and access to UNEs that is different from (i.e., inferior) to the quality of the interconnection and access Qwest accords to itself and therefore would be discriminatory. Moreover, since the FCC has already previously defined the requirement of "equal in quality" interconnection as a requirement that Qwest design interconnection facilities to meet the *same technical criteria and service standards, including transmission standards*, that are used within the Qwest network[8], there is no legitimate or good faith reason to treat CLEC to CLEC regeneration on different rates, terms, and conditions than ILEC to CLEC regeneration.

Q. THE REQUIREMENT OF NON-DISCRIMINATION MAKES SENSE WHEN ONE CONSIDERS THE FACT THAT QWEST CONTROLS SPACE ALLOCATION IN THE CENTRAL OFFICE, DOESN'T IT?

CLEC to CLEC cross-connect must be made available on the same rates, terms and conditions as ILEC to CLEC cross-connects.

[8] *Local Competition Order*, ¶224.

A. It does. Qwest controls central office space and determines how to allocate space to itself and collocators within the CO. Presumably, because Qwest makes these decisions, if regeneration is required, it is a result of a Qwest decision. Qwest, however, cannot make these allocation and placement decisions in any old way. The FCC's rules that I discussed above do not permit Qwest to engineer its central office collocation arrangements in a way that artificially increases a CLEC's costs. That is, if Qwest engineers CO space in a fashion that increases a CLEC's costs, without any simultaneous technical or cost benefit to itself, then Qwest is in violation of the FCC's collocation rules which require that Qwest use the most efficient collocation space allocation arrangements possible.

Basically what this means to me is that Qwest should not be allowed to assert a "take it or leave it" cross-connect architecture on Covad, but instead must provide an appropriate and efficient (both from an engineering and economic perspective) cross-connection architecture. Inefficiency in design is exactly what the FCC rules prohibit, and Qwest is required to offer the lowest cost, most technically efficient cross-connect architecture possible. This requirement of efficiency plainly goes hand in hand with the non-discrimination requirement in that both requirements are designed to ensure that Qwest treats its wholesale customers/retail competitors on the same terms and conditions to promote, to the maximum extent possible, a level competitive playing field.

Q. CAN YOU PROVIDE AN EXAMPLE OF WHAT YOU MEAN WHEN TALKING ABOUT EFFICIENCY IN DESIGN?

A. Sure. At the Minneapolis Downtown Central Office, the partner (another CLEC) that Covad was required to use for much of our transport was collocated on the 4th floor. Upon applying for our collocation space, I was shown space on the 5th floor, even though

space was still available on the 4th floor where Covad's partner was collocated. When I asked to be collocated on the 4th floor so that Covad would be able to connect to its partner's collocation more efficiently, Qwest denied my request stating that it had been decided that all future collocations would be on the 5th floor. No other explanation was offered. The DS3 transport circuits between the Covad collocation and our partner's collocation all required regeneration. Although Covad has since replaced these circuits with Qwest UNE transport circuits, should the need ever arise again to use transport circuits provided by a CLEC partner collocated on the 4th floor, regeneration would again be required. It is Qwest's position that the CLEC should assume the costs associated with purchasing transport circuits from their tariff which would significantly increase our cost of providing competitive service. This is a totally unreasonable expectation based upon Qwest's inefficient use of central office space. If Qwest had no other options with respect to providing collocation space, which resulted in the need to provide regeneration between collocation arrangements, then it may be appropriate for Qwest to charge CLECs for regeneration. However, from my observations in handling most of the collocation build outs for Covad in the Qwest region, this situation would be the exception rather than the rule.

Q. DO YOU HAVE SIMILAR CONCERNS WITH CENTRAL OFFICES IN OREGON?

A. Yes. A similar situation may develop in central offices in the Oregon market where Covad may be required to collocate equipment on different floors. As space becomes less available, the probability of having collocations on multiple floors becomes greater. And with the changing competitive and regulatory environment, the need to connect collocations within the same central office will also increase.

The net result in this scenario is that, rather than being able to buy a wholesale product at a cost-based TELRIC rate, Covad would have to purchase a much more expensive tariffed service that would greatly increase its cost of doing business to its detriment and the detriment of its customers to whom the excessive tariffed costs might flow.

Q. QWEST HAS STATED THAT CLECS CAN PERFORM ANY NEEDED REGENERATION FROM THEIR COLLOCATION ARRANGEMENTS. DO YOU AGREE?

A. No. The most efficient placement of the regeneration equipment would be mid span, or at a point about half way between the two collocations. When a signal leaves a carrier's equipment, it is already being transmitted at optimum signal strength per ANSI T1.102. By using mid point regeneration, the signal strength remains much more constant and remains within the ANSI limits, which enhances the capability of maintaining the integrity of the data being transmitted on the circuit. The less deviation from the optimum signal level the better the circuit quality. Just as one may be able to holler from their front steps to the neighbor, the communication will become much more clear and effective if you were to walk to the fence and speak to the neighbor with a normal voice. This fundamental physical principal underlies the ANSI standards.

While there may be a few isolated situations where signal strength can be adjusted at the end points to make a circuit work, there is no way to do this on a regular basis and still meet the specifications of the ANSI standard I discussed earlier. Not only does the ANSI standard contain cable and distance standards, it also contains power standards which cannot be exceeded without causing harm to adjacent circuits.

Q. WHAT KIND OF HARM ARE YOU TALKING ABOUT?

A. What I mean is that the CLEC-regenerated signal would cause digital cross-talk and lead to spectrum interference with the signals being transmitted over all adjacent transmission cables using the same cable racking, such that the signals transmitted by other carriers are completely "scrambled." In other words, the Covad-regenerated signal would disrupt the communications network of those carriers, which may also include Qwest. Just as there are specifications requiring regeneration over certain cable lengths, there are also specifications around how high a signal level can be transmitted in order to maintain the integrity of the network.

Q. HOW COULD A CLEC PERFORM ITS OWN MID SPAN REGENERATION?

A. It is not possible for a CLEC to provide mid-span regeneration. In the first place, it would require the construction of an entirely new collocation space and the placement of regeneration equipment. In other words, it would cost a CLEC at least ***** BEGIN CONFIDENTIAL $XXXXX and up to $XXXXX END CONFIDENTIAL ***** in collocation costs to be able to provide mid-span regeneration and take up to 130 days before such capability would be available. The time and cost associated with regeneration of one, single cross-connect makes it utterly infeasible. No carrier, Qwest or CLEC, can afford to waste time and capital in such a fashion.

Further, it is unclear to me whether a CLEC actually could provide mid-span regeneration. Based on my years of experience in Qwest central offices, the mid-span point could fall in a location in the central office to which CLECs do not have access (i.e., a switching equipment room or an MDF or COSMIC frame). In this case, even if a CLEC were inclined to do so, it would be precluded from providing its own mid-span regeneration.

Q. ISN'T IT TRUE THAT QWEST'S POSITION IN THE ARBITRATION IS DIRECTLY CONTRADICTORY TO ITS PRIOR, LONGSTANDING POSITION ON REGENERATION?

A. Yes, it is. At the first arbitration hearing in Colorado, Qwest explained that Qwest considers a CLEC-to-CLEC cross connect a wholesale product unless that cross connect requires regeneration. In that case, Qwest supposedly will provide a retail regeneration product, available under its access tariff, to provide the connection.

However, this position is entirely inconsistent with Qwest's prior positions and statements regarding regeneration. Not once prior to the Colorado arbitration did Qwest ever argue that any central office regeneration product provided to CLECs should be considered a finished service, or that Qwest had no obligation to provide regeneration, where necessary, under the Act. In fact, two years ago when it first addressed this issue, in response to a Change Request ("CR") submitted by Eschelon, Qwest provided detailed clarification of its CLEC-to-CLEC cross connection product, labeled COCC-X, and stated that the CLEC to CLEC cross-connect can and did include regeneration:

> The CLEC-to-CLEC Cross-Connection (COCC-X) offering is defined as the CLEC's capability to order a cross-connection from its Collocation in a Qwest Premises to its non-adjacent Collocation space or to another CLEC's Collocation within the same Qwest Premises at the Interconnection Distribution Frame (ICDF).
>
> ...
>
> Given the possibility that total cable lengths from the Collocation spaces through the ICDF are longer than the [ANSI Standards] table allows, there is the opportunity for a CLEC to request regeneration by using a specific Network Channel Interface (NCI) code on their order. The NCI is chosen from Table 6-5 of Tech Pub 77386 using one that calls for regeneration.
>
> ...

> Qwest, following receipt of the ASR will perform ICDF connections and regeneration functions. Equipment additions for regeneration (if no spares are available) will be initiated. Qwest completes these activities and conducts verification testing.

Covad/107 at pages 4 and 5.

In addition to the response above, in June of 2003, Qwest proposed "updates" to Tech Pub 77386, including the deletion of the Chapter 15, addressing regeneration for interconnection. When Eschelon raised concerns that deletion of this chapter would eliminate the wholesale regeneration product, Qwest replied:

> Qwest is not eliminating DSX regeneration, but merely changing who is responsible for determining when regeneration is required. The changes in the Tech Pub were driven by this recent change in who is responsible for determining when regeneration is required. More specifically, **the CLEC's are no longer responsible for determining if regeneration is required, Qwest is now responsible for that determination. As a result of this change in responsibility, the tech pub is being updated to remove all statements and NC/NCI codes that indicate that the CLEC's need to order regeneration, or are responsible for determining when regeneration is required.**

Covad/108.

Q. YOU STATED THAT QWEST'S POSITION IN THIS ARBITRATION IS THAT CLEC TO CLEC TIES REQUIRING REGENERATION MUST BE ORDERED AS A FINISHED SERVICE FROM THE TARIFF. DID QWEST TAKE THIS POSITION DURING NEGOTIATIONS PRIOR TO FILING FOR ARBITRATION?

A. I have to reiterate that the answer to that question is emphatically "No." In fact, Qwest never once mentioned during the 18 months of negotiations that CLEC to CLEC regeneration was only ordered and provided as a finished service. As I alluded to in my earlier testimony, Qwest first proffered this position in the prefiled Direct Testimony of Qwest witness Michael Norman in the Colorado Arbitration. Until that time, it was my

belief that the dispute involved whether or not Covad would be required to pay the SGAT/TELRIC based rates or whether the service would be treated like ILEC-to-CLEC regeneration, and Qwest would not charge individual CLECs for it.

Q. IS THERE ANYTHING IN ANY OF THE DOCUMENTATION AVAILABLE TO CLECS THAT WOULD SUGGEST THAT CLEC TO CLEC REGENERATION IS ONLY AVAILABLE AS A FINISHED SERVICE?

A. Not at all. To the contrary, all of the documentation very clearly demonstrates that, until the Colorado arbitration, Qwest very clearly was providing CLEC to CLEC regeneration as a UNE at TELRIC prices. Covad had proposed that the product should instead be treated like ILEC-to-CLEC regeneration, which Qwest had chosen not to charge for.

Q. PLEASE SUMMARIZE COVAD'S POSITION ON THE PRICING OF CLEC TO CLEC CROSS CONNECT REGENERATION.

A. Covad's request in this arbitration is that both forms of regeneration should be priced and treated the same: if Qwest does not charge for regeneration in the context of providing access to network elements (required by the Act and FCC rules), it also should not charge for regeneration in the context of providing CLEC to CLEC cross-connections, which are also required by the Act and FCC rules. There is no justification for treating the two situations differently, and there is certainly no justification for the retail pricing of CLEC to CLEC regeneration that Qwest is now proposing.

Q. HAS THE FCC CONSIDERED THE COMPETITIVE EFFECTS OF ILEC POLICIES AND PRICING REGARDING CLEC-TO-CLEC CROSS-CONNECTS?

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Q. HAS THE FCC CONSIDERED THE COMPETITIVE EFFECTS OF ILEC POLICIES AND PRICING REGARDING CLEC-TO-CLEC CROSS-CONNECTS?

A. Yes. In ruling that ILECs were required to provide central office cross-connects between CLECs, despite the fact that ILECs were not required to allow CLECs to *self-provision* these cross-connects, the FCC said that:

> if an incumbent LEC refuses to provision cross-connects between competitive LECs collocated at the incumbent's premises, the incumbent would be the only LEC that could interconnect with all or even any of the competitive LECs collocated at a common, centralized point – the central office.[9]

The FCC went on to explain that this would have a negative effect on the availability of competitive transport options for CLECs,[10] and that allowing central office cross-connects between CLECs is essential to the development of a competitive market for transport services.[11]

Even if CLECs have the option to self-provision a cross-connect (something the ILECs opposed at the time the Fourth Report and Order was written), ILECs must allow these cross-connections on non-discriminatory terms. If they do not, they create the exact competitive problems the FCC intended to solve in the Fourth Report and Order. For instance, if the cross-connect can only be accomplished in a way that is cost-prohibitive, while cross-connection to Qwest is readily available at reasonable rates, Qwest has an unfair pricing advantage over its competitors in the wholesale transport market, as well as other markets, and carriers are more likely to purchase Qwest's services.

I'll provide an example: suppose Covad had the option of aggressively partnering with a voice CLEC to jointly provide a data and voice bundle to customers. At the same time, Covad could partner with Qwest to provide a similar bundled service through a

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[9] *Fourth Report and Order*, ¶ 63.
[10] *Id.*
[11] *Id.*, ¶ 65.

commercial agreement. If a CLEC-to-CLEC cross-connect is available only at inflated Qwest retail rates, Qwest would be the only viable partner.

Q. IS YOUR ARGUMENT THAT QWEST SHOULD BE REQUIRED TO PROVIDE REGENERATION BECAUSE IT CAN DO SO CHEAPER THAN COVAD?

A. Absolutely not. The telecommunications market is full of examples of carriers who can, for whatever reason, accomplish certain tasks more efficiently than other carriers. That is a function of a free market economy, and is an important part of what makes competition work for consumers. For instance, Qwest can probably provision a cross connection in its central office that *doesn't* require regeneration more efficiently than Covad can, because of scale economies, dedicated on-site central office technicians, and better familiarity with its central office architecture. This is completely different from a situation where regeneration is required. If regeneration is required, Covad will not always be able to place a new collocation to provide the regeneration, and even when it could, it could not do so at a price that could ever be justified. This is not a function of the cost of regeneration equipment or the cost of cabling to Covad, it is a function of Qwest's collocation policies, which do not provide for the placement of this equipment on reasonable terms.

Q. HOW IS THAT DIFFERENT THAN A NORMAL COST ADVANTAGE BETWEEN COMPETITORS?

A. It is different because Qwest is in control of the central office, it is in a position to impose costs on Covad and other CLECs that it does not impose on itself. In other words, it can discriminate against its competitors, and erect barriers to entry. To draw an analogy, imagine two rival trucking companies. Company Q not only runs the largest trucking company in the country, but it also owns every gas station on the interstate highway

system. If Company Q were to refuse to allow other trucking companies, such as Company C, to use its gas stations, it would effectively reduce or eliminate competition. This would clearly be anti-competitive behavior. This is an entirely different situation that if many companies owned gas stations on the highway, and Company Q simply offered its affiliated trucking company discounted fuel. In that situation, Company C could make arrangements to obtain its fuel somewhere else, in an open market. If it ended up paying more for its fuel than Company C, that would not necessary be due to anti-competitive behavior by Company C. In my mind, that is the difference between a cost advantage and a discriminatory barrier to entry.

To apply this analogy to the current issue, Qwest owns all of the gas stations, and is arguing that Covad is free to build its own stations on space that it leases from Qwest at rates that make the project impossible. This is clearly anti-competitive.

Q. ARE YOU CONVINCED BY MR. NORMAN'S ARGUMENT THAT COVAD CAN HAVE A NEW COLLOCATION SPACE CONSTRUCTED AT WHOLESALE RATES?

A. No. While this may sound theoretically possible, this testimony details the actual costs of this solution. Even when the space could be provisioned, which is by no means guaranteed, those costs are ridiculously high on their face. It is inefficient to the point of being impossible. Qwest is essentially asking the Commission to ignore the practical situation and engage in an unrealistically narrow reading of the FCC's rules.

Q. ARE YOU REFERRING TO THE FCC'S RULE ON CLEC-TO-CLEC CONNECTIONS, AND SPECIFICALLY THE SELF PROVISIONING EXCEPTION RELIED UPON BY QWEST?

A. Yes. Mr. Norman argues that 47 C.F.R. § 51.323(h)(1) relieves Qwest of any obligation to provide a cross connection between CLECs if Qwest allows those CLECs to provision it for themselves. This position ignores the fact that the *Fourth Advanced Services Order* was clear in requiring that CLEC-to-CLEC connections be required on terms that met the requirements of section 251(c)(6) of the Act: they must be made available on pricing terms and conditions that are just, reasonable and non-discriminatory. Qwest seems to argue that the FCC's self-provisioning exception overrules the standards set forth in section 251(c)(6), because it has made no attempt, in previous arbitrations, to show how their language complies with this section of the Act.

At the time of the FCC's *Fourth Advanced Services Order* and resulting rules were issued, Incumbent LECs were refusing to allow <u>any</u> connections between CLEC equipment, even between adjacent collocation spaces. The FCC's intent, in my view, was to make sure that CLECs could connect with each other on reasonable terms. I don't think the FCC envisioned at the time that an Incumbent LEC would ever allow CLECs to provision their own connection that spanned the type of distances that would require regeneration, because those connections would almost always traverse common areas or ILEC-controlled areas in the central office. At the time, ILECs were refusing to allow CLECs to build these connections, and the D.C. Circuit had agreed with the ILECs on this point. *See GTE v. FCC*, 205 F.3d 416, 423-424 (D.C. Cir. 2000). It was simply not the problem the FCC set out to solve in the order.

Q. IS THERE CONCRETE EVIDENCE TO SUPPORT THIS POSITION?

A. I believe there is concrete guidance on this issue in the *Fourth Advanced Services Order*, and the Washington Utilities and Transportation Commission recently agreed while

essentially adopting Covad's position. In assessing the FCC's cross connection rule, in light of the discussion in the *Fourth Advanced Services Order,* they stated:

> The FCC addressed the nature of the exception to the rule only in a footnote. Noting that there was no statutory authority for requiring ILECs to allow CLECs to self-provision cross-connections, the FCC stated that CLEC self-provisioning imposes less of a burden on ILEC property when the cross-connection is between adjacent collocation space, "than when the cross-connect would traverse common areas of the incumbent LEC's premises." The FCC encouraged ILECs "to adopt flexible cross-connect policies that would not prohibit competitive LEC-provisioned cross-connects *in all instances*." The FCC appeared to try to avoid imposing unnecessary burdens on ILECs in providing cross-connections to adjacent CLEC collocation facilities, where CLECs can easily self-provision the connection. On the other hand, the FCC distinguished the type of situation present in this arbitration, *i.e.*, a cross-connection that would traverse common areas and make use of a distribution frame.

Washington UTC Docket No. UT-043045, *In the Matter of the Petition for Arbitration of Covad Communications Company with Qwest Corporation Pursuant to 47 U.S.C. section 252(b) and the Triennial Review Order*, Order No. 6, Final Order Affirming, In Part, Arbitrator's Report And Decision; Granting, In Part, Covad's Petition For Review; Requiring Filing Of Conforming Inter-Connection Agreement ("Washington Arbitration Order"), ¶ 89 [citations omitted].

Q. MR. NORMAN POINTS OUT THAT QWEST DOES OFFER AN ACCESS PRODUCT TO PROVIDE REGENERATION. IS THIS OFFERING, AND THE PRICING FOR THIS OFFERING, RELEVANT TO THIS PROCEEDING?

A. No. As I explained above, Qwest is obligated to offer regeneration for CLEC-to-CLEC connections as a wholesale product under section 251(c)(6) of the Act. CLEC-to-CLEC connections are just one of many products and services that are available as wholesale products at TELRIC rates in addition to similar retail product offerings at access rates. The FCC recently made clear that offering an access product in no way relieved an ILEC

from its obligation to provide elements at wholesale under the Act. In doing so, they raised precisely the same concerns that Covad has with Qwest's EICT offering:

> . . . [A] bar on UNE access wherever competitors could operate using special access would be inconsistent with the Act's text and its interpretation by various courts, would be impracticable, and would create a significant risk of abuse by incumbent LECs. It would be unreasonable to conclude that Congress created a structure to incent entry into the local exchange market, only to have that structure undermined, and possibly supplanted in its entirety, by services priced by, and largely within the control of, incumbent LECs. Finally, we find that a competitor's current use of special access in the local exchange market does not conclusively demonstrate non-impairment.

WC Docket No. 04-313; CC Docket No. 01-338, *In the Matter of Unbundled Access to Network Elements; Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Order on Remand, FCC 04-290 (rel. Feb. 4, 2005) ("TRO Remand Order"), ¶ 48.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. This concludes my Direct Testimony, however, I anticipate filing all Reply Testimony permitted by the Commission, and being presented for cross examination at the hearing on the merits.

Contract No.

QWEST DSL VOLUME PLAN AGREEMENT

This Qwest DSL Volume Plan Agreement ("Agreement") is by and between ("Customer") and Qwest Corporation ("Qwest") for participation in the Qwest DSL Volume Plan ("Volume Plan"). This Agreement may refer to Customer and Qwest individually as a "Party," and collectively, as "Parties."

1. SCOPE AND DESCRIPTION OF SERVICE.

1.1 Qwest shall provide the Volume Plan to Customer in accordance with the terms and conditions of this Agreement and Qwest's FCC1 Access Service Tariff ("Tariff"), which is incorporated herein by this reference. Qwest shall provide Qwest DSL Service ("Service") to Customer, including Qwest DSL lines. The Service will allow Customer to offer high-speed, Internet access to Customer's ISP customers and other end users (individually an "End User," and collectively, "End Users") using Qwest as the underlying DSL provider. Customer shall comply with the Tariff and be responsible for all aspects of End User acquisition (marketing, and loop qualification, etc.), ordering, fulfillment, and End-User management (End-User billing, trouble reporting, and repair calls, etc.).

1.2 By participating in the Volume Plan, Customer will receive volume discounts based on the number of active and billable Qwest DSL lines.

1.3 Both Parties agree that Customer shall be considered the consumer of any products and services sold by Qwest under this Agreement, and that this Agreement is not subject to any resale discounts.

2. TERM.

2.1 This Agreement shall commence on the date on which it is executed by Qwest following Customer's execution of this Agreement ("Effective Date"), and it expires on the third anniversary of the "Enrollment Date," which is the date on which Customer's first order is completed by Qwest within Qwest's standard delivery interval ("Term"). The date on which the necessary circuits and systems are installed, tested, and operational to allow Customer to place DSL orders with Qwest electronically shall be called the "Operational Date." The "necessary circuits and systems" means the installation of at least one DSL Host service location and the required circuits and interfaces to complete loop qualifications and issue orders through a Qwest-specified ordering tool.

2.2 The twelve (12) month period to reach the first volume tier will begin on the Enrollment Date. Qwest agrees to use commercially reasonable efforts to meet an Operational Date of , assuming that Customer completes and submits to Qwest both the Customer Profile (as defined in Subsection 5.4) and the VISP Quarterly Forecast (as defined in Subsection 5.3), within ten (10) business days of the Effective Date. If Qwest becomes aware that it will not meet the Operational Date for any reason, including Customer's failure to deliver the Customer Profile or the VISP Quarterly Forecast as required, it will notify Customer in writing of a new projected Operational Date. Customer shall place its first order within thirty (30) days of the Operational Date. If Customer fails to place such an order, the thirty-first (31st) day subsequent to the Operational Date shall be the Enrollment Date. If Qwest fails to complete within its standard delivery interval a first order placed within thirty (30) days of the Operational Date, a new Operational Date shall be established by Qwest, and Customer shall place its next order within thirty (30) days of this new Operational Date. This process shall be repeated until the Enrollment Date is set. Once the Enrollment Date is established, the Parties shall issue an Amendment to this Agreement to document the Enrollment Date.

2.3 If Customer wishes to continue to participate in the Volume Plan after the Term, a new agreement with Qwest must be executed.

3. CHARGES AND BILLING.

3.1 Exhibit 1, incorporated herein by this reference, lists the standard Qwest DSL Subscriber pricing (pre-tax) as well as the volume discount options Customer may receive based on the number of DSL lines Customer orders and installs. Customer will be eligible for only one of the discount plans, and Customer shall select the discount plan by checking the appropriate box below. The discounts will apply only to the monthly recurring charge ("MRC"), and will not apply to any nonrecurring charge ("NRC"). Customer is not eligible to participate in any DSL regulated promotions during the Term. During the first twelve (12) months following the Enrollment Date, Customer agrees to order and install the number of active, billable, Qwest DSL lines required by its discount plan selection below. Additional commitments may apply as provided in Exhibit 1, depending on the discount plan.

☐ Basic Discount Option (15,000 Qwest DSL lines)
☐ Volume Commitment Option I ([1] Qwest DSL lines X 25% =)

3.2 In addition to such MRCs and NRCs, Customer is responsible for all Taxes assessed in connection with the Volume Plan and the Service. "Taxes" means any and all applicable foreign, federal, state and local taxes, including without limitation, all use, sales, value-added, surcharges, excise, franchise, commercial, gross receipts, license, privilege or other similar taxes, levies, surcharges, duties, fees, or other tax-related surcharges, whether charged to or against Qwest or Customer, with respect to the Volume Plan and the Service, but excluding any taxes based on Qwest's net income. Qwest will not charge Customer for Taxes if Customer provides appropriate tax exemption certificates to Qwest. Customer will indemnify and pay Qwest for any tax assessment, penalties, and interest if any exemption certificate provided to Qwest by Customer is found invalid by a tax jurisdiction.

3.3 Customer shall pay each invoice within thirty (30) days of its receipt of the invoice. Late payments are subject to a late charge as specified by the Tariff, and if there is no such rate specified therein, the late charge shall be equal to one and one half percent (1½%) per month or the maximum allowed by law, whichever is less. The Volume Plan does not include customer premises equipment ("CPE"), and all prices for Service under this Agreement will be offered and charged to Customer independently from and regardless of Customer's purchase of any CPE or other services from Qwest. Customer's payment obligations are not contingent upon Customer's ability to collect payments or charges from any third party (including, without limitation, any End Users, affiliates, agents, brokers, or resellers).

3.4 Qwest reserves the right to modify the rates and charges, and change the Volume Plan, however, any percentage discount available to Customer under the Volume Plan may not be modified during the Term except as specifically provided herein. The rates and charges contained herein may change as required by the Tariff.

4. SERVICE CHANGES.

4.1 Customer may request additions/deletions to the Volume Plan or Service, and Qwest may supply such additions/deletions to Customer, subject to the following conditions: a) Qwest commercially offers such additions/deletions and necessary facilities are technically and practicably available; and b) the charges for the additions/deletions will be at the rates in effect for the Volume Plan at the time of such additions/deletions and which correspond to the remaining portion of the Term.

4.2 An additional NRC applies when Customer changes a Qwest DSL Host port speed after Qwest DSL Host service is established, or when Customer requests a change in speed for an End User. The charges for these changes will be the then-current Tariff rates at the time the change is made. Current Tariff rates are shown in Exhibit 1.

[1] Minimum 60,000 DSL lines.

5. CUSTOMER OBLIGATIONS.

5.1 It will be the sole responsibility of Customer to market, advertise and promote its product to potential End Users. Qwest will have no direct business contact with any End Users, except as stated in Subsection 5.15. Customer may represent the DSL lines as its own, and brand the service accordingly.

5.2 Customer will establish 'Restricted' Qwest DSL Host Service in all LATAs where Customer wishes to purchase Qwest DSL lines as defined in the Tariff. A 'Restricted' Qwest DSL Host customer is one that is responsible for placement of all of its own end-user orders and is not available for selection as a host by a public end user.

5.3 Customer shall provide Qwest a quarterly DSL line forecast by state, city, and month on a twelve (12) month rolling basis ("VISP Quarterly Forecast").

5.4 Customer shall complete and return to Qwest the customer profile form provided by Qwest to Customer ("Customer Profile").

5.5 Customer will receive qualified loop data electronically. Customer may perform real-time loop qualifications for individual End Users.

5.6 Customer will submit orders for Qwest DSL lines electronically. The customer of record for the Service will be Customer. The customer of record for the voice line will be the End User.

5.7 Customer shall provide to End Users CPE qualified by Qwest to work with the Qwest DSL network. Upon request, Qwest will provide to Customer a list of qualified CPE.

5.8 Qwest agrees to perform CPE qualification testing for Customer on one modem model at no charge. Customer shall pay Qwest Fifteen Thousand U.S. Dollars ($15,000.00) for each additional modem model/version qualification testing requested by Customer. This charge is payable prior to qualification testing and it will not be refunded regardless of the outcome of the test.

5.9 Customer shall be responsible for providing technical support to the End User after the Qwest DSL line has been installed. Technical support shall mean providing general product information, collecting technical problem information, screening customer support requests, problem isolation, configuration support, and defect determination. Customer will show a continuing and resolute effort to direct End Users to call only Customer's designated, support centers. Failure to make such an effort shall constitute a material breach of this Agreement. Qwest's responsibility is to support Customer as provided in Section 6, and therefore, Qwest will direct any and all End-User calls placed to a Qwest DSL support center back to Customer's designated, support centers.

5.10 Customer will be responsible for billing its End Users for Service. End Users will contact Customer for all billing questions or disputes related to Service.

5.11 Customer will designate a point of contact(s) other than Qwest for use by End Users for all troubleshooting and repair issues related to Service.

5.12 Subject to Subsection 5.13, Customer agrees to use the standard Qwest Business-to-Business electronic, user interface. Customer shall access such Graphical User Interface ("GUI") via its Web browser and the Internet. Customer may use this interface for, among other things: ordering, billing, loop qualification, and repair ticketing. The GUI is provided as the basic, transaction method for Volume Plan customers, and thus, no charges, except for any applicable termination charges, apply for use of this interface.

5.13 Customer may choose an Extensible Markup Language ("XML") electronic interface instead of the GUI. The XML interface includes multiple transaction Application Plan Interface ("API") gateways

associated with ordering, billing, loop qualification and repair ticketing. Qwest will provide Customer detailed specifications for these API gateways upon request. Customer is responsible for developing its interface to the API gateways prior to launch. Customers who choose the XML Interface Option will incur the following charges: (a) A one-time, setup fee of Three Hundred Fifty Thousand U.S. Dollars ($350,000.00) (which includes documentation, training, and two rounds of end-to-end testing); and (b) A fee of Twenty-Five Thousand U.S. Dollars ($25,000.00) for each additional end-to-end test (if additional testing is requested or required by Qwest).

5.14 If Customer requires services not included in the Volume Plan and Qwest agrees to supply such services, the Parties shall prepare and execute a written amendment to this Agreement, describing such services and all applicable terms and conditions, including pricing.

5.15 Customer will submit repair tickets for Qwest DSL lines electronically. Customer shall allow Qwest technicians to contact Customers' end users if Qwest deems it necessary for purposes of troubleshooting a Customer-initiated, repair request.

5.16 Customer's use of the Service and participation in the Volume Plan shall comply in all material respects with all applicable foreign, federal, state or local laws or regulations, including obtaining any applicable licenses, approvals, and regulatory authority for its use of the Service. Customer agrees to defend, indemnify and hold harmless Qwest, its affiliates, and contractors from any and all third party claims, liabilities, costs and expenses, including reasonable attorneys' fees, arising from or related to use, resale or modification of Service by Customer or End Users.

6. QWEST OBLIGATIONS.

6.1 Qwest will provide Customer qualified loop data and the capability to perform real-time loop qualifications for individual End Users.

6.2 Qwest will process orders submitted by Customer in Qwest's prevailing, standard, delivery interval, which is five (5) business days currently. If Customer submits a valid, qualified order for Service in a service area in which Qwest offers Service under this Agreement, and for reasons other than the fault of Customer the order is either (a) not accepted into Qwest's system, or (b) accepted, but not processed within Qwest's prevailing, standard, delivery interval, then Customer will receive credit for such order towards Customer's volume commitments hereunder, as if such order were an active, billable port.

6.3 Qwest will provision Service for Customer on the End User's voice line only when the End User has a Qwest-provided voice line that qualifies for Service.

6.4 Qwest will provide Customer the ability to monitor the status of orders Customer has placed. Qwest will not provide order status to the End User. Qwest will also supply access to basic Qwest proprietary systems related to Qwest DSL line diagnostics as available in certain Qwest central offices, including access to network diagnostic data. Although Qwest will not charge for access to the systems and services described in this Section at present, Qwest reserves the right to charge for access to these systems and services in the future, including any enhancements thereto. Customer will purchase all necessary interconnection/transport services associated with connecting to Qwest's systems.

6.5 Qwest will bill Customer for all Qwest DSL lines that Customer has ordered, which are installed and operational. The bill provided to Customer will include the total number of subscribers, the telephone number of each subscriber, the Service price for each telephone number, and the discount awarded to Customer (based on the number of Qwest DSL lines Customer has installed and the discount program selected).

6.6 If Customer has a good-faith dispute concerning its bill, Customer will notify Qwest of its concerns, and Qwest will provide Customer with appropriate information to explain and/or justify the bill.

6.7 Qwest will repair Service at the End User's location if it is determined that problems with the End User's Service are the responsibility of Qwest. If Qwest determines that the trouble at the End User's location was not Qwest's responsibility, Customer will be billed for all costs incurred by Qwest.

7. **JOINT OBLIGATIONS.** Qwest and Customer will confer as reasonably necessary to track and analyze key DSL metrics, ensuring timely provisioning and maintenance with respect to Customer's purchase of Service as well as Customer's progress toward meeting subscriber commitments.

8. **TERMINATION.**

8.1 Qwest may (a) immediately suspend all or any part of the Service, and/or (b) terminate this Agreement (effective after the applicable notice period): (i) for Cause (as defined herein); or (ii) upon written notice if Customer becomes or is declared insolvent or bankrupt or is the subject of any proceedings related to its liquidation, insolvency or for the appointment of a receiver or similar officer for it. "Cause" means the failure of a Party to perform a material obligation under this Agreement which failure is not remedied, if curable: (a) in the event of a payment default by Customer, upon five (5) calendar days written notice, or (b) in the event of any other general default, upon thirty (30) calendar days, written notice to the other Party. Customer may terminate this Agreement for Cause. If Customer terminates this Agreement for Cause prior to the conclusion of the Term, then Customer shall remain liable for charges accrued but unpaid as of the termination date. If, prior to the conclusion of the Term, this Agreement is terminated, in whole or in part, either: (a) by Customer for any reason other than Cause, or (b) by Qwest pursuant to this Subsection, then Customer shall pay for all accrued and unpaid charges for Services provided through the effective date of such termination plus the cancellation charges, termination liabilities, and rate adjustments described in Section 8.

8.2 If termination of this Agreement occurs prior to Customer ordering and Qwest accepting one hundred (100) orders and during the first (60) days following the Enrollment Date, cancellation charges shall be those reasonable costs incurred by Qwest through the date of termination, plus any other cancellation charges described herein.

8.3 If Customer selects the Basic Discount Option, it shall comply with the Basic Discount Option DSL line commitment described in Section 1 of Exhibit 1. If Customer fails to meet this commitment, Qwest shall have the right to terminate Customer's participation in the Volume Plan, and Customer shall pay to Qwest 100% of the total accumulated discount credited to Customer for the year at issue plus a ten percent (10%) surcharge on such discount. Such termination charge is due and payable within thirty (30) days of the invoice date. Such termination of participation in the Volume Plan shall not result in the disconnection of Service to End Users.

8.4 If Customer selects the Volume Commitment Option I, it shall comply with the Volume Commitment Option 1 DSL line commitment described in Section 2 of Exhibit 1. If Customer fails to meet this commitment, Qwest shall adjust Customer's enrollment in the Volume Plan and the discounts granted Customer, as follows: (a) Customer will be placed into the Basic Discount Option and will be subject to its terms, including the requirement to have a minimum of 15,000 active and billable Qwest DSL lines by the end of the twelve (12) month period commencing on the Enrollment Date; (b) the appropriate discount from the Volume Plan Discount Table will be applied prospectively to the actual active or billing DSL lines; and (c) Customer shall pay to Qwest 100% of the total accumulated discount credited for the year at issue plus a 10% surcharge on such discounts. Such termination charge is due and payable within thirty (30) days of the invoice date. Such termination of participation in the Volume Plan shall not result in the disconnection of Service to End Users.

8.5 In the event Customer has selected the GUI option and fails to have a minimum of 15,000 active and billable DSL lines by the end of the twelve (12) month period commencing on the Enrollment Date, Customer shall pay to Qwest an additional sum of up to One Hundred Thousand U.S. Dollars ($100,000.00) ("Total GUI Charge") which both Qwest and Customer agree reasonably reflects Qwest's expense to create the GUI for Customer. Customer shall pay the following percentage of the Total GUI

Charge to Qwest as determined by Customer's number of active and billable DSL lines as of the end of the twelve (12) month period commencing on the Enrollment Date: (a) More than 12,000 DSL lines, but fewer than 15,000 DSL lines, forty percent (40%); (b) More than 8,000 DSL lines, but fewer than 12,001, eighty percent (80%); and (c) Fewer than 8,001 DSL lines, one hundred percent (100%). Such amount is due and payable within thirty (30) days of the invoice date.

9. **LIMITATION OF LIABILITY.** EXCEPT FOR CUSTOMER'S PAYMENT AND INDEMNIFICATION OBLIGATIONS EXPRESSLY SET FORTH IN THIS AGREEMENT, NEITHER PARTY, ITS AFFILIATES OR CONTRACTORS SHALL BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OR FOR ANY LOST OR IMPUTED PROFITS OR REVENUES OR LOST DATA OR COSTS OF COVER ARISING FROM OR RELATED TO THE SERVICES OR THIS AGREEMENT, REGARDLESS OF THE LEGAL THEORY UNDER WHICH SUCH LIABILITY IS ASSERTED AND REGARDLESS OF WHETHER A PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH LIABILITY, LOSS, OR DAMAGE. CUSTOMER'S EXCLUSIVE REMEDIES FOR ANY AND ALL CLAIMS RELATED TO THE SERVICE SHALL BE LIMITED TO: (A) THOSE REMEDIES SET FORTH IN THE APPLICABLE OUT-OF-SERVICE CREDIT; OR (B) IF THERE IS NO SUCH APPLICABLE CREDIT, THE TOTAL MRC PAID BY CUSTOMER TO QWEST FOR THE AFFECTED SERVICE IN THE MONTH IMMEDIATELY PRECEDING THE OCCURRENCE OF THE EVENT GIVING RISE TO THE CLAIM. QWEST'S TOTAL AGGREGATE LIABILITY ARISING FROM OR RELATED TO THIS AGREEMENT SHALL NOT EXCEED THE TOTAL MRCS PAID BY CUSTOMER TO QWEST PURSUANT TO THIS AGREEMENT IN THE MONTH IMMEDIATELY PRECEDING THE OCCURRENCE OF THE EVENT GIVING RISE TO THE CLAIM.

10. **DISCLAIMER OF WARRANTIES.** QWEST MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AS TO ANY SERVICE PROVISIONED HEREUNDER. QWEST SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR TITLE, OR NONINFRINGEMENT OF THIRD-PARTY RIGHTS. NO ADVICE OR INFORMATION GIVEN BY QWEST, ITS AFFILIATES OR ITS CONTRACTORS OR THEIR RESPECTIVE EMPLOYEES SHALL CREATE ANY WARRANTY.

11. **FORCE MAJEURE.** Neither Party will be liable for any delay or failure to perform its obligations hereunder if such delay or failure is caused by an unforeseeable event (other than a failure to comply with payment obligations) beyond the reasonable control of a Party, including without limitation: act of God; fire; flood; labor strikes or unrest; sabotage; fiber cut; material shortages or unavailability or other delay in delivery not resulting from the responsible Party's failure to timely place orders therefor; lack of or delay in transportation; government codes, ordinances, laws, rules, regulations or restrictions; war or civil disorder; or acts of terrorism.

12. **DISPUTE RESOLUTION.** Any dispute arising out of, or relating to, this Agreement which cannot be resolved by the Parties will be settled by arbitration, which will be conducted in accordance with the Judicial Arbitration and Mediation Services ("JAMS") Comprehensive Arbitration Rules. The Federal Arbitration Act, 9 U.S.C. Sections 1-16, not state law, shall govern the arbitrability of the dispute. Either Party may initiate arbitration by providing to JAMS a written demand for arbitration (with a copy to the other Party), a copy of this Agreement and the administrative fee required by JAMS. The written demand for arbitration shall be sufficiently detailed to permit the other Party to understand the claim(s) and identify witnesses and relevant documents. Except for the administrative fees in commencing the arbitration, or filing any counterclaims, the costs of the arbitration, including arbitrator's fees, shall be shared equally by the Parties; provided, however, that each Party shall bear the cost of preparing and presenting its own claims and/or defenses (including its own attorneys' fees). The arbitration will be held in Denver, Colorado. The arbitrator has no authority to award any indirect, incidental, special, punitive, or consequential damages, including damages for lost profits. The arbitrator's decision shall follow the plain meaning of this Agreement and shall be final, binding, and enforceable in a court of competent jurisdiction. If either Party fails to comply with the dispute resolution process set forth herein (including, without limitation, nonpayment of an arbitration award) and a Party is required to resort to court

proceedings to enforce such compliance, then the noncomplying Party shall reimburse all of the costs and expenses incurred by the Party requesting such enforcement (including reasonable attorneys' fees).

13. **CONFIDENTIALITY.** Neither Party shall, without the prior written consent of the other Party, disclose or use (except as expressly permitted by, or required to achieve the purposes of, this Agreement) the Confidential Information of the other Party, during the Term and for one (1) year following the expiration or termination hereof. Such consent by Qwest may be given only by Qwest's Corporate Legal Department and any purported consent by any other person, including any Qwest sales or customer service representative, is void and of no effect. "Confidential Information" means written or electronic information that is either: (a) marked as confidential and/or proprietary, or which is accompanied by written notice that such information is confidential/proprietary, or (b) not marked or accompanied by notice that it is confidential/proprietary, but which, if disclosed to any third party, could reasonably and foreseeably cause competitive harm to the owner of such information. Confidential Information shall not include information which, as demonstrated by the receiving Party: (a) is in the public domain or otherwise ceases to be secret or confidential through no breach of this Agreement by the receiving Party; (b) is already known or is developed independently by the receiving Party independent of any disclosure by the disclosing Party; or (c) is revealed to recipient by a third party who does not thereby breach any obligation of confidentiality and who discloses such information in good faith. Confidential Information shall include, but not be limited to, the terms (including pricing) and existence of this Agreement; provided, however, that either Party may disclose the existence of this Agreement (but none of its terms) as may be reasonably necessary for such Party to conduct its business. Each Party will take reasonable precautions to protect the other Party's Confidential Information, using at least the same standard of care as it uses to maintain the confidentiality of its own confidential information. The receiving Party may disclose Confidential Information if required by a governmental agency, by operation of law, or if necessary in any proceeding to establish rights or obligations under this Agreement, provided that the receiving Party gives the disclosing Party reasonable prior written notice sufficient to permit the disclosing Party an opportunity to contest such disclosure.

14. **INTERRUPTIONS TO SERVICE.** The Tariff shall govern any credit allowances granted to Customer for any Service interruptions.

15. **PUBLICITY.** Neither Party shall, without the prior written consent of the other Party: (a) issue any press release or make any other public announcement regarding this Agreement or any relation between Customer and Qwest; or (b) use the name, trademarks or other proprietary identifying symbol of the other Party or its affiliates. Such consent by Qwest may be given only by Qwest's Corporate Communications Department and any purported consent by any other person, including any Qwest sales or customer-service representative, is void and of no effect.

16. **GENERAL PROVISIONS.**

16.1 This Agreement shall be governed by the laws of the State of New York, without regard to its choice of law principles.

16.2 If any provision of this Agreement is held to be unenforceable, the unenforceable provision shall be construed as nearly as possible to reflect the original intent of the Parties and the remaining provisions shall remain in full force and effect.

16.3 Neither Party's failure to insist upon strict performance of any provision of this Agreement shall be construed as a waiver of any of its rights hereunder. All terms and provisions of this Agreement which should by their nature survive the termination of this Agreement shall so survive.

16.4 This is a retail marketing agreement. Customer may not assign this Agreement or any of its rights or obligations hereunder without the prior written consent of Qwest, which consent will not be withheld unreasonably.

16.5 The terms, representations, warranties and agreements of the Parties set forth in this Agreement are not intended for, nor shall they be for the benefit of or enforceable by, any person or entity that is not a Party.

16.6 Except as otherwise provided herein, all required notices shall be in writing, transmitted to the Parties' addresses specified in the signature page, Qwest's Customer billing address, or such other addresses as may be specified by written notice, and will be considered given either: (a) when delivered in person to the recipient named on the signature page; (b) when deposited in either registered or certified U.S. Mail, return receipt requested, postage prepaid; or (c) when delivered to an overnight courier service.

16.7 If a Party returns this Agreement by facsimile machine, the signing Party intends the copy of the authorized signature printed by the receiving facsimile machine to be its original signature.

16.8 If there is any conflict between this Agreement and the Tariff or its replacement, the then-current tariff shall prevail.

16.9 This Agreement (together with the signature page and Exhibit 1) constitutes one and the same legally binding instrument and the entire agreement between Customer and Qwest with respect to the subject matter hereof, and supersedes all prior offers, contracts, agreements, representations and understandings made to or with Customer by Qwest, whether oral or written, relating to the subject matter hereof. All amendments to this Agreement shall be in writing and signed by authorized representatives of the Parties. This Agreement does not address sales or services related to CPE. CPE is addressed in a separate agreement. Qwest may act in reliance upon any instruction, instrument, or signature reasonably believed by Qwest to be genuine. Customer agrees that any employee of Customer who gives any written notice or other instruction in connection with this Agreement has the authority to do so.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Parties have read, understand and agree to all of the above terms and conditions of this Agreement, and hereby execute and authorize this Agreement as of the Qwest signature date below.

Customer	Qwest Corporation
Authorized Signature	Authorized Signature
Name Typed or Printed	Name Typed or Printed
Title	Title
Date	Date
Address for Notices	Address for Notices
	Qwest Corporation 1801 California Street, Suite 3600 Denver, Colorado 80202 Facsimile #: (303) 295-6973 Attn: Legal Department

EXHIBIT 1
QWEST DSL VOLUME PLAN AGREEMENT

QWEST DSL Subscriber Pricing

Each Qwest DSL Subscriber must pay for his/her/its residential or business phone line.

The rates below ("Rates") are based on the month-to-month Qwest DSL Service rates as forth in Section 8.4.5 of the Qwest FCC1 Access Service Tariff ("Tariff"). The Rates may change without notice. If there is any conflict between this Exhibit 1 and the Tariff or its replacement, the then-current tariff shall prevail.

	$99.00	$21.95
	$99.00	$31.95
	$30.00	
Professional Products		
	$99.00	$55.00
	$99.00	$66.00
	$99.00	$88.00
	$99.00	$165.00
	$99.00	$275.00
	$30.00	

One, three and five-year Tariff Contract Rates as defined in the Tariff are not eligible for discounts under the Qwest DSL Volume Plan.

NRCs are not subject to discount.

Volume Plan Discount Table

Total DSL Lines in Service (aggregated active ports)	Discount (applicable to all speeds and term plans) 36-Month Agreement
Up to 15,000	11% of the total monthly recurring bill
15,001 to 30,000	12% of the total monthly recurring bill
30,001 to 60,000	13% of the total monthly recurring bill
60,001 to 120,000	14% of the total monthly recurring bill
120,001 to 200,000	15% of the total monthly recurring bill
200,001 to 400,000	17% of the total monthly recurring bill

Customer must acquire 15,000 active billing ports or subscribers in the first 12 months.

Customer is eligible for one of the following discount options:

1. Basic Discount Option (Discount based on achieved volume).

Customer(s) must commit to acquiring a minimum of Fifteen Thousand (15,000) active and billable Qwest DSL lines by the end of the 12th month of its 36-month Fixed Period Service Rate Plan ("Plan"). In exchange for this commitment, Customer shall be granted the applicable discount contained in the Volume Plan Discount Table provided herein. If Customer does not have a minimum of Fifteen Thousand (15,000) active and billable Qwest DSL lines by the end of the initial 12-month period, Qwest reserves the right to terminate Customer's participation in the Plan. Customer must maintain a minimum of Fifteen Thousand (15,000) active and billable Qwest DSL lines during the entire Term.

In the event Qwest terminates Customer's participation in the Basic Discount Option, any subsequent orders for Qwest DSL lines placed by Customer will be charged the then-current, month-to-month Tariff rates for the respective Qwest DSL Service requested.

2. Volume Commitment Option 1 (Discount based on committed volume).

Customer will commit to acquiring ( )[2] Qwest DSL lines over the Term of this Agreement (Thirty-Six (36) Months).

Qwest will grant Customer the discount for the committed volume as provided in the Volume Plan Discount Table. The discount will be applied to the total monthly recurring bill throughout the term of this Agreement.

Qwest will perform an annual review of the number of active billing Qwest DSL lines. Customer will acquire 25% of the total committed DSL lines by the end of the first twelve (12) months, 60% of the total DSL lines by the end of the first twenty-four (24) months, and 100% of the total DSL lines by the end of the term of this Agreement.

At the end of the first 12-month period, if Customer's DSL line volume is at a higher level than anticipated, Customer will be given the opportunity to receive a larger discount by choosing to commit to a higher volume tier than it did originally. In order to receive a larger discount, Customer's DSL line count must meet 25% of the higher commitment level within twelve (12) months from the election. Upon making the new volume commitment, the higher discount will be applied prospectively to the monthly DSL charges for current lines in service and all future lines installed, as long as Customer meets the active and billable DSL line thresholds for the new volume commitment.

[2] Minimum 50,000 DSL lines.

DOC 01481

State Of Minnesota
Department of Commerce
INFORMATION REQUEST

P-5692,421/IC-04-549

Information Requested From: Qwest Corporation

Information Requested By: Ferguson, Sharon
Date Requested: 08/31/2004
Date Response Due: 09/10/2004

REQUEST:

As of June 30, 2004 or some other convenient date, how many of each of the following types of loops does Qwest have in Minnesota?

A. FTTH (Fiber to the home)

B. FTTP (Fiber to the premises)

C. FTTC (Fiber to the curb)

D. FTTN (Fiber to the neighborhood)

RESPONSE:

Qwest objects on the grounds that the right of ILECs to retire copper loops recognized in the TRO is not conditioned upon whether the ILEC has previously deployed fiber loops. Without waiving these objections, Qwest states that it has not deployed in Minnesota any of the types of loops listed in the request above as contemplated by the FCC in the TRO regarding next-generation networks, i.e., fiber loops that support truly broadband transmission capabilities such as voice, data, video and other services.

A. As of November 2003, Qwest had 52 terminations of fiber optic cables to end user home locations in Minnesota that are only capable of providing voice service. These fiber terminations are the result of a 1991 (approximate) trial of fiber placement that utilized a non-standard network architecture that was never approved and generally installed by Qwest.

B. 0

C. As of September 2004, Qwest had 1187 fiber to the curb (again not as currently defined) terminations that involved the use of copper drops that only provide voice service. These terminations were the result of a 1994 (approximate) trial of fiber placement that utilized a non-standard network architecture that was never approved and generally installed by Qwest.

D. Qwest is not familiar with the term "fiber to the neighborhood" loops and for purposes of this response is treating "FTTN" loops as fiber to the node loops.

Respondent: Maryann Klasinski, Qwest Manager
Karen Stewart

SUPPLEMENTAL RESPONSE dated 9/14/04:

Without waiving the previous objections, Qwest states that it has not

deployed in Minnesota any of the types of loops listed in the request above as contemplated by the FCC in the TRO regarding next-generation networks, i.e., fiber loops that support truly broadband transmission capabilities such as voice, data, video and other services. Qwest responds further as follows:

A. FTTH - 0

As of November 2003, Qwest had 52 terminations of fiber optic cables to end user home locations in Minnesota that are only capable of providing voice service. These fiber terminations are the result of a 1991 (approximate) trial of fiber placement that utilized a non-standard network architecture that was never approved and generally installed by Qwest.

B. FTTP - 0

C. FTTC - 0

As of September 2004, Qwest had 1187 fiber to the curb (again not as currently defined) terminations that involved the use of copper drops that only provide voice service. These terminations were the result of a 1994 (approximate) trial of fiber placement that utilized a non-standard network architecture that was never approved and generally installed by Qwest.

D. FTTN - 0

Qwest is not familiar with the term "fiber to the neighborhood" loops and for purposes of this response is treating "FTTN" loops as fiber to the node loops.

Respondent: Karen Stewart

Covad/103
Zulevic/1

Qwest
Spirit of Service™

November 19, 2004

Megan Doberneck
Covad Communications Company
7901 Lowry Blvd.
Denver, CO 80230
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TO:Megan Doberneck

Announcement Date:	**November 19, 2004**
First Effective Date:	**January 28, 2005**
Document Number:	**NETW.11.19.04.A.001252.Copper_Retlmts_Network_Disclosure**
Notification Category:	**Network Notifications**
Target Audience:	**CLECs, IXCs, ILECs, Cellular, Paging**
Subject/Product Name:	**Copper Retirements in AZ, CO, ID, MN, MT, NM, and WY**

Please route this notice to those in your company who have responsibility for the maintenance and implementation of your telecommunications network.

The attached Network Disclosure Announcement reflects the availability in certain areas of Qwest Communications to deliver new or augmented services.

If you have any questions or would like to discuss this notice please contact your Qwest Sales Manager, Elena Donaghy on (559) 434-9754 or your Qwest Service Manager, Eric Yohe on (303) 382-2678. Qwest appreciates your business and we look forward to our continued relationship.

Sincerely,

Qwest

Note: In cases of conflict between the changes implemented through this notification and any CLEC interconnection agreement (whether based on the Qwest SGAT or not), the rates, terms and conditions of such interconnection agreement shall prevail as between Qwest and the CLEC party to such interconnection agreement.

The Qwest Wholesale Web Site provides a comprehensive catalog of detailed information on Qwest products and services including specific descriptions on doing business with Qwest. All information provided on the site describes current activities and process. Prior to any

modifications to existing activities or processes described on the web site, wholesale customers will receive written notification announcing the upcoming change.

If you would like to unsubscribe to mailouts please go to the ?Subscribe/Unsubscribe? web site and follow the unsubscribe instructions. The site is located at:

http://www.qwest.com/wholesale/notices/cnla/maillist.html

cc: Elena Donaghy
Eric Yohe

Qwest Communications 1600 7th Ave Room 1806 Seattle WA 98008

Covad/103
Zulevic/3

700 West Mineral
Littleton, CO. 80120

Qwest

Network Disclosure Announcement No. 509

Public Notice of Network Change(s), Pursuant to CFR 47, subsections 51.325 - 51.335.
Qwest's Internet address: http://www.qwest.com/disclosures.

Copper Retirements in Arizona, Colorado, Idaho, Minnesota, Montana, New Mexico, & Wyoming

First Implementation Date: January 28, 2005 (Due to city requirements – Pls See AZ Entry)
Network Notices will be sent out to all affected CLECs associated with this specific copper retirement in addition to this Network Disclosure filing.

Other Implementation Dates: Range from February 21, 2005 – December 31, 2005

Original Date Posted: November 18, 2004

Summary: Copper Retirements are necessary to respond to various factors in the Outside Plant, including road construction, maintenance problems, and growth accommodation. Replacement cables may be either copper or fiber. Specific information will be provided with each disclosure.

Locations, Timing of Deployments & Interface Requirements: The following gives additional details on the copper retirement(s):

1	**STATE**	ARIZONA
	WIRE CENTER	CHANDLER MAIN
	8-CHARACTER CLLI	CHNDAZMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	05-Apr-05
	DA (s)	210914; 210915
	FDI Address(es)	1420 E RAY RD; 980 E ORCHID
	Replacing	This job will relocate aerial cable that is conflict with a town of gilbert road project. the road project location is being fed from the wrong da and this will also be corrected on this job
2	**STATE**	ARIZONA
	WIRE CENTER	GREEN VALLEY
	8-CHARACTER CLLI	GNVYAZMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	21-Feb-05
	DA (s)	312132; 323471
	FDI Address(es)	X 793 W WHITEHOUSE CANYON RD
	Replacing	REPLACING CABLES DUE TO MAINTENANCE ISSUES
3	**STATE**	ARIZONA
	WIRE CENTER	MARYVALE
	8-CHARACTER CLLI	PHNXAZMY
	COMPLETION DATE/PLANNED RETIREMENT DATE	28-Jan-05
	DA (s)	110173

	FDI Address(es)	7111 W CAMPBELL AV; 7110 W CAMPBELL AV
	Replacing	This job will retire approximately 3200' of f1 copper and utilize existing fiber to feed the da. the work is being done between 67th and 75th ave on turney rd and campbell rd.this work is being forced by the maricopa county flood control district due to conflicts with a new flood channel being built.
4	**STATE**	ARIZONA
	WIRE CENTER	THUNDERBIRD
	8-CHARACTER CLLI	SCDLAZTH
	COMPLETION DATE/PLANNED RETIREMENT DATE	05-Apr-05
	DA (s)	110422
	FDI Address(es)	X 11010 N SCOTTSDALE RD
	Replacing	this job will remove qwest conflicts with a maricopa flood control drainage project. the cables that are in conflict are 1 aerial and 2 buried cables that will be replaced like-for-like to clear a 10'x5' box culvert being placed
5	**STATE**	ARIZONA
	WIRE CENTER	WHITE TANKS
	8-CHARACTER CLLI	WHTKAZMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	14-Mar-05
	DA (s)	110106
	FDI Address(es)	
	Replacing	THIS JOB WILL REPLACE 285' OF BHBA-100 WITH ANMW-100 GOING JOINT ON EX. POWER POLES TO ELIMINATE BURYING UNDER THE CANAL. THIS CABLE ISWET AND REQUIRES REPLACEMENT ASAP.
6	**STATE**	COLORADO
	WIRE CENTER	BOULDER
	8-CHARACTER CLLI	BLDRCOMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	21-Feb-05
	DA (s)	423981
	FDI Address(es)	58.2 rl69a4; 57.6 rl69a4; 55.6 rl69a4
	Replacing	The scope of work to be completed is the replacement of approx 2700' of buried BHBH-50 (1972) from ped 1148 to ped 58.2 along Twin Sisters Rd served by x-box X 46.9 RL69A in D.A. 423981 in the Boulder wirecenter
7	**STATE**	COLORADO
	WIRE CENTER	DENVER NE
	8-CHARACTER CLLI	DNVRCONE
	COMPLETION DATE/PLANNED RETIREMENT DATE	21-Feb-05
	DA (s)	112722
	FDI Address(es)	IT 3651 E 86 AV
	Replacing	This job proposes to transfer all workers (52 total workers) within F2 count 3255E84,901-1000 into new count 3255E84,1051-1150 and place approx 560' of buried 200pr distribution cable from ped 3431-3621 E 86 Av to cutover an existing 100pr cable to this new count in D.A. 112722 in the Denver Northeast wirecenter.
8	**STATE**	IDAHO
	WIRE CENTER	NAMPA
	8-CHARACTER CLLI	NMPAIDMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	21-Feb-05
	DA (s)	120503
	FDI Address(es)	

	Replacing	This job REPLACES BHAA-50 WITH ANMW-200 ON LAKE LOWELL AVE BETWEEN S CASSIA ST AND S MIDDLETON RD IN NAMPA, IDAHO. DEVELOPER HAS REQUESTED POLES BE REMOVED DUE TO CONFLICT WITH CITY OF NAMPA REQUIRED ROAD IMPROVEMENTS FOR CREEKSIDE SUBDIVISION.
9	**STATE**	IDAHO
	WIRE CENTER	POCATELLO NORTH
	8-CHARACTER CLLI	PCTLIDNO
	COMPLETION DATE/PLANNED RETIREMENT DATE	31-Mar-05
	DA (s)	110201
	FDI Address(es)	X 5355 YELLOWSTONE AV
	Replacing	REPLACING AERIAL CABLE FOR MAINTENANCE PURPOSES
10	**STATE**	MINNESOTA
	WIRE CENTER	ALBERT LEA
	8-CHARACTER CLLI	ALLEMNAL
	COMPLETION DATE/PLANNED RETIREMENT DATE	01-Mar-05
	DA (s)	420102
	FDI Address(es)	901 LUTHER PL
	Replacing	THIS JOB WILL NEGATIVELY IMPACT THE LOOP MAKE-UPS AND CONSIDERED TO BE IMPACTING TO THE CLEC. THIS JOB WILL REPLACE A 22 GUAGE CABLE WITH A 24 GUAGE CABLE ALONG CIRCLE DRIVE IN THE CITY OF ALBERT LEA, MN.
11	**STATE**	MINNESOTA
	WIRE CENTER	COLERAINE
	8-CHARACTER CLLI	CLRNMNCO
	COMPLETION DATE/PLANNED RETIREMENT DATE	25-Feb-05
	DA (s)	115502
	FDI Address(es)	
	Replacing	Replace defective cable 29171 hwy 52: 1,200' of 19 guage 11 pair will be replaced with 22 guage
12	**STATE**	MINNESOTA
	WIRE CENTER	FERGUS FALLS
	8-CHARACTER CLLI	FRFLMNFB
	COMPLETION DATE/PLANNED RETIREMENT DATE	15-Mar-05
	DA (s)	390202
	FDI Address(es)	X 855/11
	Replacing	recent tests indicate 1581' of bhbh-50 pr cable along co hwy 15 and underneath the ottertail river has water in the sheath and is defective to the point beyond economical repair. presently, the maintenance techs have laid out a temporary 50 pr iwc over the culvert crossing the river and along co hwy 15 to keep customers in service. this job will consist of placing 855' of anaw-200 pr cable, and 766' of anaw-100 pr cable.
13	**STATE**	MONTANA
	WIRE CENTER	BOZEMAN
	8-CHARACTER CLLI	BZMNMTMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	31-Dec-05
	DA (s)	114941
	FDI Address(es)	X 3170 BRIDGER CANYON RD; X 3173 BRIDGER CANYON RD

	Replacing	REPLACING X BOX AND CABLING INTO IT
14	STATE	MONTANA
	WIRE CENTER	HARDIN
	8-CHARACTER CLLI	HRDNMTMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	31-Dec-05
	DA (s)	220141
	FDI Address(es)	
	Replacing	this job is required to reroute copper and fiber facilities over a new bridge. (3) sheaths being abandoned are bkma-100, bkma-50, bhaa-100 being replaced with an anmw-200. (2) 12 pair fiber cables will also be replaced with (1) 24 pr fiber
15	STATE	MONTANA
	WIRE CENTER	HELENA
	8-CHARACTER CLLI	HELNMTMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	23-Mar-05
	DA (s)	121311
	FDI Address(es)	X 5201 YORK RD
	Replacing	this job provides for ABANDONING APPROXIAMTELY 121' OF AJAW-25 CABLE. OLD RV PARK HAS BEEN RAZIED BY OWNER, PLANS TO BUILD NEW BUILDINGS IN FUTURE CLOSURE AND CABLE NOT NEEDED AND WILL ACTUALLY BE IN THE WAY OF CONSTRUCTION.
16	STATE	NEW MEXICO
	WIRE CENTER	ALBUQUERQUE ACADEMY
	8-CHARACTER CLLI	ALBQNMAC
	COMPLETION DATE/PLANNED RETIREMENT DATE	21-Feb-05
	DA (s)	311001
	FDI Address(es)	X 6503 TRUCHAS DR NE
	Replacing	THIS JOB WILL REPLACE WET SECTION OF 340FT OF BHAH-200 CABLE BETWEEN LOTS ON TRUCHAS AND LOLA AV N E. THE CABLE IS BURIED AND IS CONTINUALLY GETTING WET. THE CABLE REPLACED IS 340 FT OF BHAH-200PR(1973) AND IS REPLACED BY 340FT OF ANMW-200 (2004).
17	STATE	WYOMING
	WIRE CENTER	CASPER
	8-CHARACTER CLLI	CSPRWYMA
	COMPLETION DATE/PLANNED RETIREMENT DATE	21-Feb-05
	DA (s)	421831
	FDI Address(es)	X 802 CHAMBERLIN RD; X 10 RL66A
	Replacing	THIS JOB REPLACES 450' OF BHAH-50 WITH ANMW-50 FROM PED M 7-1 TO PED M 7 ALONG BOLES RD

Additional Information: Any customer premises equipment vendor/manufacturer or enhanced services provider desiring additional technical information in conjunction with this Disclosure can contact:

Shirley Tallman
700 W. Mineral Ave
Littleton, CO 80120
Shirley.Tallman@qwest.com

Notice of Network Change – Hialeah, Florida
Replacing Copper Facilities with Fiber and Digital Loop Carrier Systems

Carrier
BellSouth Telecommunications, Inc.
675 West Peachtree Street NE
Atlanta, Georgia 30375

Attachment contains addresses affected by the removal of copper facilities.

Date Changes are to Occur: Fourth Quarter 2004

Location of Changes: Hialeah, Florida

Description of Change Planned: Copper Facilities will be replaced with Fiber Optic cable and Digital Loop Carrier systems.

Description of Reasonably Foreseeable Impact of the Planned Change: After this work is completed, metallic facilities from the Central Office to the affected area will no longer be available. Unbundled loops that are defined as compatible with Digital Loop Carrier (DLC), e.g., those defined to transport POTS-grade service, will be transferred to the new DLC system. Competitive carriers employing unbundled loops that are defined to require metallic facilities, e.g., Digital Subscriber Line (DSL) or line sharing circuits, will be notified individually. This notification is intended to allow the affected carrier to convert the circuit to one compatible with DLC.

It should be noted that if a competitive carrier obtains an unbundled loop that has been defined to transport POTS-grade service, but then utilizes the POTS-grade loop to provide DSL service, BellSouth has no knowledge of the presence of DSL. In such a case, BellSouth has no basis to notify the carrier and there will be no means to continue the DSL service.

Contact: Technical questions relating to this change should be directed to:
Lady Schmidt, LCM
9101 SW 24th St
Miami, Fl 33165
(305) 222-8212

All other questions or concerns regarding this change should be referred to your BellSouth account team representative, the Interexchange Carrier Service Center (ICSC) or the Local Interconnection Service Center (LISC). Payphone Service Providers should contact the following numbers with questions or concerns:

In the BellSouth region: 557-2647 (AL, KY, LA, MS, TN) or
780-2171 (FL, GA, NC, SC)
(If you are calling from a mandatory 10-digit calling area, include your local area code.)

Outside BellSouth region: 1-800-786-7619
Fax: 1-205-321-2191

Attachment

ADDRESS LIST

Below is a list of addresses that may be impacted by a conversion from copper-fed to fiber-fed carrier for wirecenter "miamflhl" sorted by hno and street.

hno	st	unit	bldg
5989	w 16th av	str 2	
1655	w 44th st	347	
1655	w 44th st	540	
1655	w 44th st	550	
1695	w 44th st	str k-12	
1655	w 49 st		
1435	w 49th pl	206	
1435	w 49th pl	308	
1435	w 49th pl	403	
1435	w 49th pl	502	
1435	w 49th pl	504	
1435	w 49th pl	602	
1475	w 49th st	purch	
1595	w 49th st		
1595	w 49th st	data	
1615	w 49th st		
1625	w 49th st		
1625	w 49th st	1	
1625	w 49th st	1345	
1625	w 49th st	computer	
1625	w 49th st	entr	
1625	w 49th st	sears str	
1625	w 49th st	telco	
1625	w 49th st	trl	
1625	w 49th st	unit 1345	
1627	w 49th st	1412	
1635	w 49th st		
1635	w 49th st	1204	
1635	w 49th st	1220	
1635	w 49th st	str a-1	
1635	w 49th st	str a-1028	
1635	w 49th st	str f-1	
1635	w 49th st	str f-10	
1635	w 49th st	str f-1208	
1635	w 49th st	str f-1a	
1635	w 49th st	str f-4	
1635	w 49th st	str f-5	
1635	w 49th st	str f-7	
1635	w 49th st	str f-8	
1635	w 49th st	str f-9	
1635	w 49th st	str h-16a	
1635	w 49th st	str k-20	
1635	w 49th st	str k-2070	
1645	w 49th st		
1645	w 49th st	1324	
1645	w 49th st	1328	
1645	w 49th st	booth 1364	
1645	w 49th st	h-5-a	
1645	w 49th st	k-2	
1645	w 49th st	str 1244	
1645	w 49th st	str 1320	
1645	w 49th st	str 1328	
1645	w 49th st	str 1332	
1645	w 49th st	str 1336	
1645	w 49th st	str 1352	
1645	w 49th st	str 1354	
1645	w 49th st	str 1372	
1645	w 49th st	str 1376	
1645	w 49th st	str 2030	
1645	w 49th st	str 2080	
1645	w 49th st	str f-6	
1645	w 49th st	str h-1	
1645	w 49th st	str h-10	

1645	w 49th st	str h-11	
1645	w 49th st	str h-12	
1645	w 49th st	str h-14	
1645	w 49th st	str h-14-a	
1645	w 49th st	str h-15	
1645	w 49th st	str h-16	
1645	w 49th st	str h-16-a	
1645	w 49th st	str h-17	
1645	w 49th st	str h-19	
1645	w 49th st	str h-2	
1645	w 49th st	str h-4	
1645	w 49th st	str h-5	
1645	w 49th st	str h-5-a	
1645	w 49th st	str h-6	
1645	w 49th st	str h-8	
1645	w 49th st	str h-9	
1645	w 49th st	str h15	
1649	w 49th st		
1650	w 49th st		
1655	w 49th st		
1655	w 49th st	catalog	
1655	w 49th st	equip	
1659	w 49th st	str k-17	
1663	w 49th st		
1665	w 49th st		
1665	w 49th st	1132	
1665	w 49th st	1456	
1665	w 49th st	1464	
1665	w 49th st	1484	
1665	w 49th st	1804	
1665	w 49th st	j-19	
1665	w 49th st	space j-19	
1665	w 49th st	store 885	
1665	w 49th st	str 1012	
1665	w 49th st	str 1432	
1665	w 49th st	str 1456	
1665	w 49th st	str 1460	
1665	w 49th st	str 1472	
1665	w 49th st	str 1484	
1665	w 49th st	str 8073	
1665	w 49th st	str 885	
1665	w 49th st	str d-12	
1665	w 49th st	str j-1	
1665	w 49th st	str j-10	
1665	w 49th st	str j-11	
1665	w 49th st	str j-12	
1665	w 49th st	str j-14	
1665	w 49th st	str j-15	
1665	w 49th st	str j-16	
1665	w 49th st	str j-17	
1665	w 49th st	str j-18	
1665	w 49th st	str j-2	
1665	w 49th st	str j-3	
1665	w 49th st	str j-4	
1665	w 49th st	str j-5	
1665	w 49th st	str j-6	
1665	w 49th st	str j-6-a	
1665	w 49th st	str j-7	
1665	w 49th st	str j-8	
1665	w 49th st	str j-9	
1665	w 49th st	str jb	
1675	w 49th st		
1675	w 49th st	1121	
1675	w 49th st	1328	
1675	w 49th st	1440	
1675	w 49th st	1464	
1675	w 49th st	1486	
1675	w 49th st	1504	
1675	w 49th st	5531	
1675	w 49th st	food court	
1675	w 49th st	kiosk	

1675	w 49th st	kisok	
1675	w 49th st	l bryant	
1675	w 49th st	r 3	
1675	w 49th st	rmu	
1675	w 49th st	stockroom	
1675	w 49th st	str 1004	
1675	w 49th st	str 1012	
1675	w 49th st	str 1024	
1675	w 49th st	str 1040	
1675	w 49th st	str 1120	
1675	w 49th st	str 1124	
1675	w 49th st	str 1128	
1675	w 49th st	str 1132	
1675	w 49th st	str 1136	
1675	w 49th st	str 1140	
1675	w 49th st	str 1204	
1675	w 49th st	str 1208	
1675	w 49th st	str 1238	
1675	w 49th st	str 1240	
1675	w 49th st	str 1244	
1675	w 49th st	str 1250	
1675	w 49th st	str 1308	
1675	w 49th st	str 1316	
1675	w 49th st	str 1324	
1675	w 49th st	str 1328	
1675	w 49th st	str 1332	
1675	w 49th st	str 1340	
1675	w 49th st	str 1344	
1675	w 49th st	str 1348	
1675	w 49th st	str 1356	
1675	w 49th st	str 1364	
1675	w 49th st	str 1372	
1675	w 49th st	str 1376	
1675	w 49th st	str 1412	
1675	w 49th st	str 1424	
1675	w 49th st	str 1428	
1675	w 49th st	str 1432	
1675	w 49th st	str 1456	
1675	w 49th st	str 1460	
1675	w 49th st	str 1472	
1675	w 49th st	str 1484	
1675	w 49th st	str 1508	
1675	w 49th st	str 1524	
1675	w 49th st	str 1532	
1675	w 49th st	str 1536	
1675	w 49th st	str 1548	
1675	w 49th st	str 1560	
1675	w 49th st	str 1568	
1675	w 49th st	str 1640	
1675	w 49th st	str 2050	
1675	w 49th st	str 2060	
1675	w 49th st	str 2070	
1675	w 49th st	str 2090	
1675	w 49th st	str 50	
1675	w 49th st	str 5505	
1675	w 49th st	str 5511	
1675	w 49th st	str 5535	
1675	w 49th st	str 9504	
1675	w 49th st	str 9507	
1675	w 49th st	str j-2	
1685	w 49th st		
1685	w 49th st	1124	
1685	w 49th st	1140	
1685	w 49th st	1144	
1685	w 49th st	1204	
1685	w 49th st	1238	
1685	w 49th st	2738	
1685	w 49th st	mddl	
1685	w 49th st	str 1020	
1685	w 49th st	str 1136	
1685	w 49th st	str b-7	

1685	w 49th st	str d-1	
1685	w 49th st	str d-11-a	
1685	w 49th st	str d-14	
1685	w 49th st	str d-2-b	
1685	w 49th st	str d-3	
1685	w 49th st	str d-4	
1685	w 49th st	str d-5	
1685	w 49th st	str d-5-6	
1685	w 49th st	str d-8	
1685	w 49th st	str d7	
1685	w 49th st	str f-10	
1685	w 49th st	str f-6	
1685	w 49th st	str f-8	
1695	w 49th st		
1695	w 49th st	1528	
1695	w 49th st	1540	
1695	w 49th st	j-1328	
1695	w 49th st	k-9	
1695	w 49th st	k-9504	
1695	w 49th st	k1a	
1695	w 49th st	str 1536	
1695	w 49th st	str k-10	
1695	w 49th st	str k-11	
1695	w 49th st	str k-13	
1695	w 49th st	str k-14	
1695	w 49th st	str k-16	
1695	w 49th st	str k-17	
1695	w 49th st	str k-19	
1695	w 49th st	str k-20	
1695	w 49th st	str k-2020	
1695	w 49th st	str k-4	
1695	w 49th st	str k-5	
1695	w 49th st	str k-6	
1695	w 49th st	str k-6516	
1695	w 49th st	str k-8	
1695	w 49th st	str k-9	
1695	w 49th st	str k-9504	
1695	w 49th st	str-1536	
1695	w 49th st	telco	
1705	w 49th st		
1705	w 49th st	1004	
1705	w 49th st	1112	
1705	w 49th st	b7a	
1705	w 49th st	str 1012	
1705	w 49th st	str 1020	
1705	w 49th st	str 1040	
1705	w 49th st	str 1044	
1705	w 49th st	str b-1	
1705	w 49th st	str b-10	
1705	w 49th st	str b-2	
1705	w 49th st	str b-3	
1705	w 49th st	str b-4	
1705	w 49th st	str b-5	
1705	w 49th st	str b-6	
1705	w 49th st	str b-7-b	
1705	w 49th st	str b-8	
1705	w 49th st	str b-9-b	
1705	w 49th st	str j-1012	
1707	w 49th st	b6	
1749	w 49th st		
1751	w 49th st		
1777	w 49th st		
1777	w 49th st	alteration	
1777	w 49th st	cafe	
1777	w 49th st	term	

(270 rows)

-----Original Message-----
From: Fogle, Eric [mailto:Eric.Fogle@bellsouth.com]
Sent: Friday, December 10, 2004 12:41 PM
To: Boshier, John; Bell, Jayna; Davis, Colette
Cc: Mays, Meredith
Subject: FW: Notice of network change
Importance: High

John, Jayna and Colette,

Following is a list of 5 customer circuits in the Hialeah Florida Central office that are on a defective copper cable that needs to be replaced. The cable is an older style pulp cable that must remain pressurized to prevent moisture from damaging the cable. We are having increasing difficulty maintaining the air pressure, and need to move all customers within the next week or so if possible.

Let me know if you need any additional information, or have any questions.

Eric

60.LXFU.511 xxx - Covad Communications
60.LXFU.763 xxx - Covad Communications
60.LXFU.513 xxx - Covad Communications
60.LXFU.512 xxx - Covad Communications
60.LXFU.506 xxx - Covad Communications

Covad/105
Zulevic/1

Qwest
Spirit of Service

September 21, 2004

Megan Doberneck
Covad Communications
7901 Lowry Blvd.
Denver, CO 80230
mdoberne@covad.com

TO:Megan Doberneck

Announcement Date:	**September 21, 2004**
Effective Date:	**September 27, 2004**
Document Number:	**NETW.09.21.04.F.02089.CopperRetirements**
Notification Category:	**Network Notification**
Target Audience:	**CLECs – Colorado**
Subject:	**Copper Retirements**

Summary of Change:

Qwest is planning to retire a section of copper cable located on Highway 85, south of Highlands Ranch Parkway, within the Highlands Ranch, Colorado, wire center (TTNCOHL), as a result of road construction. The existing copper feeder cable serving Distribution Area (DA) 411722 will be replaced by fiber feeder cable. The Colorado Department of Transportation has ordered that Qwest relocate telecommunication facilities in the above noted area by September 27, 2004.

The CLEC Community is requested to respond to Qwest with questions or comments by September 24, 2004. Qwest has determined that there are no impacts to the CLEC community.

If you have any questions on this subject, please feel free to contact Shirley Tallman at shirley.tallman@qwest.com.

Qwest welcomes questions and input from the CLEC community regarding this topic.

You are encouraged to provide feedback to this notice through our web site. We provide an easy to use feedback form at http://www.qwest.com/wholesale/feedback.html. A Qwest representative will contact you shortly to discuss your suggestion.

Sincerely,

Qwest

Note: In cases of conflict between the changes implemented through this notification and any CLEC interconnection agreement (whether based on the Qwest SGAT or not), the rates, terms

and conditions of such interconnection agreement shall prevail as between Qwest and the CLEC party to such interconnection agreement.

The Qwest Wholesale Web Site provides a comprehensive catalog of detailed information on Qwest products and services including specific descriptions on doing business with Qwest. All information provided on the site describes current activities and process. Prior to any modifications to existing activities or processes described on the web site, wholesale customers will receive written notification announcing the upcoming change.

If you would like to unsubscribe to mailouts please go to the ?Subscribe/Unsubscribe? web site and follow the unsubscribe instructions. The site is located at:

http://www.qwest.com/wholesale/notices/cnla/maillist.html

cc: Elena Donaghy
Eric Yohe

Qwest Communications 1600 7th Ave Room 1806 Seattle WA 98008

Balvin, Elizabeth

From: Tallman, Shirley [Shirley.Tallman@qwest.com]
Sent: Monday, September 27, 2004 8:58 AM
To: Balvin, Elizabeth
Subject: FW: Customer Inquiry

Cable counts impacted by the change were reviewed for working CLEC circuits. Those CLEC circuits identified were POTS and will be cutover to the digital loop carrier system without disruption to the end-user customer.

Shirley Tallman
Staff Advocate
303 707-7085

Hi Mike,
This customer feedback was received through the Wholesale feedback form. Since you managed this notice, could you please have the appropriate person respond directly to Covad. Please let me know if you have any questions.

Thanks, Erin

-----Original Message-----
From: [mailto:feedback_form@qwest.wholesale]
Sent: Thursday, September 23, 2004 3:18 PM
To: Martin, Erin
Subject: Product Catalog Feedback

Product Catalog Feedback:

Message is from "" <feedback_form@qwest.wholesale>
select: CLEC

name: Elizabeth Balvin

company: Covad

state: CO

email: ebalvin@covad.com

tel-areaCode: 720

tel-firstPart: 670

tel-secondPart: 2423

preferred_contact: email

related_to_doc_number: yes

document_number: Network Notice: Announcements: GN: Copper Retireme

topic: Network

comments_questions: Please identify how "Qwest has determined that there are no impacts to the CLEC community."

Thanks, Liz

Open Product/Process CR PC120301-4 Detail

Title: Implement a process to insure Qwest adheres to ANSI Standard T1.102 and ANSI T1.104 for setting signal and loss level standards for DS3 cable length limitations.

CR Number	Current Status Date	Area Impacted	Products Impacted
PC120301-4	Completed 4/17/2002	Ordering, Maintenance/Repair, Provisioning	Collocation

Originator: Stichter, Kathy

Originator Company Name: Eschelon

Owner: Wycoff, William

Director: Perko, Gale

CR PM: Martin, Ric

Description Of Change

Qwest currently states that it will meet ANSI standards without defining how it will meet the standards. Qwest should commit to engineering a complete DS3 Circuit when the request for a CLEC to CLEC cross-connect is made through the Qwest ICDF. Eschelon asks that Qwest adhere to ANSI Standard T1.102 and ANSI T1.104 with the additional lineal footage, ICDF connections, connectors and DSX interfaces taken into consideration. Without such a standard, CLECs are not assured a clear DS3 signal. If it is discovered that a signal level of no less than -4.7 dBm is present on a single unbalanced coaxial line (20 Ga/26 Ga), Qwest will notify the CLEC that amplification is required and will appropriately amplify the signal to meet ANSI Standards (as identified in ANSI Standard T1.102 and ANSI T1.104). Additionally, Eschelon requires that the two-unbalanced coaxial cable paths are within ± .5 dBm of one another. Otherwise, corrective action is necessary to meet this requirement.

Example #1 (Qwest needs to engineer the entire path (CLEC to CLEC) when the cross-connect is made through the Qwest ICDF). A CLEC to CLEC cross-connect was made with a third party in a Central Office. When the entire lineal footage of the DS3 Circuit was taken into consideration, the DS3 signal was not within ANSI loss level standards. Qwest contends that it will engineer the DS3 cable/signal from the Qwest ICDF to each separate Co-Provider but that it is not responsible for the complete circuit, although all elements involved. (i.e. BNC connectors, ICDF Cross-connect points, and DSX interfaces) contribute significantly to overall signal loss. Since Qwest provisions all three segments of the circuit, Qwest must provision the complete circuit in such a way that meets the ANSI standard.

Status History

11/30/01 - CR received from Eschelon.

12/03/01 - E-Mail Acknowledgement issued to Eschelon Telecommunications

12/04/01 - CR posted to Qwest Wholesale Markets CMP Web page

12/07/01 - Eschelon contacted to schedule clarification call.

12/12/01 - CMP Meeting - Eschelon presented CR to CLEC Community.

12/14/01 - Clarification call conducted with Eschelon. Meeting minutes transmitted to

Eschelon.

01/16/02 - CMP Meeting - Qwest conducted CLEC community clarification discussion. Eschelon requested that Qwest contact Paul Hauser, Eschelon to discuss additional technical issues regarding the CR. Eschelon asked that Michael Zulevic, COVAD be invited to the conference call. CLEC community agreed to change CR Status to "Evaluation."

01/18/02 - Follow-up clarification call conducted with Eschelon and Covad in attendance; minutes transmited to Eschelon and Covad.

02/08/02 - Qwest draft response (dated 02/06/02) posted in CMP database & transmitted to Eschelon.

02/20/02 - CMP Meeting - Qwest presented the "Draft" response. CR status changed to "CLCE Test." Meeting discussions will be set forth in the Product/Process Draft Meeting Minutes contained in the Product/Process CMP Meeting Distribution Package (03/20/02).

02/22/02 - Qwest "Formal" response (dated 02/06/02) posted in CMP data base.

03/20/02 - CMP Meeting - Eschelon requested that the CR remain in CLEC Test for another month until the have a chance to perform a test.

04/17/02 - CMP Meeting - Meeting discussions will be set forth in the Product/Process Meeting Minutes to be posted on the CMP Web site. It was agreed that the CR could be closed.

Project Meetings

8:00 p.m. (MDT) / Friday 18th January 2002 Conference Call TEL: 877.564.8688 CODE: 6265401 PC120301-4 "Implement a process to insure Qwest adheres to ANSI Standard T1.102 and ANSI T1.104 for setting signal and loss level standards for DS3 cable length limitations." [Follow-up]

Kathleen Stichter, Eschelon Paul Hanser, Eschelon Michael Zulevic, Covad Bill Wycoff, Qwest Jeff Ferra, Qwest Laurel Burke, Qwest Peter Wirth, Qwest

1.0 Introduction of Attendees Attendees introduced.

2.0 Review Requested (Description of) Change {review long description from change request, confirm with all parties there is agreement on the change requested} Clarification was obtained from Eschelon & Covad for the subject CR. The following items were discussed: 1) Paul Hanser, Eschelon identified two (2) types of CLEC to CLEC connections in Qwest CO facilities: 1) direct connection (i.e., no routing through Qwest ICDF; and 2) connection through Qwest ICDF(s). Direct connections, in general, exhibit fewer problems and mainly concern cable lengths and re-generation concerns. Connections routed through a Qwest ICDF(s) usually involve larger Qwest CO facilities that may involve multiple floors and require more detailed assessments of circuit cable lengths, regeneration, ICDF connection losses, and other connector losses (i.e., BNC). Eschelon expressed concern that proper engineering and testing of the end to end portion of the Qwest furnished curcuit (i.e., cabling, regeneration (if required), all related connections) need to be conducted properly prior to "throwing the cables over the fence into the co-location areas." 2) Michael Zulevic, Covad concurred with Eschelon and also requested cable continuity testing and documentation for the Qwest provided portion of the circuit at the conclusion of the construction phase; along with possible collaborative testing during the test & turn-up phase. 3) William Wycoff, Qwest asked Eschelon what signal levels are being transmitted and received from their co-location areas. Paul Hanser, Eschelon indicated that maximum transmit and minimum receive are

indicative of signal levels.

3.0 Confirm Areas & Products Impacted {read from change request, modify if needed} N/A. Discussed in previous clarification meeting.

4.0 Confirm Right Personnel Involved {ensure the Qwest SME can fully answer the CLEC request. Confirm whether anyone else within Qwest has been involved with this issue, or whether we need to bring anyone else in} N/A. Discussed in previous clarification meeting.

5.0 Identify/Confirm CLEC's Expectation {Identify specific deliverables from CLEC – what does Qwest have to do in order to close this CR? (in measureable terms ie provide a documented process, change a process to include training etc)} Qwest to generate draft response for CMP Monthly Product & Process Meeting.

-

1:30 p.m. (MDT) / Friday 14th December 2001 Conference Call TEL: 877.564.8688 CODE: 6265401 PC120301-4 "Implement a process to insure Qwest adheres to ANSI Standard T1.102 and ANSI T1.104 for setting signal and loss level standards for DS3 cable length limitations" Clarification Meeting

Kathleen Stichter, Eschelon Renee Lemes, Eschelon Bill Kent, Eschelon Bill Wycoff, Qwest Jeff Ferra, Qwest Laurel Burke, Qwest Peter Wirth, Qwest

1.0 Introduction of Attendees Attendees introduced.

2.0 Review Requested (Description of) Change {review long description from change request, confirm with all parties there is agreement on the change requested} Eschelon presented the CR. Eschelon requested that the completed circuit provided by Qwest for CLEC to CLEC cross connect through a Qwest Interconnect Distribution Frame (ICDF) provide a signal level of no less than –4.7 dBm (additional detail in CR). Qwest is responsible for completing the cross connect circuit.

3.0 Confirm Areas & Products Impacted {read from change request, modify if needed} "Collocation" confirmed as appropriate. "Physical" & "ICDF Collocation" boxes under "Collocation" identified during conference call.

4.0 Confirm Right Personnel Involved {ensure the Qwest SME can fully answer the CLEC request. Confirm whether anyone else within Qwest has been involved with this issue, or whether we need to bring anyone else in} Qwest & Eschelon confirmed appropriate personnel were in attendance.

5.0 Identify/Confirm CLEC's Expectation {Identify specific deliverables from CLEC – what does Qwest have to do in order to close this CR? (in measureable terms ie provide a documented process, change a process to include training etc)} Qwest to evaluate CR. During the January 2002 Monthly P&P CMP Meeting , a CLEC community clarification session will be conducted with Qwest providing potential options for addressing the CR.

6.0 Identify any Dependent Systems Change Requests {Note any connected CRs and the potential impacts} None.

QWEST Response

February 6, 2002

Kathy Stichter ILEC Relations Manager Eschelon Telecom Inc

SUBJECT: Qwest Change Request Response - Number PC120301-4 (December 3, 2001) - Implement a process to insure Qwest adheres to ANSI Standard T1.102 and ANSI T1.104 for setting signal and loss level standards for DS3 cable length limitations.

Qwest has responsibility to engineer network elements within its Central Offices (CO) in an efficient manner. Qwest has engineering criteria establishing DSX-N cross-connect fields that are in compliance with ANSI Standard T1.102 for setting signal and loss levels using cable length limitations, signal source level control, and signal regeneration. It is unclear how ANSI Standard T1.104 relates to the signal level question.

To minimize equipment, the ICDF is not engineered as a DSX-N level point. According to Technical Publication 77386 on Interconnection and Collocation, Chapters 5 and 15, the engineering requirement is to design through the ICDF to a DSX-N point when accessing unbundled offerings such as Unbundled Loops, Unbundled Dedicated Interoffice Transport, etc. This principle was established circa 1996 in FCC Docket 93-192.

The CLEC-to-CLEC Cross-Connection (COCC-X) offering is defined as the CLEC's capability to order a cross-connection from its Collocation in a Qwest Premises to its non-ajacent Collocation space or to another CLEC's Collocation within the same Qwest Premises at the Interconnection Distribution Frame (ICDF). This is accomplished by the use of the CLEC's Connecting Facilty Assignment (CFA) terminations residing at the same ICDF and at the same service rate level.

Qwest is providing clarification for the following activities to address this request:

- CLEC ordering procedure for cross-connection; - Qwest engineering data exchange with the requesting CLEC(s) for the cross-connection; - CLEC to CLEC cross connection within the Qwest Central Office (CO); - ICDF connections, and regeneration installation; and - Verification testing.

CLEC Ordering Procedure

CLEC to CLEC cross-connections are ordered through the Qwest EXACT-PC system using the Access Service Request (ASR) form. This form is used for ordering Access and Local Network Interconnection Services. Qwest processes the ASR and determines a ready for service (RFS) date for the connection.

The requesting CLEC(s) is required to assess the need for signal regeneration prior to submittal of the completed ASR form. An engineering data exchange can be arranged through the Qwest Wholesale Collocation Project Manager (http://www.uswest.com/wholesale/clecs/escalations.html)

Qwest Engineering Data exchange with requesting CLEC(s)

The requesting CLEC(s) are required to know the cable types and lengths from their equipment to the ICDF(s) in order to assess the need for signal regeneration. The need for regeneration may arise when the distances between the CLEC's collocation equipment exceeds twice the cable length limitation criteria (table) when connected through the ICDF. The total cable length limitation from signal source to sink, without a DSX-N point is nominally, two times the shown length.

Qwest will provide the requesting CLEC(s) the type and length of cable between their physical space and the ICDF. Each CLEC uses this information to design the span between their equipment. The design is done to determine any need for regeneration. Regeneration is typically at the ICDF.

[Table in Supplemental Information]

Given the probability of having cable lengths that total less than the maximums, it has been and is the CLEC's responsibility to set any transmit attenuators in their equipment. Given the possibility that total cable lengths from the Collocation spaces through the ICDF are longer than the table allows, there is the opportunity for a CLEC to request regeneration by using a specific Network Channel Interface (NCI) code on their order. The NCI is chosen from Table 6-5 of Tech Pub 77386 using one that calls for regeneration. CLEC to CLEC cross connects occur between two CLECs within a Qwest CO and use jumper cables at the ICDF to complete the link. There is no assured DSX-N level point in the circuit.

Figure A below illustrates the situation where there is a single, ICDF cross-connect to complete a CLEC-to CLEC circuit that needs a regenerator. There is no DSX-N level point assured in this circuit.

[Figure A in Supplemental Information]

Figure A: Single ICDF Connection with Regeneration

ICDF connections and regeneration installation

Qwest, following receipt of the ASR will perform ICDF connections and regeneration functions. Equipment additions for regeneration (if no spares are available) will be initiated. Qwest completes these activities and conducts verification testing.

Verification testing

Verification testing of the cross-connection will be conducted to assure compliance with the ASR. Cooperative testing on circuits will be conducted with Qwest and requesting CLEC(s) technicians.

Qwest will coordinate with the requesting CLEC and schedule the testing of the completed cabling, ICDF connections and regeneration. CLEC(s) will be responsible to terminate cabling into their respective collocation equipment prior to the testing effort.

Although circuit testing is the responsibility of the CLECs, Qwest will provide technician support of CLEC to CLEC circuit testing efforts and provide trouble-shooting support, as necessary to successfully complete an ASR. Such testing shall confirm that ASR ordered circuits perform to service objectives in ANSI Standard T1.510, Network Performance Parameters for Dedicated Digital Services for Rates Up to and Including DS3. Clauses 8.2 and 8.3 describe DS1 and DS3 testing, respectively.

Sincerely,

William R. Wycoff Services Planning Qwest

CC: Bill Campbell, Qwest Barry Orrel, Qwest Gale Perko, Qwest Mary Retka, Qwest

Qwest

Qwest Response to Document In Review

Response Date:	**July 17, 2003**
Document:	**Product/Process: Technical Publication #77386 (Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services)**
Original Notification Date:	**June 17, 2003**
Notification Number:	**NETW.06.17.03.F.01847.TechPub_77386_Update**
Category of Change:	**Level 3**

Qwest recently posted proposed updates to Technical Publication #77386, Issue I, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services* CLECs were invited to provide comments to these proposed changes during a Document Review period from June 17, 2003 through July 2, 2003. The information listed below is Qwest's Response to CLEC comments provided during the review/comment cycle.

Resources:
Customer Notice Archive http://www.qwest.com/wholesale/cmp/review_archive.html
Document Review Site http://www.qwest.com/wholesale/cmp/review.html

If you have any questions on this subject or there are further details required, please contact Qwest's Change Management Manager at cmpcomm@qwest.com.

Qwest Response to Product/Process: Tech Pub # 77386, Issue I Comments

#	Page/Section	CLEC Comment	Qwest Response
1	Page 3-27 Section 3.5.1	***Eschelon*** ***June 25,2003*** Comment: Eschelon would like to submit the following objections to the proposed change. This may have significant impact on the ability of Eschelon to interconnect with other carriers within Large Qwest facilities; carriers that provide the basic backhaul services to Eschelon. The elimination of DS1 regeneration services could adversely affect delivery of services to customers. Page 70 reveals these soon-to-be-deleted paragraphs that describes the situation: "Tie cables that go to DSX 1 and DSX 3 "Design To" point cross connect panels may require	**Tech Pub will not be updated:** Qwest is not eliminating DSX regeneration, but merely changing who is responsible for determining when regeneration is required. The changes in the Tech Pub were driven by this recent change in who is responsible for determining when regeneration is required. More specifically, the CLEC's are no longer responsible for determining if regeneration is required, Qwest is now responsible for that determination. As a result of this change in responsibility, the tech pub is being updated to remove all statements and NC/NCI codes that indicate that the CLEC's need to order regeneration, or are responsible for determining when regeneration is required.

Qwest

		regeneration in some large wire centers to meet the templated signal requirements at the DSX panels. The CLEC must evaluate the need for regenerators using the length and type of tie cables (description provided by Qwest) and similar information about the cables and equipment on their side of the ICDF or DC POTs. Typical maximum lengths are 655 feet for 22 gauge shielded cable for DS1 and 450 feet of 728 type coaxial cable for DS3. Other tie cable types and gauges will be encountered in some wire centers. Further information about cable types and regeneration may be found in Chapter 15." When using the more typical 24 gauge wire for DDSs and 735 coaxial cable for DS3s the distances are 450ft and 225ft respectively. If this change was to occur, certain Eschelon services offered out of Large Wire Centers may have to end, or Eschelon may be forced to purchase more expensive retail products from Qwest to get such services where they are needed. Either way this move is anti-competitive as it increases cost or inhibits CLEC commerce.	NOTE: The state specific SGATs are also in the process of being updated to reflect this new stance on who is responsible for determining when regeneration is required.

BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

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Covad/109
Zulevic/1

IN THE MATTER OF: THE PETITION OF DIECA COMMUNICATIONS, INC., D/B/A COVAD COMMUNICATIONS COMPANY, FOR ARBITRATION TO RESOLVE ISSUES RELATING TO AN INTERCONNECTION AGREEMENT WITH QWEST CORPORATION	DOCKET #04-2277-02

REPORTER'S TRANSCRIPT OF PROCEEDINGS

SALT LAKE CITY, UTAH

DECEMBER 8, 2004

9:00 A.M.

VOLUME 1

BEFORE:

BEFORE ADMINISTRATIVE LAW JUDGE STEVE GOODWILL

--o0o--

Depomax SM
REPORTING SERVICES, INC.

333 SOUTH RIO GRANDE, SUITE A
SALT LAKE CITY, UTAH 84101
(801) 328-1188 1-800-DEPOMAX
FAX 328-1189

notice, does it do a screening for all CLEC facilities, or is the notice prior to that?

If the notice is at the point where we make a decision to make the installation, they maybe have not delved into what is in there. So I wasn't able to answer the question whether all cases we screened for CLECs prior to sending out the notice.

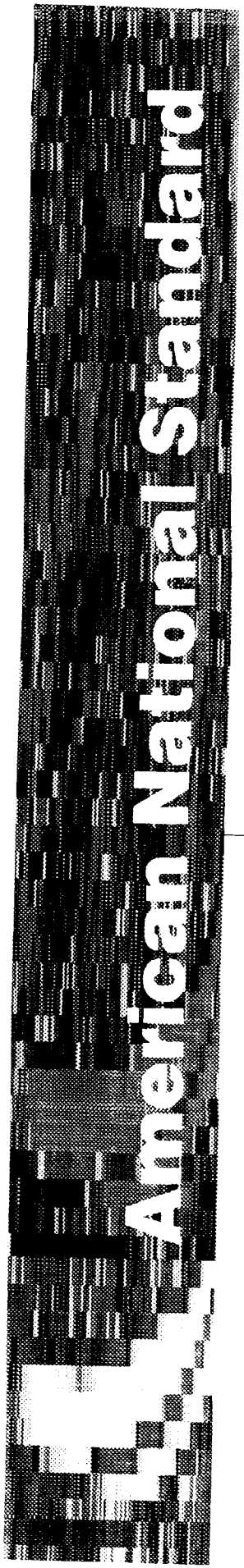
Ultimately we do look at the services that are being replaced, but there's many steps and I couldn't personally testify that that's a step that happens before every notice of a retirement.

Q Okay. So as far as you know, the steps Ms. Tallman talked about in her e-mail still take place. They may take place before the notice or after, but as far as you know they still take place?

A At some point we do look at the facilities that -- services that are being provided across the facilities, yes.

Q Now let's go to the exhibit that I had you flip to, Exhibit KMD 3. I'd like you to read the text of the section titled "Summary" about halfway down the page.

A "Copper retirements are necessary to respond to various factors in the outside plan, including road construction, maintenance problems, and growth accommodations. Replacement cables may be either copper or fiber.



for Telecommunications –
Digital Hierarchy –
Electrical Interfaces

ANSI T1.102-1993

ANSI American National Standards Institute
11 West 42nd Street
New York, New York
10036

Covad/110
Zulivic/2

ANSI®
T1.102-1993
Revision of
ANSI T1.102-1987

American National Standard
for Telecommunications –

Digital Hierarchy – Electrical Interfaces

Secretariat
Alliance for Telecommunications Industry Solutions

Approved December 8, 1993
American National Standards Institute, Inc.

Abstract

This revised standard describes the electrical interfaces for the DS1, DS1C, DS2, and DS3 levels of the North American digital telecommunications hierarchy. Compliance with this standard is necessary to achieve satisfactory interworking of the telecommunications network. This revision of the standard includes requirements on essential electrical characteristics measured at the interface, and specifies four additional signals; DS1A, DS4NA, STS-1, and STS-3.

The electrical interface for the DS1A (2048) signal has been included to aid in interworking between networks using the North American hierarchy and those using the 2048 kbits/s hierarchy. Frame structure specifications that were previously included are now found in related standards. This standard defines the interface signal and is not intended to be an equipment specification. Accordingly, equipment and cable requirements that were previously listed in the body of the standard have been moved to informative annexes.

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by

American National Standards Institute
11 West 42nd Street, New York, New York 10036

Printed in the United States of America

Contents

Foreword (This foreword is not part of American National Standard T1.102-1993.)

This standard has been revised and reissued to update sections (now clauses) of the original standard that were incomplete and to add information on four new signals; DS4NA, STS-1, STS-3, and DS1A. Other changes include removing information concerning the signal framing formats which are now found in other standards.

This standard provides requirements (1) for the defined levels of the digital hierarchy so that North American telecommunications networks may be interconnected, and (2) for the DS1A (2048 kbits/s) signal to facilitate interworking with networks utilizing the 2048 hierarchy.

This standard has six annexes. Annex A on the use of an STS-1 eye diagram is normative and is considered part of this standard. The others are informative and are not considered part of this standard

Suggestions for improvement of this standard will be welcome. They should be sent to the Alliance for Telecommunications Solutions, 1200 G Street, NW, Suite 500, Washington, DC 20005.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Telecommunications, T1. Committee approval of the standard does not necessarily imply that all members voted for its approval. At the time it approved this standard, the T1 Committee had the following members:

Arthur K. Reilly, Chair
G. H. Peterson, Vice-Chair
O. J. Gusella, Secretary

W. E. Symons, Senior Editor
M. Soulliere, Senior Editor

Organization Represented	*Name of Representative*
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	Peter K. Cencer (Alt.)
Bell Atlantic	John W. Seazholtz
	Roger Nucho (Alt.)
Bellcore	D.S. Jordan
	James C. Staats (Alt.)
BellSouth Telecommunications, Inc.	Leonard Strickland, Jr.
	William J. McNamara, III (Alt.)
Centel Corporation	Bruce Becker
Cincinnati Bell Telephone	William P. Keidel
	Kevin R. Sullivan (Alt.)
Exchange Carriers Standards Association	Joseph Mendoza
	Gregory L. Theus (Alt.)
GTE Telephone Operations	Gregory L. Theus
	Richard L. Cochran (Alt.)
National Telephone Cooperative Association	Joseph M. Flanigan
NYNEX	James F. Baskin
	Jim Papadopoulos (Alt.)
Pacific Bell	Steve Grimm
	Sal R. Tesoro (Alt.)
Puerto Rico Telephone Company	Alberto E. Morales
	Segundo Ruiz
Southwestern Bell Corporation	Joseph Mendoza
	C. C. Bailey (Alt.)
Sprint – Local Telecommunications Division	Robert P. McCabe
	Harold L. Fuller (Alt.)

Organization Represented	*Name of Representative*
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	James Dahl (Alt.)
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	William Garner (Alt.)
AT&T Communications	Charles A. Dvorak
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Novatel Communications, Ltd.	Allan Angus
Picturetel Corporation	Marshall Schachtman
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AMERICAN NATIONAL STANDARD ANSI T1.102-1993

American National Standard
for Telecommunications -

Digital Hierarchy – Electrical Interfaces

1 Scope

1.1 General

The North American digital network is made up of sources of digital signals, including channel banks, digital switches, and multiplex equipment, interconnected by transmission facilities. These operate at several different bit rates. At any one level in the digital hierarchy there may be several signal sources with unique bit stream formats, but these need to have certain common characteristics to permit interconnection with transmission facilities at that level and with multiplex equipment connecting to a higher level.

The designation DS*N* or STS-*N* refers to those common features of the digital signal at the *N*-th level in the hierarchy. The levels in the North American digital network included in this standard are: DS1 (1.544 Mbit/s), DS1C (3.152 Mbit/s), DS2 (6.312 Mbit/s), DS3 (44.736 Mbit/s), STS-1 (51.840 Mbit/s), DS4NA (139.264 Mbit/s), and STS-3 (155.520 Mbit/s). This standard also includes the DS1A (2.048 Mbit/s) level of the 2048 kbits/s hierarchy which is sometimes used for interconnection with networks using the North American hierarchy.

1.2 Cross-connects

Any digital equipment, e.g., a multiplex or transmission facility, may be terminated on both ends at equipment capable of supporting a standard level interface. This (cross-connect) equipment provides a convenient central facility for circuit rearrangements, patching, and testing purposes. The implementation of the interface is not constrained to follow a particular technological approach but as an aid in transmission loss budgeting, annex B describes details of hard-wired, manual cross-connect equipment widely used in the North American network for providing the cross-connect and interface functions.

1.3 Interface specification

A DS*N* or STS-*N* level interconnection specification describes the electrical and physical characteristics for signals appearing at the appropriate level digital interface. It does not explicitly specify parameters either for transmitting or receiving equipment or for the cabling that connects such equipment to the interface[1]. Annex C describes the cabling characteristics widely in use in the North American network.

Equipment characteristics are described here only to the extent necessary to assure proper operation of transmission facilities and higher order multiplex equipment. End-to-end compatibility of two digital terminals is not assured by adherence to these interconnection specifications alone.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are

[1] It is the responsibility of the manufacturer to specify the conditions under which their equipment meets the specifications in this standard.

subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.101-1987, *Telecommunication – Synchronization interface standards for digital networks*

ANSI T1.105-1991, *Telecommunications – Digital hierarchy – Optical interface rates and formats specifications*

ANSI T1.107-1988, *Telecommunications – Digital hierarchy – Formats specifications*

IEC 469-2-1987, *Pulse technique and apparatus, Part 2 – Pulse measurement and analysis, general consideration*[2)]

3 Definitions

3.1 alternate mark inversion (AMI): A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are normally of alternating positive and negative polarity and are of equal amplitude, and in which binary zeros are represented by signal elements that have zero amplitude. North American implementations use signal elements representing binary ones that are non-zero for only half the unit interval (50% duty cycle). The terms *bipolar*, or *pseudoternary*, are also used to describe these implementations.

3.2 bipolar with three zero substitution (B3ZS): An AMI line code with the substitution of a unique code to replace occurrences of three consecutive zero signal elements. Each block of three successive zeros is replaced by 00V or B0V, where B represents an inserted non-zero signal element conforming to the AMI rule, and V represents a non-zero signal element that is a bipolar violation. The choice of 00V or B0V is made so that the polarity of successive V elements alternates to avoid introducing a DC component to the signal. An equivalent specification is that the number of B pulses between consecutive V pulses is odd. The CCITT (now ITU-TS) also uses the designation HDB2 to describe this code.

3.3 bipolar with six zero substitution (B6ZS): An AMI line code with the substitution of a unique code to replace occurrences of six consecutive zero signal elements. Each block of six successive zeros is replaced by 0VB0VB, where B represents an inserted non-zero signal element conforming to the AMI rule, and V represents a non-zero signal element that is a bipolar violation.

3.4 bipolar with eight zero substitution (B8ZS): An AMI line code with the substitution of a unique code to replace occurrences of eight consecutive zero signal elements. Each block of eight successive zeros is replaced by 000VB0VB, where B represents an inserted non-zero signal element conforming to the AMI rule, and V represents an inserted non-zero signal element that is a bipolar violation.

3.5 bipolar violation (BPV): A non-zero signal element in an AMI (bipolar) signal that has the same polarity as the previous non-zero signal element.

3.6 coded mark inversion (CMI): A two-level, non-return-to-zero code in which each binary zero is coded such that both amplitude levels appear during the unit interval corresponding to the binary zero. Level A1 is transmitted for the first half of the unit interval followed by level A2 for the second half. A binary one is coded such that only one of the two levels appears during the unit interval corresponding to the binary one. The choice of level is made to insure that the amplitude levels alternate for successive binary ones. For electrical implementations of this code, levels A1 and A2 are of equal magnitude and opposite polarity, with A2 being positive.

3.7 high density bipolar of order 3 (HDB3): An AMI line code with the substitution of a unique code to replace occurrences of four consecutive zero signal elements. Each block of four successive zeros is replaced by 000V or B00V, where B represents an inserted non-zero signal element conforming to the AMI rule, and V represents a non-zero signal element that is a bipolar violation. The choice of 000V or B00V is made so that the polarity of successive V elements alternates to avoid introducing a DC component to the signal. An equivalent specification is that the number of B pulses between consecutive V pulses is odd.

3.8 isolated pulse: A pulse that a) is not affected by intersymbol interference from other pulses in the signal, and b) is not corrupted by noise.

[2)] This standard replaces the now recinded ANSI/IEEE Std 181-1977.

3.9 jitter: The short term variations of the significant instants (e.g., zero level crossings) of a digital signal from their ideal positions in time. Here "short term" implies phase variations of frequency greater than or equal to 10 Hz. Jitter may lead to crosstalk, or distortion, or both, of the original analog signal, and is a potential source of bit errors at the ports of digital switches.

3.10 synchronous: A characteristic of signals such that the time intervals between the beginnings of consecutive signal elements occur at precisely the same average rate.

3.11 unit interval (UI): The nominal difference in time between the beginnings of consecutive signal elements of a line code.

4 Abbreviations

AIS	alarm indication signal
ANSI	American National Standards Institute
AWG	American wire gauge
dB	decibel
dBm	decibel referred to one milliwatt
DC	direct current
DS	digital signal
DS*N*	digital signal at level *N*
Hz	hertz
kHz	kilohertz
Mbit	megabit
MHz	megahertz
ppm	parts per million
STS	synchronous transmission signal
STS-*N*	synchronous transmission signal at level *N*
UI	unit interval

5 Pulse specification

5.1 Pulse masks

The interface specifications for many of the hierarchical rates include a graphical description of a pulse mask to judge the quality of signal pulses. No allowance for noise is included in any of the pulse masks in this standard.

For alternate mark inversion (AMI) coding, a pulse mask describing an isolated pulse appearing at the interface is used. In most cases, an ideal isolated pulse can only be approximated due to line coding constraints. For those hierarchical rates that include an isolated pulse mask specification, a bit sequence to approximate an isolated pulse is also defined. In this standard, isolated pulse masks are displayed in terms of a positive-going pulse. Negative-going pulses shall be inverted prior to comparison with the mask.

Pulse masks are shown in this standard in normalized form, with the nominal pulse amplitude shown as 1.0. In judging conformance of an isolated pulse to the mask, it is only permissible to a) position the mask horizontally as needed to encompass the pulse, and b) uniformly scale the amplitude of the isolated pulse to fit the mask. The baseline of the signal shall coincide with the zero point of the baseline of the mask. (The determination of signal baseline is described in IEC 469-2.) Judging the conformance of negative-going pulses shall be performed after determining the conformance of positive-going pulses in order to maintain the signal baseline reference. When viewing inverted negative-going pulses for DS1, DS1C, and DS1A, only the horizontal positioning of the mask to encompass the pulse is permitted. Note that pulse streams with any significant dc component will not meet the requirements of this clause. Additional information on the interpretation of pulse masks is incorporated in the various DS*N* or STS-*N* specifications.

5.2 Eye diagrams

For signals not amenable to the use of pulse masks, another means of specifying the quality of pulses at the interface is an eye diagram, which is formed by superimposing the waveforms of all possible pulse sequences, including the effects of intersymbol interference. Eye diagrams in this standard do not incorporate any effects of either random noise or jitter. The diagrams are presented in normalized form with the peak pulse amplitudes normalized to 1.0 on the vertical scale and the time scale shown in terms of the unit interval. In

judging the shape of an eye diagram, it is permissible to a) position the mask horizontally as needed to encompass the eye diagram, and b) uniformly scale the amplitude of the mask as needed to encompass the eye diagram. The baseline of the mask shall coincide with the signal baseline. The determination of the signal baseline is described in IEC 469-2. Additional information on the interpretation of eye diagrams is incorporated in the various DS*N* or STS-*N* specifications.

6 North American hierarchy level specifications

6.1 DS1 level specification

6.1.1 General

The DS1 signal has a nominal rate of 1.544 Mbit/s.

6.1.2 DS1 interface

The DS1 interface specification is defined in table 1. All signals appearing at the DS1 interface shall satisfy each requirement listed.

An isolated pulse (see pulse shape in table 1) at the DS1 interface shall fit within the mask shown in figure 1. The corner points for this mask are shown below the figure. In this figure, the *y* axis shows normalized pulse amplitude. The *x* axis is time measured in unit intervals. For DS1, the unit interval is 648 nanoseconds.

Some DS1 equipment embedded in the network may have been designed using a different pulse mask than that in this standard. Annex D describes the earlier specification to provide information to designers of receiving equipment on the possible range of DS1 signals in the network.

To accommodate signals generated by equipment predating this standard, DS1 receivers should be capable of operation with a signal having a transmission rate accuracy of ±200 bits/s (±130 ppm)[3)].

6.2 DS1C level specification

6.2.1 General

The DS1C signal has a nominal rate of 3.152 Mbit/s.

6.2.2 DS1C interface

The DS1C interface specification is defined in table 2. All signals appearing at a DS1C interface shall satisfy each requirement listed.

DS1C signals that are to be multiplexed shall have the frame structure as described in ANSI T1.107.

An isolated pulse (see pulse shape in table 2) at the DS1C interface shall fit within the mask shown in figure 2. The corner points for this mask are listed below the figure. In this figure, the *y* axis shows normalized pulse amplitude. The *x* axis is time measured in unit intervals. For DS1C, the unit interval is 317 nanoseconds.

6.3 DS2 level specification

6.3.1 General

The DS2 signal has a nominal rate of 6.312 Mbit/s.

6.3.2 DS2 interface

The DS2 interface specification is defined in table 3. All signals appearing at the DS2 interface shall satisfy each requirement listed.

An isolated pulse (see pulse shape in table 3) at the DS2 interface shall fit within the mask shown in figure 3. Equations defining the various line segments making up the mask are listed below the figure. In this figure, the *y* axis shows normalized pulse amplitude. The *x* axis is time measured in unit intervals. For DS2, the unit interval is 158 nanoseconds.

6.4 DS3 level specification

6.4.1 General

The DS3 signal has a nominal rate of 44.736 Mbit/s.

6.4.2 DS3 interface

The DS3 interface specification is defined in table 4. All signals appearing at the DS3 interface shall satisfy each requirement listed.

An isolated pulse (see pulse shape in table 4) at the DS3 interface shall fit within the mask shown in figure 4. Equations defining the various line segments making up the mask are listed below the figure. In this figure, the *y* axis shows normalized pulse amplitude. The *x* axis is time measured in unit intervals. For DS3, the unit interval is 22.4 nanoseconds.

[3)] See annex D for pulse characteristics of older equipment.

To assure proper operation of transmission facilities and higher order multiplex equipment, all DS3 sources shall use the frame structure described in ANSI T1.107.

6.5 STS-1 level specification

6.5.1 General

The STS-1 signal has a nominal rate of 51.840 Mbit/s.

6.5.2 STS-1 interface

The STS-1 interface specification is defined in table 5. All signals appearing at the STS-1 interface shall satisfy each requirement listed.

To assure proper operation of transmission facilities and higher order multiplex equipment, all STS-1 sources shall use the frame structure and scrambler specification described in ANSI T1.105.

A pulse mask applicable to parts of an STS-1 signal (see clause 5) is shown in figure 5. The equations defining the pulse mask are shown in the figure. In this figure, the *y* axis shows normalized amplitude, and the *x* axis denotes time measured in unit intervals. For STS-1, the unit interval is 19.3 nanoseconds.

An eye diagram applicable to the entire STS-1 signal is contained in annex A.

6.6 DS4NA level specification

6.6.1 General

The DS4NA signal has a nominal rate of 139.264 Mbit/s.

6.6.2 DS4NA interface

The DS4NA interface specification is defined in table 6. All signals appearing at the DS4NA interface shall satisfy each requirement listed.

The signal at the interface shall fit within the eye diagram mask of figure 7. A second eye diagram mask, figure 8, describes the maximum signal at the equipment output; it is directly derived from the 139264 kbits/s pulse masks in ITU-T (formerly CCITT) Recommendation G.703. Both masks are based on a signal with a random mix of binary ones and zeros. Corner points of the exclusionary regions are listed below the figures. In these figures, the *y* axis shows normalized amplitude and the *x* axis denotes time measured in unit intervals. For DS4NA, the unit interval is 7.18 nanoseconds.

6.7 STS-3 level specification

6.7.1 General

The STS-3 signal has a nominal rate of 155.520 Mbit/s.

6.7.2 STS-3 interface

The STS-3 interface specification is defined in table 7. All signals appearing at the STS-3 interface shall satisfy each requirement listed.

The signal at the interface shall fit within the eye diagram mask of figure 9. A second eye diagram mask, figure 10, describes the maximum signal at the equipment output; it is derived from the 139264 kbits/s pulse masks in ITU-T (formerly CCITT) Recommendation G.703. Both masks are based on a signal with a random mix of binary ones and zeros. Randomization is assured by the scrambler specification. Corner points of the exclusionary regions are listed below the figures. In these figures, the *y* axis shows normalized amplitude, and the *x* axis denotes time measured in unit intervals. For STS-3, the unit interval is 6.43 nanoseconds.

To assure proper operation of the transmission facilities, all STS-3 sources shall use the frame structure and scrambler specification described in ANSI T1.105.

7 Hierarchy interworking level specifications

7.1 DS1A level specification

7.1.1 General

The DS1A signal has a nominal rate of 2.048 Mbit/s.

7.1.2 DS1A interface

The DS1A interface specification is defined in table 8. All signals appearing at the DS1A interface shall satisfy each requirement listed.

An isolated pulse (see pulse shape in table 8) at the DS1A interface shall fit within the mask shown in figure 11. The corner points for this mask are listed below the figure. In this figure, the *y* axis shows normalized pulse amplitude. The *x* axis is time measured in unit intervals. For DS1A, the unit interval is 488 nanoseconds.

The ITU-TS (formerly CCITT) has specified 2.048 Mbit/s signals in the ITU-T G.703 Recommendation for use in the 2048 kbits/s hierarchy. Annex E describes the relationship between the ITU-T G.703 requirements and the DS1A interface specification.

Table 1 – DS1 Interface specification

Parameter	Specification
Nominal line rate	1.544 Mbit/s
Line rate accuracy	In a self timed, free running mode, the line rate accuracy shall be ±50 bits/s (±32 ppm) or better. During synchronized operation, the line rate accuracy shall be as specified in T1.101 for the appropriate stratum level.
Line code	Either (1) AMI with no more than 15 consecutive zeros, and at least *N* ones in each and every time window of 8(*N*+1) digit time slots (where *N* can range from 1 to 23), or (2) B8ZS[1].
Frame structure	No frame structure is required for DS1 transmission or higher level multiplexing to higher level DS*N* signals or to SONET payloads[2].
Medium	One balanced twisted pair shall be used for each direction of transmission.
Test load impedance	A resistive test load of 100 ohms ±5% shall be used at the interface for the evaluation of pulse shape and the electrical parameters specified below.
Pulse amplitude	The amplitude[3] of an isolated pulse shall be between 2.4 v and 3.6 v.
Pulse shape	The shape of every pulse that approximates an isolated pulse (is preceded by four zeros and followed by one or more zeros) shall conform to the mask in figure 1; see 5.1 for allowable procedures to be followed in checking conformance.
Power level	For an all-ones signal, the power in a 3 kHz ±1 kHz band centered at 772 kHz shall be between 12.6 dBm and 17.9 dBm. The power in a 3 kHz ±1 kHz band centered at 1544 kHz shall be at least 29 dB below that at 772 kHz.
Pulse imbalance	In any window of seventeen consecutive bits, the maximum variation in pulse amplitudes shall be less than 200 mV, and the maximum variation in pulse widths (half amplitude) shall be less than 20 ns.
DC power	There shall be no DC power applied to the interface.
Jitter	The maximum jitter at the DS1 interface shall not exceed the values shown in table 9.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

NOTES

1) B8ZS is one method of providing bit sequence independence. Bit sequence independence in turn allows unconstrained clear channel capability. ZBTSI is another method of providing clear channel transmission. See ANSI T1.107.

2) Standardized DS1 frame structures are defined in ANSI T1.107.

3) While both voltage and power requirements are given to assist in qualification of signals at the interface, the values are not equivalent. Voltage specifications are given for isolated pulses, while power levels are specified for an all-ones signal.

Table 2 – DS1C interface specification

Parameter	Specification
Nominal line rate	3.152 Mbit/s
Line rate accuracy	In a self timed, free running mode, the line rate accuracy shall be ±95 bits/s (±30 ppm) or better. During synchronized operation, the line rate accuracy shall be as specified in T1.101 for the appropriate stratum level.
Line code	Either (1) AMI with at least 12.5 percent average ones density over any 150 consecutive bits, or (2) B8ZS.
Frame structure	No frame structure is required for DS1C transmission. DS1C signals to be multiplexed to higher level DS*N* signals shall have the frame structure as described in ANSI T1.107[1)] No frame structure is required for multiplexing into SONET payloads.
Medium	One balanced twisted pair shall be used for each direction of transmission.
Test load impedance	A resistive test load of 100 ohms ±5% shall be used at the interface for the evaluation of pulse shape and the electrical parameters specified below.
Pulse amplitude	For a signal consisting of two DS1 all-ones signals multiplexed according to T1.107, the pulse amplitude shall be between 2.3 v and 4.2 v.
Pulse shape	The shape of every pulse that approximates an isolated pulse (is preceded by four zeros and followed by one or more zeros) shall conform to the mask in figure 2; see 5.1 for procedures to be followed in checking conformance.
Power level	A wideband power measurement of a signal consisting of two multiplexed DS1 all-ones signals multiplexed according to T1.107, using a power level sensor with a working range of 10 MHz shall be between 14.5 dBm and 18.5 dBm. A low-pass filter having a flat passband and a cutoff frequency of 10 MHz shall be used. The rolloff characteristics of this filter are not important.
Pulse imbalance	(1) The ratio of amplitudes of positive and negative isolated pulses shall be between 0.95 and 1.05, and (2) positive and negative isolated pulses shall both conform to the mask of figure 2.
DC power	There shall be no DC power applied to the interface.
Jitter	The maximum jitter at the DS1C interface shall not exceed the values shown in table 9.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

NOTES

1) In ANSI T1.107, the specified frame structure is known as Mode 2.

Table 3 – DS2 interface specification

Parameter	Specification
Nominal line rate	6.312 Mbit/s
Line rate accuracy	In a self timed, free running mode, the line rate accuracy shall be ±208 bits/s (±33 ppm) or better. During synchronized operation, the line rate accuracy shall be as specified in T1.101 for the appropriate stratum level.
Line code	B6ZS
Frame structure	A standard frame structure is not required for DS2 transmission or multiplexing to higher level DS*N* signals or to SONET payloads[1)]
Medium	One balanced twisted pair shall be used for each direction of transmission.
Test load impedance	A resistive test load of 110 ohms ±5% shall be used at the interface for the evaluation of pulse shape and the electrical parameters specified below.
Pulse amplitude	For all-ones data, the pulse amplitude shall be between 0.55 v and 1.3 v peak.
Pulse shape	The shape of every pulse that approximates an isolated pulse (is preceded by four zeros and followed by one or more zeros) shall conform to the mask in figure 3; see 5.1 for allowable procedures to be followed in checking conformance. This mask includes an allowance of ±3% of the peak pulse amplitude at any point on the mask relative to the pulse mask in the earlier version of this standard. Equations defining the various line segments making up the mask are listed below the figure.
Power level	For an all-ones signal, the power in a 3 kHz ±1 kHz band centered at 3.156 MHz shall be between 0.2 dBm and 7.3 dBm. The power in a 3 kHz ±1 kHz band centered at 6.312 MHz shall be at least 20 dB below that at 3.156 MHz.
Pulse imbalance	(1) The ratio of amplitudes of positive and negative isolated pulses shall be between 0.90 and 1.10, and (2) positive and negative isolated pulses shall both conform to the mask of figure 3.
DC power	There shall be no DC power applied to the interface.
Jitter	The maximum jitter at the DS2 interface shall not exceed the values shown in table 9.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

NOTES

1) A frame structure is defined in ANSI T1.107.

Table 4 – DS3 interface specification

Parameter	Specification
Nominal line rate	44.736 Mbit/s
Line rate accuracy	In a self timed, free running mode, the line rate accuracy shall be ±895 bits/s (±20 ppm) or better. During synchronized operation, the line rate accuracy shall be as specified in T1.101 for the appropriate stratum level.
Line code	B3ZS
Frame structure	The signal shall have the frame structure defined in ANSI T1.107 to ensure transmission through all types of DS3 transport equipment. The frame structure is not required for multiplexing to higher level DS*N* signals or to SONET payloads
Medium	One unbalanced coaxial line shall be used for each direction of transmission.
Test load impedance	A resistive test load of 75 ohms ±5% shall be used at the interface for the evaluation of pulse shape and the electrical parameters specified below.
Pulse amplitude	The pulse amplitude[1)] of an isolated pulse shall be between 0.36 v and 0.85 v peak.
Pulse shape	The shape of every pulse that approximates an isolated pulse (is preceded by two zeros and followed by one or more zeros) shall conform to the mask in figure 4; see 5.1 for allowable procedures to be followed in checking conformance. This mask includes an allowance of ±3% of the peak pulse amplitude at any point on the mask relative to the pulse mask in the earlier version of this standard. Equations defining the various line segments making up the mask are listed below the figure.
Power level	A wideband power measurement of an AIS signal (as defined in T1.107) using a power level sensor with a working frequency range of 200 MHz shall be between -4.7 dBm and +3.6 dBm, including the effects of a range of connecting cable lengths between 225 feet and 450 feet. A low-pass filter having a flat passband and cutoff frequency of 200 MHz shall be used. The rolloff characteristics of this filter are not important. OR An alternate power level specification of the power of an all-ones signal[2)] is useful for some equipment qualifications. It requires that the power in a 3 kHz ±1 kHz band centered at 22.368 MHz be between -1.8 dBm and +5.7 dBm. It further requires that the power in a 3 kHz ±1 kHz band centered at 44.736 MHz be at least 20 dB below that at 22.368 MHz.
Pulse imbalance	(1) The ratio of amplitudes of positive and negative isolated pulses shall be between 0.90 and 1.10, and (2) positive and negative isolated pulses shall both conform to the mask of figure 4.
DC power	There shall be no DC power applied to the interface.

(continued)

Table 4 *(concluded)*

Parameter	Specification
Jitter	The maximum jitter at the DS3 interface shall not exceed the values shown in table 9.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

NOTES

1) While both voltage and power requirements are given to assist in qualification of signals at the interface, the values are not equivalent. Voltage specifications are given for isolated pulses, while power levels are specified for an AIS signal, or alternatively an all-ones signal.

2) The all-ones signal is not realizable within the frame structure specified in T1.107, and is not encountered in North American telecommunications networks.

Table 5 – STS-1 Interface specification

Parameter	Specification
Nominal line rate	51.840 Mbit/s
Line rate accuracy	During synchronized operation, the line rate accuracy shall be that of the network clock as specified in T1.105 (see also T1.101). In a self timed, free running mode, the line rate accuracy shall be ±1037 bits/s (±20 ppm) or better.
Line code	B3ZS
Frame structure	The signal shall have the frame structure and scrambling defined in ANSI T1.105.
Medium	One unbalanced coaxial line shall be used for each direction of transmission.
Test load impedance	A resistive test load of 75 ohms ±5 percent shall be used at the interface for the evaluation of pulse shape and the electrical parameters specified below.
Power level	A wideband power measurement using a power level sensor with a working frequency range of at least four times the bit rate frequency shall be between -2.7 dBm and +4.7 dBm, including the effects of a range of connecting cable lengths between 225 feet and 450 feet. A low-pass filter with a flat passband and a cutoff frequency of 207.360 MHz shall be used. The rolloff characteristics of this filter are not important.
Pulse shape	The shape of every pulse that approximates an isolated pulse (is preceded by two zeros and followed by one or more zeros) shall conform to the mask in figure 5; see 5.1 for allowable procedures to be followed in checking conformance. Equations defining the various line segments making up the mask are listed below the figure. For applicable procedures utilizing the entire STS-1 signal, see annex A.
DC power	There shall be no DC power applied to the interface.
Jitter	This subject is for further study.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

Table 6 – DS4NA interface specification

Parameter	Specification
Nominal line rate	139.264 Mbit/s
Line rate accuracy	In a self timed, free running mode, the line rate accuracy shall be ±2089 bits/s (±15 ppm) or better. During synchronized operation, the line rate accuracy shall be as specified in T1.101 for the appropriate stratum level.
Line code	CMI. Figure 6 shows an example of a CMI-coded signal.
Frame structure	No frame structure is required for transmission of the DS4NA signal or for multiplexing into SONET payloads[1)].
Medium	One unbalanced coaxial line shall be used for each direction of transmission.
Test load impedance	A resistive test load of 75 ohms ±5% shall be used at the interface for the evaluation of pulse shape and the electrical parameters of the signal.
Power level	A wideband power measurement using a power level sensor with a working frequency range of at least twice the bit rate frequency shall be between -2.2 dBm and +6.3 dBm, including the effects of a range of connecting cable lengths between 0 feet and 225 feet. A low-pass filter with a flat passband and a cutoff frequency of 278.528 MHz shall be used. The rolloff characteristics of this filter are not important.
Eye diagram	An eye diagram mask for the signal at the interface is shown in figure 7; see 5.2 for allowable procedures to be followed in checking conformance. A second mask defining the maximum signal at the equipment output is shown in figure 8. These were derived using a reference timing signal at twice the DS4NA rate, or 278.528 MHz. Exclusionary regions are shown as crosshatched areas on the figures. The corner points of these regions are shown below each figure.
DC power	There shall be no DC power applied to the interface.
Jitter	The maximum jitter at the DS4NA interface shall not exceed the values shown in table 9.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

NOTES

1) A frame structure is defined in ANSI T1.107.

Table 7 – STS-3 Interface specification

Parameter	Specification
Nominal line rate	155.520 Mbit/s
Line rate accuracy	During synchronized operation, the line rate accuracy shall be that of the network clock as specified in T1.105 (see also T1.101). In a self timed, free running mode, the line rate accuracy shall be ±3110 bits/s (±20 ppm) or better.
Line code	CMI. Figure 6 shows an example of a CMI-coded signal.
Frame structure	The STS-3 signal shall have the frame structure and scrambling specified in ANSI T1.105.
Medium	One unbalanced coaxial line shall be used for each direction of transmission.
Test load impedance	A resistive test load of 75 ohms ±5% shall be used at the interface for the evaluation of pulse shape and the electrical parameters of the signal.
Power level	A wideband power measurement using a power level sensor with a working frequency range of at least twice the bit rate frequency shall be between -2.5 dBm and +4.3 dBm, including the effects of a range of connecting cable lengths between 0 feet and 225 feet. A low-pass filter with a flat passband and a cutoff frequency of 311.040 MHz shall be used. The rolloff characteristics of this filter are not important.
Eye diagram	An eye diagram mask for the signal at the interface is shown in figure 9; see 5.2 for allowable procedures to be followed in checking conformance. A second mask defining the maximum signal at the equipment output is shown in figure 10. These were derived using a reference timing signal at twice the STS-3 rate, or 311.040 MHz. Exclusionary regions are shown as crosshatched areas on the figures. The corner points of these regions are shown below each figure.
DC power	There shall be no DC power applied to the interface.
Jitter	This subject is for further study.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

Table 8 – DS1A interface specification

Parameter	Specification
Nominal line rate	2.048 Mbit/s
Line rate accuracy	In a self timed, free running mode, the line rate accuracy shall be ±102 bits/s (±50 ppm) or better. During synchronized operation, the line rate accuracy shall be as specified in T1.101 for the appropriate stratum level.
Line code	HDB3.
Frame structure	No frame structure is required for DS1A transmission or higher order multiplexing to higher level DS*N* signals or to SONET payloads[1].
Medium	One balanced twisted pair shall be used for each direction of transmission.
Test load impedance	A resistive test load of 100 ohms ±5% shall be used at the interface for the evaluation of signal pulse shape and the electrical parameters.
Pulse amplitude	The pulse amplitude[2] of an isolated pulse shall be between 2.2 v and 3.3 v.
Pulse shape	The shape of every pulse that approximates an isolated pulse (is preceded by three zeros and followed by one or more zeros) shall conform to the mask in figure 11; see 5.1 for allowable procedures to be followed in checking conformance.
Power level	For an all-ones signal, the power in a 3 kHz ±1 kHz band centered at 1.024 MHz shall be between 13.7 dBm and 17.5 dBm. The power in a 3 kHz ±1 kHz band centered at 2.048 MHz shall be at least 20 dB below that at 1.024 MHz.
Pulse imbalance	(1) The ratio of amplitudes of positive and negative isolated pulses shall be between 0.95 and 1.05, and (2) positive and negative isolated pulses shall both conform to the mask of figure 11.
DC power	There shall be no DC power applied to the interface.
Jitter	The maximum jitter at the DS1A interface shall not exceed the values shown in table 9.
Verification access	Access to the signal at the interface shall be provided for verification of these signal specifications.

NOTES

1) Frame structure details appear in CCITT G.704.

2) While both voltage and power requirements are given to assist in qualification of signals at the interface, the values are not equivalent. Voltage specifications are given for isolated pulses, while power levels are specified for an all-ones signal.

Table 9 – Maximum output jitter at hierarchical interfaces

		Network limit UI (Peak-to-Peak)		Measurement filter bandwidth corresponds to a bandpass filter having lower cut-off frequency F_1 or F_3 and minimum upper cut-off frequency F_4		
Bit rate Mbit/s	Unit interval ns	Band 1 F_1 to F_4	Band 2 F_3 to F_4	F_1 Hz	F_3 (Note 1) kHz	F_4 kHz
1.544	648.	5.0	0.1	10	8	40
2.048	488.	1.5	0.2	20	18	100
3.152	317.	5.0	0.1	10	1.5	40
6.312	158.	3.0	0.1	10	3	60
44.736	22.4	5.0	0.1	10	30	400
51.840[1)]	19.3	–	–	–	–	–
139.264	7.18	1.5	0.075	200	10	3500
155.520[1)]	6.43	–	–	–	–	–

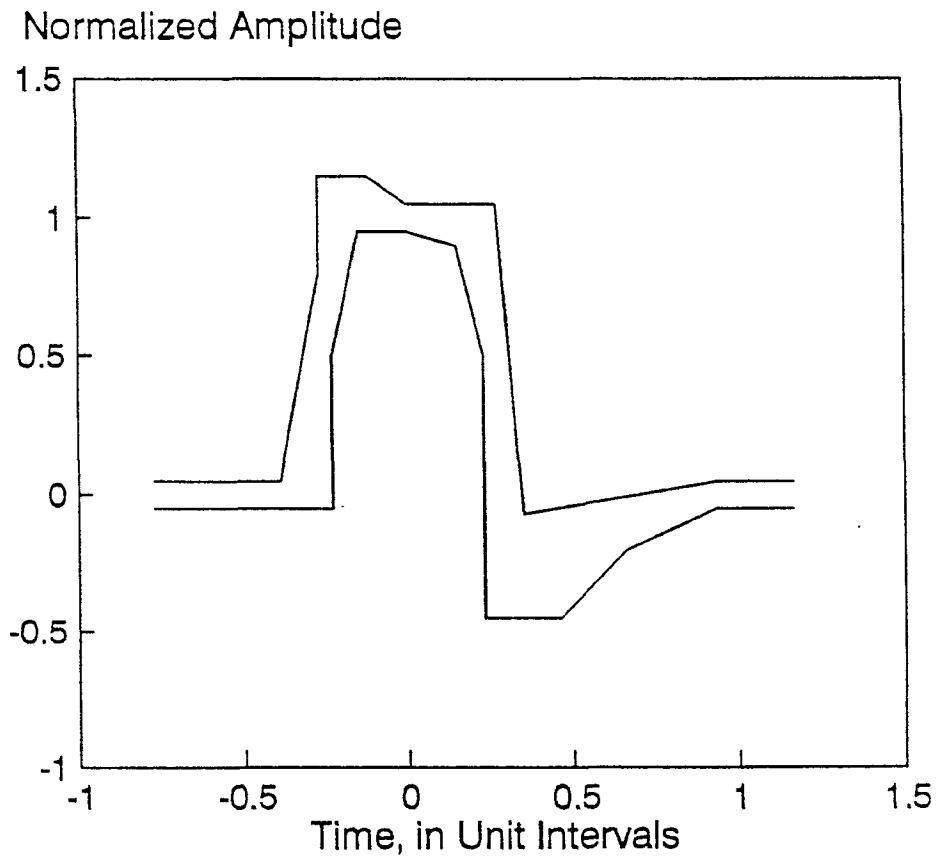
NOTES

1 F_3, the lower cut-off frequency of one of the bandpass filters, represents the jitter half-bandwidth of typical timing extraction circuits. The frequency F_3 is determined from

$F_3 = f_0 / 2Q$

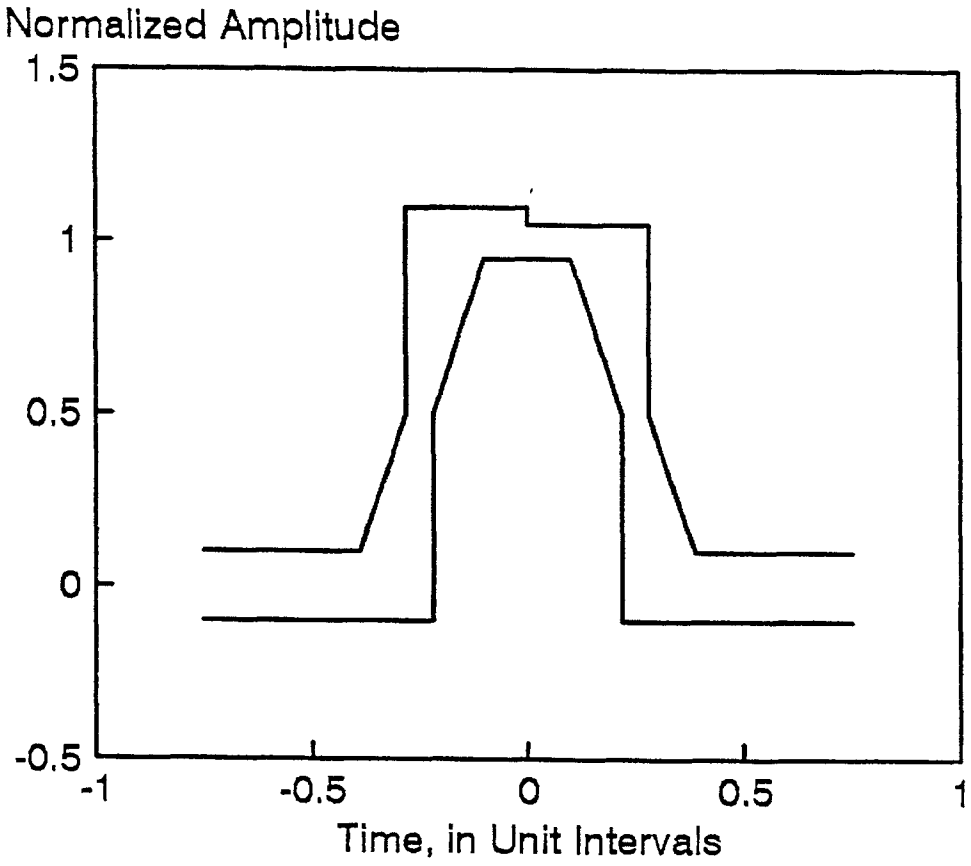
where f_0 and Q represent the digital signal rate and the Q-factor of the timing recovery circuit, respectively.

1) Under study



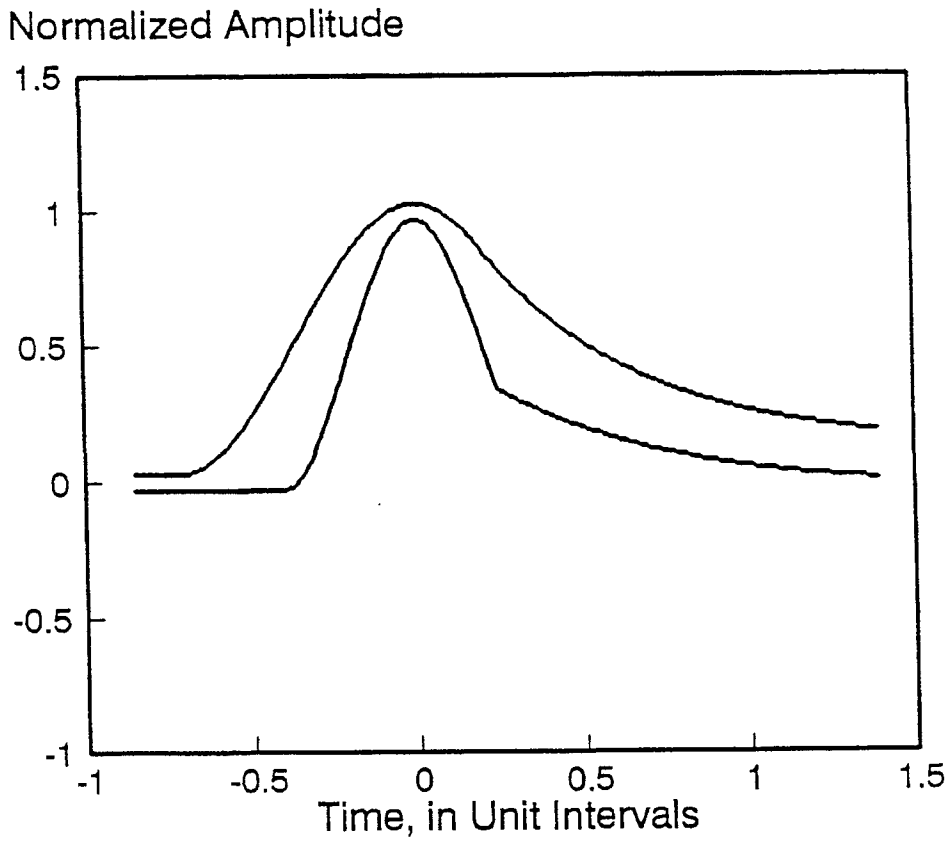
Minimum curve		Maximum curve	
Time	Normalized amplitude	Time	Normalized amplitude
-.77	-.05	-.77	.05
-.23	-.05	-.39	.05
-.23	.5	-.27	.8
-.15	.95	-.27	1.15
0.0	.95	-.12	1.15
.15	.9	0.0	1.05
.23	.5	.27	1.05
.23	-.45	.35	-.07
.46	-.45	.93	.05
.66	-.2	1.16	.05
.93	-.05		
1.16	-.05		

Figure 1 – DS1 Interface isolated pulse mask and corner points



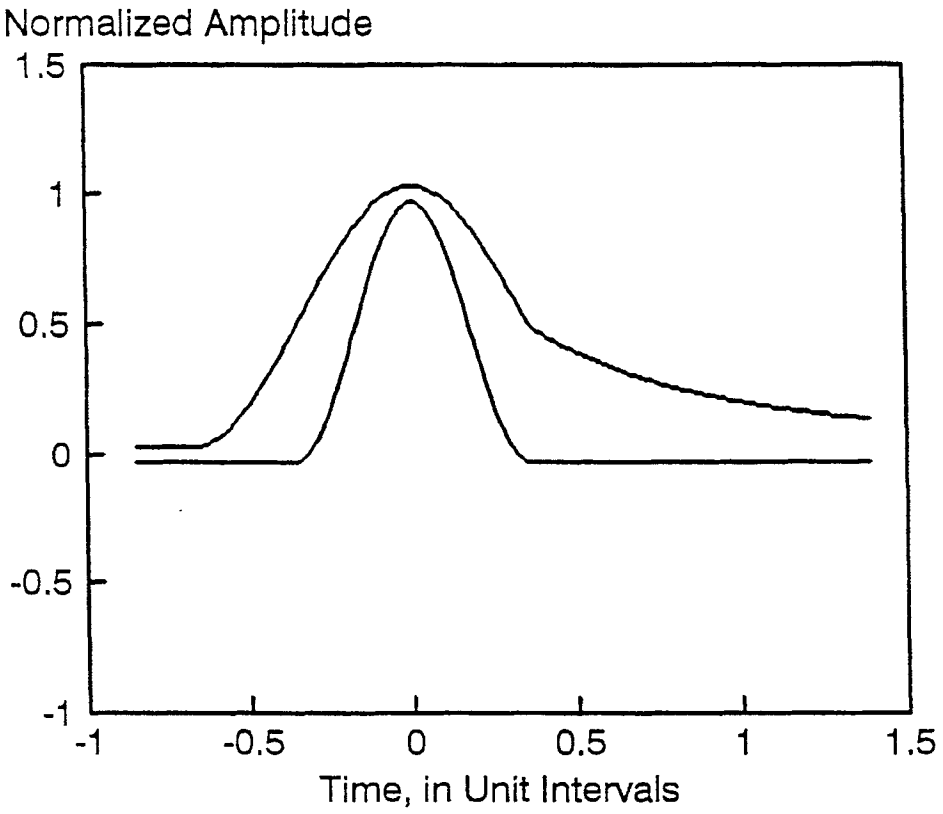
Minimum curve		Maximum curve	
Time	Normalized amplitude	Time	Normalized amplitude
-.75	-.10	-.75	.10
-.22	-.10	-.39	.10
-.22	.5	-.28	.5
-.10	.95	-.28	1.10
.10	.95	0.0	1.10
.22	.5	0.0	1.05
.22	-.10	.28	1.05
.75	-.10	.28	.5
		.39	.10
		.75	.10

Figure 2 – DS1C interface isolated pulse mask and corner points



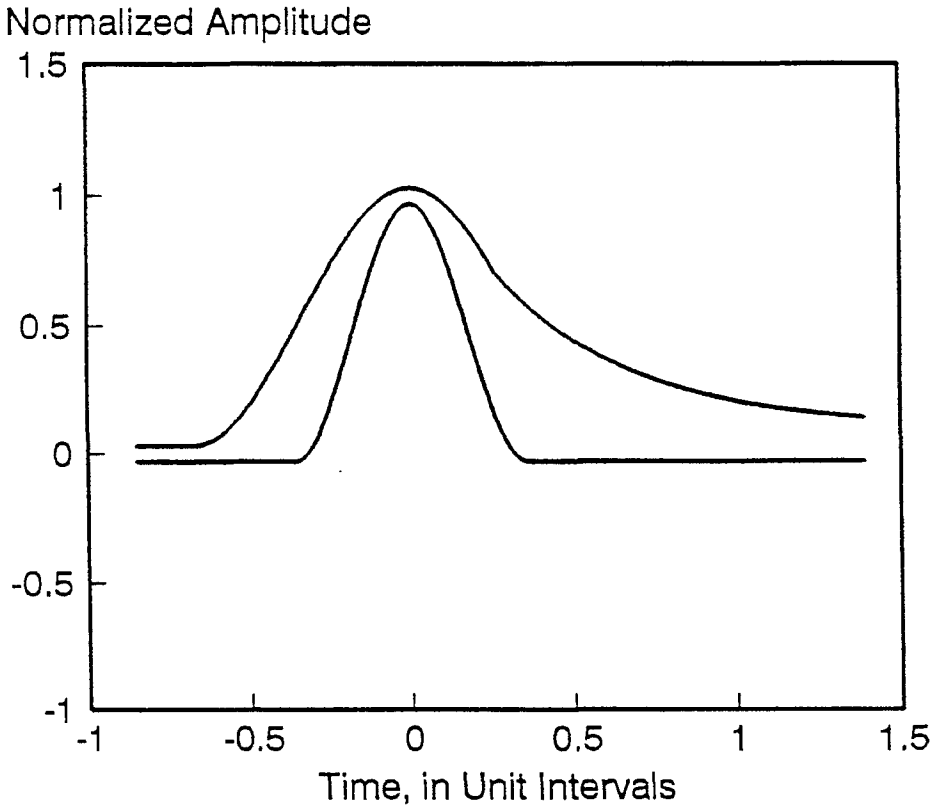
Time axis range unit intervals	Normalized amplitude equation
Upper curve	
$-0.85 \le T \le -0.72$	0.03
$-0.72 \le T \le 0.2$	$0.5\{ 1+\sin [(\pi/2)(1+T/0.36)] \} + 0.03$
$0.2 \le T \le 1.4$	$0.13+0.72\, e^{-2.13(T-0.2)}$
Lower curve	
$-0.85 \le T \le -0.41$	-0.03
$-0.41 \le T \le 0.24$	$0.5\{ 1+\sin [(\pi/2)(1+T/0.205)] \} - 0.03$
$0.24 \le T \le 1.4$	$0.331\, e^{-1.9(T-0.3)} - 0.03$

Figure 3 – DS2 interface isolated pulse mask and equations



Time axis range unit intervals	Normalized amplitude equation
Upper curve	
$-0.85 \le T \le -0.68$	0.03
$-0.68 \le T \le 0.36$	$0.5\{ 1+\sin [(\pi/2)(1+T/0.34)] \} + 0.03$
$0.36 \le T \le 1.4$	$0.08+0.407\, e^{-1.84(T-0.36)}$
Lower curve	
$-0.85 \le T \le -0.36$	-0.03
$-0.36 \le T \le 0.36$	$0.5\{ 1+\sin [(\pi/2)(1+T/0.18)] \} - 0.03$
$0.36 \le T \le 1.4$	- 0.03

Figure 4 – DS3 interface isolated pulse mask and equations



Time axis range unit intervals	Normalized amplitude equation
Upper curve	
$-0.85 \le T \le -0.68$	0.03
$-0.68 \le T \le 0.26$	$0.5\{ 1+\sin [(\pi/2)(1+T/0.34)] \} + 0.03$
$0.26 \le T \le 1.40$	$0.1+0.61\, e^{-2.4(T-0.26)}$
Lower curve	
$-0.85 \le T \le -0.38$	-0.03
$-0.38 \le T \le 0.36$	$0.5\{ 1+\sin [(\pi/2)(1+T/0.18)] \} - 0.03$
$0.36 \le T \le 1.40$	- 0.03

Figure 5 – STS-1 interface isolated pulse mask and equations

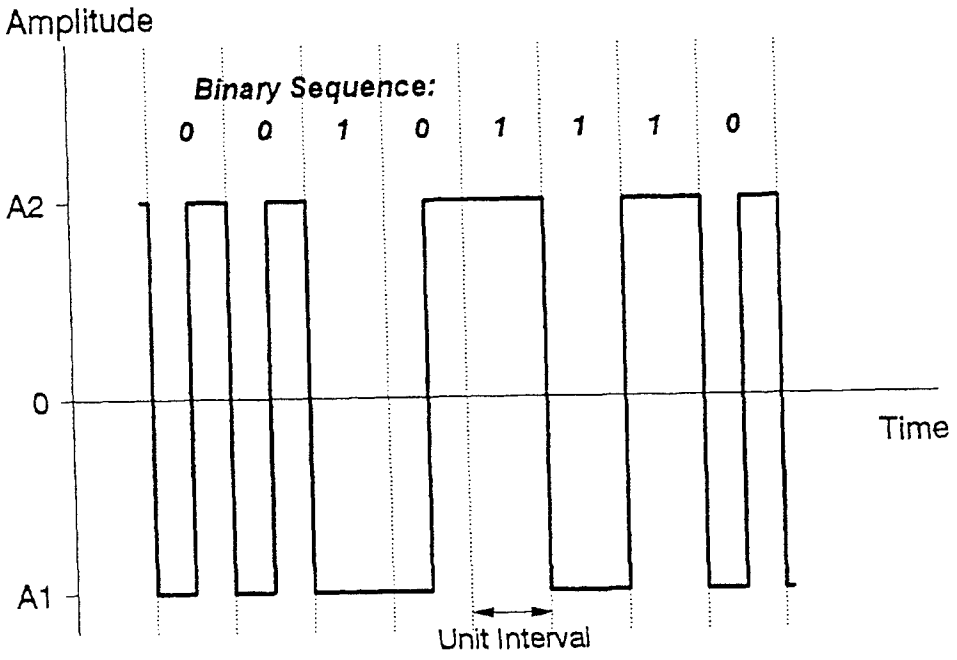
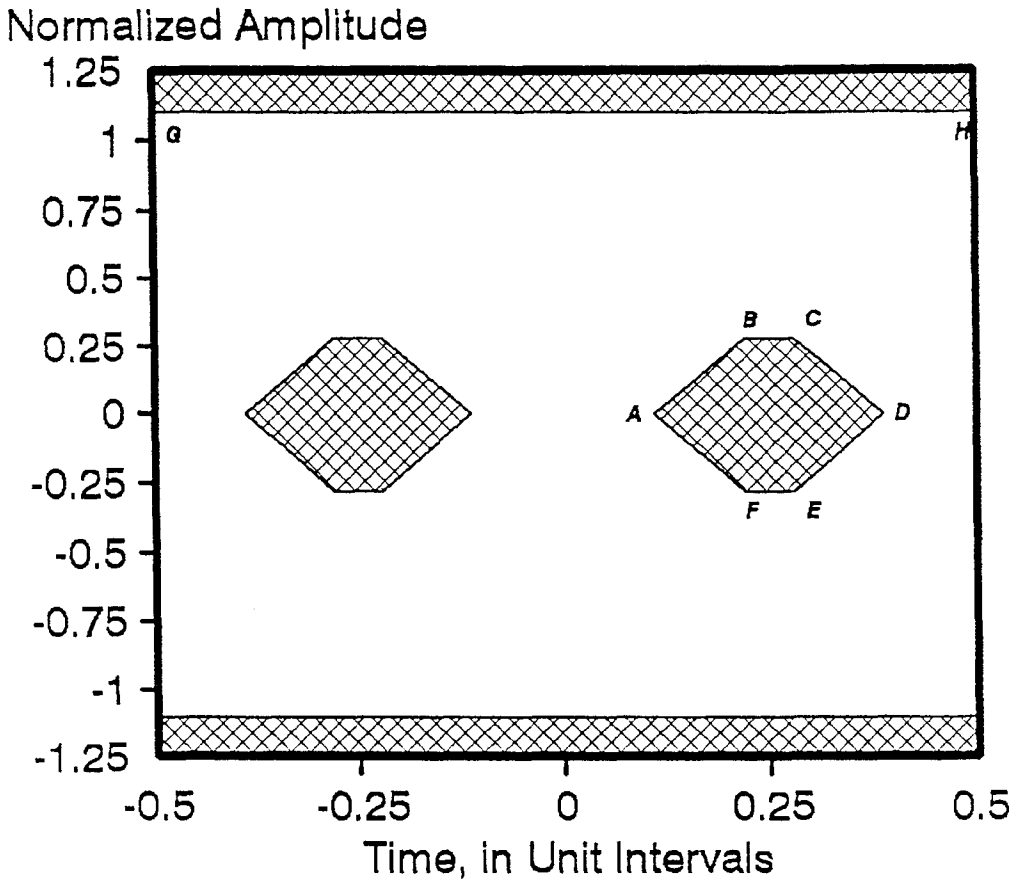


Figure 6 – Example of CMI coding



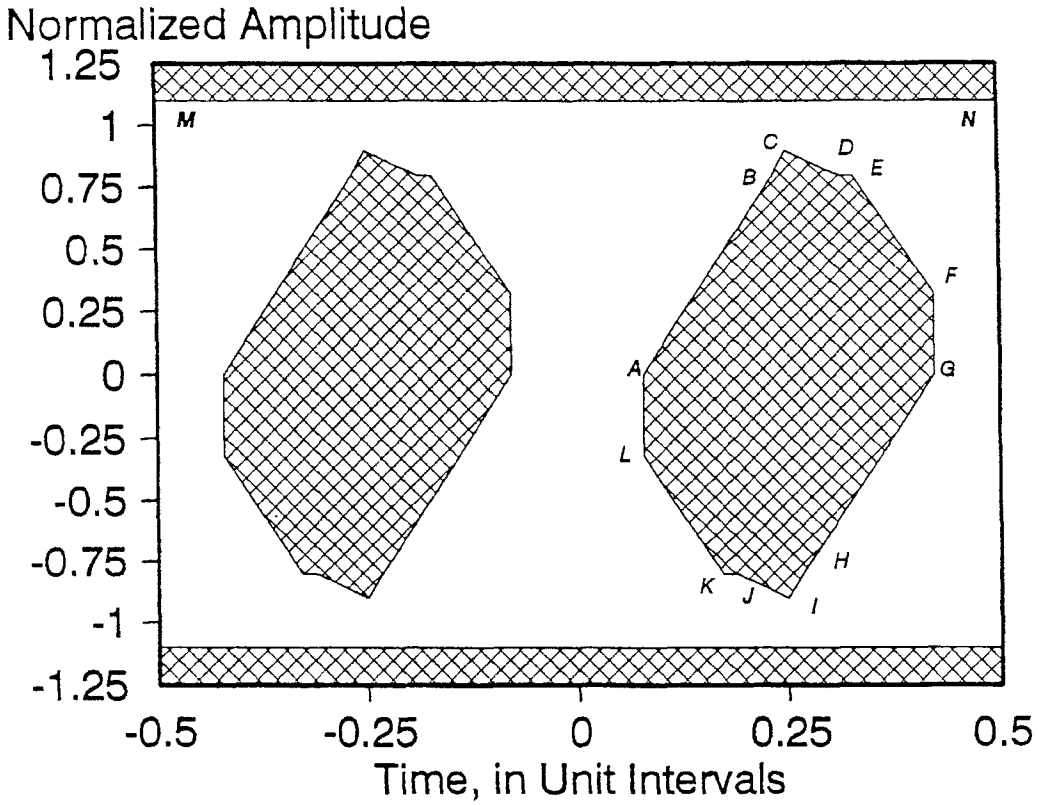
Inner region corner points			Outer region corner points		
Point	**Time**	**Amplitude**	**Point**	**Time**	**Amplitude**
A	0.112	0.0	G	-0.5	1.1
B	0.22	0.28	H	0.5	1.1
C	0.28	0.28			
D	0.388	0.0			
E	0.28	-0.28			
F	0.22	-0.28			

NOTES

1 Inner regions are identically shaped, but displaced by one-half unit interval.

2 Outer regions are symmetric about zero amplitude axis

Figure 7 – DS4NA interface eye diagram



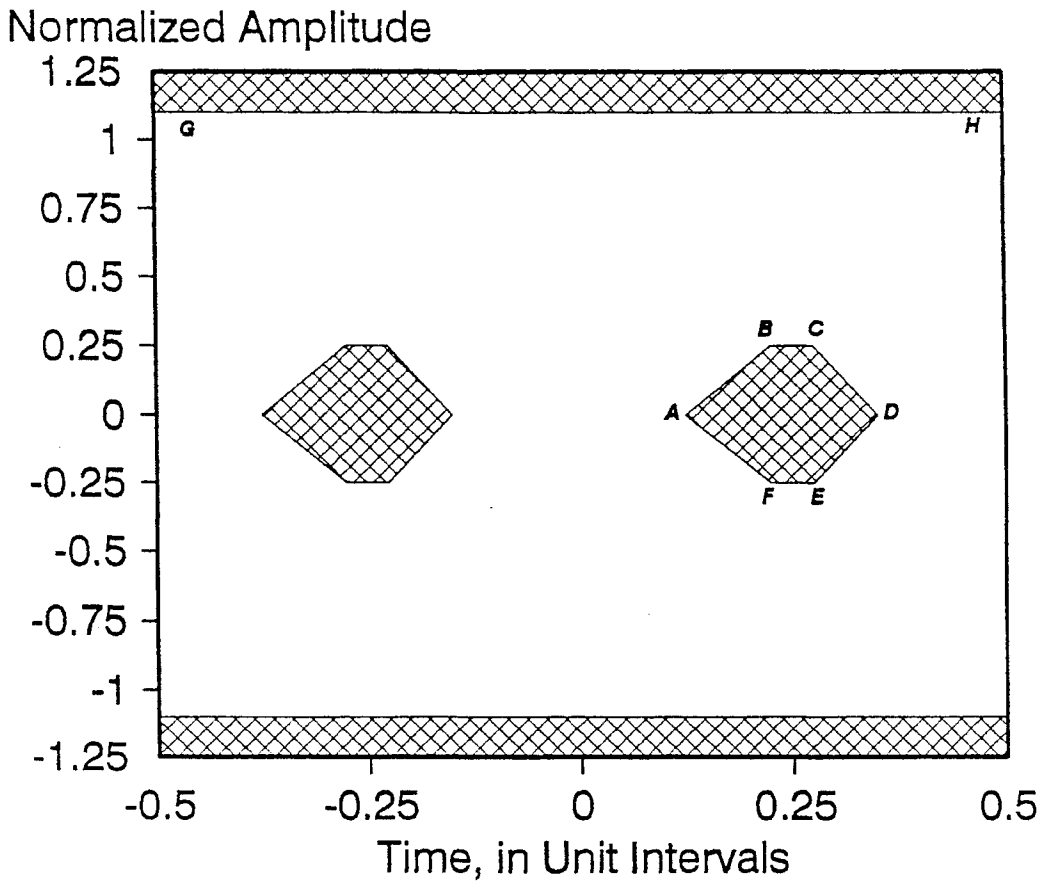
Inner region corner points			Outer region corner points		
Point	**Time**	**Amplitude**	**Point**	**Time**	**Amplitude**
A	0.078	0.0	M	-0.5	1.1
B	0.233	0.8	N	0.5	1.1
C	0.25	0.9			
D	0.313	0.8			
E	0.329	0.8			
F	0.422	0.32			
G	0.422	0.0			
H	0.267	-0.8			
I	0.25	-0.9			
J	0.187	-0.8			
K	0.171	-0.8			
L	0.078	-0.32			

NOTES

1 - Inner regions are identically shaped, but displaced by one-half unit interval.

2 - Outer regions are symmetric about zero amplitude axis

Figure 8 – DS4NA maximum equipment output eye diagram



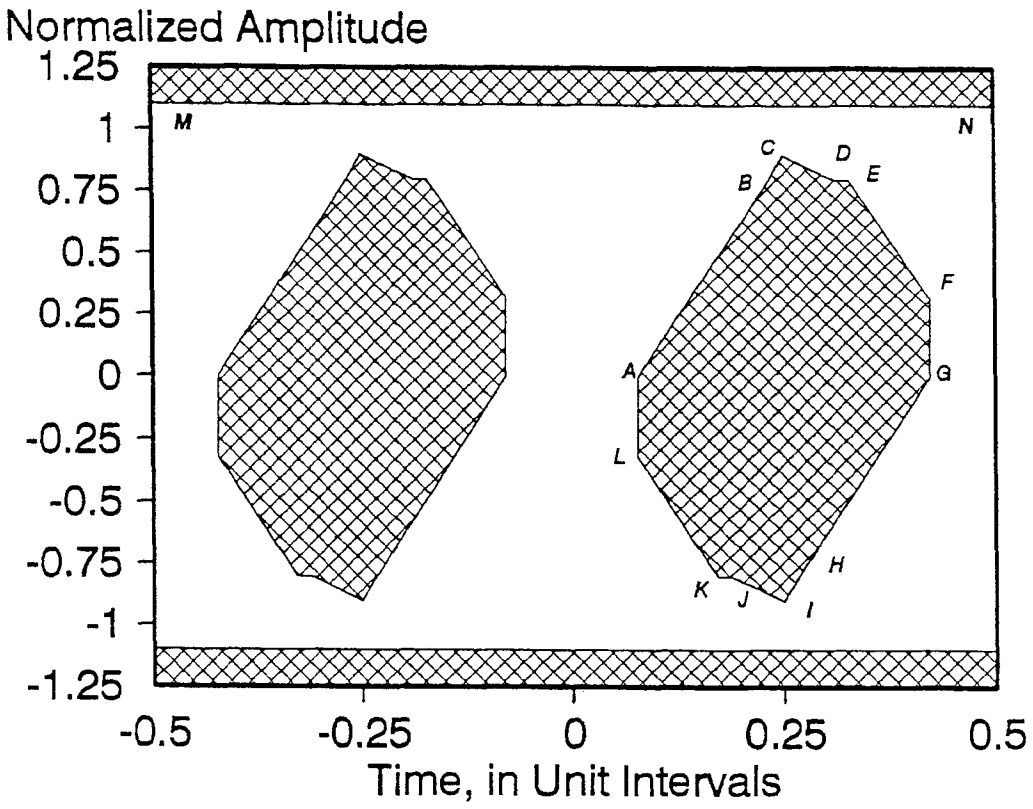
Inner region corner points			Outer region corner points		
Point	**Time**	**Amplitude**	**Point**	**Time**	**Amplitude**
A	0.125	0.0	G	-0.5	1.1
B	0.225	0.25	H	0.5	1.1
C	0.275	0.25			
D	0.35	0.0			
E	0.275	-0.25			
F	0.225	-0.25			

NOTES

1 - Inner regions are identically shaped, but displaced by one-half unit interval.

2 - Outer regions are symmetric about zero amplitude axis

Figure 9 – STS-3 Interface eye diagram



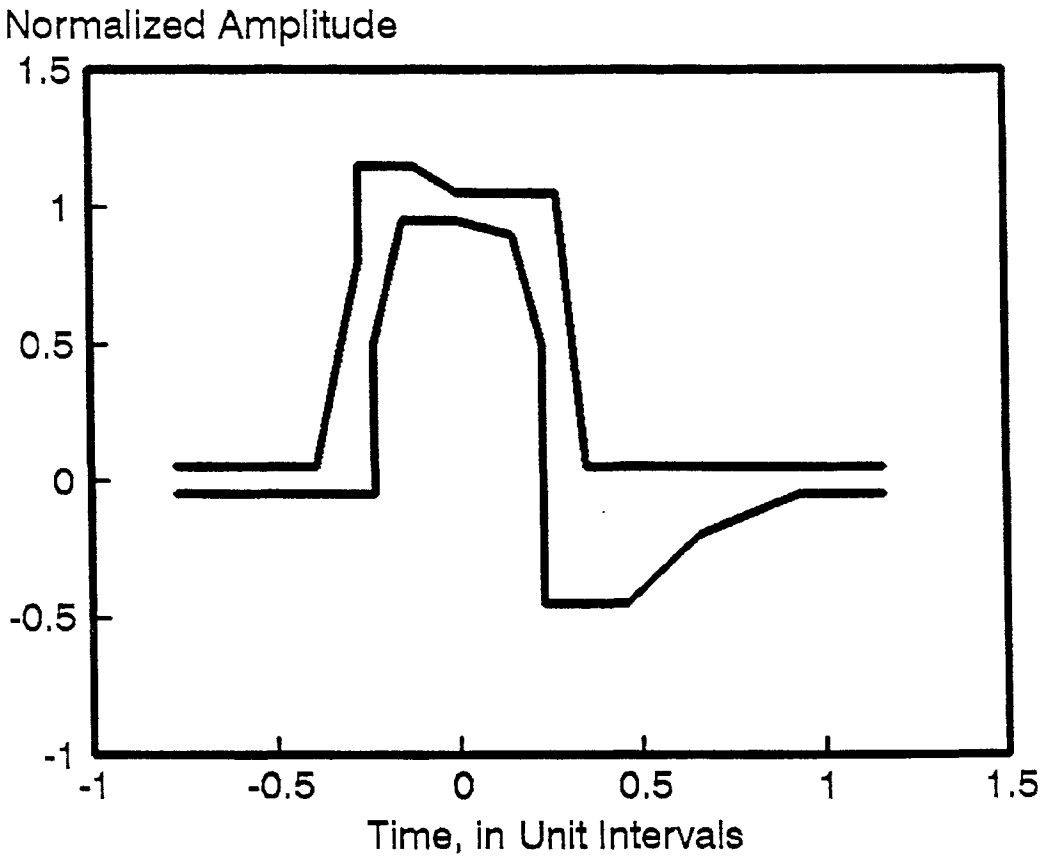
Inner region corner points			Outer region corner points		
Point	**Time**	**Amplitude**	**Point**	**Time**	**Amplitude**
A	0.078	0.0	M	-0.5	1.1
B	0.233	0.8	N	0.5	1.1
C	0.25	0.9			
D	0.313	0.8			
E	0.329	0.8			
F	0.422	0.32			
G	0.422	0.0			
H	0.267	-0.8			
I	0.25	-0.9			
J	0.187	-0.8			
K	0.171	-0.8			
L	0.078	-0.32			

NOTES

1 - Inner regions are identically shaped, but displaced by one-half unit interval.

2 - Outer regions are symmetric about zero amplitude axis

Figure 10 – STS-3 maximum equipment output eye diagram



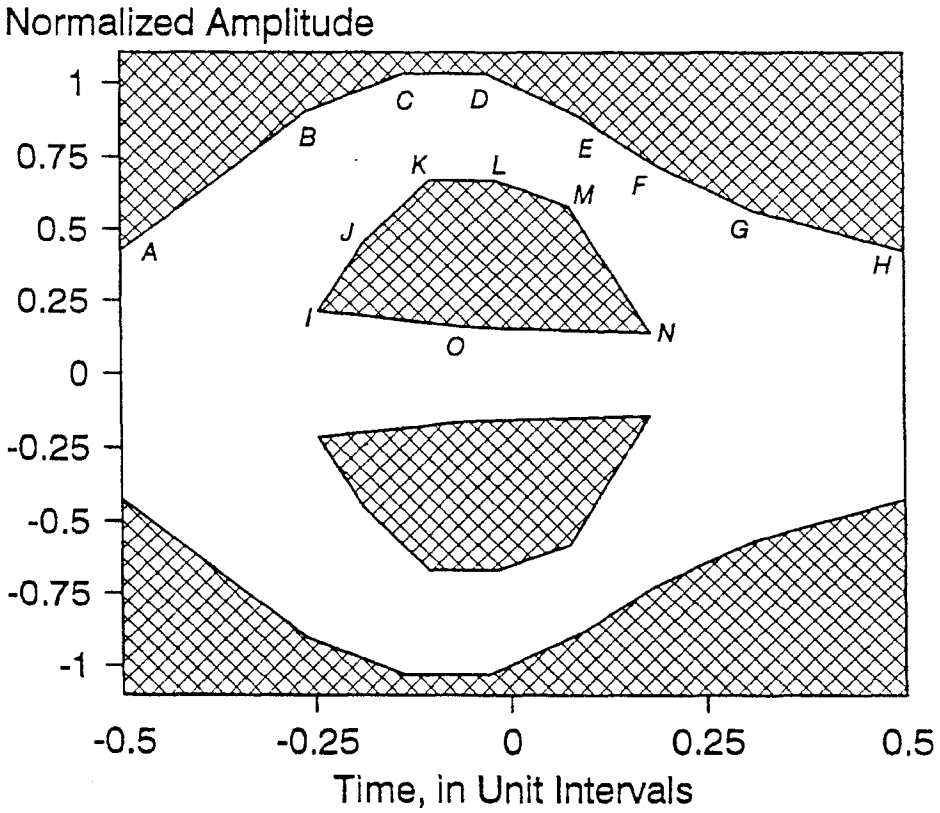
Minimum curve		Maximum curve	
Time	Normalized amplitude	Time	Normalized amplitude
-.77	-.05	-.77	.05
-.23	-.05	-.39	.05
-.23	.5	-.27	.8
-.15	.95	-.27	1.15
0.0	.95	-.12	1.15
.15	.9	0.0	1.05
.23	.5	.27	1.05
.23	-.45	.35	.05
.46	-.45	.93	.05
.66	-.2	1.16	.05
.93	-.05		
1.16	-.05		

Figure 11 – DS1A interface isolated pulse mask and corner points

Annex A
(normative)

STS-1 eye diagram

Pulse shape can be evaluated only with an eye diagram if the entire STS-1 signal is to be examined. The complete STS-1 signal at the interface shall conform to the eye diagram shown in figure A.1; see 5.2 for allowable procedures to be followed in checking conformance. Exclusionary regions are shown as crosshatched areas on the figure. The corner points of these regions are listed below the figure. Note that a stable STS-1-rate clock signal is required to trigger the display device to yield an accurate eye-diagram measurement.



Outer region corner points			Inner region corner points		
Point	**Time**	**Amplitude**	**Point**	**Time**	**Amplitude**
A	-0.5	0.426	I	-0.245	0.214
B	-0.261	0.904	J	-0.187	0.455
C	-0.136	1.03	K	-0.104	0.67
D	-0.028	1.03	L	-0.017	0.67
E	0.094	0.883	M	0.077	0.581
F	0.187	0.723	N	0.18	0.14
G	0.31	0.566	O	-0.054	0.16
H	0.5	0.426			

NOTE - Both inner and outer regions are symmetric about zero amplitude axis

Figure A.1 – STS-1 interface eye diagram

Annex B
(informative)

Manual DS*N* cross-connect characteristics

B.1 General

The interface specifications in this standard are written so as to not dictate any particular technological approach to providing the interface. This annex describes details of the manual cross-connect frame technology that provides these interface functions in present networks. Implementation of an interface with electronic cross-connect technology would alter a number of these details, particularly in the area of return loss, insertion loss, and crosstalk loss.

The North American cross-connects are designated DSX-*N*, where *N* indicates the level (DS*N*) of the digital network interconnected at that cross-connect. Thus, DS1 equipment is interconnected at the DSX-1 cross-connect, DS1A equipment is interconnected at the DSX-1A cross-connect, and so on. In designating the physical connection to these cross-connects, the distribution frame jack connected to a pair bringing signals to the distribution frame is designated the out-jack. The distribution frame jack connected to a pair carrying signals away from the distribution frame is designated the in-jack. Widespread practice references the Interface to the out-jack appearance on a cross-connect.

The detailed electrical characteristics of typical cables used to connect equipment to and from cross-connects appear in annex C. Maximum cable lengths in use, based on current engineering practice in networks is included for each of the cross-connect implementation descriptions.

B.2 Implementation descriptions

B.2.1 DSX-1

DSX-1 cross-connects can be engineered in a variety of configurations in the network. A simplified schematic diagram for a DSX is shown for reference in figure B.1.

Typical electrical parameters associated with the DSX-1 cross-connect include:

- The insertion loss of the DSX-1 is typically less than the loss of 85 feet of 22 gauge cross-connect wire.

- The return loss at the DSX-1 is typically greater than 26 dB at 772 kHz. The measurement is made at the out-jack including the effect of 85 feet of 22 gauge cross-connect or patch cabling to an in-jack which is terminated in 100 ohms ±5% tolerance.

- The crosstalk loss at the DSX-1 is typically greater than 55 dB at 772 kHz between the out-jack and the in-jack of adjacent signal paths. All other jacks are terminated with 100 ohms ±5% tolerance terminations.

- Protected (non-intrusive) monitoring access is provided through a high impedance bridging circuit consisting of 432 ohm ±5% tolerance resistors connected to the tip and ring conductors at the out-jack. This provides a monitor level 19.64 dB ±0.87 dB below the signal power.

- Typical engineering rules constrain cabling to and from equipment to the DSX-1 cross-connect to up to 655 feet of multi-pair 22 AWG office cable with overall outer shield. This cable is also widely known as 22 AWG ABAM.

B.2.2 DSX-1A

DSX-1A cross-connects can be engineered in a variety of configurations in the network. A simplified schematic diagram for a DSX is shown for reference in figure B.1. Typical electrical parameters associated with the DSX-1A cross-connect include:

- The insertion loss of the DSX-1A is typically less than the loss of 85 feet of 22 gauge cross-connect wire.

- The return loss of the DSX-1A is typically greater than 26 dB at 1.024 MHz. The measurement is made at the out-jack including the effect of 85 feet of 22 gauge cross-con-

nect or patch cabling to an in-jack which is terminated in 100 ohms ±5% tolerance.

– The crosstalk loss of the DSX-1A is typically greater than 55 dB at 1.024 MHz between the out-jack and the in-jack of adjacent signal paths. All other jacks are terminated with 100 ohms ±5% tolerance terminations.

– Protected (non-intrusive) monitoring access is provided through a high impedance bridging circuit consisting of 432 ohm ±5% tolerance resistors connected to the tip and ring conductors at the out-jack. This provides a monitor level 19.64 dB ±0.87 dB below the signal power.

– Typical engineering rules constrain cabling to and from equipment to the DSX-1A cross-connect to up to 655 feet of multi-pair 22 AWG office cable with overall outer shield. This cable is also widely known as 22 AWG ABAM.

B.2.3 DSX-1C

DSX-1C cross-connects can be engineered in a variety of configurations in the network. A simplified schematic diagram for a DSX is shown for reference in figure B.1. Typical electrical parameters associated with the DSX-1C cross-connect include:

– The insertion loss of the DSX-1C is typically less than the loss of 85 feet of 22 gauge cross-connect wire.

– The return loss of the DSX-1C is typically greater than 26 dB at 1.576 MHz. The measurement is made at the out-jack including the effect of 85 feet of 22 gauge cross-connect or patch cabling to an in-jack which is terminated in 100 ohms ±5% tolerance.

– The crosstalk loss of the DSX-1C is typically greater than 55 dB at 1.576 MHz between the out-jack and the in-jack of adjacent signal paths. All other jacks are terminated with 100 ohms ±5% tolerance terminations.

– Protected (non-intrusive) monitoring access is provided through a high impedance bridging circuit consisting of 432 ohm ±5% tolerance resistors connected to the tip and ring conductors at the out-jack. This provides a monitor level 19.64 dB ±0.87 dB below the signal power.

– Typical engineering rules constrain cabling to and from equipment to the DSX-1C cross-connect to up to 655 feet of multi-pair 22 AWG office cable with overall outer shield. This cable is also widely known as 22 AWG ABAM.

B.2.4 DSX-2

DSX-2 cross-connects can be engineered in a variety of configurations in the network. A simplified schematic diagram for a DSX is shown for reference in figure B.1. Typical electrical parameters associated with the DSX-2 cross-connect include:

– The insertion loss of the DSX-2 is typically less than the loss of 15 feet of individually shielded 22 gauge pairs.

– The return loss of the DSX-2 is typically greater than 26 dB at 3.156 MHz. The measurement is made at the out-jack including the effect of 15 feet of 22 gauge individually shielded twisted pairs to an in-jack which is terminated in 110 ohms ±5% tolerance.

– The crosstalk loss of the DSX-2 is typically greater than 55 dB at 3.156 MHz between the out-jack and the in-jack of adjacent signal paths. All other jacks are terminated with 110 ohms ±5% tolerance terminations.

– Protected (non-intrusive) monitoring access is provided through a high impedance bridging circuit consisting of 432 ohm ±5% tolerance resistors connected to the tip and ring conductors at the out-jack. This provides a monitor level 18.9 dB ±0.87 dB below the signal power.

– Typical engineering rules constrain cabling to and from equipment to the DSX-2 cross-connect to up to 1000 feet of multi-pair 22 AWG office cable with overall outer shield. This cable is also widely known as 22 AWG ABAM.

B.2.5 DSX-3

DSX-3 cross-connects can be engineered in a variety of configurations in the network. A simplified schematic diagram for a DSX is shown for reference in figure B.2. Typical

electrical parameters associated with the DSX-3 cross-connect include:

- The insertion loss of the DSX-3 is typically less than 1.15 dB at 22.368 MHz.

- The return loss of the DSX-3 is typically greater than 20 dB at 22.368 MHz. The measurement is made at the out-jack including the effect of 27 feet of cross-connect or patch cabling (WE Co 728 A cable or equivalent) to an in-jack which is terminated in 75 ohms ±5% tolerance.

- The crosstalk loss of the DSX-3 is typically greater than 55 dB at 22.368 MHz between the out-jack and the in-jack of adjacent signal paths. All other jacks are terminated with 75 ohm ±5% tolerance terminations.

- Protected (non-intrusive) monitoring access is provided through a bridging circuit connected to the center conductor and outer shield at the out-jack. This provides a monitor level 21.5 dB ±1.5 dB below the signal power.

- Typical engineering rules constrain cabling to and from equipment to the DSX-3 cross-connect to up to 450 feet of 75 ohm coaxial cable with tinned copper shield (WE Co 728 A cable or equivalent).

B.2.6 DSX-4NA

A simplified schematic diagram for a DSX is shown for reference in figure B.2. Typical electrical parameters associated with the DSX-4NA cross-connect include:

- The insertion loss of the DSX-4NA is typically less than 2.0 dB.

- The return loss of the DSX-4NA is typically greater than 20 dB at from 7 MHz to 280 MHz.

- The crosstalk loss of the DSX-4NA is typically greater than 50 dB from 7 MHz to 280 MHz between the out-jack and the in-jack of adjacent signal paths. All other jacks are terminated with 75 ohm ±5% tolerance terminations.

- Protected (non-intrusive) monitoring access is provided through a bridging circuit connected to the center conductor and outer shield at the out-jack. This provides a monitor level 21.5 dB ±1.5 dB below the signal power.

- Typical engineering rules constrain cabling to and from equipment to the DSX-4NA cross-connect to up to 225 feet of 75 ohm coaxial cable with tinned copper shield (WE Co 728 A cable or equivalent).

B.2.7 STSX-1

Characteristics to be determined.

B.2.8 STSX-3

Characteristics to be determined.

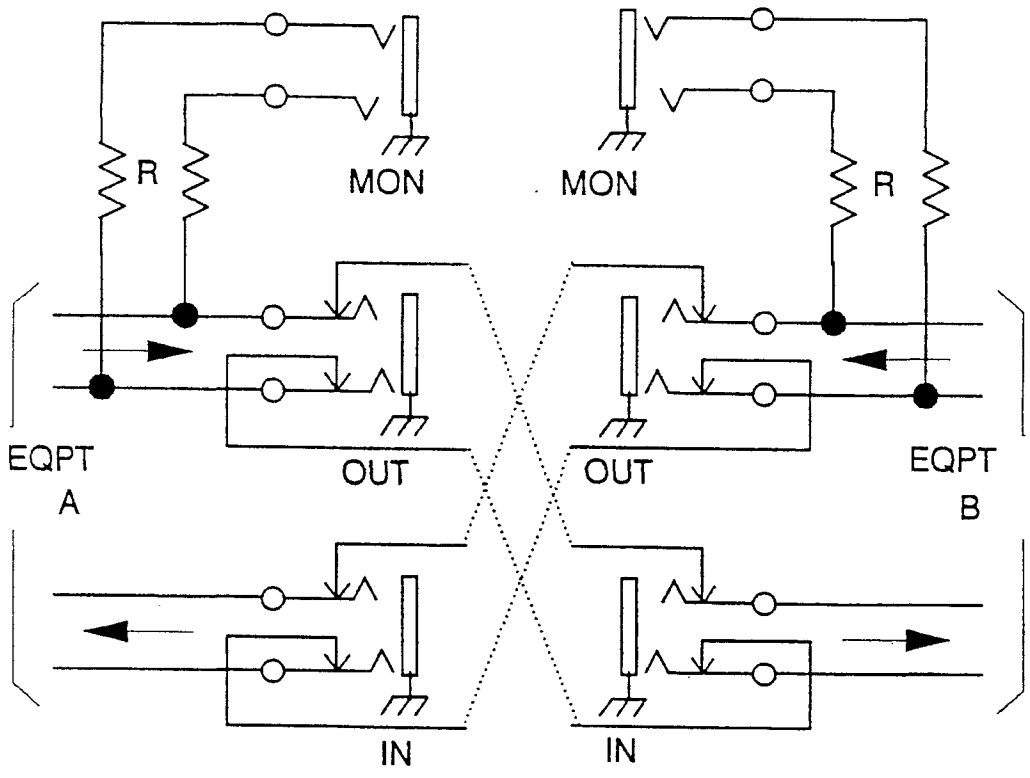


Figure B.1 – Schematic drawing of cross-connects for DSX-1, DSX-1A, DSX-1C, and DSX-2

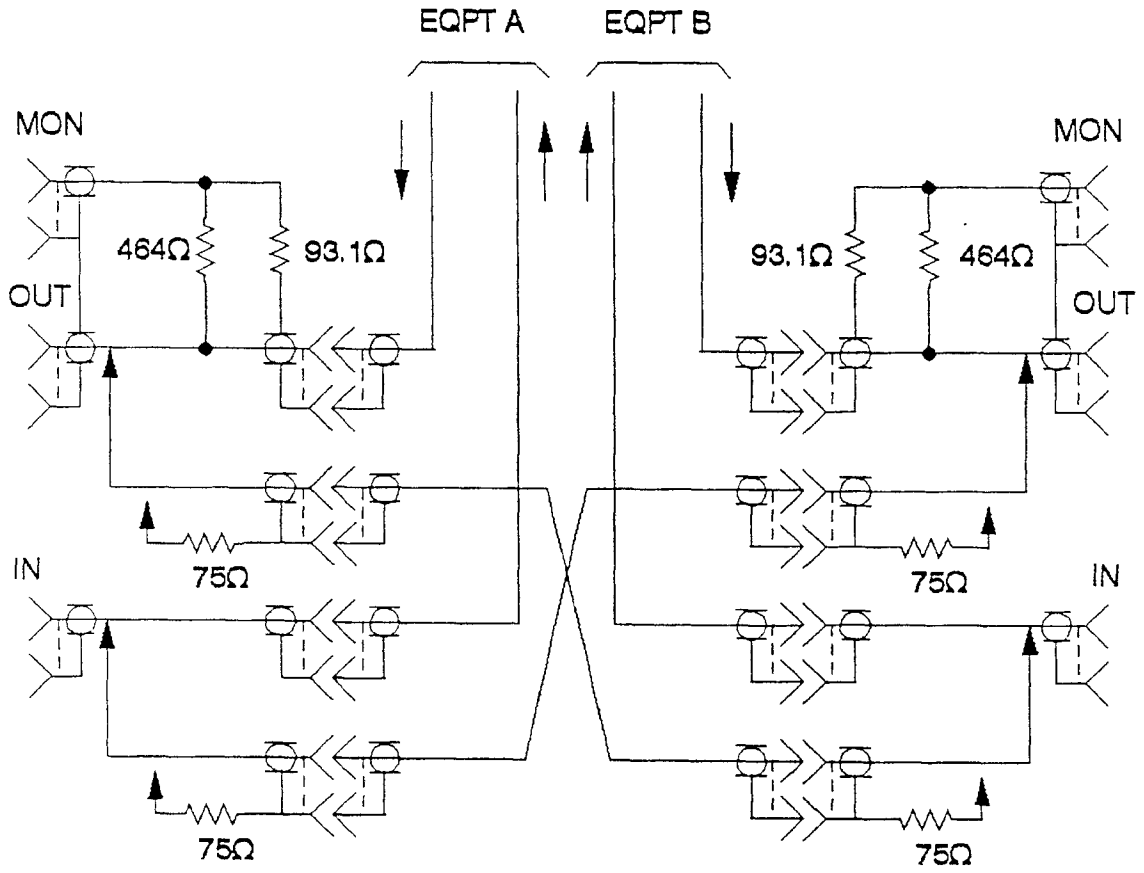


Figure B.2 – Cross-connect schematic for DSX-3 and DSX-4NA

Annex C
(informative)

Cable characteristics

C.1 General

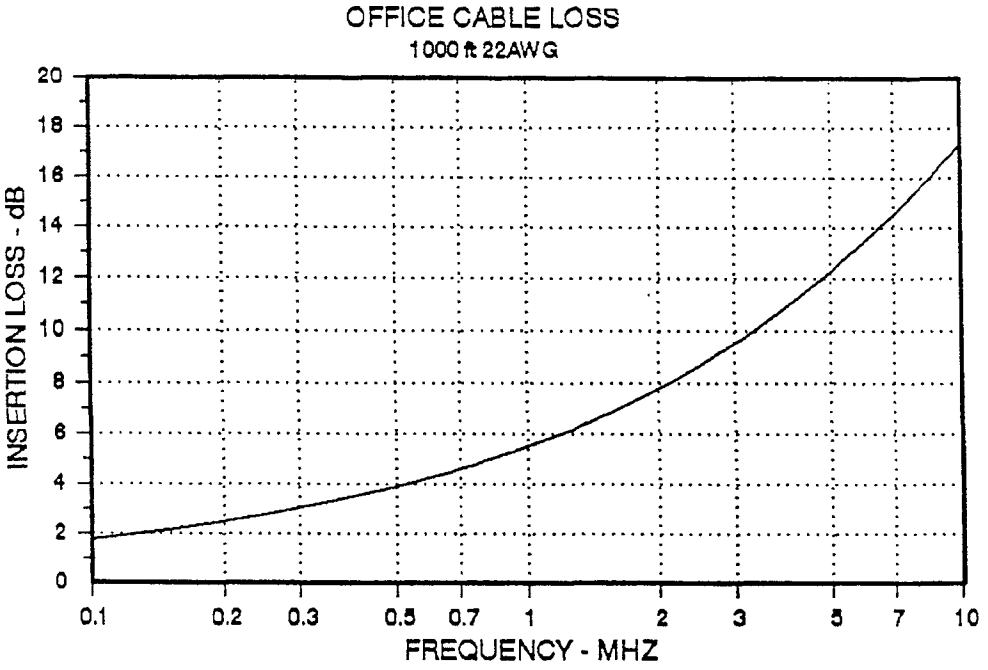
This annex describes the electrical transmission characteristics of telephone cables in widespread use in North American networks to connect equipment to DSX-*N* cross-connects. This information is of value to equipment designers to enable them to generate signals meeting the appropriate digital interface specifications in this standard.

C.2 Paired cable characteristics

Connections to DSX-1,-1A,-1C, and DSX-2 cross connects are typically made with 22 AWG cable intended for use in commercial buildings. Examples of insertion loss and phase characteristics of this cable are shown in figure C.1.

C.3 Coaxial cable characteristics

Connections between equipment and DSX-3, DSX-4NA, STSX-1 and STSX-3 cross-connects are typically made with 75 ohm coaxial cable. Examples of insertion loss and phase characteristics for that cable are shown in figure C.2.



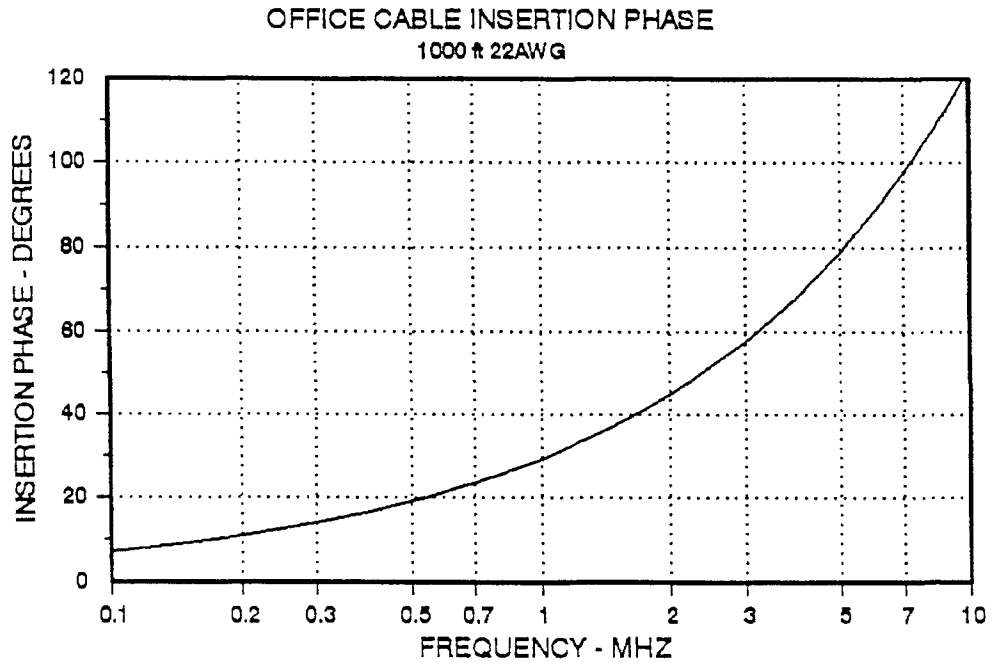
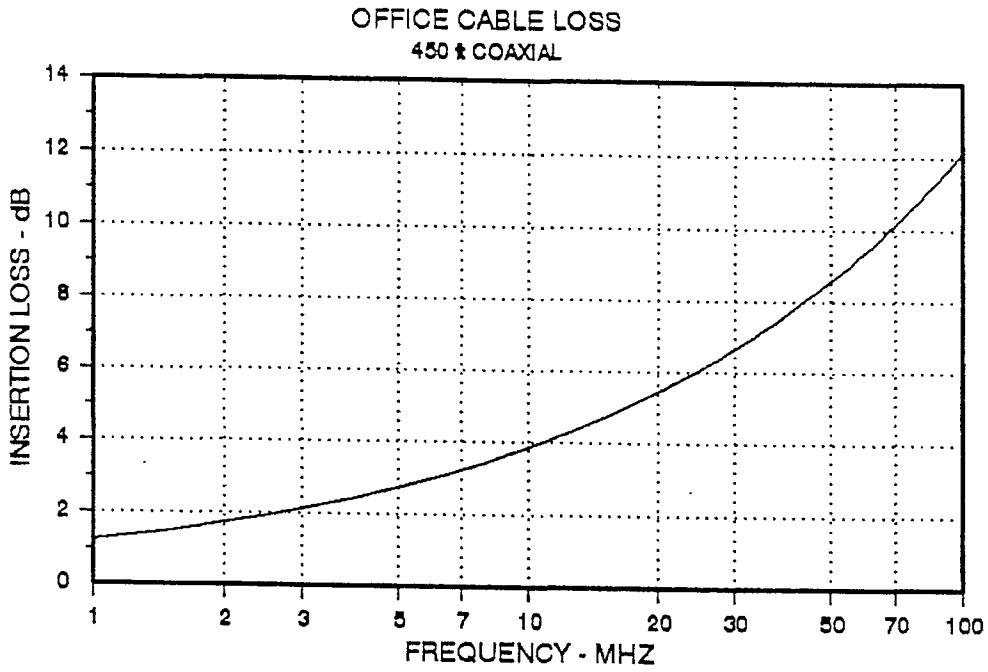


Figure C.1 – Insertion loss and phase of typical cable for DS1, DS1A, DS1C, and DS2



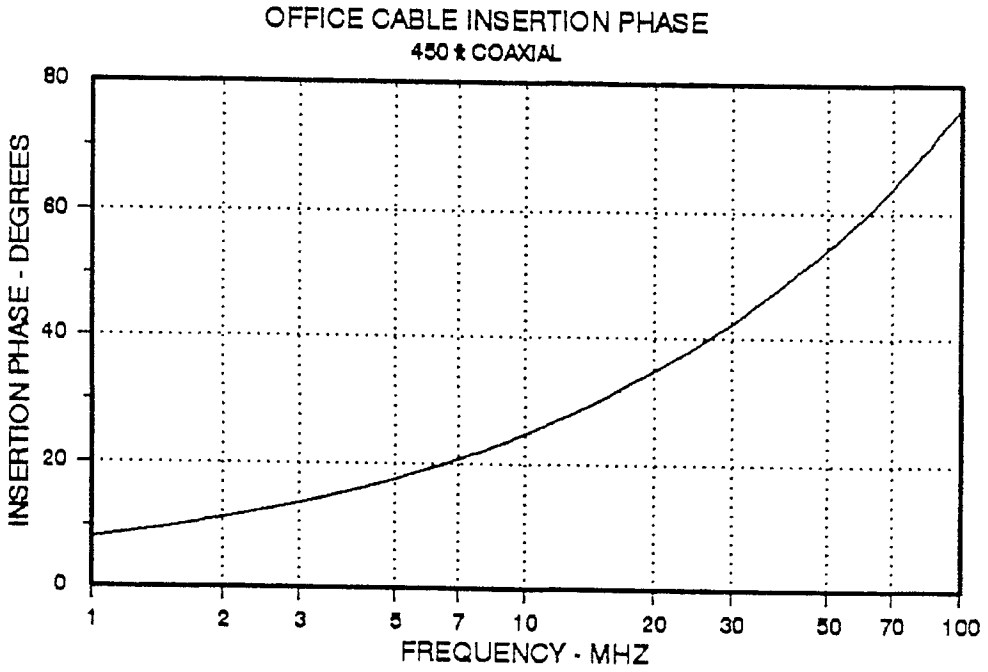


Figure C.2 – Insertion loss and phase of typical cable for DS3, DS4NA, STS-1, and STS-3

Annex D
(informative)

Obsolete DS1 interface specification

D.1 General

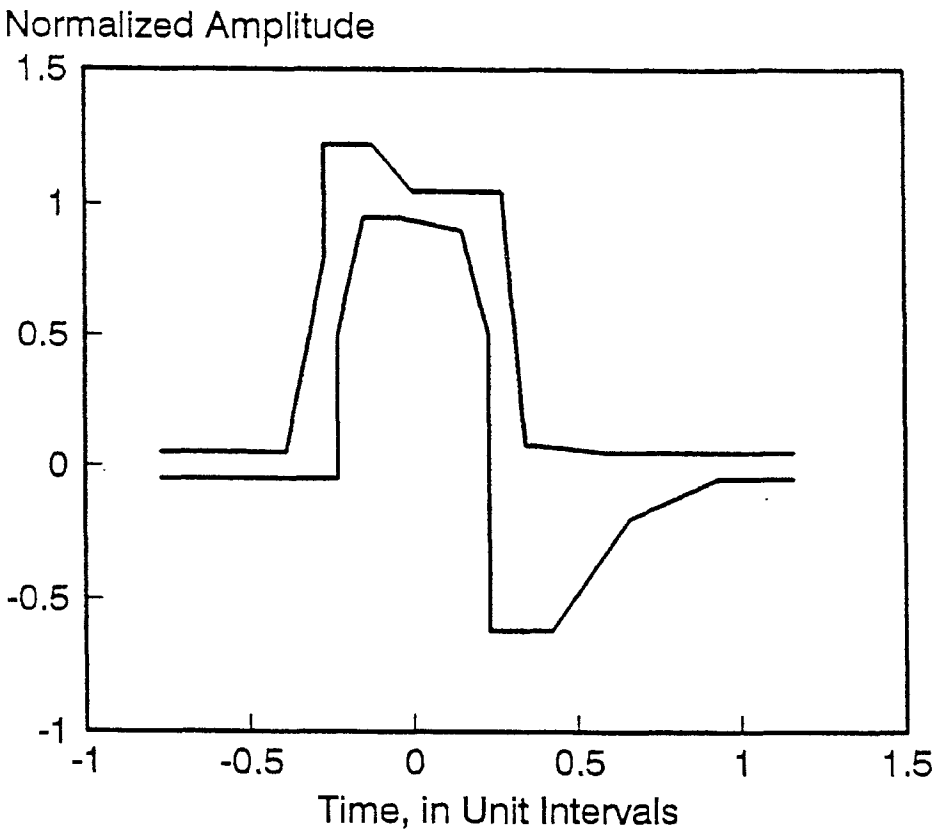
This annex describes an earlier DS1 interface that included a pulse mask with substantially greater allowance for overshoot on the trailing edge of the pulse than the current standard. While the current pulse mask has been socialized in a number of network compatibility publications since the late 1970s, equipment designed to the earlier specification may be widespread in the network. Hence, designers of equipment need to be aware of the nature of signals that may be delivered to that equipment.

D.2 Interface specification

Most of the interface parameters in table 1 including power levels and pulse amplitudes apply to the older interface. One major difference is in the line rate tolerance. The older specification calls for a ±130 ppm tolerance, reflecting an earlier, now obsolete, technology for line driver circuitry.

D.3 Pulse mask

Figure D.1 is the DS1 pulse mask corresponding to the earlier interface specification. It is based on equipment generating pulses with considerably more overshoot on the trailing edge than is currently allowed in the standard.



Minimum curve		Maximum curve	
Time	Normalized amplitude	Time	Normalized amplitude
-.77	-.05	-.77	.05
-.23	-.05	-.39	.05
-.23	.5	-.27	.8
-.15	.95	-.27	1.22
-.04	.95	-.12	1.22
.15	.9	0.0	1.05
.23	.5	.27	1.05
.23	-.62	.34	.08
.42	-.62	.58	.05
.66	-.2	1.16	.05
.93	-.05		
1.16	-.05		

Figure D.1 – Obsolete DS1 interface isolated pulse mask and corner points

Annex E
(informative)

Use of ITU-T Recommendation G.703 (formerly CCITT Recommendation G.703)

The ITU-T Recommendation G.703 2048 kbits/s specification and the DS1A interface specified in this standard have some fundamental differences. ITU-T Recommendation G.703 specifies the pulse shape and associated parameters at the equipment output port, whereas this standard gives the pulse specifications at an interface (i.e., the isolated pulse mask and power level at the crossconnect) that may be some distance from the equipment. Some pulses meeting the ITU-T Recommendation G.703 may meet the DS1A requirements through short distances of interconnect cable.

For applications where the 2.048 Mbit/s pulse is not required to meet the DS1A interface requirement, the ITU-T Recommendation G.703 output can operate over cable lengths of approximately 1120 feet. This equates to the 6.0 dB of total loss permissible at the ITU-T Recommendation G.703 2.048 Mbit/s input port. In order to prevent interference between 1.544 Mbit/s signals and 2.048 Mbit/s signals when operating in this mode, separate cables and crossconnect equipment should be used.

For applications where the 2.048 Mbit/s pulse must meet the DS1A interface requirement, a new transmitter will be required. This new transmitter will permit the utilization of embedded cable, and can be designed to provide the equal level pulse at the interface. This minimizes the probability of crosstalk, and eliminates the need for separate cable sheaths and crossconnect equipment.

Annex F
(informative)

Bibliography

This standard is also intended to be used in conjunction with International Telecommunications Union – Telecommunications Standardization Sector (ITU-T) recommendations (formerly CCITT recommendations):

ITU-T Recommendation G.703, *Physical/Electrical Characteristics of Hierarchical Digital Interfaces*[4)]

ITU-T Recommendation G.704, *Synchronous Frame Structures Used at Primary and Secondary Hierarchical Levels*[4)]

ITU-T Recommendation G.772, *Digital Protected Monitoring Points*[4)]

[4)] Available from American National Standards Institute, 11 West 42nd Street, New York, NY 10036.