



ATT-TP-76450

Common Systems Equipment Interconnection Standards for the ATT Local Exchange Companies and AT&T Corporation

Abstract

Presented in this document are the Common Systems Equipment Interconnection Standards for equipment placement and interconnection in the ATT LOCAL EXCHANGE companies Network. Users of this document should note that requirements and information contained within may only be excerpts of full requirements necessary for an acceptable installation of network equipment in a ATT facility. Users must refer to reference document for detailed requirements.

Target Audience: The primary audience for this document is telecommunications equipment manufacturers. This document will also be used in the PDF process associated with Requests for Information (RFI), Requests for Price (RFP) and Requests for Quote (RFQ) for equipment placed into the ATT Local Exchange Companies and AT&T Corporation networks.

Effective Date: 1/1/2008

Issue Date: 8/31/2007

Expires On: N/A

Related Documents: See Reference Section of this document.

Canceled/Superseded Doc: N/A

Issuing Dept: ATT Services, Inc., Network Planning & Engineering (Common Systems & Transport)

Documents Coordinator: John Tablerion – (708) 403-4450, E-Mail: jt3216@att.com

Author: Bon Pipkin – (925) 823-4325, E-Mail: bp2318@att.com

GENERAL

1.1 Requirements

This document provides the requirements for interconnection of new equipment in the AT&T Local Exchange Carrier and AT&T Corporation networks. The appendices include the ATT equipment evaluation process to be used to verify compliance to these requirements.

1.2 Purpose

The AT&T Local Exchange Company's and AT&T Corporation's networks is designed around fundamental standards for the purposes of meeting interconnection, safety, and industry standards such as ANSI, space considerations, and compatible technologies. New equipment is required to integrate into the network seamlessly (fit, form and finish), without the impact or cost pressure to compensate for the product introduction.

The purpose of this section is to provide equipment suppliers with an overview of the AT&T network interconnection requirements most commonly encountered as non-compliant with new equipment and a process for relaying information about compliance to these requirements. This document is not intended to be a comprehensive list of all AT&T interconnection requirements. A product's compliance with the requirements and objectives of this section will not be the sole basis for the acceptance of the product, however noncompliance with one or more of the requirements or objectives of this section may be the basis for a product's denial of purchase.

1.3 Scope

Unless otherwise stated, the requirements contained herein apply to equipment systems and assemblies intended for installation in network equipment buildings, equipment areas within buildings, electronic equipment enclosures such as controlled environmental vaults, outside electronic equipment cabinets, and customer locations.

1.4 Pre-assembled versus Field Assembled Network Equipment

Network Equipment layouts provided as overall solutions need to be reviewed in one of two ways regarding the applicability of Common Systems components and products. ATT Local Exchange is only concerned with the connectivity and interconnection issues between the OEM equipment and the telco facilities for Common Systems evaluations. OEM requirements internal to the Network Equipment hardware are not reviewed under this documentation.

OEM connectors and external contact points will meet the requirements contained in this document for performance, reliability and suitability. The use of a "Plug & Play" system using internal self contained Network Elements must also meet ATT standards contained in TP 76200.

If the product uses various components that are interconnected together, document will be applicable for interconnection between the various external components and cabling in addition to stand-alone Common Systems components that may have been standardized with other products within the ATT Local Exchange companies. If the OEM has presented a solution that uses "off the shelf" separate components that are externally cabled within the bay or relay rack, validation and use of the ATT standard product lines shall be given.

Example: All DSX-1, DSX-3 and FDF panels will be provided by ADC Telecommunications Inc. for the ATT Local Exchange companies.

Finally, determinations will need to be made with AT&T Local Exchange company's technical staff as to whether the items provided within the product meet either pre-assembled requirements or will be field assembled. Pre-assembled products will be considered within any Network Equipment/Element hardware box or panel that includes intelligent hardware or software. The assembly of multiple pre-assembled Network Equipment/Element products within the same footprint will be negotiated with the AT&T Local Exchange companies. The assembly of multiple pre-assembled Network Equipment/Element products outside of the same footprint will be handled as a field assembled installation. Any Network Equipment/Element that uses a passive product panel or box that does not include intelligent hardware or software will meet ATT Local Exchange Company's and AT&T Corporation's product approval standards and will be field assembled.

All assemblies, including internal wiring between components shall meet workmanship standards that include a neat and well-secured assembly with no sharp edges or cable/wire ends exposed.

1.5 ATT-TP-76450 Internet Web Site

Copies of this document and general information about AT&T's environmental equipment standards may be found at <https://ebiznet.att.com/attnebs/>.

1.6 Product Evaluation Process

TP 76450 Product Evaluation Process is documented in Appendix A of this document. Equipment manufacturers should follow this process for each new Network Element under review by AT&T Local Exchange companies.

1.7 Additional AT&T Requirements

The following is for notification purposes only. Refer to the directions given to obtain further information on these subjects. Verification of conformance to these standards is not part of the evaluation process for this section.

- ATT-TP-76200, Network Equipment Power, Grounding, Environmental, and Physical Design Requirements

- TP 76300, AT&T Installation Requirements
- TP 76400, AT&T Design Engineering Requirements

1.8 Adherence to AT&T Standard Suppliers

Within the Common Systems Checklist, standard corporate providers of the product are listed as applicable. Selections of this product are performed through AT&T Services Inc. NP&E on behalf of the entire AT&T Enterprise. Each approved provider shall be used using AT&T Local Exchange companies approved PIDs, distributors and pricing.

1.9 Reasons for Reissue

The Reason for Reissue part of this section identifies the changes made to this document when it is revised.

Revisions of this section was primarily undertaken to standardize requirements from newly merged companies and affiliates including SBC Services, Inc., AT&T Corporation, and Bell South Telephone. Specific changes to Issue 8 include:

2 DC Power Interconnection Standards

2.1 GENERAL

2.1.1 Nominal -48v DC

Nominal -48v DC is the standard platform for power delivery to any Network Element (NE). Manufacturers should comply with this requirement by providing their equipment internally with various inverters and converters to meet this condition. The design criterion of the DC power is based on a normal operating voltage of approximately -50v to -56v DC, with nominal rating of -48v DC and low voltages of -42.6v DC measured at the termination point of the network element.

2.1.1.1 AC Powered Equipment

AC powered equipment will only be considered for approval in the AT&T Telco network when the inverter is embedded as part of the total equipment package.

2.1.2 Redundant Power Feeds

Redundant power feeders are required for all equipment serving network elements. The term network element refers to all switching, transport, data, operator services equipment, and any adjuncts for those elements.

Each element/shelf/circuit pack, whichever is the smallest independent load device of the NE, shall obtain power from at least two power feeds. Furthermore, the return path from the power units shall have individual return cabling from the source.

The use of "OR-ing" diode technology to combine power feeders may be used to power a network element from two power sources provided all the following requirements are met:

- a) Appropriately sized over-current protection devices shall be present in each power path to the unit, within the network element.
- b) Diodes shall also be included in each power path return of the unit.
- c) The maximum steady state current to be handled by the diode shall be limited to 50% of the diode's maximum steady state current rating.
- d) Current transients shall not exceed the maximum rated value for the diode.
- e) The maximum reverse voltage across the diode shall be limited to 70% of the diode's peak inverse voltage rating

NE shall be designed to accept diverse power cable routing with inputs on each side of the NE.

2.1 Power Feeds

Redundant power feeder information must be provided in the supplier's response documentation to be in compliance with this item. Power feeds (supply and return) provided by manufacturer's shop wired configurations shall be paired and closely coupled.

2.1.3 Battery Return Conductor

2.1.3.1 Each power feeder shall have its own battery return conductor. This design concept shall also carry through directly to each piece of equipment.

2.1.3.2 Equipment configured with the battery return and chassis ground bonded together shall not be deployed in the network.

2.1.3.3 Battery return and current path information must be provided in the supplier's response documentation to be in compliance with this item. List 1, 1X, 2 and 2X drains shall be provided in the documentation.

Drain Definitions

Defined below are the four drain categories used in this document.

- **List 1 Drain:**
Represents the average busy-hour current required at normal operating voltages at operating conditions as provided by the equipment manufacturer. List 1 current drains are used to size batteries and rectifiers. The cumulative List 1 current drain is the current consumed on both the A and B supplies.
- **List 1X Drain**
The amperage that will flow in one side of a dual powered circuit when the other supply circuit has failed and the power plant feeding the remaining circuit is at its nominal operating voltage (float voltage).
- **List 2 Drain:**
Representing the peak current required to operate equipment at -42.64 vDC. This value is based on manufacturer-supplied data, and calculated to the AT&T minimum - 42.64 vDC design level and equipment configuration.
- **List 2X Drain**
The amperage that will flow in one side of a dual powered circuit if the other supply circuit is failed and the power plant feeding the remaining circuit is at 42.64 volts or the total wattage divided by 42.64volts.

2.1.4 Architecture Integration

Any equipment that requires more than a 70 amp fuse (56 amp load of List 2X) may necessitate special accommodations.

2.2 POWER TERMINATIONS AT THE NETWORK ELEMENT

This section describes the various acceptable DC power connectors and connections that are approved for use within AT&T. See Table 2-1 for a classification of acceptable power connections based on cable termination.

2.2.1 Location of Power Terminations

2.2.1.1 Rear Power Terminations

It is preferred that power terminations be located on the rear of the panel.

2.2.1.2 Front Power Terminations.

NE designed as “front access only” (no rear access allowed) shall have the power terminations on the front of the NE.

All power terminations shall be mounted in the top half of the bay. All power connections shall be clearly labeled and fully protected with a non-metallic, non-flammable cover. All power leads entering the front or side shall be protected *from accidental bumps, pulls and hits*.

2.3 CONNECTORS

Connectors used to attach the product to external power cabling shall conform to the following requirements:

2.3.1 16 AWG Stranded Power Cable and Larger

For applications where the size of wire supplying or distributing power to/from the equipment is 16 AWG stranded power cable or larger, pressure crimped connectors shall be used on the power cable creating a ring type termination.

2.3.2 Two Hole Connections

Power input terminations that will accept # 8 AWG connector terminations shall use dual threaded post (stud) termination able to accept the appropriate two-hole crimp connection. The two post termination may be either 5/8” or ½ “on centers.

Equipment surface terminations shall accept crimp connections that meet the following specifications:

- UL486A Wire Connectors and Soldering Lugs for Use with Copper
- UL467 Grounding and Bonding Equipment Conductors
- UL 486C Splicing Wire Connectors
- SAE-AS25036 (Insulated Copper Ring Crimped Terminal - Dimensions)
- SAE-AS7928 (Copper Ring Crimped Terminal - Specifications)

Equipment submitted for approval should provide a UL listed (power) termination strip designed and designated as “field wireable” to insure product compliance with the UL listing of the

product. This termination or barrier strip should be able to accommodate a ring lug connectors that comply with the UL, CSA and Mil Spec listings.

2.3.3 18 AWG Power Cable and Smaller

For applications where the size of wire supplying power to the equipment is 18 AWG power cable or smaller, mechanical connectors may be used.

- o The connectors shall be listed by a Nationally Recognized Test Laboratory for its intended use.
- o The connector shall be tested to assure long-term tightness and reliability. The following tests are acceptable for this requirement; IEC 60068-2-6, Basic Environmental Test Procedures, Part 2: Test Fc and Guidance: Vibration (sinusoidal); EIA Specifications 364-27B (Mechanical Shock Test Procedure for Electrical Connectors), 364-28D (Vibration Test Procedure for Electrical Connectors and Sockets), Telcordia GR-63-CORE and Telcordia GR-1089-CORE. Other vibration test procedures demonstrating long-term reliability will be considered for evaluation.
- o The product supplier shall provide documentation of routine maintenance (if any) associated with the supplied connector.

Table 2 – 1

Size conductor	Acceptable termination	Associated Listings
22 AWG – 18 AWG	Mechanical; American Standard UNC threads (Class 2 fit)	Listed by NRTL, IEC 60068-2-6, EIA SPEC 364-27B, 364-28D
16 AWG – 10 AWG	One or Two hole crimp connection. American Standard UNC threads (Class 2 fit)	UL467, UL486A, UL486C, SAE-AS25036, SAE-AS7928
8 AWG – 1AWG 1/0-4/0 250MCM – 750MCM	Two hole crimp connection. American Standard UNC threads (Class 2 fit)	UL467, UL486A, UL486C, SAE-AS25036, SAE-AS7928

2.4 Visual Power Alarms and Status Indicator

The NE equipment shall provide visual power alarm and status indications by indicator devices mounted directly on the equipment. The equipment shall also be capable of transmitting alarm signals to an office alarm circuit and to sending circuits for remote surveillance using dry loop relay contacts or other means. Power alarm and status reporting information must be provided in the supplier's response documentation to be in compliance with this item.

If an alarm indicator pilot fuse is present in the power circuit, it should operate when the power fuse fails.

2.5 Fusing of Capacitors

Equipment incorporating the use of power distribution apparatus which uses capacitors shall be fused to protect the power distribution bus from a shorted capacitor. Fuse and protection information must be provided in the supplier's response documentation to be in compliance with this item. The equipment manufacturer shall provide a label indicating equipment capacitors must be pre-charged prior to power up the equipment.

2.6 POWER DISTRIBUTION DELIVERY

All power distribution products must meet the requirements listed in Section 1 of this document.

AT&T approved Power Distribution Units (PDU) shall be used to power transport and data equipment. Power is distributed to the NE from Battery Distribution Fuse Bays (BDFB) or an arrangement utilizing a Secondary Power Distribution Unit (SPDU). The SPDU is smaller than a BDFB in physical size and capacity. Direct feeds to the NE from the BDFB will be considered on a case by case basis when required. NE will not be directly fed from Power Board Distribution. Contact the AT&T Common Systems Power Technical Staff when requesting direct BDFB feed.

PDUs that are independent of the network element but included as part of the total package must meet the requirements listed in this section; must be approved for use, and should be identified by an associated AT&T PID (Product ID) number assigned by the AT&T Power Technical Staff

All approved PDUs shall be equipped with at least one of these forms of overprotection devices, (1) GMT Fuses, (2) Telpower® Fuses, (3) Telecom TLS Fuses, (4) DC Rated Circuit Breakers. (note: circuit breakers in PDUs shall only be fed by circuit breakers). The recommended form of DC power distribution is GMT fuses, Telpower® fuses, Telecom TLS Fuses, or Circuit Breakers, in that order. The size of the DC requirement will serve as the primary qualifier, but fuses are the preferred method of over-current protection.

- GMT Fuses – Generally sized to accommodate 0.18 – 20 amp requirements. List 2X demand should not exceed 80% rated fuse size.

Telpower® Fuses – Exclusively produced by Cooper-Bussmann, these fuses are available in sizes from 3 amps to 600 amps, packaged in Blue to signify DC only. Telpower® fuses are also available in various styles for different needs. Some of the approved styles commonly seen are TPA, TPL, TPS and TPN. All Telpower® fuses should be sized at 125% of List 2X load (List 2X load not greater than 80% of their fuse faceplate rating).

- Telecom TLS Series Power Fuses – Exclusively manufactured by Littelfuse shall be used in the 80-125A sizes with the Canadian Shunt TFD101-011-01 fuse disconnect/fuse holder. Littelfuse TLS fuses should be sized at 125% of List 2X load (List 2X load not greater than 80% of their fuse faceplate rating).

Circuit Breakers - Only thermal magnetic and magnetic type DC circuit breakers are acceptable. Circuit breakers should adhere to all applicable UL and ANSI standards. DC Circuit breakers that are labeled 100% are full load rated and may be sized at the same capacity as the List 2X drain.

- **NOTE:** Due to the circuit protection strategy deployment found in AT&T companies, the use of circuit breakers placed in the power architecture should be avoided when a fuse provides the next step of protection (generally found at the BDFB). It is recommended that circuit breakers be protected by circuit breakers, fuses with fuses or fuses protected by circuit breakers. The use of circuit breakers placed in the embedded power distribution units found in network elements should be avoided. The preferred method of circuit protection at this level is fuses.

2.6.1 All fuses and circuit breakers shall meet Quality Level III as defined by Telcordia SR-332.

2.6.2 Filtered Battery

All Network Elements requiring "Filtered Battery" shall provide the filtering within the Network Element. (Filtered DC power PDUs are not provided by AT&T to remove excessive levels of transient noise generated within the Network Element).

2.7 Individually Mounted PDU

Even though not recommended as a choice by AT&T, some Network Elements designed by various manufacturers require specific PDUs that include unique characteristics needed to serve their specific network device. These "special PDUs" must meet all the same design criteria identified in this document as well as the ATT-TP-76200 NEBS publication. If accepted, this "special PDU" would be listed as part of the Network Element approval, purely as an integral part of the package and its approval is exclusive to the associated network element. Furthermore, this "special PDU" should be reviewed by the Common Systems Technical Staff to insure its integrity.

2.8 NE Integrated Power Distribution

Defined as; power distribution that is integrated within the framework of the network element (e.g. #5 ESS PDF frame). Generally speaking, NEs requiring more than 200 amps of DC power need this type of power distribution. The NEs are commonly found in large multiple interrelated-bays.

These type devices are considered equipment specific and should meet the requirements as listed in Section 1 of this document as well as the ATT-TP-76200 NEBS publication. Additionally, AT&T recommends the use of fuses in lieu of breakers in these applications.

2.9 Direct BDFB Power Delivery

As an exception, there are some new network elements that employ high DC current demands that when collectively configured in a packaged bay arrangement may exceed available fuse position capacities found at the BDFB. In a method to utilize the existing AT&T - DC distribution architecture, these individual network elements may be independently and directly fused at the BDFB via an SPDU. In these instances, direct feeds to the BDFB may be considered appropriate. However, the individual network element shall include an on/off /power cut off to locally disconnect the power from the bay components. In applications where a bay mounted SPDU is desired, AT&T has approved products designed to serve in that capacity and still allow for independently fused services.

Standards

3 Synchronization/Timing Standards

The Building Integrated Timing Supply (BITS) concept is the method of providing Phase and Frequency synchronization. The BITS plan details that each office have one Primary Reference Source (PRS)/(Stratum-1) traceable office master clock called the BITS. Under the BITS concept, each/every timing capable Network Element (NE) in the office should derive its timing from that single source within the office. A timing capable Network Element is defined as any digital equipment piece that is capable of conforming to the BITS concept by accepting timing from an external source. A Network Element is still timing capable even if it is not currently configured or equipped to accept external timing via AT&T approved, adequately protected wire-wrap connections; as long as the option exists to allow it to be so equipped.

3.1 Termination of timing leads

All critical network element timing signals lead termination points shall terminate only on the BITS/TSG office master shelf or one of its expansion shelves or a Remote Master shelf equipped with oscillators that can maintain phase alignment.

3.2 Primary and Secondary Interfaces

A Network Element should be equipped with separate external primary and secondary timing interfaces.

3.3 Clock output lead cabling

Clock output leads to network equipments shall be cabled with physically diverse routing. The primary and secondary input leads for a NE must have physically separate paths/routes with a minimum of six-foot separation. If physically separate paths/routes do not exist, running leads on opposite sides of the cable rack is acceptable.

External Clock Wire Wrap pins on the backplane of shelf are the AT&T standard and preferred method but the use of a wire wrap adapter kit or equivalent is acceptable. To be compliant to GR-1244, R3-10, no DB or RJ type connectors would be allowed

Each terminal shall consist of three pins designated "TIP", "RING" and "SHIELD."
Note that while GR-1244 **R3-10 [11v2]** and **R3-11 [108]** do not require that the wire-wrap terminals be located on the backplane of the equipment, AT&T requires hardware, backplane chassis integration, rather than having the terminals located close to the equipment in order to facilitate trouble-shooting and maintenance procedures. Also note that **R3-11 [108]** applies independent of whether the NE itself supports the external timing mode (e.g., it would apply to a line-timed NE that supports the capability to generate an external timing signal for use at another NE).

3.4 Redundancy of timing inputs

Each Switch (Host, or Remote, where applicable) or each Transport Network Element requiring redundant timing inputs (for instance, a SONET ADM/DCS) shall be individually timed from the

office BITS, with primary and secondary DS1 (or Composite Clock) reference signals from separate T1 (DS1) or Composite Clock (CC) output cards, with odd-even slot, alternate group assignments. The ability to access, test and validate timing is critical to maintaining and administering a sync network. AT&T approved wire-wrap pins/points for Tip, Ring & Shield connections are most important and a prerequisite for test access for troubleshooting, analyses and diagnostic purposes. To be effective as a test point the approved wire-wrap pins must be mechanically, physically and electrically integrated into the network element hardware (backplane, chassis) to provide those test access points. The Tip & Ring terminations for DS1 signals electrically must be 100 Ohms resistive with +/- 10 % tolerance. The Tip & Ring terminations for Composite Clock signals electrically must be 133 Ohms resistive with +/- 10% tolerance; paralleling 100 Ohms resistive with 100 Ohm AC impedance terminations is not permitted. The shield lead is "DC" grounded where the signal originates.

3.5 Output card exhaustion

In the event of T1 (DS1) or Composite Clock (CC) output card exhaustion, daisy-chaining to enable cascading of synchronization to all terminals within a bay framework is not an AT&T company's standard and shall not be permitted. Arrangements must be made to install additional BITS outputs. Should there be a necessity for more timing outputs than can be supplied by a single TSG, multiple TSGs timed directly from the Master (or its directly associated expansions) may be required. The subtending (or remote expansion) TSGs must remain phase aligned with the office master TSG. To achieve and sustain phase alignment, the subtending TSGs must be timed from the master ensemble via redundant Composite Clock signals. The subtending TSG must have the characteristic that it will remain tightly phase-locked with the master TSG to ensure proper DS0 phase alignment throughout the office.

4 Alarms

4.1 Equipment surveillance is performed at two levels, remote surveillance and local surveillance.

- Remote surveillance - Involves providing Alarm, Status and Control (AS&C) capabilities for central office equipment to a remotely located surveillance center. Remote surveillance interfaces are well-defined and supported in all AT&T regions.
- Local surveillance - Involves the annunciation of the local central office equipment audible and visual alarm indications within the central office.

4.2 Local and Telemetry Alarms

- All equipment (Network Elements - NE) deployed in a Central Office must have the capability of providing both local and telemetry alarm outputs for failed and threshold activities.

Footnote: The term "*Network Element*" is used within this document to refer to any and all equipment other than switching equipment deployed in a CO or remote location. This would include, but is not limited to transport, conditioning, power and testing equipment as well as environmental and building operations sensors.

4.3 Separation of Local Alarms

- Local alarms must be separate alarm outputs from the telemetry alarms. At a minimum this would be a Major (MJ) and Minor (MN), both audible and visual. The visual alarm output must be designed so it cannot be disabled with an alarm cut-off (ACO).

4.4 Audible Alarm Cut-off (ACO)

A local control button shall be provided for local office audible alarm cut-off (ACO).

- A local control button shall be provided for local office audible alarm cut-off (ACO).
- The ACO function shall simultaneously silence all active office audible alarm indications.
- The ACO function shall not inhibit office visual alarms, or subsequent audible indications due to additional failures.
- If all previous alarms have been ACO'ed, and a new alarm becomes active, then the ACO condition shall be cleared and the highest severity audible alarm contact shall be activated.
- An amber LED shall be associated with the ACO button to indicate the current status of the ACO. If active office audible alarm indications are cut-off due to execution of the ACO, the ACO LED shall be lit indicating that the alarm condition exists and that all active alarms of the system have been ACO'ed. The ACO LED stays extinguished if there are no active alarms when the ACO is executed. The ACO LED is extinguished when all active alarms clear, or when a new alarm is activated in the system, thus clearing the ACO condition.
- As an optional feature, equipment may provide capabilities to remotely activate the ACO function.

4.5 Telemetry Alarm Protocols:

Table 4-1 is included for reference only.

Table 4-1

TL1 / TCP-IP	Most Preferred
TL1 (sync) X.25	Second Most Preferred
TL1 (async)	Third Most Preferred
BACnet/Modbus/LonTalk	Fourth Most Preferred
E2A Serial	Fifth Most Preferred

(TBOS/TABS)	
E2A Discrete	Least Preferred

Footnote: A discrete telemetry interface may be provided, on an optional basis, in addition to higher level interfaces, to provide a summary of alarm and status information for remote surveillance.

4.6 Alarm Interconnection:

Each NE in a bay shall produce its own unique set of alarm outputs. Pre-designed "busing" of alarms or alarm leads within a bay is at the discretion of AT&T and shall not be mandated by the equipment design.

- The interface for TL1 interconnection may be Ethernet RJ45, DB25 or RS422/449 (37 Pin).
- The interface for E2A Serial or Discrete interconnections may be wire-wrap pins or other non-proprietary connector.

Discrete Alarm Conditions:

4.7 Discrete Alarm Rating

Minimum current carrying capacity - steady state: 0.9 amps at 60 volts for -48 volt applications.

Minimum current (20 msec. duration) during initial contact closure: 0.9 amps at 60 volts for -48 volt applications.

4.8 Open discrete alarm outputs

All discrete alarm outputs shall be designed to provide both normally open (closed when corresponding failures are declared by the system) and normally closed (opened when corresponding failures are declared by the system) alarm outputs. The use of Form-C relays may be used to provide this capability.

4.9 Discrete alarm paired leads

All discrete alarm outputs shall be paired leads (tip and ring) with no common or shared return leads.

4.10 Discrete alarm dry contacts

All discrete alarm outputs shall be electro-mechanical (non-solid state) dry relay contacts without any type of constant voltage source or current flow present in a normal or failed state.

4.11 Housekeeping/Overhead Alarm Inputs

All network elements that will be deployed in a non-central office environment, such as RT, CEV, Cabinet, etc., that are intended to carry local power and environmental alarms to a surveillance center must have at minimum sixteen (16) housekeeping/overhead user definable discrete alarm inputs. Although not required, an Ethernet/DCC access connection to the overhead for this purpose is strongly desired.

5 Fiber

All Fiber Optic Standards contained herein are applicable to any manufacturer's product that can be administered or managed by AT&T personnel.

5.1 Fiber Optic Cable

Fiber Optic cables/jumpers shall adhere to BELLCORE Standards as defined in GR-409, *Generic Requirements for Premises Fiber Optic Cable*.

5.2 Optical Cable/Jumpers & Connectors

Fiber Cross Connect Cables/Jumpers and Connectors shall be SingleMode.

5.3 Fiber Attenuators

Attenuators shall be for SingleMode Facilities.

5.4 Fiber Connector Boots

Fiber connector boots shall be straight and not angled.

5.5 Fiber Minimum Bend Radius

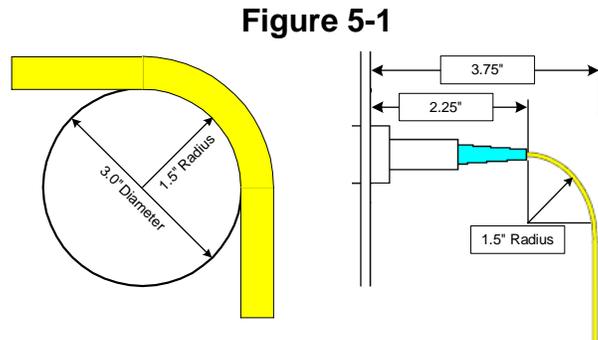
The minimum fiber bend radius shall be 1.5-inches or 10 times the cable diameter at any point whichever is greater. Network equipment shall provide fiber management facilities that maintain a minimum 1.5 inch bend radius from the connector until handoff to the bay or cabinet fiber management facilities. **See Figure 5-1**

5.6 Maximum Fiber Connector length

The maximum fiber connector length (including boot) away from the mating connector housing shall not exceed 2.25 inches. **See Figure 5-1**

5.7 Minimum Distance Between Connector Housing and 90 Degree Bend

Minimum Fiber distance away from a connector housing to bend 90 degrees shall be 3.75-inches. See Figure 5-1.



5.8 Space Between Door/Panel and Fiber Connector

To avoid pinching or reduction of minimum fiber bend radius the minimum distance between the fiber connector and any door/panel cover shall be a minimum of 3.75 inches.

See Figure 5-1

5.9 Standard Fiber Connector

The AT&T standard fiber connector shall be SC-UPC single mode or LC-UPC single mode type connector. Application of connector type shall be determined by equip design or manufacturer.

5.10 Alternative FTTP Fiber Connector

The AT&T alternative fiber connector for FTTP shall be SC-APC, SingleMode, 8-degree, keyed type connector.

5.11 FiberOptic Cable Mode

- Central Office fiber optic cable shall be SingleMode.
- Customer Premises or IXC fiber optic cable may be SingleMode or Multimode.
- SONET services fiber optic cable shall be SingleMode.

5.12 Fiber Transmission Material

Fiber transmission material shall be glass, not plastic or any other material not specifically pre-approved by AT&T NP&E Staff.

5.13 Maximum optical power levels

Optical aggregate power level must not exceed +16.8 dBm optical power level at any connector (Hazard Level 3b). If the product exceeds this, there must be an embedded (to the network equipment) solution to protect the human exposure for both TXMT and RCV including the Automatic Power Reduction (APR) potential solutions.

5.14 Passive Network Element WDM Modules to be placed in the FDF

Passive Network Element WDM Modules (fiber optic splitters) to be placed in the FDF shall be standard LGX style vertical 12 slot Miscellaneous Panels (other types will not fit in the FDF).

5.15 Fiber Frames/Bays & Panels for all Network Elements

Fiber Frames/Bays & Panels for all Network Elements shall be Generation I, II, III Fiber Distribution Frames per GR-449-CORE.

5.16 Fiber Raceway

Fiber raceways shall be standard trough system for all Interbay fiber jumper routing per GR-449-CORE.

6 Copper

6.1 DS3/STS-1 Connector & Cabling BNC Connector

DS3/STS-1 connector standard & cabling BNC connector shall be standard DS3/STS-1 BNC(180, 90 & 45 degree) electrical coaxial connector (except Posilock 180, 90 & 45 degree)
Note: Use Trompeter Electronics BNC for Midwest, ADC Telecommunications BNC for Southeast and Kings Electronics BNC for West, Southwest and East. For Legacy AT&T, use Trompeter Electronics BNC, ADC Telecommunications BNC and Kings Electronics BNC within the same regions previously cited, and use the existing BNC of choice in all other areas .

6.2 Alternative DSC/STS-1 Connector

For Network Elements that require a unique connector DS3/STS-1 SMZ Electrical Coaxial Connector shall be used on the Network Element only.

6.3 Coaxial Stripping Tools and Coaxial Crimping Tools

Coaxial Cable Stripping Tools and Coaxial Connector Crimping Tools shall be 734C/735C and shall be limited to those specific tools that each connector manufacturer approves for stripping and crimping.

6.4 DS1 Cross-Connect Wire

DS1 Cross-Connect Wire (Violet/Red) shall be special high twist Wire to mitigate spectrum interference with DSL Wire (Violet/Blue).

6.5 DSL Cross-Connect Wire

DSL Cross-Connect Wire (Violet/Blue) with Different turns than DS1(Violet/Red), used to mitigate spectrum interference.

6.6 Electrical Ethernet Cabling Standards

Electrical Ethernet cabling shall be a minimum Category 5E using either RJ21X connectors or RJ45 connectors.

6.7 Electrical Jumper (Cross-Connect) Standards

Jumpers for Electrical Ethernet cross-connects shall be a minimum Category 5E using RJ 45 connectors.

6.8 Data Patch Panels

Data patch panels shall be Electrical (10Base T, 100Base T, 1000Base T) Ethernet Patch Panels and Skeleton Bays for both Network Element and Ethernet Distributing Frame (EDF) bays. These patch panels shall have a minimum Category 5E rating.

6.9 Media Converter

Media converters shall be optical range extenders for the limited Electrical Ethernet signal.

6.10 Central Office Copper Wire and Cable Flammability Ratings

Wire and Cable with UL Flammability Ratings of CMX and CMU must not be used within AT&T central offices as UL Flammability Ratings must be MP/CM(same floor), MPR/CMR(Riser-Between Floor) or MPP/CMP(Plenum Condition).

6.11 Central Office Copper Wire and Cable

Frame Wire, DS1 Cross-Connect Wire, Switchboard Cable, Tie Cables and T1 Cable

6.12 Central Office Copper Coaxial Cable

734C/1734C, 735C/1735C Single Conductor and Multiple Conductor Coaxial Cables

6.13 Central Office Copper "Bits" Synchronous Timing Cables

1175A Red Jacketed Bits Timing Cable for all regions except Legacy AT&T, which will use gray jacketed 1175A.

6.14 Central Office Copper Wire and Cable Minimum Inside Bend Radius

For Switchboard, Shielded and Twin Conductor Cable, 5X the Cable Diameter

6.15 Central Office Copper Coaxial Cable Minimum Inside Bend Radius

For Non-Bundled 734 or 735 Type Coaxial Cable and for Bundled 734 Type Coaxial Cable, 7X the Cable/Bundle Diameter.

For Bundled 735 Type Coaxial Cable, 10X the Bundle Diameter.

6.16 Copper Cable Terminations

Copper Cable Terminations must have both toe and heel screw terminations for permanent lockdown. If a 90 degree connector is used and blocks the screw, use a clamp to permanently terminate the connector.

6.17 Cable Trays

Panels that use twisted pair jumper/cables less than 25 pair groups will be required to have a cable tray or rings. Do not place jumpers without a protection tray.

6.18 Tie Bar

Panels that use cables of 25 pair and above shall have a tie bar affixed for tie wrapping. Do not place cables without a tie bar on panel backplanes.

6.19 Use of "Y" Cable

If a "Y" cable is used, the junction must only fit in the vertical troughs, not Network Elements or horizontal troughs, except switch cutover work.

6.20 Unusual Cable Types

Unusual wiring patterns, connectors and cable types need to be mitigated.

6.21 Protection of Cable and Jumpers

Network Equipment interconnection cabling/jumpers shall be provisioned with protection.

7 Vendor Documentation

The term "documentation" as used in this section refers to vendor documentation as defined in GR-2914-CORE and GR-454-CORE.

Vendor documentation is an integral part of the network equipment and shall be validated/tested by the vendor before delivery to AT&T to insure its accuracy, comprehensibility, comprehensiveness and completeness as defined and measured by the following documents and guidelines. Critical or Major Documentation deficiencies (determined by AT&T) can delay equipment deployment until corrected by the vendor and approved by AT&T. The requirements contained in this section are supplemental to other documents that govern vendor documentation such as GR-454-CORE and GR-2914-CORE.

7.1 Softcopy Documentation

Documentation must be provided in both PDF and HTML format on a CD that is fully indexed and fully searchable.

7.2 Hard Copy Documentation

Documentation must be furnished in paper copy on request.

7.3 Craft Interface Instructions

Documents must provide step by step instructions for each procedure using Craft GUI, EMS GUI, and TL1 (preferred) or equivalent commands.

Note: Items 7.4 and 7.5 Extend the testing procedure in GR-2914-CORE 20.8 Test Method for Documentation Comprehension to include the complete "Installation Guide

7.4 Installation Guide: installation, provisioning, and testing of the network element

Vendor must test and validate that a new user can successfully install, provision, and test the network element by following the "Installation Guide".

7.5 Installation Guide: Creation, provisioning, and testing of a multi-node ring or system

Vendor must test and validate that a new user can successfully create, provision, and test a multi-node ring or system by following the "Installation Guide".

7.6 Alarm/Trouble Shooting Guide

Vendor must test and validate that a new user can use the Alarm or Trouble Shooting guide to successfully identify and clear alarms

7.7 Personnel Injury and Equipment Damage Warnings

Documentation must keep the user aware of personnel injury and equipment damage by using the appropriate warnings, dangers, or cautions preceding procedures and incorporating the appropriate steps within the procedures.

7.8 Reference Guide

Documentation must include a "Reference" guide that describes each component of the NE in detail

Example: Photographs or detailed drawings of the faceplates of each plug-in with a description of the LEDs in a normal state and in an alarm or other informational state, optical connection type, if applicable, power requirements , etc

7.9 Consistent Terminology throughout Documentation

Per GR-454-CORE, Section 2.4, terminology must remain consistent throughout all documentation for a platform.

Example: Maintenance Mode must remain Maintenance Mode and not vary to Maintenance Condition or Maintenance State

7.10 Consistent Terminology between Documentation and Platform.

Per GR-454-CORE, Section 2.4, terminology must be consistent between the documentation and the platform.

Example: If it is referred to as Maintenance Mode in the documentation it must be Maintenance Mode in the Craft and EMS GUIs.

7.11 Revision Numbering

Documentation shall be clearly marked on each page with Revision numbers to indicate when changes are made within the document.

7.12 Revision History

A revision history section shall be included to clearly indicate what and where changes are made within the document.

7.13 Documentation Submitted for Review

The following shall be submitted with the TP7650-001 Check list.

7.13.1 Excerpts from Documentation

Forward excerpts of documentation for the following detail procedures:

- a) Initial shelf activation to include Log-on, Setting IP and Sub-net,
- b) Card insertion and system recognition
- c) Switch-over from Working to Standby circuits

Note: The expectation is that a 2-3 page extraction from a larger manual will be submitted as evidence for each of the tasks above. Based on this information, AT&T may elect to conduct a more thorough review by accessing the information as listed below

7.13.2 List of Documentation

Forward a list of all documentation that will be provided to AT&T for the planned deployment of the equipment (e.g., full document number, title and revision number for planning, installation, operations, etc.) and instructions on how AT&T can access these documents at this time (e.g., Public Website, Restricted client portal.)

7.13.3 Provide a list sites where AT&T can gain access to the above documents today. (i.e. Public Website, Restricted client portal.)

8 Other interconnection requirements

8.1 Equipment lighting

If NE includes integrated lighting system, the system shall meet the lighting and illumination requirements in ATT-TP-76400.

8.2 Test (Streaker) Cards

Network Transport Elements shall have test cards (e.g., streaker) to enable verification of the network element hardware and the continuity of cabling, through the backplane, to the point of termination such as DSX panels or frames.

The test card or cards **shall not**:

- require the shelf to be powered for such testing.
- interrupt existing service on any other slot.

The test card or cards **shall**:

- Provide metallic access to each backplane terminating conductor via an appropriate connector Bantam for DS1, including timing inputs, 440 for DS-3, STS-1 and E-3 Facilitate electrical signal insertion and transmission toward the drop; especially for DS1 or DS3 signals.
- Facilitate optical signal insertion and transmission for continuity checking of optical jumpers that would, when such active Plug-In were installed, interconnect rear terminated Plug-Ins utilizing shelf backplane(s) optical connectors/barrels using SC or LC connectors.

Note: Test Set connections on face of Plug-In shall conform to AT&T standard connectors.

9 APPENDIX A – ATT-TP-76450 Checklist Instructions and Process

9.1 Purpose

The purpose of this appendix is to assist product suppliers with preparing and furnishing equipment documentation to the company representative for product evaluation purposes.

9.2 Scope

An evaluation reviews a product against all applicable requirements based on the equipment and its intended use in the network. Unless otherwise stated, all requirements apply to equipment systems and equipment units that will be installed in network equipment buildings and equipment areas within buildings, electronic equipment enclosures such as controlled environment vaults, outside mounted electronic equipment cabinets, and at customer locations.

9.3 Instructions:

Manufacturer is to complete the ATT-TP-76450 Checklist in Appendix B as follows:

Mark the appropriate column in the checklist as follows:

- “Yes” indicates that the equipment listed is compliant to the requirement.*
- “No” indicates that the equipment listed is not compliant to the requirement.
- “N/A” indicates that the requirement is not applicable to the equipment listed. Each requirements checked “N/A” must include an explanatory footnote.

*If equipment is evaluated by manufacturer as compliant, but deviates in some way from the stated requirement, mark “Part” (partial) in the “No” column and include an explanatory footnote.

Explanatory footnotes should be placed in the matrix following the checklist and reference specific requirement numbers for each comment.

Forward supporting documentation as required in Section 7.3.

9.4 Process:

Requirements marked “Yes” for compliance will require no further action.

Requirements marked “No” for non-compliance will trigger the AT&T SME for the requirement to contact the manufacturer in an effort to resolve the non-compliance. All issues must be resolved before the equipment is approved for use in AT&T.

Footnote references for requirements marked “N/A” for not applicable or “Part” for partially compliant will be reviewed by the AT&T SME for that requirement. The SME may initiate contact with the vendor for further clarification and/or resolution.

When compliance/resolution to all requirements is met, the TP 76450 SPOC will notify the AT&T Product Manager for the equipment that it is compliant.

Forward the completed checklist and supporting documentation as required in Section 7.3 to:

John Tablerion
15248 S. Rivina
Orland Park Ill. 60462
Office: 708-403-4450
Fax: 708-460-4457
Email: jt3216@att.com

Appendix B – ATT-TP 76450 Checklist

Manufacturer: _____ Date: _____

Equipment Name/Model Number, etc.: _____

Contact Name: _____ Phone Number: _____

Product Description (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Frame or Cabinet | <input type="checkbox"/> Multi-Frame or Cabinet |
| <input type="checkbox"/> Single Shelf | <input type="checkbox"/> Multi-Shelf |
| <input type="checkbox"/> Transport Product | <input type="checkbox"/> Switching Product |
| <input type="checkbox"/> Customer Premises Application | <input type="checkbox"/> Non-network Product |

*Refer to paragraph number in previous sections for detailed requirements

Rqmt*	Description	Yes	No	N/A
2 DC POWER INTERCONNECTION STANDARDS				
2.1 General				
2.1.1	Nominal -48V DC Power			
2.1.1.1	AC Powered Equipment			
2.1.2	Redundant Power Feeds			
2.1.2.1	Power Feeds			
2.1.3	Battery Return Conductor			
2.1.4	Architecture Integration			
2.2	Power Terminations at the Network Element			
2.2.1	Location of Power Terminations			
2.2.1.1	Rear Power Terminations			
2.2.1.2	Front Power Terminations.			
2.3	Connectors			
2.3.2	Two Hole Connections			
2.3.3	18 AWG Power Cable and Smaller			
2.4	Visual Power Alarms and Status Indicator			
2.5	Fusing of Capacitors			
2.6	Power Distribution Delivery			
2.6.1	All fuse & circuit breaker shall meet Quality Level III as defined Telcordia SR-332			
2.6.2	Filtered Battery			
2.7	Individually Mounted PDU			
2.8	NE Integrated Power Distribution			
2.9	Direct BDFB Power Delivery			
3 SYNCHRONIZATION/TIMING STANDARDS				
3.1	Termination of Timing Leads			

3.2	Primary and Secondary Interfaces			
3.3	Clock Output Lead Cabling			
3.4	Redundancy of timing inputs			
3.5	Output Card Exhaustion			
4 ALARM STANDARDS				
4.1	Equipment surveillance is performed at two levels, remote surveillance and local surveillance			
4.2	Local and Telemetry Alarms			
4.3	Separation of Local Alarms			
4.4	Audible Alarm Cut-off (ACO)			
4.5	Telemetry Alarm Protocols			
4.6	Alarm Interconnection			
4.7	Discrete Alarm Rating			
4.8	Open Discrete Alarm Outputs			
4.9	Discrete Alarm Paired Leads			
4.10	Discrete Alarm Dry Contacts			
4.11	Housekeeping/Overhead Alarm Inputs			
5 FIBER				
5.1	Fiber Optic Cable			
5.2	Optical Cable/ Jumpers & Connectors			
5.3	Fiber Attenuators			
5.4	Fiber Connector Boots			
5.5	Fiber Minimum Bend Radius			
5.6	Maximum Fiber Connector Length			
5.7	Minimum Distance Between Connector Housing & 90 degree bend			
5.8	Space Between Door /Panel and Fiber Connector			
5.9	Standard Fiber Connector			
5.10	Alternative FTTP Fiber Connector			
5.11	FiberOptic Cable Mode			
5.12	Fiber Transmission Material			
5.13	Maximum Optical Power Levels			
5.14	Passive Network Element WDM Modules Placed in FDF			
5.15	FiberFrames/Bays & Panels for all Network Elements			
5.16	Fiber Raceway			
6 COPPER CABLE				
6.1	DS3/STS-1 Connector & Cabling BNC Connector			
6.2	Alternative DSC/STS-1 Connector			
6.3	Coaxial Stripping Tools and Crimping Tools			
6.4	DS1 Cross-Connect Wire			
6.5	DSL Cross-Connect Wire			
6.6	Electrical Ethernet Cabling			
6.7	Electrical Jumper (Cross-Connect) – Standards			
6.8	Data Patch Panels -			
6.9	Media Converter			
6.10	Central Office Copper Wire and Cable Flammability Ratings			

6.11	Central Office Copper Wire and Cable			
6.12	Central Office Copper Coaxial Cable			
6.13	Central Office Copper "Bits" Synchronous Timing Cables			
6.14	Central Office Copper Wire and Cable Minimum Inside Bend Radius			
6.15	Central Office Copper Coaxial Cable Minimum Inside Bend Radius			
6.16	Copper Cable Terminations			
6.17	Cable Trays			
6.18	Tie Bar			
6.19	Use of "Y" Cable			
6.20	Unusual Cable Types			
6.21	Protection of Cable and Jumpers			
7 VENDOR DOCUMENTATION				
7.1	Softcopy Documentation			
7.2	Hardcopy Documentation on Request			
7.3	Craft Interface Instructions			
7.4	Installation Guide: installation, provisioning, and testing of the network element			
7.5	Installation Guide: Creation, provisioning, and testing of a multi-node ring or system			
7.6	Alarm/Trouble Shooting Guide			
7.7	Personnel Injury and Equipment Damage Warnings			
7.8	Reference Guide			
7.9	Consistent terminology throughout Documentation			
7.10	Consistent terminology between Documentation & Platform			
7.11	Revisions Numbering			
7.12	Revision History			
7.13.	Documentation Submitted for Review			
7.13.1	Excerpts from Documentation			
7.13.2	List of Documentation			
8 OTHER INTERCONNECTION REQUIREMENTS				
8.1	Equipment Lighting			
8.2	Test (Streaker) Card Standards			

“Part” & “N/A” Footnotes:

Rqmt#	Comment

10 APPENDIX C - References

ATT TP documents may be obtained on the [AT&T Technical Publication and Nebs Web site](#).

Telcordia documents may be obtained directly from Telcordia Technologies Inc.

Document Number	Document Description	
ATT-TP-76200	Network Equipment – Building Systems	Current
ATT-TP-76300	Installation Guide within the Central Office	Current
ATT-TP-76305	Cable Installation & Removal	Current
ATT-TP-76305-001	SNFA Cable Installation & Removal	Current
ATT-TP-76305-002	48V DC Power Single Line Diagrams	Current
ATT-TP-76306	Firestopping (non-workmanship & processes)	Current
ATT-TP-76400	Detail Engineer Requirements for the C.O.	Current
ATT-TP-76401	Space Planning	Current
ATT-TP-76401-001	Floor Loading Considerations	Current
ATT-TP-76406	Distributing Frames	Pending
ATT-TP-76407	Equipment Framework	Current
ATT-TP-76408	Equipment Superstructure	Current
ATT-TP-76410	Raised Floors	Current
ATT-TP-76412	Telco Electrical and Optical Ethernet Standards	Current
ATT-TP-76413	Connecting Block Standards (89-MDF type)	Current
ATT-TP-76414	Connecting Block Standards (COSMIC 78-112 type)	Pending
ATT-TP-76415	Connecting Block Standards for Protectors	Pending
ATT-TP-76416	Bonding & Grounding	Current
ATT-TP-76419	High-Twist Distributing Frame Wire Standards	Current
ATT-TP-76430	Synchronization Standards	Current
ATT-TP-76450	Common Systems Standards	Current
ATT-TP-76460	Fiber optic Protection in the Central Office	Pending
ATT-TP-76461	Fiber optic Connector Cleaning	Current
GR-137-CORE	Telcordia-Generic Requirements for Central Office Cable	Current
GR-518-CORE	Telcordia – Generic Switch Synchronization	Current
GR-253-CORE	Telcordia – SONET Synchronization for the Network	Current
GR-436-CORE	Telcordia – Digital Synchronization Plan	Current
GR-454-CORE	Telcordia –Supplier-Provided Documentation	Current
GR-1209-CORE	Telcordia –Fiber optic Branching Components	Current
GR-449-CORE	Telcordia –Fiber Distributing Frames	Current
FR-439	Telcordia – Operations Technology Generic Requirements (OTGR)	Current
TR-EOP-000001	Telcordia – Lightning, Radio Frequency, and 60-Hz Disturbances at the BOC Network Interface	Current
GR-833-CORE	Telcordia – NE and Transport Surveillance Messages	Current
TR-NWT-000930	Telcordia – Hybrid Microcircuits Used in Telecommunications Equipment	Current
GR-2419-CORE	Telcordia – Human Factors Requirements for Equipment to Improve Network Integrity	Current

11 Appendix D - ATT Contact List

Wing Eng, Area Manager-Common Systems Standards, DSX, Copper Cable Standards
(925) 823-4616, E-Mail: we2583@camail.att.com

Doug Florence, Area Manager- Common Systems Standards, New Product Integration
(925) 867-9951, E-Mail: df1538@camail.att.com

Ed Granger, Area Manager- Common Systems Standards Power Pro Support
(203) 553-8189, E-Mail: eg1724@ctmail.att.com

Jeffrey Langley, Area Manager- Common Systems Standards, Alarm Standards
(816) 275-5140, E-Mail: jl8501@momail.att.com

Dave Overdorf, Area Manager- Common Systems Standards, Synchronization Standards
(404)927-9603, E-Mail: do3863@att.com

John Tablerion, Area Manager- Common Systems Standards, ATT-TP-76200 (NEBS)
(708) 403-4450, E-Mail: jt3216@att.com

Mike Yeilding, Area Manager- Common Systems Standards, Common Systems Drawings
(925) 823-4747, E-Mail: my1515@camail.att.com

12 Appendix E – Acronyms

- a) The term **product supplier** as used throughout this section refers to the equipment manufacturer or agent of the equipment manufacturer, whichever is appropriate for the product being considered.
- b) Requirements are those product features that **must** be provided by the equipment manufacturer. The words “shall” and “must” are used throughout this section to identify requirements.
- c) Objectives are product features that are **desired** for the long term use or application. The word “should” is used throughout this section to identify objectives.
- d) **NE**- Network Equipment or Network Element package provided by the Manufacturer for consideration.
- e) **OEM** – Original Equipment Manufacturer
- f) **OSMINE** – Operations Systems Modifications for Integration of Network Elements
- g) **PDM** – Product Manager
- h) **PDU** – Power Distribution Unit
- i) **RMU** – Rack Mounting Unit
- j) **TIRKS** – Trunk Integrated Records Keeping System
- k) **SME**- Subject Matter Expert

