SBC-002-216-221

SBC Midwest: BNC Assembly Specifications

This Method and Procedure addresses DSX3 coaxial connectors and cables in the SBC Midwest region.

To:	SBC Midwest Personnel / Installation Suppliers involved in installing DS3 related coaxial cables and BNC connectors, FWG and Quality Engineering
Effective Date:	Immediately
Issue Date:	Issue 7, 12/07/05
Expires On:	Until cancelled or superseded
Related Documents:	TP76300 Issue 3, Aug. 2001, SBC-002-316-017 Product Specification BNC Plug Connectors
Canceled Documents:	N/A
Issuing Department:	SBC Midwest METS Staff
Business Unit:	Network
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INTRODUCTION

This technical document is intended for everyone installing coaxial cables and BNCs for the SBC Midwest region. These procedures **must be** adhered to and can only be amended by an authorized SBC Midwest Support Engineer. Installation supplier shall be used throughout this document and is intended to reference internal SBC personnel and/or external approved SBC Midwest Cluster Vendors.

1. Reason for Current Issue

1.1. Issue 7

- Changed Contact Information
- Updated entire document

2. Certification Requirements

All BNC procedures must be certified by an SBC Midwest Support Engineer.

The Installation Supplier shall ensure that their installation technicians are trained and certified in the proper connector installation and testing procedures. The installation technician will be required to carry proof of certification while assembling connectors within an SBC Midwest facility. Furthermore the Installation Supplier will provide additional documentation regarding certification to be placed in the Yellow Wallet this requirement will be discussed in more detail later in this document.

From time to time an SBC Midwest Support Engineer and/or Quality Engineer will make coordinated site inspections. During these visits the Installation supplier will be required to provide proof of certification, upon request, for each employee engaged in BNC assembly. All required documentation will be inspected in the Yellow Wallet as well. Failure to provide the required documentation may result in a job stoppage order.

All new or previously un-certified employees are **not to** assemble connectors without valid certification No Exceptions.

2.1. Training and Certification Requirements

The Installation Suppliers connector installation personnel must be knowledgeable in state of the art BNC installation and quality verification processes. The Installation Supplier shall ensure that each installer receives training and certification of BNC connectors by the approved connector supplier.

Proof of certification shall be in the possession of installers at all times while performing any type of BNC assembly at any SBC Midwest location.

NOTE:
Vendor installation technicians are to be certified yearly. This is a requirement.

2.2. Training and Certification Resources

SBC Personnel:

- SBC Midwest employees are required to be certified if they are installing connectors on coaxial cables for DS3 or higher service rates.

  See SBC Midwest Network Services Training (NST / CFL) at http://nst.sbc.com/ .

Subdiscipline	Course No.	Course No.	Course Name	Delivery Medium	Hrs.
SPECSVCS/AIT	01003841	NT024**	BNC Connector Replacement-LL	Leader Led	8.00
CNTRLOFC/MW	50647181	BNC - CO	BNC for Central Office-LL	Leader Led	4.0

** Can be suitcased to your location.

2.2.1. Training and Certification for Current Training - Installation Supplier

SBC Contract Manager, Common Systems, 847-248-1883.

3. Approved Connectors for SBC Midwest

When field assembling in *SBC Midwest only*, the connectors listed below shall be used:

- Trompeter straight BNC connector, UPL220-025 for 734C cable
- Trompeter right angle BNC connector, UPLR220-025 for 734C cable
- Trompeter 45 degree BNC connector, UPLFF220-025 for 734C cable
- Trompeter straight BNC connector, UPL220-026 for 735C cable

- Trompeter right angle BNC connector, UPLR220-026 for 735C cable
- Trompeter 45 degree BNC connector, UPLFF220-026 for 735C cable

NOTE:
Right angle adapters are not approved for use on new installations.

NOTE:
Connector types to be used are dependant on provided Engineered drawings and approved configurations as indicated in Woodduck. Deviation from these documents are not permitted.

3.1. Coaxial Cable

See SBC Detailed Engineering Requirements, SBC-E-00067-E, note 12, Wire and Cable Requirements - located at http://woodduck/standarddrawings/sbc/sbc-index.htm .

4. Approved Tools

4.1. Installation Tool Systems, Testing and Inspection Instrument Kit

For current approved product PIDs and pricing - contact SBC Contract Manager - Common Systems 847-248-1883.

4.2. Programmable Stripping Machines

For current approved product PIDs and pricing - contact SBC Contract Manager - Common Systems 847-248-1883.

4.3. Battery/AC Operated Stripping Machine

Required

A hand held motorized stripping machine with a fully charged battery may be used when stripping up to 48 strips. There are no limitations on the number of strips when operating with AC power.

For current approved product PIDs and pricing - contact SBC Contract Manager - Common Systems 847-248-1883.

NOTE:
Costal Battery Power Stripping machines are not approved.

4.4. Mitutoyo Pin Position Dial Gauge

Required

For current approved product PIDs and pricing - contact SBC Contract Manager - Common Systems 847-248-1883.

4.5. Twelve Indent Center Pin Crimp Tool

Quantity 1 - Required

For current approved product PIDs and pricing - contact SBC Contract Manager - Common Systems 847-248-1883.

4.6. Center Contact Crimp Tool Verification Gauge

Required - (dependant on Twelve Indent Center Pin Crimp Tool)

For current approved product PIDs and pricing contact SBC Contract Manager - Common Systems 847-248-1883.

4.7. Rear Sleeve Crimp Tools

Required

For current approved product PIDs and pricing, contact SBC Contract Manager - Common Systems, 847-248-1883.

NOTE:
A single PID has been obtained from the supplier to receive a rear sleeve and crimp and tool and die set in the same unit.

NOTE:
Die sets are sequentially numbered and are no longer inscribed with supplier information.

4.8. Coaxial Cable Cutter

Required

For current approved product PIDs and pricing contact SBC Contract Manager - Common Systems 847-248-1883.

NOTE:
An approved cleaving tool provides consistent, accurate and non-deformed coaxial cable cleaving.

4.9. Coax Connector Tensile Strength Pull Test Instrument

Required

For current approved product PIDs and pricing contact SBC Contract Manager - Common Systems 847-248-1883.

4.10. Micrometer

Required

For current approved product PIDs and pricing contact SBC Contract Manager - Common Systems 847-248-1883.

4.11. BNC Continuity, Shorts and Open Tester

Recommended

For current approved product PIDs and pricing contact SBC Contract Manager - Common Systems 847-248-1883.

NOTE:
This is only authorized for use as continuity tester, it is not to be used as a pin position gauge.

5. Other Recommended Tools

- Magnifying glass with light.

  NOTE:
  This device has a bifocal, 6x lens this is a good tool that may be used for close inspection of any stage of

BNC assembly for irregularities such as nicks, gaps and loose braiding.

- BNC engagement/disengagement tool, straight BNC
- BNC engagement/disengagement tool, right angle BNC
- Small flaring tool such as a miniature flat blade screwdriver or other device that has a small, flat surface that could be used as a flaring instrument.

6. Tool Calibration and Testing Requirements

6.1. Stripping Machines

Adjustment and calibration instructions are included with each stripping machine. Periodic visual inspections of the stripped portion of the cable during installation must be performed to confirm that the stripper cutting depth is correct and is not nicking either the cable center conductor or braid.

To obtain calibration and warranty information please refer to the appropriate tool supplier for more information.

6.2. Rear Sleeve Crimp

Follow manufacturers recommended calibration cycle. If at any time the tool no longer produces a finished crimp within specifications, have the tool recalibrated immediately.

6.3. Standard Center Contact

This tool must be tested daily with the Center Pin Calibration Gauge. If it fails the test, the tool must be discarded and replaced, or recalibrated if applicable.

6.4. Center Contact Crimp Tool

This tool must be tested daily with the Center Pin Calibration Gauge.

6.5. Coax Connector Tensile Strength Pull Test Instrument

The pull tester calibration must be periodically verified by the user in accordance with instructions supplied with the unit.

Factory calibration utilizing a NIST traceable standard is required. Follow manufacturer recommendations for the calibration cycle for this pull tester.

6.6. Mitutoyo Pin Position Depth Dial Gauge

This calibration check must be performed after every 100 center pin position tests.

- Periodically inspect the BNC adapter locking pins on this gauge for wear. These pins can develop "flats" which may alter the way the connector engages. This can potentially produce inaccurate readings.
- If the pins show wear, the BNC adapter must be replaced. A new BNC adapter can be purchased from appropriate vendor.

6.7. Micrometer

Follow the manufacturers guidelines regarding the calibration of the micrometer

7. Other Tool Calibration and Testing Recommendations

7.1. Installation Supplier Quality Assurance Guaranteeing Quality Installations

It is strongly recommended that each Installation Supplier perform daily inspection and verification of their tools and the proficiency of their installer.

Should the Installation Supplier require their installers, each using their own tools, to assemble a small sample of finished BNC connectors, the installation supervisor should then perform the recommended pull force tests as follows:

- A destructive pull test is to be performed on a newly crimped center pin. The crimped center pin must be retained on the coax center conductor with a minimum pull force of 6 pounds.
- A destructive pull test is to be performed on the newly assembled connector. The connector installed on either 735C or 734C cable shall have a minimum pull retention of 50 pounds.

NOTE:

SBC-002-316-017 Section 4.12. Cable Shield Retention states that the cable shield retention of the completed connection shall exceed 70 pounds nominal (no less than 60 pounds worst case on any individual connector) or until cable braid failure. SBC Midwest is currently requiring only 50 pounds.

- If the tensile pull strength specifications are not achieved after a pull test, the source of failure must be identified and corrected prior to proceeding to any field location.

NOTE:
Once a connector body has been locked on a center pin and removed, the body must not be re-used. It must be replaced with a new connector body.

7.1.1. SBC Midwest BNC Quality Inspection and Verification Supplement

In a continuing effort to increase the reliability of customer and network transport services, various measures are being implemented within SBC Midwest to obtain consistency in the quality of work performed and in the manner in which the level of quality is measured.

One such measure is the addition of a BNC Quality Inspection and Verification Supplement to be placed in the Yellow Wallet on every installation. A copy of this can be found at the end of this document and will provide further guidance for compliance.

8. COAX Stripping

The programming instructions for the Schleuniger stripping tools are detailed in the operating manual.

Operation and adjustment instructions are included with the Trompeter motorized hand held stripper.

Stripping of coaxial cable must only be done on a motorized stripping machine. Installers will not hand-strip coaxial cables.

- The coax should be cleaved evenly at a 90 degree angle from the length using a coaxial cable cutter.
- The diameter setting may vary by plus or minus 0.003" due to the variance in the coaxial cable. A good strip shall be a square clean cut. If the cut is not clean (has nicked or cut through the center conductor, braid or has cut beyond the surface of the dielectric) readjust the diameter setting until the strip is clean and the stripping dimension matches the template on the connector package. Using the magnifying glass, the Installation supplier will visually inspect the trimmed coaxial cable. The center conductor and braid will not display any nicks.
- **Do not** use the connector package as a stripping template due to the fact that temperature changes cause the

dimensions to change. The package may be used as a reference as to the correct approved specifications.

- If the exposed portion of the center conductor is bent at any time during the BNC assembly, you must stop further assembly of the connector, re-cleave cable and start over. Dispose of the used materials immediately.
- The stripping machine should not have to be readjusted while making multiple cable terminations on cable from the same source of coaxial cable.

9. Crimping

1. Place the pin fully on the center conductor with the bottom of the pin seated against the cable dielectric
2. Using an approved Twelve Indent Center Pin Crimping tool, crimp the center pin to the center conductor.

NOTE:
The center contact crimp must have 3 rows, as viewed from the side of the pin lengthwise, of (4) four indentations each (total of 12) spaced evenly around the pin, every 90 degrees.

3. The resulting center pin crimp must be able to meet a center pin pull test of 6 pounds (minimum). This is a destructive test. Any connectors tested may not be used for service.

10. Assembly

1. Slip the rear crimp sleeve onto the cable with the "stepped end" of the sleeve pointed away from the connector.
2. Slightly flare the braid away from the dielectric. **Do not unweave the braid.**
3. Install the body of the connector, with the groove ferrule first, onto the prepared cable center contact pin.
4. Push the cable with the center contact pin into the connector body until the center pin surface indent seats into the connector body. An audible "click" can be heard when proper seating has occurred.
5. Slip the rear crimp sleeve up the cable and over the exposed braid, seating it squarely against the rear portion of the connector body, leaving no gap.
6. Crimp the sleeve once.

   The crimp sleeve should exhibit six flat surfaces, with no fins or excessive rounding.

   No braid strands should appear.

NOTE:
One side of the pre-existing connector rear sleeve crimp will emboss the Installation Supplier's identifying characters on the sleeve. For example: NTI for Nortel, ADC for ADC or FNTS for Fujitsu. The identifiable marking could also be a part number, but only if no other Installation Supplier or SBC Midwest technician has access to a connector with that part number. If the Installation Supplier uses a part number as the identifying mark, the part number must be registered with the SBC Midwest Support Engineer. The part must be one of the SBC Midwest's approved products.

NOTE:
New sequentially numbered die sets do not need to be registered with an SBC Midwest Support Engineer.

The following information is from a letter dated November 4, 2005 from Bill Spink, Design Engineering Manager of Trompeter Electronics, Inc., Mesa Arizona.

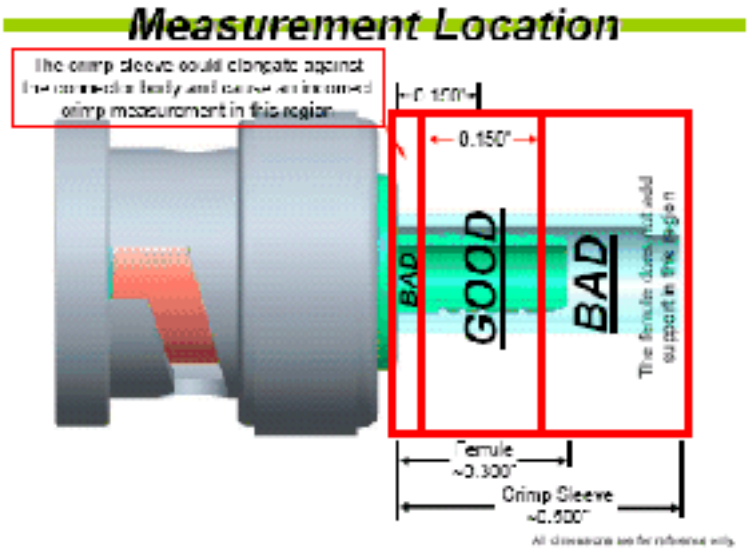
Trompeter Engineering recommends that the following dimensional result of crimping can be used for verification of an acceptable cable crimp:

In the case of 735 type cable typically used in central office DS3 hookup and installs, the range of acceptable crimp dimensions, as measured over two of the 3 possible flats of the hex, is 0.175 to 0.190 inches.

In the case of 734 type cable typically used in central office DS3 hookup and installs, the range of acceptable crimp dimensions, as measured over two of the 3 possible flats of the hex, is 0.252 to 0.272 inches.

This is a change from previous Trompeter recommendations. Note that we believe a precision measurement cannot be accurately attained over the crimped flat that includes die-set number embossing. This is why we specify any two flats of three possible should meet the above new acceptable cable crimp range specification.

Further, when measuring the flat, we recommend that the measurement device be positioned per the diagram shown:



7. Using the micrometer measure across the flats of the crimp.

   For 734 cable the micrometer should read .252 to no more than .272.

   For 735 cable the micrometer should read .175 to no more than .190.

> **NOTE:**
> If the crimp sleeve does not meet the dimensional specification it may indicate that the crimp tool is out of calibration, or the crimp die has excessive wear or that the die halves are not in alignment. The connector must be cut off, discarded and a new connector must be installed and re-verified.

8. Using the calibrated pin position dial gauge, verify that displayed reading is within the range of -20 to +20 thousandths, with the revolution dial showing one revolution. This measurement must be made with the center pin fully locked into the connector body.

   If the pin tip position measures out of range, the connector has failed and must be cut off and replaced.

   The right angle BNC center pin on the bayonet side of the connector is factory installed. A pin position measurement shall be made when the connector is removed from the manufacturer's package. The pin position measurement range of the right angle connector must be within the same dimensional specifications as the straight connector.

9. After each connector is installed, a continuity, short and open test must be performed on the completed connector and cable.

NOTE:
If at any time of the installation any tools, connector manufacturing lot or cable manufacturing lot should change; the pull tests **must be** repeated.

11. Termination

1. Using the appropriate BNC Engagement Tool, terminate the coaxial cable with the BNC connector at the appropriate panel jack location and lock into place.

NOTE:
Follow the manufacturers guidelines regarding the calibration of the micrometer.

2. Verify proper engagement.

3. This completes the assembly and termination requirements.

12. Attachment 1 - SBC Midwest BNC Quality Inspection and Verification Supplement (to be included in the Yellow Wallet on every BNC Installation)

Effective immediately every installation in the five SBC Midwest states that involves BNC assembly (new or maintenance) shall have included in the Yellow Wallet this document including all (if any) required additional documentation or items described herein.

Background

In a continuing effort to increase the reliability of Customer and Network Transport Services various measures are being implemented within SBC Midwest to obtain consistency in the quality of work performed and in the manner in which the level of quality is measured. This requirement is specified in Issue 7 of SBC-002-216-221 SBC Midwest BNC Assembly Specifications.

General Requirements

1. This document shall be included and retained in the Yellow Wallet at the Job Start and as many of the fields filled out where applicable.

2. This document shall be included and retained in the Yellow Wallet at the Job Start and as many of the fields filled out where applicable.

3. Employees who perform BNC / Coaxial assembly work in an SBC Midwest Office, Remote or Customer locations MUST attest to their possession of a valid Trompeter BNC Certifications by noting the appropriate fields on page 2 of this document.

4. Upon completion of the job as detailed in the JSA this form must be filled out in its entirety prior to acceptance of the job by the SBC LEC.

5. References to the JSA, JSM, LEC and or other current requirements may be found in SBC-TP-76300, SBC LEC Installation Requirements.

The following excerpts from this SBC 13-state and SBC Midwest regional document provide additional information to this requirement:

SBC TP-76300 SBC LEC Installations Requirements

3.2 Installation Supplier and Installer Skill Level Requirements

3.2.2.2 If the Installation Supplier can demonstrate to the SBC LEC a documented program for qualifying an installer on specific work activities and specific systems, related to the level requirements indicated below, the Installation Suppliers rating of its personnel will be accepted. The Installation Supplier shall participate in the SBC LEC's supplier verification process such as a Quality Program Analysis (QPA).

and

SBC-002-216-221 SBC Midwest BNC Assembly Specifications - Issue 7

2.1. Training Certification Requirements

The Installation Suppliers connector installation personnel must be knowledgeable in state of the art BNC installation and quality verification processes. The Installation Supplier shall ensure that each installer receives training and certification of BNC connectors by the approved connector supplier.

From time to time SBC Quality Engineers will be conducting quality reviews of BNC/Coaxial installations and will be referencing this document. Any discrepancies will be brought to your attention.

Failure to abide by the requirements detailed above may result in disciplinary action by SBC Procurement as provided for in the contractual agreement between the Installation Supplier and SBC.

Job Information

Project Number:	_____	TEO Number:	_____
CLLI:	_____	SBC Engineer:	_____
Installation Supplier Company	_____	Installation Supplier Contact #:	_____

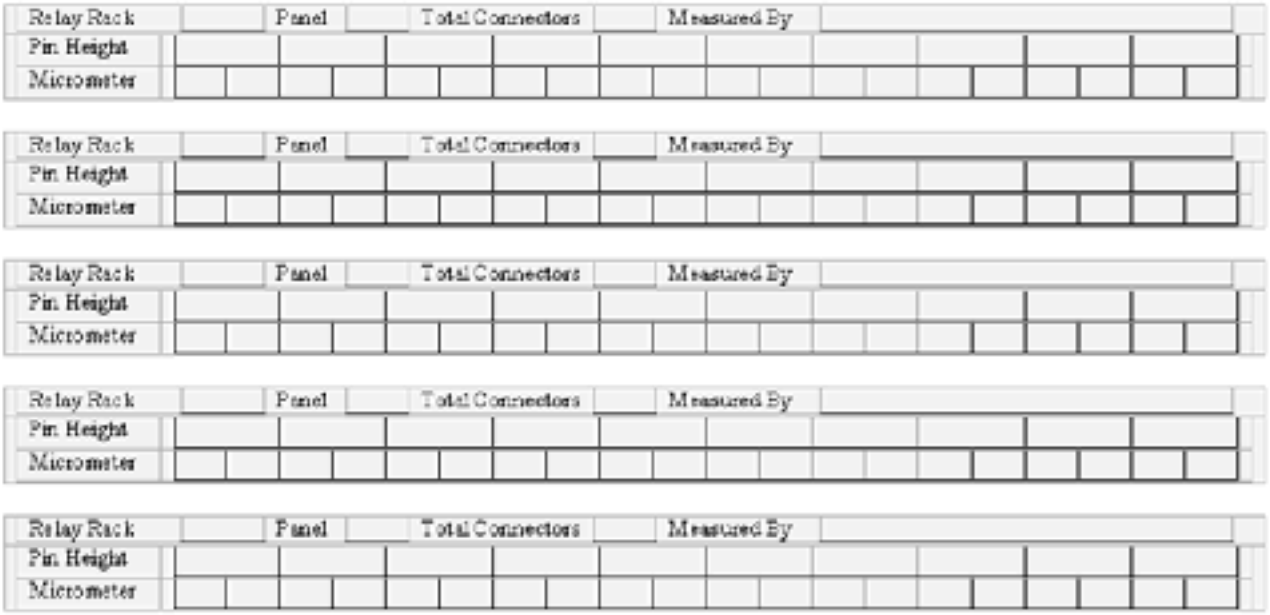
Technical Information

NOTE:
By providing the following information you are attesting to the validity of the provided information and that if asked will provide proof of valid certification.

Technician Name	Trompeter Certification Expiration Date	Notes

Quality Verification Requirements

100% of connectors must be tested. 15% of or no less that 6 connectors per panel or Network Element must be recorded in this document. For information on how to perform the following measurements and tests please see SBC-002-216-221.



Installation Supplier Quality Engineer Inspection

I, _____ attest this ____ day of _____ _____ that the above information is factual and accurate and certify this job as complete and meets SBC quality requirements as provided to me.

Engineers Trompeter Certification Expiration _____

SBC Quality Engineer Inspection

Date of inspection: _____

Notes:
_____
_____
_____
_____
_____
_____

13. Revision Log

13.1. Issue 6 - 10/14/04

1. Added PID information.

13.2. Issue 5 - 10/11/04

1. Updated practice for additional clarification regarding Installation Supplier certification requirements.
2. Updated URL links and contact information.

13.3. Issue 4 - 1/12/04

1. Section 4.3 changed Note to read Costal Stripping Machines.

13.4. Issue 3 - 10/07/04 -

1. Changed reference in section 2.1.
2. Corrected phone number in contact list.

13.5. Issue 2 - 9/03

1. Rewrite of entire document

13.6. Initial Issue - 5/02

14. Contact List

Name	SBCUID	Phone #	Department/Responsibility
Byron Atkinson	ba2593	847-248-2686	Network Operations
Michael Matelse	mm3921	312-727-8798	Network Operations

Acronyms

A.1. NETWORK ACRONYMS DICTIONARY

Refer to SBC-000-000-020, Network Acronyms Dictionary.