

INSPECTION
INSTALLED CENTRAL OFFICE EQUIPMENT
SOLDERLESS WRAPPING BITS AND PRODUCT CONNECTIONS
DETAILED INFORMATION
EQUIPMENT DESIGN REQUIREMENTS
COMMON SYSTEMS

1. GENERAL

1.01 This section contains procedures and criteria for qualifying and verifying bits, using test wire and test terminals, for use in making solderless wrapped connections in conformity with the intent of engineering requirements pertaining to their ability to withstand stripping force and unwrapping without the wire breaking. Procedures and criteria are also outlined for inspecting product connections made with these bits for conformance to engineering requirements. Engineering requirements covering solderless wrapping bits and product connections are outlined in Section 800-612-154. Inspection records and summaries, required for Quality Assurance purposes, are also specified.

1.02 The procedure given in this section presumes that the prescribed results for bit qualification and verification will be secured by the installer since conformance to the requirements for ability to withstand stripping force from terminals (hereinafter referred to as "stripping") and unwrapping without the wire breaking (hereinafter referred to as "unwrapping") can be checked on a completed connection only by tests which are destructive. For this reason, checking of product connections with respect to the stripping and unwrapping requirements is not permissible, and control of quality with regard to these requirements is based on the continuing ability of the bits to make satisfactory test connections. In this particular case, therefore, results secured by the installer will be acceptable in lieu of results obtained by the independent agency approved by Bell Laboratories provided the agency assures itself of the adequacy of the installer's sampling and inspection procedures for wrapping bits and product connections.

1.03 All test connections shall be inspected for and shall meet all visual requirements for a solderless wrapped connection and for a test connection before being subjected to either qualification or verification per Part 3. If the bit fails to meet the requirements for either stripping or unwrapping as outlined in Part 3, it shall be immediately withdrawn from use until it can be repaired and requalified.

1.04 Solderless wrapped connections may be made with approved solderless wrapping tools which are either power driven or hand driven. However, 20-gauge wire has not been authorized for use with hand wrapping tools and therefore the qualification and verification of 20-gauge bits and 20-gauge wire is not required.

2. DEFINITIONS

2.01 *Test Connections:* A solderless wrapped connection made on a test terminal with test wire of the same gauge for which the bit is to be used; it shall meet all visual requirements for a solderless wrapped connection as defined in Section 800-612-154 and shall have no more than one turn more than the minimum specified therein.

2.02 *Test Terminals:* A terminal used for qualifying bits for use in making solderless wrapped connections as follows:

- (a) *Minimum Cross-Section Terminal:*
P-10F653 embossed terminal 0.010 inch by 0.060 inch, P-10F652 embossed terminal 0.012 inch by 0.060 inch, or P-11F864 embossed crosspoint terminal 0.009 inch by 0.060 inch.

(b) **Maximum Cross-Section Test Terminal:** P-10F651 flat terminal 0.030 inch by 0.060 inch.

2.03 ♦Test Wire: Wire for use in qualifying bits for making solderless wrapped connections follows:

- (a) 20-gauge wire P-46B681 per D-180316
- (b) 22-gauge wire P-46B485 per D-180315
- (c) 24-gauge wire P-46B438 per D-180047
- (d) 26-gauge wire P-46B669 per D-180046

2.04 Sample of Test Connections: The sample shall consist of the required number of test connections as covered in 3.02 and 3.08.

- (a) Each test connection may be made on an individual test terminal; or
- (b) A test connection to be used for the stripping test may be made on the same test terminal as a test connection to be used for the unwrapping test; or
- (c) The same test connection may be used for the stripping test and then for the unwrapping test. This may be accomplished either by unwrapping the partially displaced connection or by returning it to the terminal if the stripping test dislodges it completely. If a test connection fails on the unwrapping test in this method, a substitute test connection that has not been subjected to the stripping test may be tested for unwrapping before the consideration of failure.
- (d) The test connection for stripping shall not be made on a terminal from which a connection has been removed by stripping.♦

3. INSPECTION FOR ABILITY TO WITHSTAND STRIPPING AND UNWRAPPING

A. Qualification Inspection

3.01 ♦All bits (either new, repaired, readjusted, or modified) shall meet the qualifying procedures stated in 3.02 through 3.06 before issue (or reissue), for use in making solderless wrapped connections. If the bit fails to meet requirements

in 3.05 or 3.06, it shall be rejected and repaired or junked.♦

3.02 The sample to be used in qualifying a bit shall be twelve groups of five test connections each. All of the test connections of any one group shall be made on test terminals of the same cross-section, either maximum or minimum, as specified in 3.03 and 3.04. The sample of twelve groups shall be divided into two subgroups of six groups of five connections each. One subsample (designated S) shall be used for the stripping test. The other subsample (designated U) shall be used for the unwrapping test.

3.03 For No. 20- and 22-gauge bits, the subsample S and the subsample U shall each be composed of six groups of five connections each on maximum cross-section test terminals.

3.04 ♦For No. 24- and 26- gauge bits, the subsample S and the subsample U shall each be composed of:

- (a) Three groups of five connections each on maximum cross-section test terminals,
- (b) Three groups of five connections each on minimum cross-connection test terminals (See Note A, 3.10).♦

3.05 Subsample S shall be tested for stripping. The bit shall qualify only if all test connections withstand a stripping force of 3000 grams or more and the median stripping force for each group of five test connections is at least 5700 grams for 20-, 22-, and 24-gauge wire and 4250 grams for 26-gauge wire.

3.06 Subsample U shall be subjected to the unwrapping test. The bit shall qualify only if all test connections meet the unwrapping requirements.

B. Verification of Bit in Use

3.07 ♦Each bit that is in use shall be subjected to the procedures outlined in 3.08 through 3.13 at least once each week.♦

3.08 ♦The sample to be used in checking a bit for continued use in production shall be four groups of five test connections each.♦ All of the test connections of any one group shall be made

on test terminals of the same cross-section, either maximum or minimum, as specified in 3.09 and 3.10, preferably by the operator who is using the bit. ♦The sample of four groups shall be divided into two subsamples of two groups of five connections each. ♦ One subsample (designated S) shall be used for the stripping test. The other subsample (designated U) shall be used for the unwrapping test.

3.09 ♦For No. 20- and 22- gauge bits, the subsample S and the subsample U shall each be composed of two groups on maximum cross-section test terminals.

3.10 For No. 24- and 26-gauge bits, the subsample S and the subsample U shall each be composed of:

- (a) One group of five connections each on maximum cross-section test terminals
- (b) One group of five connections each on minimum cross-section test terminals (see Note A). ♦

Note A: ♦Use of a minimum cross-section test terminal is not required for qualification and verification inspection of 24- and 26-gauge bits unless the equipment involved is equipped with apparatus having embossed terminals. The particular minimum cross-section test terminal used shall correspond to the minimum size embossed terminal in the equipment involved. In those cases where embossed terminals are not furnished on the equipment involved, an equal number of maximum cross-section terminals shall be substituted for the number specified for the minimum cross-section terminal. ♦

3.11 Subsample S shall be tested for stripping. No test connection shall fail to withstand a stripping force of 3000 grams or more and in no group of five test connections shall the median be less than 5700 for 20-, 22-, and 24-gauge bits and less than 4250 grams for 26-gauge bits.

3.12 Subsample U shall be tested for unwrapping and shall meet the following requirements:

- (a) No failure; or

- (b) ♦One failure provided there was no failure in either of the two preceding checks; or ♦

- (c) One failure provided there is no failure in an additional sample of 20 test connections on the same type terminals.

3.13 ♦If the sample of test connections made by any production bit fails to meet the requirements of either 3.11 or 3.12, that bit shall be immediately withdrawn from use and repaired and requalified or junked. ♦

C. Diagram of Sampling and Requirements

3.14 ♦A diagram of requirements for bit qualification and for verification of bits in use is given in Table A. ♦

4. INSPECTION OF COMPLETED CONNECTIONS

4.01 ♦Inspection of completed solderless wrapped connections on apparatus in wired equipment should, in general, be limited to a visual inspection as outlined in Section 800-612-154. However, tests for tightness shall be made on product connections that meet all visual requirement to determine their ability to withstand a force of 2500 grams, measured with a gauge readable and accurate within ± 10 percent and applied in a direction parallel to the axis of the terminal without visible displacement of the connection as a whole. ♦

4.02 Table B outlines the lot range and size, the sample size, the inspection items, and the allowable number (AN) of defects permitted in the sample. Lots of from 1 to 4000 connections shall be inspected completely.

4.03 No specific inspection for broken or weak wires (skinners) is regularly required. However, if the number of broken wires observed incidental to the inspection exceeds 0.5 percent of the connections inspected, the condition shall be reported for special consideration. This consideration will determine the advisability of eliminating the condition by further inspection or in the course of subsequent testing operations.

4.04 ♦Defects with respect to security of connection or a connection that fails the tightness test (ie, moves with a force of 2500 grams or less) shall be corrected by soldering or replacing the connection. ♦

(a) If clearance defects are removed by disturbing the wrapped wire, the connection or connections involved should be examined for tightness and if found defective should be soldered or replaced.

4.05 Causes of failure to meet requirements for clearance between the terminals are often of such a nature that more than two of the terminals on a single relay, terminal strip, etc, are affected. Clearance defects shall be counted on the basis of the connection as indicated in Table B, except under the following conditions:

(a) Where one clearance defect occurs on a single relay, a single terminal strip, etc, only one clearance defect for each such single apparatus unit shall be counted in determining the number of defects chargeable to the sample for this inspection item.

5. INSPECTION RESULTS

A. Records

5.01 Records shall be maintained of inspection results for each bit checked for summary purposes. The results shall include:

- (a) Bit identification (as required)
- (b) Date of inspection
- (c) Whether qualification or verification
- (d) If available, job order number on which used or to be used, together with city and state and type of office (No. 1, No. 5, Step-by-Step, etc)
- (e) Gauge and type of wire used
- (f) Size of test terminal used
- (g) Number of bits failing unwrapping test

(h) Number of group medians for stripping test below 5700 grams for 20-, 22-, and 24-gauge wire or 4250 grams for 26-gauge wire.

(i) Values of individual readings below 3000 grams on stripping tests.♦

B. Summaries

5.02 ♦A monthly summary showing the following information separately for bit verification and qualification tests:

- (a) Number of bits checked
- (b) Number of bits failing stripping test
 - (1) Number failing median (5700 or 4250 gram) requirement
 - (2) Number failing individual (3000 gram) requirement with values
- (c) Number of bits failing unwrapping requirement.

5.03 A monthly summary of product tightness tests and a job summary of conformance to visual requirements, per 4.01 and 4.02, respectively.

5.04 One copy of each summary of inspection results shall be sent to:

Director, Quality Assurance Center

Bell Telephone Laboratories, Incorporated

Holmdel, New Jersey 07733♦

REASONS FOR REISSUE

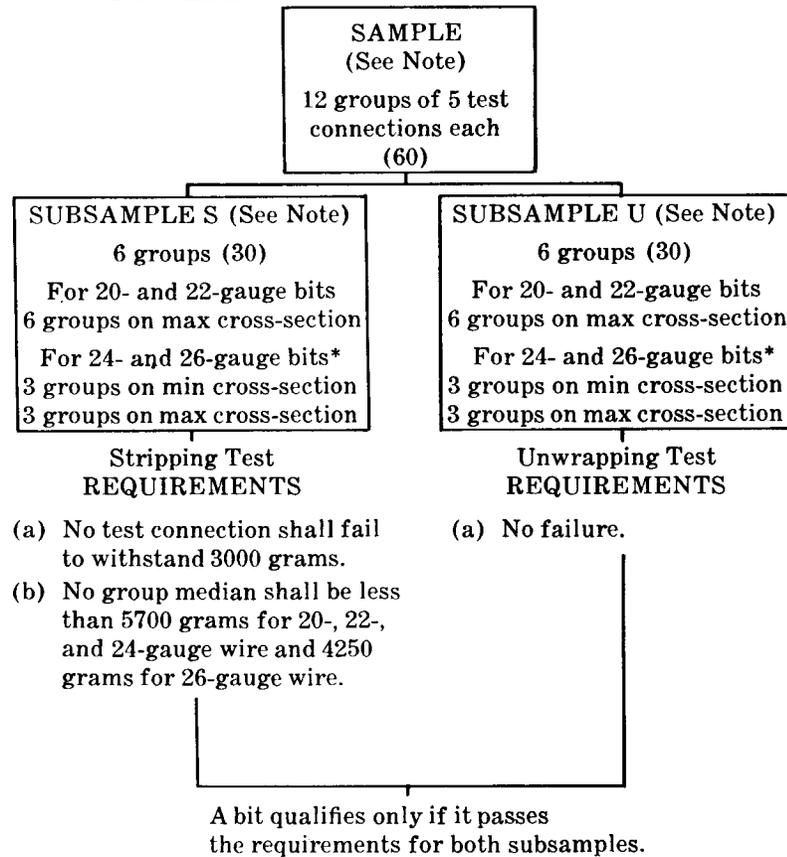
♦To reference new 9-digit BSP in place of AA612.006; to revise 1.02; to delete reference to number of connections in 3.07; to modify 4.01, 4.04 and 5.02 to be more definitive. Corresponding changes were made in Tables A and B. Title was changed.♦

**TABLE A
STRIPPING AND UNWRAPPING—DIAGRAM OF REQUIREMENTS AND PROCEDURES
FOR SOLDERLESS WRAPPED TEST CONNECTIONS**

TOOL QUALIFICATION

Applies to:

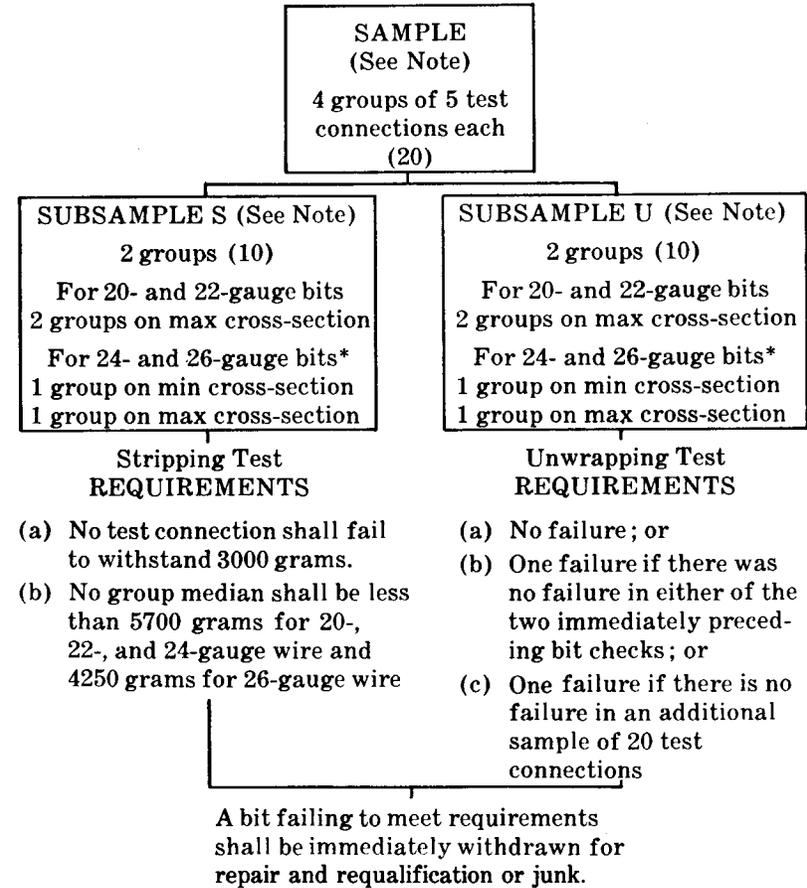
- (a) Each new bit — before issue
- (b) Each bit that has been repaired, readjusted, or modified — before reissue



FOR VERIFICATION OF TOOL IN USE

Applies to:

- (a) Each bit at least once every week during job use.



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Note: Samples shall be in groups of 5 test connections each, each group to be made on terminals of one cross-section only and divided into subsamples, one subsample being designated S for the stripping test, the other U for the unwrapping test.

* See Note, Page 3.

TABLE B
VISUAL AND TIGHTNESS INSPECTION
OF PRODUCT CONNECTIONS

Lot Range		B	C	D	E	F	G	H	I
Lot Size (Thousands of Connections)		4 8	8 12	12 20	20 40	40 100	100 200	200 600	600 1000
Sample Size (Hundreds of Connections)		26	39	52	64	79	100	138	180
Inspection Item (For requirements refer to Section 800-612-154. For detailed explanation and use refer to Section AA668.002)	Basis for Counting Defects	Allowable Defect Number							
		AN	AN	AN	AN	AN	AN	AN	AN
1. Security of Connection <i>Defect</i> (a) Wire, larger than 20 gauge (b) Loose wire (Moves with a force of 1000 grams or less) (c) Less than four conforming turns for 20, 22, and 24 gauge, less than six conforming turns for 26 gauge	Connection	0	1	2	2	3	4	6	8
2. Connection Properly Wrapped <i>Defect</i> (a) 26-gauge wire: six but fewer than eight successive nonoverlapping turns (b) 24-gauge wire: four but fewer than six successive nonoverlapping turns (c) 20- and 22-gauge wire: four but fewer than five successive nonoverlapping turns (d) One connection on terminal soldered; other connections on same terminal not soldered (e) Moves with a force of more than 1000 but less than 2500 grams	Connection	9	15	20	25	31	41	59	78
3. Clearance	Connection	1	2	3	4	5	7	10	14