ATT-TP-000-000-006

SSTC: SSIM:: High Capacity Digital Testing

To:	ATT technicians that test Hi-Cap DS1 circuits
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Related Documents:	TR Report Number 25 - Test Patterns for DS1 Circuits, AM-002-546-012 Ameritech High Capacity Digital Service Provisioning Guidelines, L-780059 PB/NB Standards (Tech Pub), ATT-TELCO-002-216-234-Job Aid -HDSL4 Deployed using ADC Soneplex Loop Extender Chassis, Tech Support Bulletin Tab 6-67
Canceled Documents:	AM-SR-NCS-000022, AM-002-546-042, TP 76625 High Capacity Digital Service (1.544 Mb/s) Requirements and Transmission Limits(ATT West)
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General

Purpose

This document replaces regional documents for 13 state conformity. Special Services Test Centers Management requested a team to update test parameters to include High-Bit-Rate Digital Subscriber Line (HDSL).

This document defines basic stress testing functions for DS1 services and testing parameters to enable the Special Services Test Center (SSTC) tester and Special Services Installation & Maintenance (SSIM) technician to determine which tests will be run for acceptance of new DS1 circuits.

Stress tests are used in several ways:

- Pre-service testing to ensure that a DS1 facility meets objectives for characteristic parameters before it is turned up for service

- Trouble verification in response to a trouble report or indication

- Sectionalizing confirmed faults

- Verification of repair

The stress tests performed that pertain to installation and maintenance stress testing use specific bit patterns for AMI and B8ZS line codes. These tests are time dependent with stipulated performance requirements of zero errors. The testing functions described in Attachment 1 - Section 6, should be used for installation and maintenance of all 1.544 Mb/s, High-Capacity Digital Services.

Scope

An installation test on a typical circuit will require the use of these stress tests to ensure proper turn-up. For maintenance, the choice of a useful sequence must be made by the tester and is dependent upon the trouble reported or an indication of what the trouble may be. Decision logic for trouble isolation is not defined to allow the tester to choose the next function to be performed based on previous results. Trouble isolation logic or sequence may vary by area; therefore, local methods and procedures should be used to perform trouble isolation and repair functions. The functions included are intended for use in providing testing support for installation and maintenance stress tests of DS1 services.

Stress tests are applied to a circuit to identify or confirm that a circuit or facility is within acceptable test parameters. Circuits are stressed by applying a maximum or minimum ones-density pattern, that is, all-ones signal versus a 1-in-8 signal(B8ZS)or 3 in 24(AMI).

1. REASON FOR REISSUE

Issue 12: 8/18/06 PMW - Replace Attachments 1-4 in document. Update SBC verbiage to ATT.

Issue 11: 05/06/03 PMW - Attachment 1, Section 3.0 Add H4TU-C Soneplex Tech Support Bulletin information-Midwest Only.

Issue 10: 01/07/03 PMW Change AIT to SBC Midwest, SWBT to SBC Southwest, PB/NB to SBC West and SNET to SBC SNET to show correct corporate identity. Add Special Note to Attachment 1 to reflect that Litespan changes the line code default on HDSL2 units from B8ZS to AMI. The system must be reprovisioned to return the line code to B8ZS after insertion of the card.

Issue 9: 10/10/02 PMW Show PB/NB Tech Pub L-780059 in Related Documents. Add PB/NB verbiage to section 5.9. Add to Appendix 1 Section 2, Boot Process for DS1 card in Litespan system, SBC Midwest only. Update Section 2.2 in the appendix to show CART is the preferred method to populate OSSCN screen in WFA/C. Update Section 5.1 to add CART and Remote Testing.

Issue 8: 06/15/02 PMW Add HDSL4 info with 2 regenerators, revise HDSL test tables to show reading taken via software and assumes sync between HDSL units. Add note to signal level for HDSL.

Issue 7 :04/22/02 PMW Add HDSL4 information, revise OSSCN.

Issue 6: 03/25/02 PMW Revise Section 3.2.1. Span Identification Table updated to reflect 4 characters in WFA . Tables noted that HDSL4 is under development.

Issue 5: 03/05/02 PMW Add NC codes, change Table 2 to add note for HDSL2 units that do not have line code options.

Issue 4: 01/23/02 PMW - Note added to sections for standard span current measurement test when fiber exists to the customer premises. Update special note in Section 4.0.

Issue 3: 8/20/01 PMW - Update General section in Attachment 1 to give SSTC option of phoning CO to verify mux options. Update section 4.0 to clarify this test is not used on B8ZS circuits. Add SSTC can call to verify mux options.

Issue 2: 6/2001 ATAS information added, change title on Table 8 , add verbiage to clarify B8ZS line code verification in Section 4. Add Attachment 3 - Terminology and Definitions, and Attachment 4, HDSL Remote Unit Problems. Merge framing and line code section and add impedance. Delete section to verify protect switch path.

2. IDENTIFYING HICAP (T1) SERVICES

2.1. COMMON LANGUAGE CIRCUIT IDENTIFICATION (CLCI)

The Common Language Circuit Identification (CLCI) is located in Work Force Administration / Control (WFA/C) on screens that contain a circuit number. The circuit number is also found on Work Order Record Detail (WORD) documents with serial number circuit identifications.

Example: CKT S /**HC**GS/796406 /LB

The CLCI is HCGS. The first two characters identify the type of service. Below is a list of T1 CLCIs.

- HC

- DH

- HX or FL

- IP

- SY

- YB

- UM

2.2. COMMON LANGUAGE FACILITY IDENTIFICATION (CLFI)

The Common Language Facility Identification (CLFI) is located on WFA/C screens that carry a facility type circuit number.

Example: C 101/**T1**ZF /CHCGILLADC0/CHCGILTFH01

T1 is the facility type to denote HiCap.

3. IDENTIFYING STANDARD (NON HDSL) VS. HDSL SPANS

Standard spans do not utilize HDSL technology. Span identification is region specific.

3.1. STANDARD SPAN IDENTIFICATION

3.1.1. ATT Midwest, ATT Southwest and ATT SNET

Span type identification is determined from the circuit design on the WORD document. The span type is determined from the customer premises Network Interface (NI) to the central office serving the customer premises.

Example:

FH101 CABLE 00045

L1 **T1S** 9

FH101 CABLE 00145

T1S is a standard(non-HDSL) span.

Below is a portion of a WORD document containing an example of a standard span utilizing Intelligent Office Repeaters(IOR). Note the pair separation.

W **T1R3LU02** IP12188919 **Example of IOR with options.**

S2=ALL SEGMENTS OUT(0.

0DB),S3=-130V,S4=POSITI

ON 0,S9=ENABLE,LOOPABLE

,LOOPBACK ADDRESS CODE=

#1,(AM365-200-952)S10A&

S10B=AIS

MDF 01/F01/N127 ACD TRDF 01/F10 MILWWI45

47 CABLE **00904** AZ **Pair separation indicates standard span.**

47 CABLE **01504** ZA

W L1 T1S 4

47 CABLE 00904 AZ

47 CABLE 01504 ZA

Below is a portion of a WORD document of a standard span utilizing Intelligent Line Repeaters (ILR)

MILWWIR0236 BLMD RD 880'WOF CALHOUN RD RT ADDR MILWWIR0236

819 CASE=21 SLOT=21

T1R1B10C PE MILWWIR0236

EXC47 24 00904 XT **Note pair separation in standard spans.**

EXC47 24 01504 XR

3.1.2. ATT West Region

Pair separation also identifies Standard span types in ATT West. See ATT Midwest, ATT SNET and ATT Southwest example above.

3.2. HDSL SPAN IDENTIFICATION

Span type identification is determined from circuit design on the WORD document. The span type is determined from the customer premises Network Interface (NI) to the central office serving the customer premises.

Example:

1784A CABLE 00129 **Note: HDSL does not require pair separation.**

L01 T1**SH** 2 (**SH** indicates ADC (Pairgain) with no regenerator.)

1784A CABLE 00128

3.2.1. ATT Midwest, ATT Southwest and ATT SNET

Following is a table of span types.

Table 1: Span Types ATT Midwest, ATT Southwest and ATT SNET

T1S	Standard span no HDSL
T1SH	ADC(Pairgain) HDSL no regenerators
T1SHD **Note: WFA may populate only 4 characters and may be seen as T1SD**	ADC(Pairgain) HDSL - 1 regenerator
T1SHT **Note: WFA may populate only 4 characters and may be seen as T1ST**	ADC(Pairgain) HDSL - 2 regenerators
T1H	Adtran HDSL - No regenerators
T1HD	Adtran HDSL - 1 regenerator
T1HT	Adtran HDSL - 2 regenerators
T1H2	Adtran HDSL2 (2 wire HDSL - no regenerators used with this product)
T1H4	Adtran HDSL4
T1H4D **Note:WFA may populate only 4 characters and this may be seen as T14D.**	Adtran HDSL4 - 1 regenerator
T1H4T	Adtran HDSL4 - 2 regenerators

3.2.2. ATT West

Equipment type defines the span type in ATT West. The following function codes are to be used on HiCap designs. The chart below shows all combinations of function codes old and new for office repeaters.

These function codes must be used in pairs; i.e., the CO unit must match the Network Channel Terminating Equipment (NCTE)unit. Please note that the new PAIRGAIN unit now has 2 function codes, one for AMI and one for B8ZS. In the near future, the distinction will be made to the Kentrox and ADTRAN. Due to the massive PROCDS models involved, it will be done when the PROCDS enhancement that is on request to Telcordia is available.

The old PAIRGAIN unit is still usable for redesigns without changing the plug that is place.

NOTE:
Pairgain was acquired by ADC. Unit may have either name.

Table 2: ATT West Equipment Codes

Usage	Co Repeater	NCTE at Customer End
T1 (non HDSL)	KENTORB	TSNPSC2ANN
T1 (non HDSL) Teltrend	ORBSTT	TSNPSC2ANN
T1 (non HDSL) Westell	ORBSTW	TSNPSC2ANN
HDSL2 AMI ADTRAN (NEW)	HC6AANNNNN2N	HR6NNNN2AN
HDSL2 B8ZS ADTRAN (NEW)	HC6ABNNNNN2N	HR6NNNN2AN
HDSL using ADTRAN	TRHCZE0AFAN	+F44HA
HDSL AMI using PAIRGAIN	HDPA9AUHNNNN	+F44HP
HDSL B8ZS using PAIRGAIN	HDPA9BUHNNNN	+F44HP
HDSL PAIRGAIN (old, AMI or B8ZS)	TRHCBBNNNMD	+F44HP
Limited HDSL / HDSL2 usage (6 max) mountings: ADTRAN HDSL PAIRGAIN HDSL ADTRAN HDSL2 AMI ADTRAN HDSL2 B8ZS **Note:**Adtran HDSL2 unit may be HDSLPB2 - without an A or B modifier depending on if the card has a line code option.	 HDSLPB HDSLPBP HDSLPB2A HDSLPB2B	 +F44HA +F44HP HR6NNNN2AN HR6NNNN2AN
ADTRAN HDSL4 220, 3192, DDM+ Shelf Soneplex Shelf TA 3000 Shelf Note: xxx will vary depending on line code, bit rate and span power.	 HU4SCxxxx SNRZNNxxxx HT13Dxxxxxxx	HU4SRNxxx

4. IDENTIFYING LINE CODE (AMI VS. B8ZS),FRAMING, AND IMPEDANCE

4.1. NCI and NC CODES TO IDENTIFY LINE CODE (AMI VS. B8ZS),FRAMING, AND IMPEDANCE

Table 3, below carries select NC codes. The fourth character is not included in the chart and is represented by a dash(-).

NOTE:
For more information see Telcordia Technologies Practice BR-795-403-100.

Table 3: Select NC Codes

HC--	AMI - SF
HCD-	ANSI AMI - ESF
HCE-	ANSI B8ZS - ESF
HCF-	Non ANSI AMI - ESF
HCG-	Non ANSI B8ZS - ESF
HCZ-	B8ZS - SF

NCI codes are used to identify AMI vs. B8ZS on circuits with a serial number circuit ID.

Example NCI: 04DU9/**1SN**/

The NCI code is composed of 12 characters. The first 2 characters denote the number of wires. In the example above, it is 4 wires. Character 3 and 4 is the protocol code. DU is a digital access interface.

Character 5 denotes the impedance. A 5 in this field denotes 135#, a 9 denotes 100#.

The first delimiter is a slash(/). Characters 7, 8 and 9 are the option codes which will determine AMI vs. B8ZS. Some common option codes are listed below.

Table 4: Line Coding and Framing Utilizing NCI Codes

Option Codes	Line code and framing
1S or 1SN (N denotes no line power)	B8ZS - ESF
D or DN	B8ZS - SF
1K or 1KN	AMI - ESF
B or BN	AMI - SF

NOTE:
For more information see Telcordia Technologies Practice BR-795-403-100.

4.2. FACILITY TYPE AND LINE CODE FOR USE WITH CLFI CODE

AMI or B8ZS can be identified from the circuit number, when the CLFI code is used. The facility type will have a **Z** embedded in the facility type for B8ZS operation.

Example:

101 /T1**Z**F/CHCGILLADC0/CHCGILTFH01 (B8ZS)

The lack of a Z in the facility type below indicates the circuit is AMI.

Example:401 /T1/LVPKILRNDC0/RCFRILADW01 (AMI)

The facility type indicates the framing ordered by the customer when CLFI circuit identification is used.

An **F** in the facility type denotes ESF. Lack of the F denotes Superframe or D4 framing.

Example:

101 /**T1ZF** /CHCGILCLDC3/CHCGILYRH05 **EXTENDED SUPERFRAME- B8ZS**

401 /**T1** /LVPKILRNDC0/RCFRILADW01 **D4 FRAMING (Superframe)- AMI**

5. TEST PATTERNS, DEFINITIONS AND USAGE (SEE ATTACHMENT 1 FOR TEST PARAMETERS)

Table 5: Definitions

Errored Second	Any one-second period containing one or more bit errors.
AMI	Alternate Mark Inversion is a pseudo-ternary signal conveying binary digits in which successive "ones" (marks, pulses) are of alternating, positive (+) and negative (-) polarity, equal in amplitude and in which a "zero" (space, no pulse) is of zero amplitude.
B8ZS	Bipolar with 8-Zero Substitution is a code in which eight consecutive "zeros" are replaced with a sequence 000+-0-+ if the preceding pulse was a positive (+) and with the sequence 000-+0+- if the preceding pulse was a negative (-) pulse; zero represents no pulse.
Straight-away	A test configuration where the testing is performed using BERT test sets at both ends of the circuit or portion of circuit to be tested.

5.1. DB LOSS TEST (USED ON STANDARD SPANS ONLY)

DB loss tests are only required on service orders with non-HDSL copper facilities and on maintenance cases where non-HDSL copper facilities have been replaced.

To test the end section loss, an un-framed "all ones" 1.544Mb DS1 signal is sent (by the Central Office Technician, SSIM through CART, or the SSTC remote access) from the serving CO and measured at the customer's Service Interface by the outside Technician. An un-framed all ones signal is used because it leaves the last repeater at the required 772 KHz at 0 db toward the customer.(Loopbacks may be used by the outside field technician.)

Step 1

Send an un-framed "all ones" DS1 signal toward the customer location using a DS1 Bit Error Rate Test Set (BERT). The Central Office (CO) technician will do this from the local Serving Office DSX-1 frame. The Special Services Test Center technician will send this pattern when a remote test system is available.

Step 2

At the customer Service Interface, the Outside Technician must connect a BERT Test Set to the receive cable pair. The test set should be set to measure the receive signal level in dBDsx. See the specific test set manual for setup. The measured level must be between 0 and -16.5 db at the Service Interface.

5.2. CURRENT MEASUREMENT (also known as Milliamp test) USED ON STANDARD SPANS ONLY FROM THE NETWORK INTERFACE/SMARTJACK

Use a volt meter that measures voltage with at least 2 decimal point accuracy. On a smartjack or NCTE measure the

voltage between the two test points labeled **CURRENT** or **VOLTAGE**. The voltage should be 0.6 VDC +/- 0.03 volts to equal 60ma.

NOTE:
Current measurement test is not required when the span is fiber out to the customer site and the smartjack is located in the same bay or adjacent bay as the mux and is locally powered by the same power plant as the mux.

5.3. QRSS (Quasi Random Signal Sequence) TEST PATTERN

This pseudo-random sequence is based on a 20-bit shift register and generates every possible combination of 20-bits (except all zero) and repeats every 1,048,756 bits. Before transmission into the network, this sequence is limited to 14 zeros so that it meets the 15-zero limitation when framed. The sequence has an average ones density of 50 percent. This pattern is good for simulating traffic in a T1 system and has been shown to be similar in spectral content to voice traffic.

Table 6: QRSS TEST PATTERN FOR AMI AND B8ZS LINE CODING

Pattern	Average Ones Density	Maximum Zeros	Circuit Stressed
QRSS (un-framed)	50%	14	Timing and Equalization
QRSS (framed)	50%	15	Timing and Equalization

5.4. 1 in 8 PATTERN (also known as 1:7)

This pattern stresses the minimum ones density requirement for repeaters. This pattern will help determine if a timing recovery problem exists with low-density patterns. When framed, the bits that are ones must be located in the second bit position of each byte within the frame or a yellow alarm will occur. This test pattern is used to test the minimum ones density for a B8ZS line code.

. . . 00 F 01000000 01000000 01000000 01. . .

Table 7: 1 in 8 TEST PATTERN FOR B8ZS LINE CODING

Pattern	Average Ones Density	Maximum Zeros	Circuit Stressed
1 in 8 (un-framed)	12.5%	7	Timing
1 in 8 (framed)*	12.5%	8	Timing

*When the 1 in 8 bit pattern is sent with framing bits, the 1 bit must be located in the second position to prevent a yellow alarm or excessive zero condition.

5.5. 3 in 24 PATTERN

This pattern simultaneously stresses both the minimum ones density and the maximum number of consecutive zeros. This sequence is useful for testing the timing recovery circuit of the repeater. When framed, the frame bit must be located in the position identified, or either a yellow alarm or a sequence of 16 zeros will occur. This test pattern is used to test the minimum ones density for an AMI line code.

. . . 0100 F 01000100 00000000 00000100 01000100. . .

Table 8: 3 in 24 TEST PATTERN FOR AMI LINE CODING

Pattern	Average Ones Density	Maximum Zeros	Circuit Stressed
3 in 24 (un-framed)	12.5%	15	Timing
3 in 24 (framed)*	12.5%	15	Timing

The frame bit location must be as specified to prevent a D4 yellow alarm or excessive zero condition.

5.6. ALL ONES

This sequence is useful for stressing the regenerator circuit of a repeater. When received, the all ones sequence causes the repeater to consume the maximum amount of power. If inadequate, DC power is provided by the office repeater through the simplex current path, which may cause the repeater to drop out.

Table 9: ALL 1'S TEST PATTERN FOR AMI AND B8ZS LINE CODE

Pattern	Average Ones Density	Maximum Zeros	Circuit Stressed
All Ones (un-framed)	100%	0	Regenerator and DC current
All Ones (framed)	99.7%	1	Regenerator and DC current

5.7. ALL ZEROS TEST PATTERN

The ALL ZEROS test pattern must be used for verifying correct optioning for B8ZS line code. The all zero test pattern should not be used as a stress test pattern.

5.8. BRIDGED TAP TEST

A problem, often encountered in the deployment of DS1 facilities via existing networks, is the "unrecorded" bridged tap. A bridged tap is an unterminated pair of wires of unspecified length which generally occurs when service to one customer is terminated and a portion of the same wire pair is re-used for a second customer. The wire run to the site of the previous customer frequently remains connected. It is recommended that the bridged tap test pattern be used as a tool to identify trouble conditions that may not be totally defined when using the standard stress tests. The test is used on standard spans when other tests fail, or if a new pair is obtained on a maintenance case of trouble. This test is conducted on the copper portion of the loop only.

Document T1M1.3/92-006R2, titled "A Technical Report on The Test Patterns for DS1 Circuits," is an excellent resource for explanations of various test patterns used for testing DS1 circuits.

NOTE: For Maintenance, Bridged Tap tests are only required for a chronic trouble if the copper facilities were changed to restore service. For Provisioning, Bridged Tap tests are only required when other stress test patterns fail on standard spans.

5.9. NON-STANDARD TESTS - BILLABLE TESTS

Often, customers request the use of non-standard test patterns to identify DS1 circuit faults, e.g., the Daly Pattern (55 Octet). Trouble reports are not taken solely on the result of a failed 55 Octet test. Inform the customer that the pattern they are requesting isn't an ATT standard test pattern. ATT will run the test pattern based upon the availability of test sets that have the pattern requested. Circuits will not be redesigned based on the 55 Octet test. Follow normal maintenance restoration procedures. ATT will not incur additional expense for engineering costs or redesigns with a failed 55 Octet test.

NOTE:
The 55 Octet test and other non standard tests are billable tests for both provisioning and maintenance.

PB/NB: Tech Pub L-780059-PB/NB that is available upon customer request contains parameters from this document for provisioning and maintenance tests. Note that anytime a test is repeated by the ATT technician at the testers discretion is not billable to the customer. Tests that are performed by the ATT technician at the request of the customer that are longer than standard durations are billable to the customer. The ATT technician can state in the circuit log if there are reasons why billing does not occur.

6. Attachment 1 - DS1 SERVICE 1.544 MB/S TESTING PROCEDURES, PROVISIONING AND MAINTENANCE

Test requirements.

1. INTRODUCTION

Below are test requirements for the provisioning and maintenance of DS1 services. These guidelines are intended to provide a base for testing DS1 1.544 Mb/s High-Capacity Digital Services.

These guidelines incorporate the use of specific bit patterns to perform stress tests in conjunction with the conventional QRSS tests for AMI and B8ZS line codes. Stress testing is done after basic continuity is established.

Stress testing is used as a diagnostic tool for determining the integrity of a 1.544 Mb/s DS1 facility.

B8ZS line code verification is not a standard test. B8ZS line code verification is not used on circuits that are to be optioned B8ZS. It is used when line code mismatches are suspected. (AMI circuit is suspected of being optioned B8ZS in error at one or more muxes.) The SSTC always has the option of phoning each CO where muxes are located to verify the line code options. When that cannot be done, see Section 4 for flow chart to verify B8ZS multiplexer optioning.

Many customers perform longer test durations that range from 2 hours to 24 hours. Additional test durations may be required depending on the test results received from our customers.

The charts below indicate the type of tests and parameters that will be taken on all HiCaps. Results will be recorded on the WFA/C OSSCN (Circuit Notes in WFA/C) screen.

2. PROVISIONING TESTS

Provisioning tests below are separated into 4 categories:

AMI Standard (Non-HDSL) Spans in Table 1. AMI HDSL Spans in Table 2. B8ZS Standard (Non-HDSL) Spans in Table 3. B8ZS HDSL Spans in Table 4. All test parameters tables are for use after continuity is verified. Local practice will dictate sectionalization strategies.

Table 10: AMI Standard (Non-HDSL) Spans - Provisioning

Required Tests	General Information	Parameters
DB Loss Test	Unframed all ones pattern sent from CO or remote test system. Measurements at NI.	0 to -16.5 dB
Span Current **NOTE:** Current measurement test is not required when the span is fiber out to the customer site and the smartjack is located in the same bay or adjacent bay as the mux and is locally powered by the same power plant as the mux.	Use a volt meter that measures voltage with at least 2 decimal point accuracy. On a smartjack or NCTE, measure the voltage between the two test points labeled current or voltage.	Voltage meaurement must be 0.6 VDC +/- 0.03 volts to equal 60ma. Current measurement if taken in milliamps must be 60 ma +/- 3ma.
QRSS 1 five minute test	test pattern	0 errors
3 in 24 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors
Bridged Tap test is run on copper portion of spans only, when errors are detected on other stress patterns	21 test patterns (test sets are programmed to run these tests) Only use this test on copper spans.	0 errors

Table 11: AMI HDSL Span - Provisioning

Required Tests	General Information	Parameters
Pulse (Attenuation)	HDSL reading at customer premises (This reading is taken once there is continuity between the 2 HDSL units and HDSL sync has been acquired) Retrieve reading via menu software.	**ADC/Pairgain** 0 to -28 dB (Each link when doublers are used.) **Adtran HDSL and HDSL2** 0 to -30 dB (Each link when doublers are used.) **Adtran HDSL4** 0 to -35 dB (No regenerator or 1st link (CO to regenerator)) 0 to -31 dB (Regenerated signal 2nd link (regenerator to premise.))
Signal to Noise Signal Quality Margin	HDSL reading at customer premises (This reading is taken once there is continuity between the two HDSL units and HDSL sync has been acquired) Retrieve reading via menu software.	ADC/Pairgain or Adtran(HDSL, HDSL2 or HDSL4) 6 or greater
Signal Level	HDSL card reading at customer premises Measure 1.544 signal at drop side of HDSL card (RJ48C)	ADC/Pairgain or Adtran 0 to -7.5 DB Note: 0 DB level may be as high as +1.6 DB
QRSS 1 five minute test	test pattern	0 errors
3 in 24 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors

On All HDSL Cards:

- Date and time must be set.

- Actual pair loss for HDSL and HDSL2 should not exceed -35 dB at 196 kHz using a 135 # termination per link or section. This is not a required test.

- Actual pair loss for HDSL4 should not exceed -44 dB at 196 kHz using a 135 # termination for circuits not using a regenerator or on the first link (CO to regenerator) of a circuit using regeneration. Actual pair loss on the second link (regenerator to premise) should not exceed -41 dB at 196 kHz using a 135 # termination.

- Sync light should be green for Adtran units. For ADC/Pairgain, reading should be between -64 to +64 for good synchronization.

Table 12: B8ZS Standard (Non-HDSL) Spans - Provisioning

Required Tests	General Information	Parameters
DB Loss Test	Unframed all ones pattern sent from CO or remote test system. Measurements at NI.	0 to -16.5 DB
Span Current **NOTE:** Current measurement test is not required when the span is fiber out to the customer site and the smartjack is located in the same bay or adjacent bay as the mux and is locally powered by the same power plant as the mux.	Use a volt meter that measures voltage with at least 2 decimal point accuracy. On a smartjack or NCTE, measure the voltage between the two test points labeled current or voltage.	Voltage meaurement must be 0.6 VDC +/- 0.03 volts to equal 60ma. Current measurement if taken in milliamps must be 60 ma +/- 3ma.
QRSS 1 five minute test	test pattern	0 errors
1 in 8 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors
All Zeros 1 thirty second test	test pattern	0 errors
Bridged Tap test run on copper portion of spans only when errors are detected on other stress patterns	21 test patterns (test sets are programmed to run these tests) Only use this test on copper spans.	0 errors

Table 13: B8ZS HDSL Spans - Provisioning

Required Tests	General Information	Parameters
Pulse (Attenuation)	HDSL card reading at customer premises (This reading is taken once there is continuity between the 2 HDSL units and HDSL sync has been acquired) Retrieve reading via menu software.	**ADC/Pairgain** 0 to -28 DB (Each link when doublers are used.) **Adtran HDSL and HDSL2** 0 to -30 DB (Each link when doublers are used.) **Adtran HDSL4** 0 to -35 dB (No regenerator or 1st link (CO to regenerator)) 0 to -31 dB (Regenerated signal 2nd link (regenerator to premise.))
Signal to Noise Margin	HDSL reading at customer premises (This reading is taken once there is continuity between the 2 HDSL units and HDSL sync has been acquired) Retrieve reading via menu software.	ADC/Pairgain or Adtran (HDSL, HDSL2 or HDSL4) 6 or greater
Signal Level	HDSL reading at customer premises Measure 1.544 signal at drop side of HDSL card (RJ48C)	ADC/Pairgain or Adtran 0 to -7.5 DB Note: 0 DB level may be as high as +1.6 DB
QRSS 1 five minute test	test pattern	0 errors
1 in 8 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors
All Zeros	test pattern	0 errors

1 thirty second test		

Special Note: For Adtran HDSL2 cards used in a Litespan application. Although the Adtran card is shipped with a line code of B8ZS, the Litespan will change that value to the Litespan automatic default of AMI. The Central Office, NOC or SSTC must provision the Litespan to ensure proper line code information is set in the system.

SSIM, ATT Midwest ONLY: SPECIAL BOOT PROCESS WHEN T1 "RIDES" ON A LITESPAN SYSTEM

When adding DS1 cards to an existing Litespan system, a "boot proc" is performed. The SSIM technician will need to verify the software version in the card is the same as the latest software release. If not the same,a boot process will ensure the newest software version is loaded onto the Litespan element. This process only applies to the new card being installed in the Litespan. Doing this on existing cards will cause a momentary hit to service. **If a card already is in the Litespan slot (previous disconnected circuit), and the service is new, the same "boot proc" must be done.**

To determine if boot proc must be done on a DS1 card for a new circuit installation:

- retrieve equipment for that card, this will show you what the software release is. Ex: (10.02.02)

- Retrieve version, this will show the latest software version. (11.02.02)

- If the software versions do not match, follow the Boot Proc below.

To Boot Proc the DS1 card:

- Display " boot proc" procedure. This procedure is found in the TL1 Messages section under BOOT-PROC.

This process must be done on new installs, when the card is reused if the software versions do not match. **This procedure is for ATT Midwest only. The NOC normally does this process in other regions.**

On HDSL Cards:

- Date and time must be set.

- Actual pair loss for HDSL and HDSL2 should not exceed -35 dB at 196 kHz using a 135 # termination per link or section. This is not a required test.

- Actual pair loss for HDSL4 should not exceed -44 dB at 196 kHz using a 135 # termination for circuits not using a regenerator or on the first link (CO to regenerator) of a circuit using regeneration. Actual pair loss on the second link (regenerator to premise) should not exceed -41 dB at 196 kHz using a 135 # termination.

- Sync light should be green for Adtran units. For ADC/Pairgain, reading should be between -64 to +64 for good synchronization.

> **NOTE:**
> **Above tests constitute acceptable test parameters for circuit turnup in accordance with ANSI Standard T1 403 Figure 1.** If these parameters are not met, the tests may be run 1 additional time. If the retest passes, the circuit is considered acceptable for turnup. If the retest fails, sectionalization must be done to isolate the cause of the trouble. Upon sectionalization, the above tests (span type and line code dependent) will be rerun.

PB/NB Only:

2.1 Intermittent Errors on Above Provisioning Tests

Extended tests may have to be run for test acceptance, due to intermittent errors.

Table 14: Extended Test Pattern Parameters

Test Duration and Test	Errored Seconds (ES) Allowed	Severe Errored Seconds (SES) Allowed	Consecutive Severe Errored Seconds (CSES) Allowed
5 minutes 1 in 8 (B8ZS) 3 in 24 (AMI) All Ones (AMI and B8ZS)	0 ES	0	0
2 -15 minute QRSS (AMI and B8ZS)	3 or less ES for each 15 minute QRSS test	0	0

Table 15: 24 Hour Test Parameters (Not a Standard Extended Test)

Facility Type	Errored Seconds (ES) Allowed	Severe Errored Seconds (SES) Allowed	Consecutive Severe Errored Seconds (CSES) Allowed
All Fiber CO to NI	20	9	1
End to End	20	9	1
Fiber/(Copper<5 miles) CO to NI	100	9	1
End to End	100	9	1
Fiber/(Copper>5 miles) CO to NI	216	9	1
End to End	432	31	1

Reference: GR 64 Core Issue 1 December 1996

2.2 POPULATING OSSCN SCREEN IN WFA/C

The OSSCN screen will have different fields populated depending on the span type and line coding .

The OSSCN screen may be populated by both:

• SSIM technician - SSIM technician will use Craft Access Remote Testing (CART)

• SSTC technician - SSTC technician will use WFA/C to populate OSSCN screen.

The following fields must be populated for proper documentation during the circuit provisioning process. The only 'required' fields that must be populated by the Special Services Test Center Technician are "ES" and "Accepted By". All other fields could by populated by the I & M technician through CART. The SSTC tester has final responsibility upon circuit completion to verify information is populated on the OSSCN screen. The SSIM technician must populate all fields except "ES" and "Accepted By" when CART is used to post CTR1 complete.

• ES - Populate (A-Z), (Z-A), LPBK depending on type of test.

• Installer - name of installer(s) at A and Z locations.

- Accepted by - name of person accepting service

- LCON - name and phone number of Local Contact

- NI A/Z - Physical location, type and position numbers of network interface at customer premises for both A and Z locations if applicable.

- GRD OK? - Y or N - answer obtained from Installation and Maintenance Technician.

The technician will determine the span type and populate fields on OSSCN according to type.

Below is the required input on OSSCN screen for standard spans, without Intelligent Office Repeaters or Intelligent Line Repeaters.

- DB - Record loss at demarc with unframed all ones sent.

- MA - Record span current - record voltage or current measurement here

Required Input on OSSCN screen for HDSL Spans - no doublers

- PA - Pulse Attenuation

- MRGN - Signal to Noise Margin

- 2W HDSL Y or N

Required Input on OSSCN screen for HDSL Spans with Doublers

- PA - Pulse Attenuation

- MRGN - Signal to Noise Margin

- CO-LP1/LP2 - Reading of CO to first doubler

- R1-LP1/LP2 - Doubler #1 Loop1 to Loop 2

- R2-LP1/LP2- Doubler #2 Loop1 to Loop2

- REM-LP1/LP2 - Remote unit

3.0 MAINTENANCE TESTS

Automated Testing and Analysis System (ATAS) is the automated system that will populate test results in the log of WFA/C. These test results are used for trouble sectionalization when a trouble is not chronic or intermittent. See Section 5, ATAS testing.

Maintenance testing procedures will vary depending on the type of trouble reported. The initial test pattern and section-alization strategies used for trouble isolation should be at the discretion of the tester.

Special Note: Any trouble report that is a chronic trouble or "intermittent" errors reported, must utilize Table 5 , Extended Test Pattern Parameters. A circuit does not have to be intermittent or chronic to view Performance Monitoring(PM) data.

Current status and history PM data is available from both the Adtran and ADC/ Pairgain HDSL units. If no trouble is found, the CO or outside field technician can utilize current status and history from the HDSL units to help sectionalize the trouble.

Other PM data may be available depending on equipment used in circuit design. See local practices for PM retrieval on specific equipment types.

After the trouble has been isolated and repaired, the following tests should be performed:

Table 16: Maintenance Test Patterns AMI Line Code

Required Tests	General Information	Parameters
QRSS 1 five minute test	test pattern	0 errors
3 in 24 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors

Table 17: AMI HDSL Span - Maintenance

Required Tests	General Information	Parameters
Pulse (Attenuation)	HDSL card reading at customer premises	**ADC/Pairgain** 0 to -28 DB (Each link when doublers are used.) **Adtran HDSL and HDSL2** 0 to -30 DB (Each link when doublers are used.) **Adtran HDSL4** 0 to -35 dB (No regenerator or 1st link (CO to regenerator)) 0 to -31 dB (Regenerated signal 2nd link (regenerator to premise.))
Signal to Noise Margin	HDSL card reading at customer premises	ADC/Pairgain or Adtran 6 or greater
Signal Level	HDSL card reading at customer premises	ADC/Pairgain or Adtran 0 to -7.5 DB Note: 0 DB level may be as high as +1.6 DB
QRSS 1 five minute test	test pattern	0 errors
3 in 24 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors

On HDSL Cards:

- Date and time must be set.

- Actual pair loss should not exceed -35 dB at 196 kHz using a 135 # termination per link or section. This is not a

required test.

- Actual pair loss for HDSL4 should not exceed -44 dB at 196 kHz using a 135 # termination for circuits not using a regenerator or on the first link (CO to regenerator) of a circuit using regeneration. Actual pair loss on the second link (regenerator to premise) should not exceed -41 dB at 196 kHz using a 135 # termination.

- Sync light should be green for Adtran units. For ADC/Pairgain, reading should be between -64 to +64 for good synchronization.

ATT Midwest Only: H4TU-C for Soneplex

There are currently 2 versions of the H4TU-C card used for Soneplex and these cards use different technology and cannot be swapped out from first generation to second generation and vice versa without reprovisioning.

. When a card is pulled from a slot and replaced with a card of a different technology the first card **must** be de-provisioned and the slot must be made unequipped before pulling the old card and replacing it with the new. The slot with the new card must be set equipped at this time and the card also needs to be placed in-service and provisioned. This same procedure needs to be applied when changing 1st generation H4TU-C cards with 2nd generation H4TU-C cards and vice versa, even though the cards are seemingly the same technology.

Not following this procedure will cause a loss of communication to the card and will need a dispatch to the location of the card with a customer release to take down the circuit to resolve the problem. Until the problem is corrected, the SCU will see the slot as having a mismatch. Tech Support states if there are too many mismatches, communications can be lost to the entire shelf.

- T1L6CDLBAA and T1L4XNJCAA - First generation cards

- T1L6CDFBAA Second generation card (different technology from first generation cards)

After a card is replaced, technicians must log into the Soneplex shelf and check the equipment status of the card on the Trouble Isolation screen located in the System Maintenance menu. If the status shows a Comm Failure there is a problem and the card was most likely not provisioned when it was changed. A mismatch can also be checked on the Configuration Validation screen located in the Unit Configuration menu. A mismatch will be indicated by "mis" in the card field.

See Tech http://tst.ameritech.com/tst_tsb/Tab06_digital_facilities(DS1_Hi-Cap)/TAB_06-67_Adtran%20H4TU-C%20Sone Bulletinplex%20LEC.txt for additional information.

Table 18: Maintenance Test Patterns B8ZS Line Code Standard Spans

Required Tests	General Information	Parameters
QRSS 1 five minute test	test pattern	0 errors
1 in 8 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors
All Zeros	test pattern to check for B8ZS line code	0 errors
Bridged Tap (non HDSL span only)	21 test patterns test run on copper portion of spans only when errors are detected on other stress patterns, when there is a chronic trouble, or when a pair change is made	0 errors

Table 19: B8ZS HDSL Spans - Maintenance

Required Tests	General Information	Parameters
Pulse (Attenuation)	HDSL card reading at customer premises	**ADC/Pairgain** 0 to -28 DB (Each link when doublers are used.) **Adtran HDSL and HDSL2** 0 to -30 DB (Each link when doublers are used.) **Adtran HDSL4** 0 to -35 dB (No regenerator or 1st link (CO to regenerator)) 0 to -31 dB (Regenerated signal 2nd link (regenerator to premise.))
Signal to Noise Margin	HDSL card reading at customer premises	ADC/Pairgain or Adtran 6 or greater
Signal Level	HDSL card reading at customer premises	ADC/Pairgain or Adtran 0 to -7.5 DB Note: 0 DB level may be as high as +1.6 DB
QRSS 1 five minute test	test pattern	0 errors
1 in 8 1 two minute test	test pattern	0 errors
All Ones 1 two minute test	test pattern	0 errors
All Zeros 1 thirty second test	test pattern	0 errors

Special Note: For Adtran HDSL2 cards used in a Litespan system. Although the Adtran card is shipped with a line code of B8ZS, the Litespan will change that value to the Litespan automatic default of AMI. The Central Office, NOC or

SSTC must set the Litespan linecode to B8ZS to ensure proper line code information is set in the Litespan system line card. The SSIM technician is not able to make this change at the remote unit.

NOTE:
Above tests become optional ONLY if the customer waivers test. (Hard trouble cleared and customer requests circuit for immediate use.) It must be noted in the OSSLOG with customer name and phone number."

4.0 B8ZS LINE CODE VERIFICATION

SPECIAL NOTE: This test is not normally performed. This test is primarily for use on AMI circuits . (Errors detected on loopback and mux line code option is suspected.)
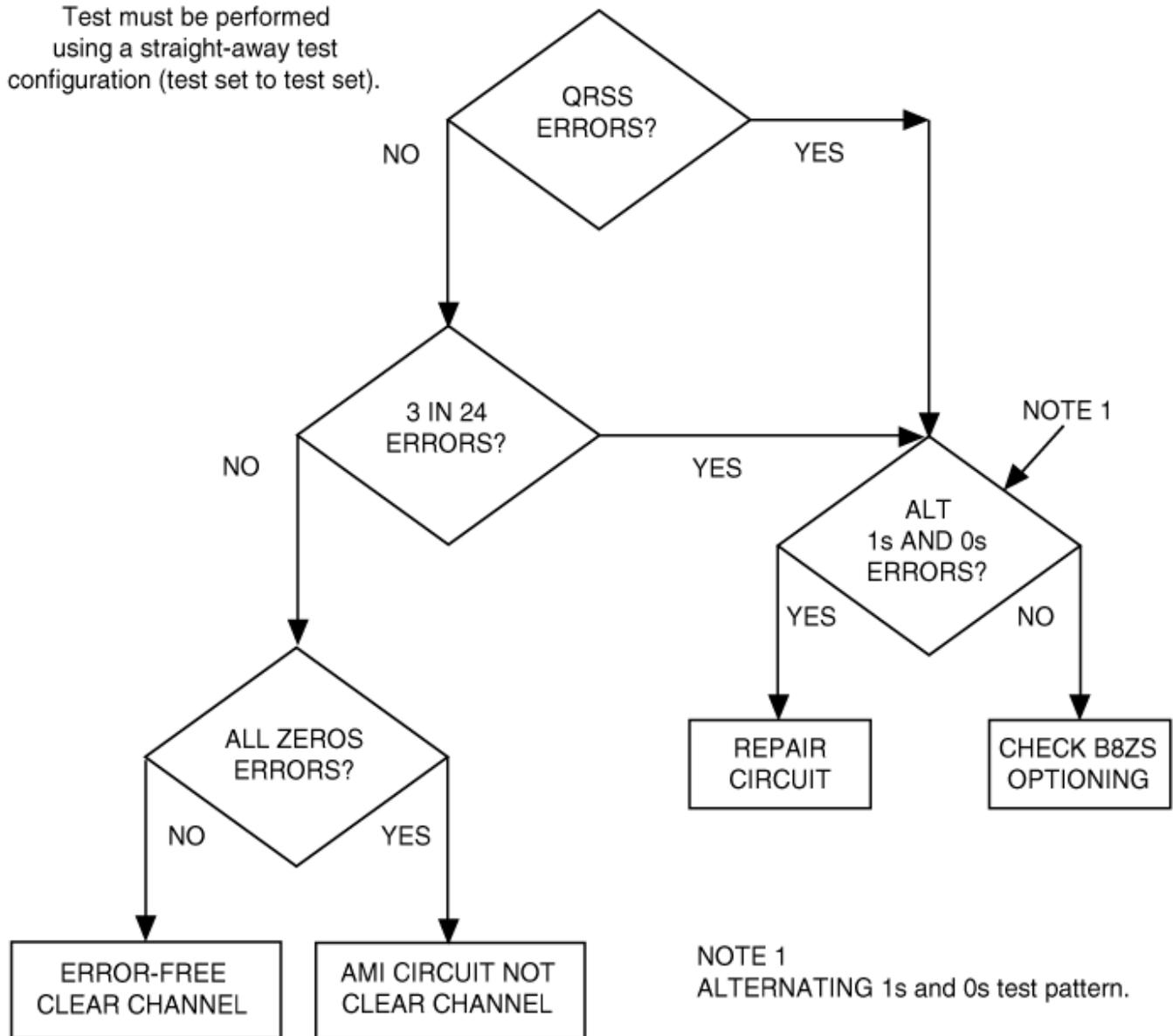
To verify muxes are optioned correctly, the SSTC can call each CO where there is a mux to verify muxes are optioned AMI. If that cannot be done and the SSTC or other tech suspects a mux(s) is optioned B8ZS in error, the following test may be performed.

See flowchart in figure 1, below, to verify line code option in mux is optioned B8ZS in error. This verification is NOT a required test.

Note: All zeros is the normal test to verify B8ZS circuit operation on circuits designed with a line code of B8ZS. This test is primarily used when the line code is AMI and the tester needs to verify the multiplexer is not optioned B8ZS in error, or a line code mismatch on each side of a span.

Figure 1: B8ZS Line Code Verification

B8SZ LINE CODE VERIFICATION TEST

Test must be performed using a straight-away test configuration (test set to test set).

QRSS ERRORS?

NO   YES

3 IN 24 ERRORS?

NO   YES

NOTE 1

ALT 1s AND 0s ERRORS?

YES   NO

ALL ZEROS ERRORS?

NO   YES

REPAIR CIRCUIT

CHECK B8ZS OPTIONING

ERROR-FREE CLEAR CHANNEL

AMI CIRCUIT NOT CLEAR CHANNEL

NOTE 1
ALTERNATING 1s and 0s test pattern.

NOTE:
Do not utilize loopbacks to run this line code verification. A straight-away test is used. This test may be run from remote test access points, with field technicians in the Central Office or at customer premises.

5.0 ATAS TESTING

5.1 Circuits tested by ATAS

ATAS will grab a new report from the WFA/C trouble list when the following conditions are met:

- The circuit ID Service Code must be among the service codes in the ATAS tables.

- The FLC code for the trouble report must be one that ATAS works from.

- The trouble report must be a Customer Report (CR).

- TEST field on the OSSTRE screen is populated with a "Y" (Yes).

- The "TYPE" field on the OSSTRE screen must not be RFR.

The TEST field on the OSSTRE screen in WFA/C when populated with an "N" (NO) will trigger ATAS to add a note to the log (OSSLOG) that the test flag is set to "N" and drop the ticket for manual intervention.

ATAS TEST FLOW

Below is a condensed recap of the ATAS trouble flow. See ATAS documentation for complete flows.

- ATAS monitors the circuit in each direction for 15 seconds from the test point closest to the A end of the circuit. ATAS notes access ID information in the log(OSSLOG).

- ATAS looks for loopable devices on the WORD document. All ATAS tests are from the test point closest to the A end, and will attempt to loop equipment farthest from the A end. Human Equipment Code Item(HECI) codes on a WORD document identify loopable equipment. Verbiage such as "Demarc - 4W" on the WORD document also is a trigger for ATAS to know there is loopable equipment. ATAS will assume there is a Smart Jack on the circuit when "Demarc - 4W" verbiage is seen on the WORD document. This causes ATAS to attempt to loop the CSU at the Z end of the circuit. ATAS will attempt to loop the circuit from the same test point it used to monitor the circuit.

- Successful loopback of the CSU will result in a TOK - No trouble found message in the OSSLOG. CSU loopback failure causes ATAS to attempt to loop the smart jack. ATAS continues with this sectionalization process.

- ATAS will use the line code from the WORD document, however will check the other line code if errors are run on a loopback. ATAS will note the line code used to produce error free results if other than the line code specified on the WORD document.

DURATION OF ATAS TESTS

Loopback tests will be one minute in duration for all test patterns except all zeros. The all zeros test pattern is 15 seconds in duration.

TEST PATTERNS USED by ATAS

Test patterns used are determined by the line coding. ATAS will run these tests depending on the line code ATAS is checking for.

AMI ATAS tests are:

- QRSS

- 3 in 24

- All ones

    B8ZS ATAS tests are:

- QRSS

- 1 in 8

- All ones

- All zeros

    ATAS populates the log with test results. The test results in the log should be used to assist with trouble sectionalization.

    The tester always has the option of running extended duration tests utilizing the Remote Access and Test System(REACT).

7. Attachment 2 - Acronyms

1 in 8 - test pattern

3 in 24 - test pattern

All Ones - test pattern

All Zeros - test pattern

AMI - Alternate Mark Inversion line coding

AML - Actual Measured Loss - See definition in Attachment 3

ATAS - Automated Testing and Analysis System

B8ZS - Binary with 8 Zero Substitution line coding

BERT - Bit Error Rate Test

BT - Bridged Tap - See definition in Attachment 3

CART - Craft Access Remote Testing

CLCI - Common Language Circuit Identification

CLFI - Common Language Facility Identification

CO - Central Office

CSES - Consecutive Severe Errored Seconds

D4 Framing - Superframe

DB - Decibel

DS1 - Digital Signal 1.544 Megabits/second

DSX - Digital Signal Cross Connect Bay in CO

EML - Engineered/Estimated Measured Loss - See definition in Attachment 3

ES - Errored Seconds

ESF - Extended Superframe

FEXT - Far End Cross Talk - See definition in Attachment 3

HDSL - High-Bit-rate Digital Subscriber Line

HECI - Human Equipment Code Item - (11 character code naming revision level of card to be used)

ILR - Intelligent Line Repeater

IOR - Intelligent Office Repeater

ma - milliamps - current measurement

NCI - Network Channel Interface

NCTE - Network Channel Terminating Equipment

NEXT - Near End Cross Talk - See definition in Attachment 3

NI - Network Interface

OSSCN - WFA/C screen for Circuit Notes - Test readings are recorded on this page

PA - Pulse Attenuation - See definition in Attachment 3

PM - Performance Monitoring

PROCDS - TIRKS Model

QRSS - Quasi Random Signal Sequence - test pattern r

REACT - Remote Access and Test System

SES - Severe Errored Seconds

SNR - Signal to Noise Ratio - See definition in Attachment 3

SR - Synch Readings - See definition in Attachment 3

SSIM - Special Services Installation and Maintenance

SSTC - Special Services Test Centers

STS - Synchronous Transport Signal

WFA/C - Work Force Administration / Control

WORD - Work Order Record Detail

8. Attachment 3 - HDSL TERMINOLOGY AND DEFINITIONS

- **AML** - Actual Measured Loss; The loss measured (35 dB max) using two test sets at 196 kHz with 135 ohms terminations on both ends of an HDSL span section (CO to Remote, CO to Repeater, Repeater to Remote, or Repeater to Repeater in the form of 4W-HDSL). AML can also be the measurement made by the HDSL equipment when using a laptop or dumb terminal device in the RS232 jack on the face of the units.

- **BT** - Bridged Tap; Any section of a cable pair not on the direct electrical path between the central office and the end user. (A bridged tap increases the electrical loss on the pair - because a signal traveling down the pair will split its signal between the bridge and main pairs).

  HDSL BT parameters:

  - Total bridged tap length on any HDSL span may not exceed 2.5 kft.

  - No single bridged tap section may exceed 2.0kft. on any HDSL span.

  - All 26 gauge cable plus bridged tap, may not exceed 9kft

- Single or multi-gauge (19, 22, or 24) cable plus bridged tap may not exceed 12 kft

- HDSL2 requires that Multi-gauge containing 26-gauge cable plus bridged tap may not exceed 9 kft. This conforms to Carrier Serving Area Guidelines (Loop Deployment Policy and Guidelines, Section 4.1.1, 9/00).

- **EML** - Engineered/Estimated Measured Loss; The engineering approximation of loss on a loop using Carrier Serving Area (CSA) design rules (35 < dB depending on local guidelines) for an HDSL span. This is an estimation of the AML, but takes into consideration the quality of the plant, environmental temperature fluctuation, record inaccuracies, BT and gauge changes.

- **FEXT** - Far-End X-Talk(crosstalk). A type of crosstalk which occurs when signals on one twisted pair are coupled to another pair as they arrive at the far end of multi-pair cable system. FEXT is an issue on short loops supporting high-bandwidth services such as VDSL (Very-high-bit-rate Digital Subscriber Line), given the relatively high carrier frequencies involved. Services such as ADSL and HDSL are not affected to the same extent, as the loops are longer and as such interference tends to be attenuated (weakened) on longer loops.

- **NEXT** - Near-End X-Talk. A type of crosstalk which occurs when signals transmitted on one pair of wires are fed back into another pair. Since at this point on the link the transmitted signal is a maximum strength and the receive signal has been attenuated, it may be difficult to maintain an acceptable ACR (Attenuation-to-Crosstalk Ratio). NEXT is particularly troublesome when a number of high-speed transmission services (e.g., ADSL, HDSL and T-carrier) are supported within a single copper cable system. Shielded or screened cable systems are more desirable in addressing this problem than are unshielded varieties.

- **PA** - Pulse Attenuation; The HDSL equipment measured loss on all sections in a HDSL designed span (28 to 30 dB max depending on the manufacturer). This PA reading must be determined by using a laptop or dumb terminal at the RS232 jack of the HDSL unit.

  - · Adtran = 30 dB (HTU-C/HTU-R)

  - · Pair Gain Technologies = 28 dB (HLU/HRU)

  - · ADC HDSL Loop Extender Shelf = 31dB (HLXC/HLXR)

- **SNR** - Signal to Noise Ratio; The ratio of the usable signal being transmitted to the noise or undesired signal. Usually expressed in decibels. This ratio is a measure of the quality of a transmission. The signal to noise difference is measured by the HDSL equipment and using a laptop or dumb terminal at the RS232 jack to get the reading.

- **SR** - Sync Readings; Loss of synchronization between HDSL units as measured by the HDSL equipment using a laptop or dumb terminal at the RS 232 jack on the HDSL units

9. Attachment 4 - HDSL Remote Unit Problems

4.1 A study was done on returned HDSL remote units.

- 38% of the units returned were found to have been subjected to a power surge. Proper grounding eliminates this problem.

- 38% of the units had no trouble found. This indicates the units may have been optioned incorrectly or were placed on marginal loops.

- 24% of the units returned had a problem with an undersized capacitor. New units come with the correct size capacitor.

  In conclusion:

- Verify grounding connections

- Provide all test results to SSTC to record in WFA/C on OSSCN screen

  On the new T200 Low-Voltage HTU-R circuit pack from Adtran, the ground is located on pins 1,11 and 27. This is compatible with the Troncom mounting that is used, as the ground is on pin 27 of the mounting. Older Adtran units with a ground on pins 1 or 11 will require an additional connection to pin 27 of the mounting to obtain a good chassis ground.