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AEROSPACE STANDARD

SAE AS4290

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Validation Test Plan for AS4074 Linear Token Passing Multiplex Data Bus

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1. SCOPE:

1.1 General:

This test plan defines the test requirements for determining that Bus Interface Units (BIUs) meet the requirements of SAE AS4074, Linear Token Passing Multiplex Data Bus.

1.2 Application:

This is a general test plan that completely describes the validation testing of any BIUs designed to meet the requirements of AS4074. The task group recognizes that a complete validation test of a BIU for AS4074 will be a lengthy and costly process. However, from a technical viewpoint, a complete validation test should be accomplished during the design verification process. Decisions to deviate from this test plan because of programmatic or financial concerns are not within the purview of the technical community, and may ultimately be made on other than technical grounds.

The primary intent of this plan is to test those requirements of AS4074 for BIUs that have been implemented in hardware, software or firmware. However, it is recognized that some additional software may be required to meet this intent and that this software may be the operational software (or some portion thereof), special test software or some combination of these.

This document deals only with BIU functions which are explicitly specified in AS4074. This document does not specify tests that check the integrity of data from the Host to the bus, nor does it attempt to address the system test requirements.

For production-level testing, the task group is developing a companion document, AIR4753, "Acceptance Test Plan for AS4074, Linear Token Passing Multiplex Data Bus." This document suggests a subset of the tests defined herein to be performed on each BIU as a production acceptance test.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this specification and references cited herein, the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS4074	Linear Token Passing Multiplex Data Bus
AIR4288	Linear Token Passing Multiplex Data Bus User's Handbook
AIR4753	Acceptance Test Plan for AS4074, Linear Token Passing Multiplex Data Bus (DRAFT)

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

DOD-STD-1678 Notice 1	Fiber Optic Test Methods and Instrumentation (26 Dec 84)
MIL-STD-1553B Notice 3	Digital Time Division Command/Response Multiplex Data Bus (31 Jan 93)

2.3 Other Publications:

EIA-455	Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices

3. DEFINITIONS:

3.1 Definitions:

EQUIPMENT: Combination of BIU and Host.

EXTINCTION RATIO: Ratio between the signal high and signal low powers.

FRAME: Structured collection of bits by which information is transferred.

HOST OR USER: The hardware/software entity that a BIU connects to the LTPB.

PREAMBLE: Highest-density signal used for acquiring synchronization.

TEST EQUIPMENT: Hardware and software used to stimulate and monitor the Unit Under Test (UUT).

3.2 Acronyms and Abbreviations:

AIR	Aerospace Information Report
AS	Aerospace Standard
ASIC	Application-Specific Integrated Circuit
BAT	Bus Activity Timer
BFC	BIU Fault Code
BIT	Built-In Test
BIU	Bus Interface Unit
BL	Bus Loopback
BW	Spectral Bandwidth
CT	Cumulative Tokens
dB	Decibel
dBm	Decibel Referenced to 1 Milliwatt
DA	Destination Address field (may contain physical or logical address data depending on frame type)
DE	Disable/Enable Status
DOD	Department of Defense
EIA	Electronic Industries Association
ELRX	Electrical Receiver
ELTX	Electrical Transmitter
F.O.	Fiber Optic
FORX	Fiber Optic Receiver
FOTX	Fiber Optic Transmitter
HSDB	High Speed Data Bus
IF	Interface Fault
I/O	Input/Output
IR	Interface Reset
LIT	LTPB Implementation Taskgroup
LTPB	Linear Token Passing Bus
ms	Microsecond
m	Meter
ms	Millisecond
mV_{rms}	Millivolts Root-Mean-Square
Mbaud	Megabaud
Mbps	Megabits Per Second
MFCS	Message Frame Check Sequence

3.2 (Continued):

MHz	Megahertz
MIL	Military
MIU	Media Interface Unit
nm	Nanometer
ns	Nanosecond
NA	Not Applicable
OC	Optical Coupler
O/E	Opto-Electronic
OTx	Optical Transmitter x
Px	Priority Level x
P_r	Receiver Minimum Valid Preamble Length
P_t	Transmitter Preamble Length
PSA	Physical Station Address
PWA	Printed-Wiring Assembly
R_{ber}	Receiver Bit-Error Rate
R_{cmr}	Receiver Common-Mode Rejection Ratio
R_d	Data Rate (Mbps)
R_{dr}	Receiver Dynamic Range
R_f	Receiver Maximum Fall Time (90% to 10%)
R_{idr}	Receiver Intertransmission Dynamic Range
R_{iz}	Receiver Input Impedance
R_{nv}	Receiver Noise Voltage Input
R_{or}	Receiver Operating Range
R_{ous}	Receiver Combined Over/Undershoot
R_{pwd}	Receiver Maximum Pulsewidth Distortion
R_{pm}	Receiver Minimum Optical Power Input
R_{po}	Receiver Maximum Optical Power Input
R_r	Receiver Maximum Rise Time (10% to 90%)
R_s	Signaling Rate
R_{vm}	Receiver Minimum Input Voltage
R_{vo}	Receiver Maximum Input Voltage
RAT	Ring Admittance Timer
RC	Remote Command
S_d	Surge Voltage Duration
S_{itg}	System Minimum Intertransmission Gap
S_p	Preamble Size
S_v	Surge Voltage
S0	Idle State
S1	Claim Token State
S2	Check Token Address State

3.2 (Continued):

S3	Send Message State
S4	Pass Token State
S5	Check Token Pass State
S6	Check Message Address State
S7	Receive Message State
SA	Source Address
SAE	Society of Automotive Engineers
SMC	Station Management Code
STD	Standard
T_{ds}	Data Streaming Timer
T_f	Transmitter Maximum Fall Time
T_{iz}	Transmitter Drive Impedance
T_m	Minimum Duration Between Transitions
T_o	Nominal Bit Time
T_{ous}	Transmitter Combined Over/Undershoot
T_{pl}	Transmitter Optical Leakage Power
T_{po}	Transmitter Optical Power
T_{pr}	Transmitter Residue Power
T_{pwd}	Transmitter Maximum Pulsewidth Distortion
T_r	Transmitter Maximum Rise Time
T_{rotn}	Empty Token Rotation Time
T_{sk}	Transmitter Redundant Media Skew Time
T_{sr}	Maximum Station Response Time
T_{to}	Transmitter Nominal Bit Time
T_{vo}	Transmitter Output Voltage Level (On)
T_{vr}	Transmitter Peak Output Voltage Level (Off)
TBD	To Be Determined
TFCS	Token Frame Check Sequence
THT	Token Holding Timer
TM	Time Master
TPIU	Token Passing Interface Unit
TPT	Token Passing Timer or Token Passing Time Value
TRT	Token Rotation Timer
TRTx	Token Rotation Timer (for priority level x)
TSM	Time Synchronization Message
T&V	Test and Validation
UUT	Unit Under Test
V_{rms}	Volts Root-Mean-Square
V_p	Volts, Peak
V_{p-p}	Volts, Peak-to-Peak
VDC	Volts Direct Current

3.2 (Continued):

VOAx	Variable Optical Attenuator x
VTP	Validation Test Plan
WC	Word Count
W1	Optical Wavelength Lower or Transmission System Lower Bandpass Frequency
W2	Optical Wavelength Upper or Transmission System Upper Bandpass Frequency

4. GENERAL TEST REQUIREMENTS:

Inspection, analysis, demonstration, and test shall be conducted for evaluation of the UUT to determine that the performance, design, and operability characteristics conform to the requirements of the AS4074 aerospace standard. Unless otherwise specified by the test method, the test equipment connected to the UUT shall operate such that all LTPB transmit and receive signal parameters fall within the allowable ranges in the appropriate slash sheet.

4.1 General:

The requirements of the AS4074 aerospace standard shall be verified by one or more of four methods: (1) Inspection, (2) Review of analytical data, (3) Demonstration, and (4) Test. When two or more verification methods are used against a specification requirement, part of the requirement can be shown compliant with one method and the remainder by the other method or methods.

The test methods described for each detailed requirement are intended to explicitly illustrate each requirement's applicability to the UUT. In some cases, the test method may require an operational mode or capability not required by the AS4074 standard. Under these circumstances the vendor and the buyer may choose to: (1) add the testing capability to the UUT design, (2) use analytical data to verify the design, (3) modify the test, or (4) not conduct the test.

4.1.1 Responsibility for Verification: This document is provided to assist a supplier in validating his or her product to the AS4074 standard. It is assumed that such validation will be accomplished by the supplier in facilities of his choice. The SAE does not assume responsibility for such validation.

4.1.2 Pass Criteria: Pass criteria for any of the tests contained herein shall be as defined in the appropriate paragraph. Failure of a UUT during any of these tests shall cause the suspension of testing until corrective action is performed on either the original test article or its replacement.

4.1.3 Verification Cross-Reference Index: An example of a verification cross-reference index is shown in Figure 1. This index will be generated by the vendor and approved by the buyer prior to the start of a LTPB validation process. This index correlates the requirements in AS4074 to corresponding Section 5 validation tests and is used to identify which method(s) will be used to verify the UUT conforms to each requirement.

SAE AS4290 Paragraph No.	Title	Test Method	SAE AS4074 Reference
5.0	DETAILED REQUIREMENTS	-	N/A
5.1	Physical Requirements	-	N/A
5.1.1	Fiber Optic	-	3.2.2.1 and following
5.1.1.1	Short-Circuit	-	3.2.2.1.1.1
5.1.1.2	Transmitter Characteristics	-	3.2.2.1.2 and following
5.1.1.2.1	Output Power	TE	3.2.2.1.2.1
5.1.1.2.2	Residual Power	TE	3.2.2.1.2.2
5.1.1.2.3	Leakage Power	TE	3.2.2.1.2.3
5.1.1.2.3.1	End of Transmission	TE	3.2.2.1.2.3, 3.2.2.1.2.4
5.1.1.2.3.2	Power Cycling	TE	3.2.2.1.2.3
5.1.1.2.4	Signaling Rate	TE	3.2.2.1.1.3, 3.2.2.1.2.4
5.1.1.2.5	Waveform	TE	3.2.2.1.2.4
5.1.1.2.6	Intertransmission Gap	TE	3.2.2.1.1.4
5.1.1.2.7	Preamble Size	D	3.2.1.2
5.1.1.2.8	Data Streaming Timeout—Maximum Length Transmission	TQ	3.2.2.1.2.5
5.1.1.2.9	Data Streaming Timeout—Defective Transmitter	TQ	3.2.2.1.2.5
5.1.1.2.10	Redundancy Synchronization	TE	3.2.3
5.1.1.2.11	Correct Encoding	TE	3.2.2.1.2.4
5.1.1.3	Receiver Characteristics	-	3.2.2.1.3 and following
5.1.1.3.1	Signaling Rate	TE	3.2.2.1.3.4
5.1.1.3.2	Minimum Valid Preamble Size	D	3.2.1.2
5.1.1.3.3	Optical Wavelength	TE	3.2.2.1.2.1
5.1.1.3.4	Maximum Optical Power Input	TQ	3.2.2.1.3.2
5.1.1.3.5	Operating Range	TQ	3.2.2.1.3.2
5.1.1.3.6	Intertransmission Dynamic Range	TQ	3.2.2.1.3.2
5.1.1.3.7	Minimum Optical Power Input	TE	3.2.2.1.3.1
5.1.1.3.8	Optical Waveform	TE	3.2.2.1.3.4
5.1.1.3.9	Maximum Bit-Error Rate	TE	3.2.2.1.3.3
5.1.1.3.10	Correct Decoding	TE	3.2.2.1.3.4
5.1.2	Electrical	-	3.2.2.2 and following
5.1.2.1	Short-Circuit	I	3.2.2.2.1.1
5.1.2.2	Transmitter (ELTX) Characteristics	-	3.2.2.2.2
5.1.2.2.1	ELTX Output Voltage Level	TE	3.2.2.2.2.1
5.1.2.2.2	ELTX Output Impedance	TE	3.2.2.2.2.1
5.1.2.2.3	ELTX Peak Residual Output Voltage Level	TE	3.2.2.2.2.2

FIGURE 1 - Verification Cross-Reference Index (Example)

SAE AS4290 Paragraph No.	Title	Test Method	SAE AS4074 Reference
5.1.2.2.3.1	End of Transmission	TE	3.2.2.2.2.2, 3.2.2.2.2.3
5.1.2.2.3.2	Power Cycling	TE	3.2.2.2.2.2
5.1.2.2.4	ELTX Output Waveform	TE	3.2.2.2.2.3
5.1.2.2.5	ELTX Data Streaming Timeout	TQ	3.2.2.2.2.4
5.1.2.2.6	ELTX Signaling Rate	TE	3.2.2.2.2.3
5.1.2.2.7	Intertransmission Gap	TE	3.2.2.2.1.4
5.1.2.2.8	Preamble Size	D	3.2.1.2
5.1.2.2.9	Electrical Media Surge Voltage	TQ	3.2.2.2.1.5
5.1.2.2.10	Electrical Isolation—Redundant Ports		*No requirement*
5.1.2.2.11	Redundancy Synchronization	TE	3.2.3
5.1.2.2.12	Correct Encoding	TE	3.2.2.2.2.3
5.1.2.3 Electrical Receiver (ELRX) Characteristics		-	3.2.2.2.3 and following
5.1.2.3.1	ELRX Signaling Rate	TE	3.2.2.1.3
5.1.2.3.2	ELRX Minimum Valid Preamble Size	D	3.2.1.2
5.1.2.3.3	ELRX Maximum Input Voltage	TE	3.2.2.2.3.1
5.1.2.3.4	ELRX Dynamic Range	TE	3.2.2.2.3.1
5.1.2.3.5	ELRX Minimum Input Voltage	TE	3.2.2.2.3.1
5.1.2.3.6	ELRX Electrical Waveform	TE	3.2.2.2.3.1
5.1.2.3.7	ELRX Input Impedance	TE	3.2.2.2.3.4
5.1.2.3.8	ELRX Common-Mode Rejection	TQ	3.2.2.2.3.3
5.1.2.3.9	ELRX Surge Voltage	TQ	3.2.2.2.1.5
5.1.2.3.10	ELRX Maximum Bit-Error Rate	TE	3.2.2.2.3.5
5.1.2.3.11	ELRX Correct Decoding	TE	3.2.2.2.3.1
5.2	Frame Formats	-	3.3.1 and following
5.2.1	Frame Formats (Transmit)	-	3.3.1
5.2.1.1	Start Delimiter (Transmit)	D	3.2.1.2
5.2.1.2	Frame Control (Transmit)	D	3.3.1.1
5.2.1.2.1	Frame Type (Transmit)	D	3.3.1.2.1
5.2.1.2.2	Priority (Transmit)	TQ	3.3.1.1.2
5.2.1.2.3	Station Management Code (Transmit)	D	3.3.1.1.3
5.2.1.3	Source Address (Transmit)	D	3.3.1.2
5.2.1.4	Destination Address (Transmit)	TQ	3.3.1.3
5.2.1.5	Word Count (Transmit)	TQ	3.3.1.4
5.2.1.6	Information (Transmit)	TQ	3.3.1.5
5.2.1.7	Message Frame Check Sequence (Transmit)	TQ	3.3.1.6
5.2.1.8	Token Frame Check Sequence (Transmit)	TQ	3.3.1.7
5.2.1.9	End Delimiter (Transmit)	D	3.2.1.2
5.2.2	Frame Formats (Receive)	-	3.3.1

FIGURE 1 - Verification Cross-Reference Index (Example) (Continued)

SAE AS4290 Paragraph No.	Title	Test Method	SAE AS4074 Reference
5.2.2.1	Start Delimiter (Receive)	D	3.2.1.2
5.2.2.2	Frame Control (Receive)	D	3.3.1.1
5.2.2.2.1	Frame Type (Receive)	D	3.3.1.1.1
5.2.2.2.2	Station Management Code (Receive)	D	3.3.1.1.3
5.2.2.3	Source Address (Receive)	D	3.3.1.2
5.2.2.4	Destination Address (Receive)	TQ	3.3.1.3
5.2.2.5	Word Count (Receive)	TQ	3.3.1.4
5.2.2.6	Information (Receive)	TQ	3.3.1.5
5.2.2.7	Message Frame Check Sequence (Receive)	TQ	3.3.1.6
5.2.2.8	Token Frame Check Sequence (Receive)	TQ	3.3.1.7
5.2.2.9	End Delimiter (Receive)	D	3.2.1.2
5.3	Timer Functions	-	3.3.2 and following
5.3.1	Token Holding Timer (THT) and Token Rotation Timer (TRT)	TQ	3.3.2, 3.3.2.1, 3.3.2.2
5.3.2	Ring Admittance Timer (RAT)	TQ	3.3.2.3
5.3.3	Token Passing Timer (TPT)	TQ	3.3.2.4
5.3.4	Bus Activity Timer (BAT)	TQ	3.3.2.5
5.4	Traffic Summary Counters	TQ	3.3.3 and following
5.4.1	Valid Messages Transmitted Counter	TQ	3.3.3
5.4.2	Claim Tokens Transmitted Counter	TQ	3.3.3
5.4.3	Transmissions Aborted Counter	TQ	3.3.3
5.4.4	Frame Validity Errors Counter	TQ	3.3.3
5.4.5	Frame Received Errors Counter	TQ	3.3.3
5.4.6	Valid Messages Received Counter	TQ	3.3.3
5.4.7	Receive Queue Overflow Counter	TQ	3.3.3
5.5	Station Management	-	3.4 and following
5.5.1	Status Report	TQ	3.4.2.2
5.5.1.1	BIU Status Register	TQ	3.4.2.2.1
5.5.1.1.1	BIU Commanded Modes	TQ	3.4.1.2
5.5.1.1.1.1	QUIESCENT Mode	TQ	3.4.1.2.2
5.5.1.1.1.2	LOOPBACK Mode	TQ	3.4.1.2.3
5.5.1.1.1.3	DISABLED Mode	TQ	3.4.1.2.4
5.5.1.1.1.4	ENABLED Mode	TQ	3.4.1.2.5
5.5.1.1.1.5	RESET Mode	TQ	3.4.1.2.1
5.5.1.1.1.6	FAULTED Mode	TQ	3.4.1.2.6
5.5.1.1.2	BIU Media Interface Operational Modes	-	N/A
5.5.1.1.2.1	ENABLE BUS Mode	TQ	3.4.1.3
5.5.1.1.2.2	ENABLE BUS TEST Mode	TQ	3.4.1.3
5.5.1.1.2.3	ENABLE RECEIVER ONLY Mode	TQ	3.4.1.3
5.5.1.1.2.4	DISABLE DATA STREAMING TIMER and ENABLE TPO TEST Mode	TQ	3.4.1.3

FIGURE 1 - Verification Cross-Reference Index (Example) (Continued)

SAE AS4290 Paragraph No.	Title	Test Method	SAE AS4074 Reference
5.5.1.1.2.5	RESET DATA STREAMING TIMER Mode	TQ	3.4.1.3
5.5.1.1.2.6	DISABLE BUS Mode	TQ	3.4.1.3
5.5.1.2	BIU Error Register	-	N/A
5.5.1.2.1	BIU Error Register (Receive)	-	N/A
5.5.1.2.1.1	Receiver Parity Error (Receive)	TQ	3.4.2.2.2
5.5.1.2.1.2	Message Word Count Error (Receive)	TQ	3.4.2.2.2
5.5.1.2.1.3	Redundant Media Timeout (Receive)	TQ	3.4.2.2.2
5.5.1.2.1.4	Redundant Media Skew Error (Receive)	TQ	3.4.2.2.2
5.5.1.2.1.5	Bus A Error (Receive)	TQ	3.4.2.2.2
5.5.1.2.1.6	Bus B Error (Receive)	TQ	3.4.2.2.2
5.5.1.2.1.7	Receive Queue Full (Receive)	TQ	3.4.2.2.2
5.5.1.2.2	BIU Error Register (Transmit)	-	N/A
5.5.1.2.2.1	Transmit Message Aborted (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.2	Transmitter Parity Error (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.3	Bus A Error (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.4	Bus B Error (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.5	Bus A Transmission Monitor Timeout (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.6	Bus B Transmission Monitor Timeout (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.7	BAT Timeout (Transmit)	TQ	3.4.2.2.2
5.5.1.2.2.8	TPT Timeout (Transmit)	TQ	3.4.2.2.2
5.5.2	Load/Report Configuration Command	D	3.4.2, 3.4.2.1
5.5.3	Test Message and Wrap Around Message Echo	D	3.4.3
5.5.4	Time Report	TQ	3.4.2.3
5.5.5	Time Synchronization Report	-	N/A
5.5.5.1	Time Synchronization Report - Master	TQ	3.4.6
5.5.5.2	Time Synchronization Report - Slave	TQ	3.4.6
5.5.5.3	Time Synchronization Report - New Master	TQ	3.4.6
5.6	Power-Up	-	N/A
5.6.1	LTPB BIU Initialization	TQ	3.4.4
5.6.2	Entry into the Logical Ring	TQ	3.1.4, 5.1
5.6.2.1	Entry into the Logical Ring—No Messages Pending	D, TQ	3.1.4, 3.4.1, 5.1
5.6.2.2	Entry into the Logical Ring—Messages Pending	D, TQ	3.1.4, 3.4.1, 5.1
5.7	Response to Errors	-	5.0 and following
5.7.1	Error Injection at the Physical Layer	-	N/A
5.7.1.1	Fiber Optic	-	N/A

FIGURE 1 - Verification Cross-Reference Index (Example) (Continued)

SAE AS4290 Paragraph No.	Title	Test Method	SAE AS4074 Reference
5.7.1.1.1	Sensitivity	TQ, TE	3.2.2.1.3.2, 3.2.2.1.3.3, 3.2.2.1.3.4
5.7.1.1.2	Dynamic Range	TE, TQ	3.2.2.1.3, 3.2.2.1.3.1, 3.2.2.1.3.2, 3.2.2.1.3.3, 3.2.2.1.3.4
5.7.1.1.3	Signaling Rate	TE	3.2.2.1.1.3
5.7.1.1.4	Waveform	TE	3.2.2.1.3.4
5.7.1.1.5	Intertransmission Gap	TE	3.2.2.1.1.4
5.7.1.1.6	Preamble	D	3.2.1.2
5.7.1.1.7	Correct Decoding	D	3.2.1.3, 3.2.1.4
5.7.1.2	Electrical	-	N/A
5.7.1.2.1	Sensitivity	TE	3.2.2.2.3.1
5.7.1.2.2	Signaling Rate	TE	3.2.2.2.1.3
5.7.1.2.3	Waveform	TE	3.2.2.2.3.1
5.7.1.2.4	Intertransmission Gap	TE	3.2.2.2.1.4
5.7.1.2.5	Preamble	D	3.2.1.2
5.7.1.2.6	Common-Mode Rejection	TQ	3.2.2.2.3.3
5.7.1.2.7	Noise Rejection	TQ	3.2.2.2.3.3
5.7.1.2.8	Correct Decoding	D	3.2.1.3, 3.2.1.4
5.7.2	Frame Formats	-	N/A
5.7.2.1	General Frame Format Errors	-	N/A
5.7.2.1.1	Incorrect Start Delimiter	D, TQ	3.2.1.2, 5.1, 5.3, 5.8
5.7.2.1.2	Interrupted Messages	D, TE, TQ	3.2.1.3, 3.2.1.4, 3.2.4, 3.3.3, 5.1, 5.3, 5.8
5.7.2.1.3	Undefined Symbols Received	D, TQ	3.2.1.4, 5.1, 5.3, 5.8
5.7.2.1.4	Incorrect Token Frame Check Sequence	TQ	3.3.1.7, 5.3
5.7.2.1.5	Incorrect Message Frame Check Sequence	TQ	3.3.1.6, 5.8
5.7.2.1.6	Incorrect End Delimiter	D	3.2.1.2
5.7.2.1.7	Illegal Source Address	D	3.3.1.2
5.7.2.1.8	Illegal Word Count	TQ	3.3.1.4
5.7.2.1.9	Word Count Field Doesn't Match Actual Word Count	TQ	3.3.1.4, 3.3.1.5, 5.8
5.7.2.2	Claim Token Frame Format Errors	-	N/A
5.7.2.2.1	Claim Token Coding Error	TE, D, TQ	3.2.4, 3.3.1, 5.2
5.7.2.2.2	Claim Token Data Error	TE, D, TQ	3.2.4, 3.3.1, 5.2
5.7.2.3	Detection of Illegal Frame Type	D, TQ	3.3.1, 5.1
5.7.3	Station Management-Induced Errors	-	N/A
5.7.3.1	Incorrect Destination Addresses	D	3.3.1.3, 3.4.1
5.7.3.2	Illegal Source Address	D	3.3.1.2

FIGURE 1 - Verification Cross-Reference Index (Example) (Continued)

SAE AS4290 Paragraph No.	Title	Test Method	SAE AS4074 Reference
5.7.3.3	Illegal Word Count	TQ	3.3.1.4, 3.3.1.5
5.7.3.4	Word Count Doesn't Match Actual Word Count	TQ	3.3.1.4, 3.3.1.5, 5.8
5.7.3.5	Wrong MFCS	TQ	3.3.1.6, 5.8
5.7.4	Power-Up Induced Errors	D, TQ	3.4, 3.4.4, 3.4.5, 3.4.5.1
5.8	Synchronous Redundancy	TE	3.2.3
5.8.1	Redundant Transmission	TE	3.2.3
5.8.2	Redundant Reception	TE	3.2.3
5.8.2.1	Bus A Active and Bus B Inactive	TE	3.2.3
5.8.2.2	Bus B Active and Bus A Inactive	TE	3.2.3
5.8.2.3	Bus A Active and Bus B Active	TE	3.2.3
5.8.2.4	Bus A Active and Bus B Skewed	TE	3.2.3
5.8.2.5	Bus B Active and Bus A Skewed	TE	3.2.3
5.8.2.6	Bus A Active and Bus B WC Errors	TE, TQ	3.2.3, 3.3.1.4, 3.3.1.5, 5.8
5.8.2.7	Bus B Active and Bus A WC Errors	TE, TQ	3.2.3, 3.3.1.4, 3.3.1.5, 5.8
5.8.2.8	Bus A Active and Bus B Coding Errors	TE, TQ	3.2.3, 3.2.1.4, 5.1, 5.3, 5.8
5.8.2.9	Bus B Active and Bus A Coding Errors	TE, TQ	3.2.3, 3.2.1.4, 5.1, 5.3, 5.8
5.8.2.10	Bus A Active and Bus B MFCS Errors	TE, TQ	3.2.3, 3.3.1.6, 5.3
5.8.2.11	Bus B Active and Bus A MFCS Errors	TE, TQ	3.2.3, 3.3.1.6, 5.3
Appendix A	BIT-ERROR RATE MEASUREMENT	-	N/A

Test Method Key: D = Demonstration
I = Inspection
TE = Engineering Test
TQ = Qualification Test

FIGURE 1 - Verification Cross-Reference Index (Example) (Continued)

4.2 Quality Conformance Verification Methods:

To assure that the equipment meets the requirements of AS4074, the following verification methods (including test categories) shall be used as identified by the vendor- and buyer-approved verification cross-reference index.

4.2.1 Inspection Verification Method: An examination to determine conformance with requirements of the specification with respect to materials, workmanship, design interchangeability, finishes, marking, and applicable drawings.

4.2.2 Review of Analytical Data: A review of data developed on a theoretical or empirical basis to verify requirements in which the conditions cannot be duplicated in a controlled situation or where sufficient margins exist to permit analysis in lieu of testing on a cost effective basis. The use of functional simulation tools at the application-specific integrated circuit (ASIC) level, subassembly circuitry (sub-module or printed-wiring assembly (PWA) integration) level and PWA/module level is an acceptable analytical method of validating the UUT to the requirements of this document, provided the test vectors exercise and validate the functions exactly as outlined in the applicable paragraphs. In addition, this method of verification will be applied when data developed on earlier programs can be utilized on a similarity basis for current requirements

4.2.3 Demonstration Verification Method: A trial or display which established that the equipment has the attributes which are required for conformance to safety, maintainability, and other operating characteristics required by the applicable specification. Typically, demonstrations require simple instrumentation.

4.2.3.1 Laboratory Demonstration: Laboratory demonstrations shall be conducted to verify that the UUT achieves the specified requirements under controlled laboratory conditions.

4.2.4 Test Verification Method: These methods refer to determination by technical means that a UUT meets the physical and/or functional requirements of the applicable specifications. A test obtains quantitative data by the application of established scientific procedures, and includes the evaluation of the data to determine if the requirements have been met.

4.2.4.1 Laboratory Test: Laboratory tests shall be performed on the UUT for verification of design criteria, developmental testing, assurance of safety-of-flight, and to demonstrate conformance with the applicable specifications. Initial testing will be at the component level, followed by UUT testing, and then integration testing of the entire prime specification item. Test stands will include a complete set of the functional components of the UUT installed in a manner representative of their final assembly.

4.2.4.2 Test Categories: Tests shall be conducted in six categories: Engineering Test and Evaluation, Preliminary Qualification, Formal Qualification, Reliability/Maintainability, Operational Test, and Acceptance Tests.

4.2.4.2.1 Preliminary Qualification–Scan of Performance: Preliminary qualification testing shall be the selective testing of performance early in the development of the equipment to achieve interim acceptance for:

(1) Qualification to initiate flight test, or
(2) Discovery of potential problems prior to committing the design to a costly, complete qualification.

4.2.4.2.2 Formal Qualification–Full Performance: Qualification included in this paragraph includes verification by laboratory test or simulation, ground test, flight test, or equipment formal qualification performed in a laboratory at combined environmental conditions.

4.2.4.2.3 Built-In Test: The capabilities of the UUT to provide the required built-in test modes, functions, and performance shall be verified by analysis using design data for the UUT, failure mode analysis and predictions, predicted failure-rate data for the mature UUT, and accrued laboratory and vehicle installed test data, without using special fault-introducing test equipment.

4.2.4.2.4 Acceptance Test–Production: Acceptance tests are performed on the UUT to assure that the product meets certain minimum performance requirements, and are performed in a production environment. The test may leave the production environment to serve as acceptance tests at the delivery or UUT installation point.

4.3 General Monitoring Requirements:

In addition to the specific tests that follow, certain UUT parameters must be continuously monitored throughout all tests. These parameters are:

(1) All transmissions

(a) Intertransmission gap time within range
(b) First frame preceded by preamble only
(c) No gap between frames
(d) Last frame is a token

(2) All Frame Formats

(a) Correct start delimiter
(b) Correct end delimiter
(c) Contiguous symbols
(d) Correct coding

(3) Token frame

(a) Correct frame control
(b) Correct TFCS (Token Frame Check Sequence)

4.3 (Continued):

(4) Claim token frame

(a) Correct frame control
(b) Correct source address
(c) Correct fill word value (4884_{16})

(5) Message frame

(a) Correct frame control
(b) Source address within range
(c) Word count within range
(d) Number of information words equal to word count
(e) Correct MFCS (message frame check sequence)

The UUT shall have failed the test if at any time during the test any of these parameters fail to meet the requirements of AS4074.

4.4 Order of Tests:

Unless otherwise stated, tests described herein may be performed in any order, combined with one another or combined with other tests of a subsystem or equipment in which the BIU may be embedded.

4.5 Completion of Tests:

Following completion of tests in any section herein, unless otherwise specified, the test interface shall transmit a station management command to the UUT commanding a complete reset and BIT. This will reset the UUT interfaces to known states for the tests following.

5. DETAILED REQUIREMENTS:

5.1 Physical Requirements:

5.1.1 Fiber Optic: Each BIU shall have one or two receiver and transmitter ports depending on redundancy required. Each port shall be tested.

5.1.1.1 Short-Circuit:

a. PURPOSE: This test will check that any electrical signals (if present) provided by the UUT (e.g., power-on control) at the input or output port are short-circuit protected.

b. TEST METHOD: The UUT shall be caused to continuously transmit preamble. A short-circuit shall be applied between the electrical signal and ground for 10 seconds.

c. PASS CRITERIA: No damage or degradation in performance shall be caused to the UUT. The transmission may halt while the short-circuit is present but must return when the short-circuit is removed.

5.1.1.2 Transmitter Characteristics: All characteristics shall be measured at the end of a 10 m length of the specified fiber connected to the Transmitter Output Port, after cladding-mode stripping and mode scrambling.

NOTE: The attenuation of the extra connector introduced by this measurement technique (i.e., the fiber-to-test-equipment connector) must be taken into account to give the real power levels.

5.1.1.2.1 Output Power:

a. PURPOSE: This test will check that the UUT can transmit a signal with the required power.

b. TEST METHOD: The UUT shall be caused to continuously transmit preamble.

The optical spectrum of the signal shall be measured.

The spectral range, measured as above, between the -3 dB power points either side of the peak wavelength of the optical “pulse” (logic “high”) shall be measured.

c. PASS CRITERIA: The maximum output power shall lie between W1 and W2. The spectral range shall be less than BW. The optical power output over the spectral range shall be in the range T_{po} dBm.

5.1.1.2.2 Residual Power: a.PURPOSE: This test will check that the UUT can meet the residual power requirements.

b. TEST METHOD: The UUT shall be caused to continuously transmit preamble. The minimum residual power of the optical “space” (logic “low”) shall be measured after 1/3 T_m following a high to low transition.

c. PASS CRITERIA: The optical power output over the spectral range, W1 - BW/2 to W2 + BW/2 shall be less than T_{pr} dBm.

5.1.1.2.3 Leakage Power:

5.1.1.2.3.1 End of Transmission:

a. PURPOSE: This test will check that the transmitter leakage power reaches the correct level after a transmission.

b. TEST METHOD: The UUT shall be commanded to transmit a message. Measurement of the output power shall be made at 2 * TPT, after the expected end of the message.

c. PASS CRITERIA: The output power measured shall be less than T_{pl} dBm.

5.1.1.2.3.2 Power Cycling: a.PURPOSE: This test will check that the transmitter leakage power remains below the required level during power-up/power-down.

b. TEST METHOD: The power to the UUT shall be cycled five times. The output power shall be monitored throughout.

c. PASS CRITERIA: The optical output power shall not rise above T_{pl} dBm.

5.1.1.2.4 Signaling Rate:

a. TEST METHOD: The UUT shall be caused to continuously transmit preamble.

The average signaling rate shall be measured over a period of 1 hour. During which, the average signaling rate shall be measured ten times over a period of 1 second.

b. PASS CRITERIA: The average signaling for each part of the test shall be R_s Mbaud.

5.1.1.2.5 Waveform:

a. PURPOSE: This test will determine the output waveform characteristics of the UUT.

b. TEST METHOD: The UUT shall be commanded to transmit a signal containing all nominal times between transitions (T_m, $2T_m$, $3T_m$, $4T_m$, etc.) as appropriate for the encoding scheme employed. The transitions for each pulsewidth shall be observed for reversals. The rise and fall time for each pulsewidth between the 10% and 90% points shall be measured. The mid-amplitude crossing deviations from the ideal crossing point, as measured from the previous ideal crossing point, shall be measured for each pulsewidth. The undershoot, overshoot and ringing for each pulsewidth shall be measured.

c. PASS CRITERIA: There shall be no reversal of the signal during transition period between the 10% to 90% points. The mid-amplitude crossings shall deviate by no more than T_{pwd} from the ideal. The waveform distortion from undershoot, overshoot and ringing shall be less than T_{ous}.

5.1.1.2.6 Intertransmission Gap:

a. PURPOSE: This test will verify that the intertransmission gap of the UUT is within limits. The maximum intertransmission gap time can also be thought of as the maximum station response time.

b. TEST METHOD: This test shall be conducted in two parts. First, the UUT shall be initialized and active on the bus but will not have any data messages to send. The test equipment shall pass a valid token addressed to the UUT and the time required for the UUT to respond with a token pass shall be measured. The time measurement shall be performed as close as possible to the UUT's physical media inputs and outputs, so as to minimize uncertainty relative to signal propagation delay. Secondly, the UUT shall be loaded with a maximum-length message for transmission prior to the arrival of the token. The test equipment shall then pass a valid token addressed to the UUT and the time required for the UUT to respond with a token pass shall be measured.

5.1.1.2.6 (Continued):

c. PASS CRITERIA: The intertransmission gap measured in both parts of this test shall be between S_{itg} and T_{sr} ns.

5.1.1.2.7 Preamble Size:

a. PURPOSE: This test will check that the preamble strap option is functional.

b. TEST METHOD: The test equipment shall pass the UUT a number of tokens. For each value of the strap option, the length of the preamble shall be measured.

c. TEST CRITERIA: The length of the preamble shall be P_t bit times in length.

5.1.1.2.8 Data Streaming Timeout–Maximum Length Transmission:

a. PURPOSE: This test will check that the data streaming timer of the UUT allows a maximum length transmission to be sent.

b. TEST METHOD: The UUT's THT shall be set to maximum (65535 ms) and the UUT commanded to send 100 messages of 4096 words each, at priority 0. The test equipment shall pass tokens to the UUT.

c. PASS CRITERIA: Test equipment shall verify that the UUT responds by sending messages to the end of its allowed THT, and then appends the token. The data streaming timer shall not expire and terminate the transmission.

5.1.1.2.9 Data Streaming Timeout–Defective Transmitter:

a. PURPOSE: This test will check that the data streaming timer of the UUT does not allow a defective transmitter to jam the bus.

b. TEST METHOD: The UUT shall be commanded to send continuous preamble.

c. PASS CRITERIA: Test equipment shall monitor the transmission to verify that the data streaming timer terminates the transmission after T_{ds}, and does not allow further messages to be sent until the UUT transmitter has been given a positive clear signal. The UUT shall record that the fault had occurred.

5.1.1.2.10 Redundancy Synchronization:

a. PURPOSE: This test shall verify the correct transmission on redundant media. This test is required when redundant media is specified.

b. TEST METHOD: The test equipment shall pass a Token to the UUT. The response of the UUT shall be monitored at both transmitter ports.

c. PASS CRITERIA: There shall be a skew between the two signals of less than T_o.

5.1.1.2.11 Correct Encoding:

a. PURPOSE: This test will check that correct encoding is employed by the Transmitter Encoder.

b. TEST METHOD: The UUT shall be caused to transmit every valid symbol identified in the respective slash sheet, preceded and followed by every different valid symbol which forms a valid sequence as part of a series of messages. The UUT transmissions shall be monitored to ensure the correct waveform is produced.

c. PASS CRITERIA: The UUT shall produce the correct encoded signals.

5.1.1.3 Receiver Characteristics: All characteristics shall be measured by monitoring UUT operation with a specific known input signal. This signal shall be measured at a point of injection at the end of a ten meter length of the specified fiber, connected to the Receiver Input Port (Figure 2), after cladding mode stripping and mode scrambling (Reference DOD-STD-1678 and EIA-455). The signal injected shall be any signal conforming to the Transmitter Characteristics as affected by any network conforming to the Media Characteristics unless otherwise specified.

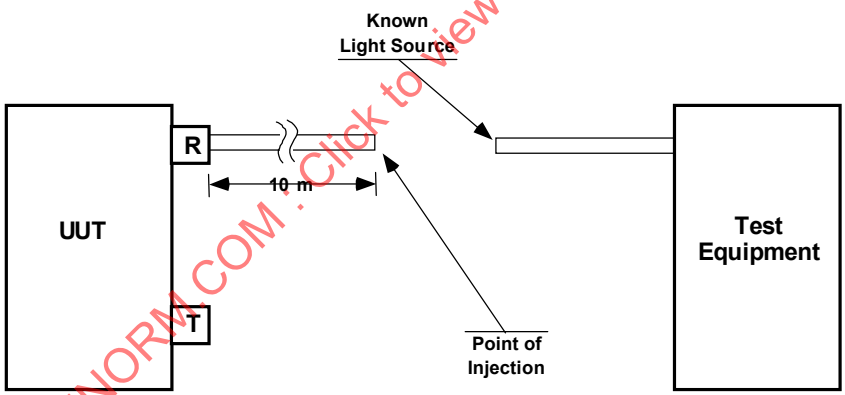

FIGURE 2 - BIU Receiver Characteristics Measurement

5.1.1.3.1 Signaling Rate:

a. PURPOSE: This test shall check that the UUT can meet the signaling rate requirement.

b. TEST METHOD: The test equipment shall transmit a valid message to the UUT using a clock at the maximum R_s Mbaud. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit another valid message to the UUT using a clock at the minimum R_s Mbaud.

c. PASS CRITERIA: The UUT shall correctly receive both messages.

5.1.1.3.2 Minimum Valid Preamble Size:

a. PURPOSE: This test shall verify that the receiver will function correctly with the minimum valid preamble length.

b. TEST METHOD: The test equipment shall transmit a valid maximum-length message to the UUT at a power level R_{pm} - R_{idr} dBm. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit a valid minimum-length message to the UUT with a preamble length equal to P_t bit times at the power level R_{pm} dBm.

c. PASS CRITERIA: The UUT shall correctly receive both messages.

5.1.1.3.3 Optical Wavelength:

a. PURPOSE: This test shall check the wavelength dependency of the UUT.

b. TEST METHOD: The test equipment shall use two transmitters, one having a center wavelength of W1 and the other W2, each with a spectral bandwidth of BW nm providing a maximum peak output power of R_{pm} dBm and with a transmitter residual power of T_{pr}.

The test equipment shall transmit a valid message to the UUT with the UUT's address using a wavelength of W1 nm. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit a valid message to the UUT with the UUT's address using a wavelength of W2 nm.

c. PASS CRITERIA: The UUT shall correctly receive the message in each case.

5.1.1.3.4 Maximum Optical Power Input:

a. PURPOSE: This test shall check the saturation of the UUT's receiver.

b. TEST METHOD: The test equipment shall transmit a valid maximum-length message to the UUT using a transmitter with a spectral bandwidth of BW nm at a maximum peak output power of R_{po} dBm and with a transmitter residual power of T_{pr}. After a 1 second delay, the test equipment shall transmit a valid minimum-length message at a power level of R_{pm} dBm.

c. PASS CRITERIA: The UUT shall correctly receive the second message.

5.1.1.3.5 Operating Range:

a. PURPOSE: This test shall prove the operating range of the UUT's receiver.

b. TEST METHOD: The test equipment shall transmit a valid minimum-length message to the UUT at a power level of L dBm. The value of L shall start at R_{pm} + R_{or}, at the test repeated with L being decremented in one decibel steps until L = R_{pm}. These repetitions shall be at 1 second intervals.

c. PASS CRITERIA: The UUT shall correctly receive all messages.

5.1.1.3.6 Intertransmission Dynamic Range:

a. PURPOSE: This test shall prove the intertransmission dynamic range capability of the UUT's receiver.

b. TEST METHOD: The test equipment shall transmit a valid maximum-length message to the UUT at a power level of H dBm. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit a valid minimum-length message to the UUT at a power level of L dBm. The values of H and L shall always satisfy the relationship L = H – R_{idr}. The value of H shall start at R_{pm} + R_{or}, and the test repeated with H being decremented in one decibel steps until H = R_{pm} + R_{idr}. These repetitions shall be at 1 second intervals.

c. PASS CRITERIA: The UUT shall correctly receive all messages.

5.1.1.3.7 Minimum Optical Power Input:

a. PURPOSE: This test shall check the sensitivity of the UUT.

b. TEST METHOD: The test equipment shall transmit a valid minimum-length message to the UUT using a transmitter with a spectral bandwidth of BW nm providing a maximum peak output power of R_{pm} dBm and with the a transmitter residual power of T_{pr}.

c. PASS CRITERIA: The UUT shall correctly receive the message.

5.1.1.3.8 Optical Waveform:

a. TEST METHOD: The test equipment shall transmit a sequence of ten concatenated valid minimum-length messages to the UUT at a power level of R_{pm} dBm. The messages shall include random, changing bit patterns including all ones and all zeros. The waveform presented to the receiver shall be characterized by a combined over/under shoot of R_{ous} %, a rise time of R_r ns, a fall time of R_f ns, and a pulsewidth distortion of R_{pwd} ns.

b. PASS CRITERIA: The UUT shall correctly receive the message.

5.1.1.3.9 Maximum Bit Error Rate:

a. PURPOSE: This test shall check that the UUT meets the specified bit-error rate performance. Because the receiver output cannot be directly monitored, this test will measure a message-error rate and extrapolate the bit-error rate from that. Because of the uncertainties involved, a confidence interval will be established on both sides of the required error rate. This is directly based on the methods used in MIL-STD-1553B. For purposes of this test, all errors are assumed to be attributable to the receiver.

5.1.1.3.9 (Continued):

b. TEST METHOD: The test equipment shall transmit a series of valid eight-word messages (200 bits total) to the UUT. The messages shall contain random, changing bit patterns. The following signal parameters shall be fixed at their worst-case values: intertransmission gap of S_{itg} ns; preamble size of S_p bit times, and a waveform characterized by the worst-case limits specified in 5.1.1.3.8. The following signal parameters shall be varied at different times during the test: signaling rate R_s; nominal bit time T_o; and optical wavelength W. The optical power level shall be varied throughout the operating range, from R_{pm} to $R_{pm} + R_{or}$. The receiver shall be frequently presented with message sequences of first a high power and then a low power, with a power difference of the intertransmission dynamic range R_{idr}, as in 5.1.1.3.6.

c. PASS CRITERIA: The test shall be run continuously until, for a particular number of errors, the number of messages sent exceeds the required number for passage of the test or is less than the required number for failure of the test. Reference Figure 3.

5.1.1.3.10 Correct Decoding:

a. PURPOSE: This test shall check the receive decoder of the UUT.

b. TEST METHOD: The test equipment shall transmit a series of messages to the UUT containing every valid symbol preceded and followed by every valid symbol that forms a valid sequence. The UUT shall be monitored to determine correct interpretation of all symbols.

c. PASS CRITERIA: The UUT shall correctly interpret all symbols.

5.1.2 Electrical:

5.1.2.1 Short-Circuit:

a. PURPOSE: This test will check that any electrical signals provided by the UUT (e.g., transmitter output(s) and receiver input(s), control or power) at the input or output port are short-circuit protected.

b. TEST METHOD: The UUT shall be caused to continuously transmit preamble. A short-circuit shall be applied between the electrical signal and ground for 10 seconds.

c. PASS CRITERIA: No damage or degradation in performance shall be caused to the UUT. The transmission may halt while the short-circuit is present but must return when the short-circuit is removed.

Number of Errors	Number of Messages Sent (in multiples of R_{ber} x 200)		Number of Errors	Number of Messages Sent (in multiples of R_{ber} x 200)	
	Fail (equal or less)	Pass (equal or more)		Fail (equal or less)	Pass (equal or more)
0	NA	4.40	26	14.54	37.46
1	NA	6.40	27	15.31	38.68
2	NA	8.14	28	16.10	39.90
3	NA	9.76	29	16.89	41.11
4	NA	11.31	30	17.69	42.31
5	NA	12.79	31	18.48	43.52
6	1.87	14.09	32	19.28	44.72
7	2.35	15.35	33	20.19	45.91
8	2.86	16.60	34	20.89	47.11
9	3.39	17.82	35	21.70	48.30
10	3.94	19.03	36	22.51	49.49
11	4.51	20.22	37	23.32	50.68
12	5.10	21.39	38	24.14	51.86
13	5.70	22.56	39	24.96	53.04
14	6.32	23.72	40	25.78	54.22
15	6.94	24.86	41	26.60	55.40
16	7.57	26.00	42	27.43	56.57
17	8.21	27.13	43	28.26	57.74
18	8.87	28.25	44	29.09	58.91
19	9.52	29.37	45	29.92	60.08
20	10.19	30.48	46	30.75	61.25
21	10.86	31.59	47	31.59	62.41
22	11.54	32.69	48	32.42	63.58
23	12.22	33.78	49	33.26	64.74
24	12.99	35.01	50	34.10	65.90
25	13.76	36.24	NA = Not Applicable		

FIGURE 3 - Maximum Bit-Error Rate Test Criteria

5.1.2.2 Transmitter (ELTX) Characteristic:

5.1.2.2.1 ELTX Output Voltage Level:

a. PURPOSE: This test checks that the ELTX meets the specified output voltage level.

b. TEST METHOD: The UUT ELTX output port, shall be connected with the test circuitry per Figure 4. The UUT shall be caused to transmit maximum length messages or continuous preambles only. The peak-to-peak output voltage shall be measured from center conductor-to-shield.

c. PASS CRITERIA: An output voltage level in the range $2T_{vo}$ V_{p-p} measured center conductor-to-shield shall be produced.

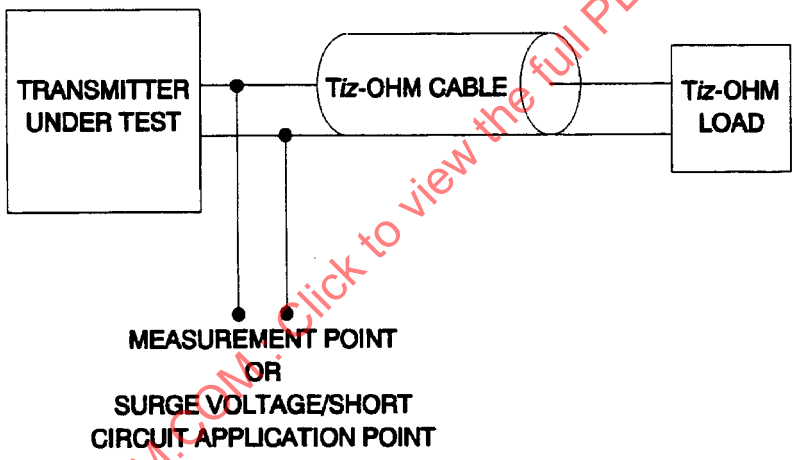

FIGURE 4 - Output/Surge Voltage and Short-Circuit Test Setup

5.1.2.2.2 ELTX Output Impedance:

a. PURPOSE: This test checks that the ELTX meets the specified output impedance level.

b. TEST METHOD: The output impedance of the transmitter shall be measured over the frequency range of W1 MHz to W2 MHz.

c. PASS CRITERIA: An output impedance in the range T_{iz} Ohms over the frequency range shall be measured.

5.1.2.2.3 ELTX Peak Residual Output Voltage Level:

5.1.2.2.3.1 End of Transmission:

a. PURPOSE: This test checks that the ELTX meets the specified peak residual output voltage level when the ELTX completes a transmission.

b. TEST METHOD: The UUT ELTX output port shall be connected with test circuitry per Figure 4. The UUT shall be commanded to transmit a message. The peak-to-peak output voltage shall be measured from center conductor-to-shield at 2 * TPT after expected end of message.

c. PASS CRITERIA: The UUT shall produce an output voltage level of $2T_{vr}$ V_{p-p} maximum measured center conductor-to-shield at the specified time.

5.1.2.2.3.2 Power Cycling:

a. PURPOSE: This test checks that the ELTX meets the specified peak residual output voltage level during power-up/power-down.

b. TEST METHOD: The power to the UUT shall be cycled five times. The output voltage shall be monitored throughout.

c. PASS CRITERIA: The UUT shall produce an output voltage level of $2T_{vr}$ V_{p-p} maximum, measured center conductor-to-shield during the test.

5.1.2.2.4 ELTX Output Waveform:

a. PURPOSE: These tests check that the ELTX meets the specified output waveform requirements.

b. TEST METHOD: The UUT ELTX output port shall be connected with test circuitry per Figure 4. The UUT shall be caused to transmit a message containing all nominal times between transitions (e.g., T_m ns, $2T_m$ ns, $3T_m$ ns). The output waveform shall be observed measuring rise and fall times (10 to 90% and 90 to 10%), reversal of signal during the 10 to 90% and 90 to 10% transition periods, mid-amplitude crossing deviation from the ideal point as measured from the previous ideal point for each pulsewidth, undershoot/overshoot and ringing for each pulsewidth and bit time for the T_m ns, $2T_m$ ns, $3T_m$ ns pulses.

c. PASS CRITERIA: The UUT shall produce a waveform conforming to the following specifications:

Rise time	=	T_r ns
Fall time	=	T_f ns
Signal reversal	=	None
Undershoot, overshoot, ringing	=	T_{ous} % combined
Bit time	=	T_{to} ns

5.1.2.2.5 ELTX Data Streaming Timeout:

a. PURPOSE: This test checks that the ELTX operates as specified under a data streaming condition.

b. TEST METHOD: The UUT shall be caused to transmit 100 messages of 4096 words. Timeout and fault indicator shall be monitored. The UUT shall then be caused to attempt a continuous data transmission. Transmitter timeout and setting of a fault condition shall again be monitored.

c. PASS CRITERIA: For the first test, the UUT shall not produce a timeout (fault) condition. For the second test a timeout shall occur, and transmission cease, after T_{ds} ms and a fault condition set.

5.1.2.2.6 ELTX Signaling Rate:

a. PURPOSE: This test checks the correct speed of operation of the ELTX.

b. TEST METHOD: The UUT shall be caused to continuously transmit maximum length messages containing the maximum transition frequency. The signaling rate shall be measured over a period of 1 hour with measurements taken ten times over a period of 1 second.

c. PASS CRITERIA: The UUT shall produce a signaling rate of R_s Mbaud.

5.1.2.2.7 Intertransmission Gap:

a. PURPOSE: This test checks that the ELTX meets the minimum intertransmission gap requirements.

b. TEST METHOD: The test equipment shall pass the UUT a token. The time between the last bit of the token and the first bit of the transmitted preamble shall be measured.

c. PASS CRITERIA: The intertransmission gap shall be S_{itg} ns minimum.

5.1.2.2.8 Preamble Size:

a. PURPOSE: This test checks that the preamble strap option is functional.

b. TEST METHOD: The test equipment shall pass the UUT a number of tokens. For each value of the strap option, the length of the preamble shall be measured.

c. PASS CRITERIA: The length of the preamble shall be P_t bit times in length.

5.1.2.2.9 Electrical Media Surge Voltage:

a. PURPOSE: This test checks that the ELTX will operate following application of a surge voltage on its output lines.

b. TEST METHOD: With the UUT ELTX port connected per Figure 4, apply a surge voltage of S_v VDC across the output lines for a period of S_d ms.

Repeat ten times.

Repeat the tests of 5.1.2.2.1, 5.1.2.2.2, 5.1.2.2.3, and 5.1.2.2.4.

c. PASS CRITERIA: The pass criteria shall be the same as for the test paragraphs referenced.

5.1.2.2.10 Electrical Isolation–Redundant Ports:

a. PURPOSE: This test checks whether the redundant ports (if present) of the UUT have the proper electrical isolation from one another. This test is required when one or more redundant media are specified. While AS4074 does not require the use of redundant media, many systems will specify dual, triple or quadruple redundancy for increased system availability.

b. TEST METHOD: All UUT transmitter ports shall be connected to the test equipment as shown in Figure 4. All UUT receiver ports shall be connected to the test equipment as shown in Figure 5. The test shall be conducted in two parts. First, each transmitter (one at a time) shall continuously transmit preambles. There shall be no signal transmitted to the receivers. The voltage levels shall be measured at the active transmitter port, the passive transmitter port(s) and the receiver ports.

Next, the test equipment shall send continuous preambles to each receiver port (one at a time) at a voltage level of R_{vo} V_{p-p}, with all transmitters idle. The voltage levels shall be measured at the active and passive receiver ports and at the transmitter ports.

c. PASS CRITERIA: The ratio in dB between the peak-to-peak voltage on the active port and the peak-to-peak voltages on each of the inactive ports shall be greater than or equal to 45 dB (suggested value), for each port tested.

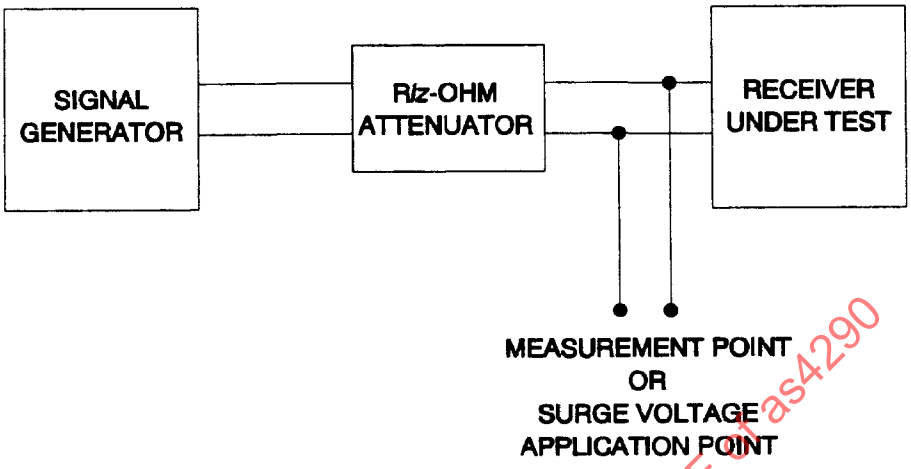

FIGURE 5 - Maximum Input Level/Surge Voltage Test Setup

5.1.2.2.11 Redundancy Synchronization:

a. PURPOSE: This test checks for correct transmission on the redundant bus. The test is required when redundant media is specified.

b. TEST METHOD: The test equipment shall pass a token to the UUT. The response to the UUT shall be monitored on both receiver ports and the results compared.

c. PASS CRITERIA: A skew of less than T_{sk} between the two signals shall be measured.

5.1.2.2.12 Correct Encoding:

a. PURPOSE: This test will check that correct coding is employed by the Transmitter Encoder.

b. TEST METHOD: The UUT shall to transmit every valid symbol identified in the respective slash sheet, preceded and followed by every valid symbol which forms a valid sequence as part of a series of messages. The UUT transmission shall be monitored to ensure the correct waveform is produced.

c. PASS CRITERIA: The UUT shall produce the correct encoded signals.

5.1.2.3 Electrical Receiver (ELRX) Characteristics: All characteristics shall be measured by monitoring UUT operation with a specific known input signal. This signal shall be measured at a point of injection as shown on the applicable Figures 4 through 7. The signal injected shall be any signal conforming to the Transmitter Characteristics as affected by any network conforming to the Media Characteristics unless otherwise specified.

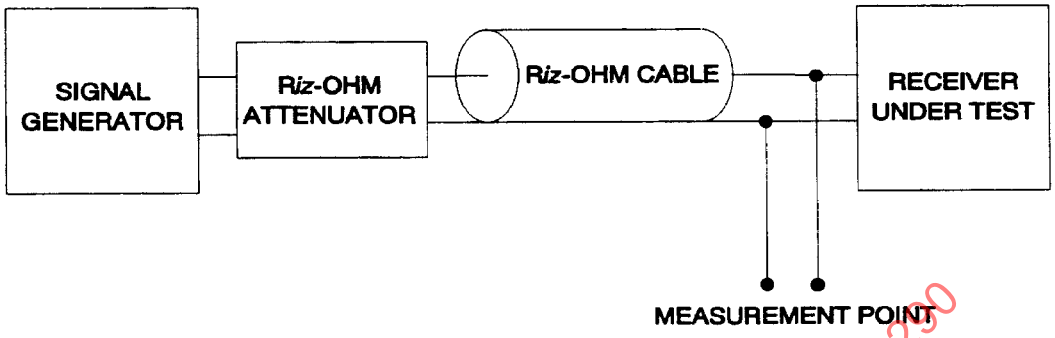

FIGURE 6 - Minimum Input Level Test Setup

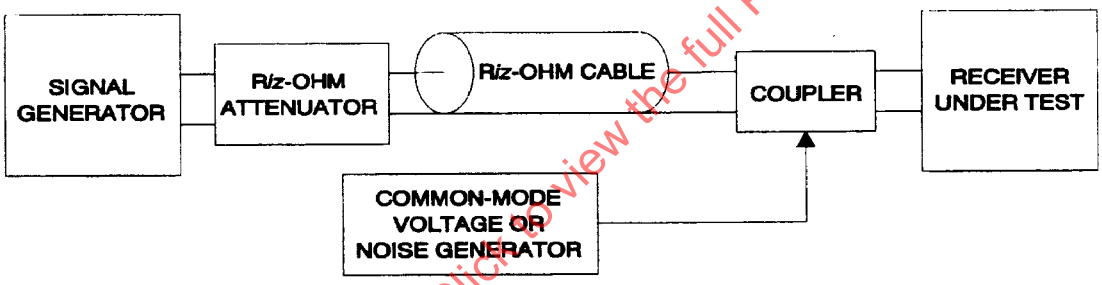

FIGURE 7 - Common-Mode/Noise Rejection Test Setup

5.1.2.3.1 ELRX Signaling Rate:

a. PURPOSE: This test shall check that the UUT can meet the signaling rate requirement.

b. TEST METHOD: The test equipment shall transmit a valid message to the UUT using a clock at the maximum R_s Mbaud. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit another valid message to the UUT using a clock at the minimum R_s Mbaud.

c. PASS CRITERIA: The UUT shall correctly receive both messages.

5.1.2.3.2 ELRX Minimum Valid Preamble Size:

a. PURPOSE: This test shall verify that the receiver will function correctly with the minimum valid preamble length.

b. TEST METHOD: The test equipment shall transmit a valid maximum-length message to the UUT at a voltage level R_{vo} V. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit a valid minimum-length message to the UUT with a preamble length equal to S_p bit times at the voltage level R_{vm} V.

c. PASS CRITERIA: The UUT shall correctly receive both messages.

5.1.2.3.3 ELRX Maximum Input Voltage:

a. PURPOSE: This test shall check the maximum input voltage of the UUT's receiver.

b. TEST METHOD: The test equipment shall transmit a valid maximum-length message to the UUT at a voltage level of R_{vo} V.

c. PASS CRITERIA: The UUT shall correctly receive the message.

5.1.2.3.4 ELRX Dynamic Range:

a. PURPOSE: This test shall prove the dynamic range capability of the UUT's receiver.

b. TEST METHOD: The test equipment shall transmit a valid maximum-length message to the UUT at a voltage level of R_{vo} V. After a time equal to the minimum intertransmission gap, S_{itg} ns, the test equipment shall transmit a valid minimum-length message to the UUT at a voltage level of R_{vm} V.

c. PASS CRITERIA: The UUT shall correctly receive both messages.

5.1.2.3.5 ELRX Minimum Input Voltage:

a. PURPOSE: This test shall check the sensitivity of the UUT.

b. TEST METHOD: The test equipment shall transmit a valid minimum-length message to the UUT at a voltage level of R_{pm} V.

c. PASS CRITERIA: The UUT shall correctly receive the message.

5.1.2.3.6 ELRX Electrical Waveform:

a. PURPOSE: This test shall verify the ability of the UUT's receiver to operate correctly with waveforms at the allowable limits of combined over/undershoot, maximum rise/fall time and maximum pulsewidth distortion.

5.1.2.3.6 (Continued):

b. TEST METHOD: The test equipment shall transmit a sequence of ten concatenated valid minimum-length messages to the UUT at a voltage level of R_{pm} V. The messages shall include random, changing bit patterns including all ones and all zeros. The waveform presented to the receiver shall be characterized by a combined over/undershoot of R_{ous} %, a rise time of R_r ns, a fall time of R_f ns, and a pulsewidth distortion of R_{dpw} ns.

c. PASS CRITERIA: The UUT shall correctly receive the message.

5.1.2.3.7 ELRX Input Impedance:

a. PURPOSE: This test shall verify the input impedance of the receiver input port of the UUT.

b. TEST METHOD: The test equipment shall measure the input impedance of the UUT in a stand-alone configuration, with the power on and with the power off, using a sinusoidal waveform having an amplitude from 1.0 to 2.0 V_{rms} over the frequency range W1 MHz to W2 MHz.

c. PASS CRITERIA: The input impedance measured shall be within the specified tolerance for R_{iz} Ohms.

5.1.2.3.8 ELRX Common-Mode Rejection:

a. PURPOSE: This test shall verify that the UUT's receiver achieves a satisfactory common-mode rejection ratio.

b. TEST METHOD: The test equipment shall be configured as illustrated in Figure 7. The test equipment shall transmit a valid maximum-length message to the UUT at a voltage level of R_{vm} V. A common-mode voltage of $|R_{cmr} * R_{vo}|$ V shall be applied. The voltage shall be measured from each signal line to signal ground.

c. PASS CRITERIA: The UUT shall correctly receive the message.

5.1.2.3.9 ELRX Surge Voltage:

a. PURPOSE: This test shall verify that the UUT is undamaged by application of a surge voltage to the receiver input port.

b. TEST METHOD: The test equipment shall be configured as illustrated in Figure 6. A voltage of S_v V shall be applied to the receiver input for a period of time equal to S_d ms. This shall be repeated ten times. The test described in 5.1.2.3.5, ELRX Minimum Input Voltage Test shall then be performed.

c. PASS CRITERIA: The UUT shall successfully pass the minimum input voltage test.

5.1.2.3.10 ELRX Maximum Bit-Error Rate:

a. PURPOSE: This test shall check that the UUT meets the specified bit-error rate performance. Because the receiver output cannot be directly monitored, this test will measure a message-error rate and extrapolate the bit-error rate from that. Because of the uncertainties involved, a confidence interval will be established on both sides of the required error rate. This is directly based on the methods used in MIL-STD-1553B. For purposes of this test, all errors are assumed to be attributable to the receiver.

b. TEST METHOD: The test equipment shall transmit a series of valid eight-word messages (200 bits total) to the UUT. The messages shall contain random, changing bit patterns. The following signal parameters shall be fixed at their worst-case values: intertransmission gap of S_{itg} ns; preamble size of S_p bit times, and a waveform characterized by the worst-case limits specified in 5.1.2.3.6. The following signal parameters shall be varied at different times during the test: signaling rate R_s; and nominal bit time T_o. The voltage level shall be varied throughout the operating range, from R_{vm} to R_{vo}. The receiver shall be frequently presented with message sequences of first a high voltage and then a low voltage, with a voltage difference of the dynamic range R_{dr}, as in 5.1.2.3.4.

c. PASS CRITERIA: The test shall be run continuously until, for a particular number of errors, the number of messages sent exceeds the required number for passage of the test or is less than the required number for failure of the test. Reference Figure 3.

5.1.2.3.11 ELRX Correct Decoding:

a. PURPOSE: This test shall check the receive decoder of the UUT.

b. TEST METHOD: The test equipment shall transmit a series of messages to the UUT containing every valid symbol preceded and followed by every valid symbol that forms a valid sequence. The UUT shall be monitored to determine correct interpretation of all symbols.

c. PASS CRITERIA: The UUT shall correctly interpret all symbols.

5.2 Frame Formats:

In this and subsequent sections, the test equipment may require access to the Host (or User) interface of the UUT, in order to place the UUT in certain modes or monitor the UUT status from the Host perspective. Figure 8 illustrates the fact that the test equipment will require separate connections to the LTPB and the Host interfaces of the UUT.

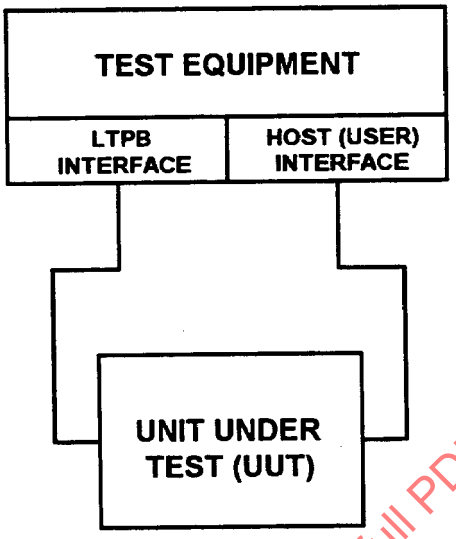

FIGURE 8 - Test Equipment Interfaces to UUT

5.2.1 Frame Formats (Transmit): This section shall verify that the UUT exhibits correct operation of protocol data unit transmission.

5.2.1.1 Start Delimiter (Transmit):

a. PURPOSE: This test shall verify that the UUT transmits a correct Start Delimiter.

b. TEST METHOD: The test shall be the transmittal by the UUT of a Start Delimiter appended to the beginning of a message frame.

c. PASS CRITERIA: The UUT shall transmit a start delimiter followed by a message frame.

5.2.1.2 Frame Control (Transmit): This section shall verify that the UUT exhibits correct transmission of frame control subfields.

5.2.1.2.1 Frame Type (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits the Frame Type subfield.

b. TEST METHOD: The test sequence shall consist of the four subtests. The UUT will transmit four frames (token, claim token, station management message, data message), each with a unique valid frame type.

c. PASS CRITERIA: The UUT shall correctly transmit each of the three frames and the respective frame types.

5.2.1.2.2 Priority (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits the priority subfield.

b. TEST METHOD: The test sequence shall consist of requests to the UUT to transmit a message frame to each of the four priority levels.

c. PASS CRITERIA: The UUT shall correctly transmit the correct priority code in the priority subfield of each of the messages transmitted, and the messages shall be transmitted in the correct priority order.

5.2.1.2.3 Station Management Code (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits the SMC subfield.

b. TEST METHOD: The test sequence shall consist of the transmission by the UUT of multiple frames, each frame transmitting a unique valid SMC code.

c. PASS CRITERIA: The UUT shall correctly transmit the SMC code in the SMC subfield in each of the respective frames transmitted.

5.2.1.3 Source Address (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits Physical Station Address in the source address field.

b. TEST METHOD: The test sequence shall consist of the transmittal by the UUT of a sequence of message frames covering each of the possible source address field values as determined by the station physical address strap. The station physical address strap will be changed and unique for each of the message frames transmitted.

c. PASS CRITERIA: All source addresses sent by the UUT shall match the physical station address as set for the respective message frame.

5.2.1.4 Destination Address (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits the requested destination address in the destination address field.

b. TEST METHOD: The test shall consist of transmissions by the UUT. The UUT will transmit message frames with the destination address field of each frame containing a unique physical destination address. The test sequence shall transmit enough frames to cover all possible destination addresses. The test sequence will be repeated to transmit enough frames to cover all possible logical addresses in the destination address field.

c. PASS CRITERIA: In each destination address field in each message frame, the destination address shall match that which was requested and expected for that frame.

5.2.1.5 Word Count (Transmit):

a. PURPOSE: This test shall verify that the UUT transmits a value in the word count field that corresponds exactly to the number of words in the information field.

b. TEST METHOD: The test shall consist of a sequence of transmissions by the UUT. The UUT shall transmit a message frame for each of the possible values of the word count; each frame containing a unique word count.

c. PASS CRITERIA: In each message frame transmission, the value in the word count field shall match the value requested for that frame, and the number of words in the information field shall equal the value in the word count field.

5.2.1.6 Information (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits the information field.

b. TEST METHOD: The test shall consist of a sequence of transmissions by the UUT. The UUT shall transmit a message frame for each of the possible number of 16-bit words in the information field; each message frame containing a unique number of information words. The information data bit pattern shall be randomly generated, and shall be different for each message frame transmitted.

c. PASS CRITERIA: The information field shall exactly match the information that the UUT was commanded to send.

5.2.1.7 Message Frame Check Sequence (Transmit):

a. PURPOSE: This test shall verify that the UUT calculates and transmits the MFCS correctly.

b. TEST METHOD: The test shall consist of a sequence of requests to, and subsequent transmission of message frames to/by the UUT to verify that the MFCS was calculated and transmitted correctly by the UUT.

c. PASS CRITERIA: The MFCS shall be correct for each frame.

5.2.1.8 Token Frame Check Sequence (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly calculates and transmits the TFCS.

b. TEST METHOD: The test shall consist of a sequence of requests to, and subsequent transmission of token frames to/by the UUT to verify that the TFCS has been calculated and transmitted correctly by the UUT.

c. PASS CRITERIA: The TFCS shall be correct for each frame.

5.2.1.9 End Delimiter (Transmit):

a. PURPOSE: This test shall verify that the UUT correctly transmits the End Delimiter.

b. TEST METHOD: The test shall consist of the transmission by the UUT of an End Delimiter appended to the end of a message frame.

c. PASS CRITERIA: The correct End Delimiter shall be transmitted by the UUT.

5.2.2 Frame Formats (Receive): The purpose of these tests is to verify that the UUT correctly receives all protocol data units.

5.2.2.1 Start Delimiter (Receive):

a. PURPOSE: This test shall verify that the UUT correctly recognizes and responds properly to a valid start delimiter.

b. TEST METHOD: The test shall be the receipt by the UUT of a valid start delimiter appended to the beginning of a message frame.

c. PASS CRITERIA: The UUT shall recognize the received start delimiter, evidenced by the fact that it correctly receives the remainder of the message frame.

5.2.2.2 Frame Control (Receive): The purpose of this test is to verify that the UUT correctly receives and recognizes the frame control subfields.

5.2.2.2.1 Frame Type (Receive):

a. PURPOSE: This test shall verify that the UUT correctly recognizes each of the valid frame type subfield values.

b. TEST METHOD: The test sequence shall be the receipt by the UUT of four frame each containing a different valid frame type (token, claim token, station management message, data message) in the frame type subfield.

c. PASS CRITERIA: The UUT shall correctly recognize each of the valid frame types.

5.2.2.2.2 Station Management Code (Receive):

a. PURPOSE: This test shall verify that the UUT correctly recognizes and properly responds to valid received SMC subfield values.

b. TEST METHOD: The test sequence shall consist of the receipt by the UUT of message frames each containing a unique valid SMC subfield value.

c. PASS CRITERIA: The UUT shall correctly recognize each of the valid received SMC subfield values.

5.2.2.3 Source Address (Receive):

a. PURPOSE: This test shall verify that the UUT correctly receives the receive source address field value.

b. TEST METHOD: The test shall consist of sequence of message frames received by the UUT, each containing a different value of the source address. The sequence shall cover all possible values of the source address.

c. PASS CRITERIA: The UUT shall correctly receive the value of the source address subfield in each of the message frames received.

5.2.2.4 Destination Address (Receive):

a. PURPOSE: This test shall verify that the UUT correctly recognizes the receive destination address field.

b. TEST METHOD: The test shall consist of the reception by the UUT of a sequence of message frames each containing a unique value of a physical address which is equal to the value that the UUT physical address strap is set to. The test sequence shall cover all values of physical addresses. A similar test sequence shall be executed whereby the UUT receives message frames containing all possible logical addresses. For each message frame received by the UUT, the UUT will have set in the logical address bit map, one and only one logical address to receive, which shall correspond to that value in the respective message frame.

c. PASS CRITERIA: The UUT shall correctly receive the complete message frame where the physical address of the message frame is equal to the physical address strap of the UUT; and the UUT shall correctly receive the complete message frame where the logical address of the message frame is equal to the one and only one logical address set in the UUT logical address bit map.

5.2.2.5 Word Count (Receive):

a. PURPOSE: This test shall verify that the UUT correctly recognizes the received Word Count field.

b. TEST METHOD: The test shall consist of the receipt by the UUT of a sequence of message frames each containing a unique value of the word count field. The test sequence shall receive enough message frames to cover all possible values of the word count field.

c. PASS CRITERIA: The UUT shall correctly recognize the word count field value for each message frame received, and shall correctly receive the same amount of data words in the information field.

5.2.2.6 Information (Receive):

a. PURPOSE: This test shall verify that the UUT correctly receives the entire information field.

b. TEST METHOD: The test shall consist of the receipt by the UUT of a sequence of message frames each with different numbers of 16-bit data words in the information field. The sequence shall provide the receipt of enough message frames to cover all possible values of the information field word count. The data in the information field shall be randomly generated and shall be different for every message frame in the sequence.

c. PASS CRITERIA: The UUT shall correctly receive each of the information fields of each of the message frames received.

5.2.2.7 Message Frame Check Sequence (Receive):

a. PURPOSE: This test shall verify that the UUT correctly receives and verifies the MFCS.

b. TEST METHOD: The test shall consist of the receipt of a sequence of message frames by the UUT with different, correct MFCS values.

c. PASS CRITERIA: The UUT shall correctly receive and verify the MFCS for each message frame received.

5.2.2.8 Token Frame Check Sequence (Receive):

a. PURPOSE: This test shall verify that the UUT correctly receives and verifies the TFCS.

b. TEST METHOD: The test shall consist of the receipt of a sequence of token frames by the UUT with different, correct TFCS values.

c. PASS CRITERIA: The UUT shall correctly receive and verify the TFCS for each token frame received.

5.2.2.9 End Delimiter (Receive):

a. PURPOSE: This test shall verify that the UUT correctly receives and recognizes the received end delimiter.

b. TEST METHOD: The test shall consist of the reception by the UUT of a message frame with an end delimiter appended to it.

c. PASS CRITERIA: The UUT shall correctly receive and recognize the end delimiter, evidenced by completing the reception of the message frame.

5.3 Timer Functions:

The following timer functions are tested here:

a. Token Holding Timer (THT)
b. Token Rotation Timers (TRT)
c. Ring Admittance Timer (RAT)
d. Token Passing Timer (TPT)
e. Bus Activity Timer (BAT)

5.3.1 Token Holding Timer (THT) and Token Rotation Timer (TRT):

a. PURPOSE: The purpose of these tests is to verify that the THT and TRT correctly govern the UUT token hold time, that the TRT serve to defer lower priority message traffic when bus usage is high, and that these timer values are correct.

b. TEST METHOD: The following tests assume that the HSDB tester node has the capability to monitor HSDB frames and to measure time periods between frames. The HSDB tester must also be capable of transmitting message frames at a rate that uses a specified percentage of HSDB bandwidth to create a specified token rotation time. For all tests, the UUT shall be set to HSDB address N and the tester shall be set to HSDB address N + 1. The tester claim token process is not capable of initializing the HSDB, and the tester ring admittance function shall be disabled.

(1) THT Test

The tester shall be enabled onto the HSDB. The UUT shall be loaded with four priority 0 messages each containing a number of data words corresponding to the following lengths (THT is the UUT THT value in ms):

(a) Two messages of P words such that (4.5 + P) * 0.32 = THT - 1.28.

This tests that two messages of length just shorter in time than the THT timeout value (message length = THT - tolerance) will both be transmitted on the same token hold.

(b) Two messages of M words such that (4.5 + M) * 0.32 = THT.

This tests that two messages of length just longer in time than the THT timeout value (message length = THT, assuming THT is reset just before message transmission) will be transmitted on two separate token holds.

The UUT shall be enabled onto the HSDB. The tester shall monitor the HSDB for token and message frames, and shall verify that three successive token passes from the UUT to the tester are preceded by message frames of the specified length and content. The tester shall further verify that the first token pass is preceded by two message frames of P words, and the second and third token passes are each preceded by one message frame of M words.

5.3.1 (Continued):

The tester shall continue to monitor the HSDB for token frames. The period of time between two consecutive tester token transmissions shall be measured by the tester, and shall be recorded for the following tests as the HSDB empty token rotation time (T_{rotn}).

(2) TRT Test

The following test shall be repeated for TRT1, TRT2, and TRT3, where TRTx in the test description refers to the TRT under test (x = 1, 2, 3). The tester and the UUT shall be disabled from operation on the HSDB before starting the test.

The tester shall be set up to send message frame(s) on every token hold so that the length of the message frame(s) in time corresponds to the UUT TRTx value. The tester shall be enabled onto the HSDB but shall no attempt to initialize the bus because its claim token process has been disabled. The UUT THT shall be set to a value greater than TRTx. The UUT shall be loaded with four priority x messages each containing a number of data words corresponding to the following lengths (TRTx is the UUT TRTx value in μs):

(a) Two messages of P words such that $(4.5 + P) * 0.32 = TRTx - T_{rotn} - 1.28$.

This tests that two messages of length just shorter in time than the TRTx timeout value (message length = TRTx – the token rotation time –tolerance) will both be transmitted on the same token hold.

(b) Two messages of M words such that $(4.5 + M) * 0.32 = TRTx - T_{rotn}$.

This tests that two messages of length just longer in time than the TRTx timeout value (message length = TRTx – the token rotation time) will be transmitted on two separate token holds.

The UUT shall be enabled onto the HSDB. (The UUT will initialize the bus and start passing tokens to the tester, which will append message traffic to its token passes such that the UUT TRTx is always expired when the UUT receives the token.) The tester shall monitor the HSDB and verify that no message frames are transmitted by the UUT.

The tester shall then stop sending message frames and shall monitor the HSDB for token and message frames from the UUT. The tester shall verify that the second, third, and fourth successive token passes from the UUT to the tester after the last tester message frame are preceded by message frames of the specified length and content, and that the first token pass is not preceded by a message frame. The tester shall further verify that the second token pass is preceded by two message frames of P words, and third and fourth token passes are each preceded by one message frame of M words.

c. PASS CRITERIA: All tests shall be considered passed if the specified token and message frame patterns have been established. Any incorrect or unidentified results shall be considered a test failure.

5.3.2 Ring Admittance Timer (RAT):

a. PURPOSE: The purpose of these tests is to verify that the RAT and TRT3 correctly govern the ring admittance process, and that the RAT value is correct.

b. TEST METHOD: The following tests assume that the HSDB tester node has the capability to monitor HSDB frames and to measure time periods between frames. The HSDB tester must also be capable of transmitting message frames at a rate that uses a specified percentage of HSDB bandwidth to create a specified token rotation time. For all tests, the UUT shall be set to HSDB address N and the tester shall be set to HSDB address N + 2. The tester ring admittance function shall be disabled.

(1) Normal Ring Admittance Test

Normal bus operation (token passing) shall be established by enabling in succession, the UUT then the tester. The tester shall monitor the HSDB for token frames. The period of bus inactivity between token addresses N and N + 2 shall be measured by the tester, and shall be recorded for future use as the UUT response time (T_{resp}). The measured time between two tokens with address N + 1 that immediately follow tokens of address N shall be the UUT RAT value.

(2) Ring Admittance Deferral

The tester shall be set up to send message frame(s) on every token hold so that the length of the message frame(s) in time corresponds to the UUT TRT3 value. The tester shall continue to send the message frame(s) for a period of time that is greater than the specified UUT RAT value. The tester shall monitor the bus for token frames to address N + 1 and verify that none are seen. The tester shall then stop sending message frames and shall monitor the bus to verify that the UUT sends a token to address N + 1 on its second token pass following the last message frame.

c. PASS CRITERIA:

(1) Normal Ring Admittance

The normal ring admittance test shall be considered passed if the measured time (T_{meas}) between the address N + 1 token passes is RAT < T_{meas} < RAT + 2 * T_{resp}. A measured time not meeting this relationship or a failure to detect tokens to address N + 1 over a period of time equivalent to T_{meas} shall be considered test failure.

(2) Ring Admittance Deferral

The ring admittance deferral test shall be considered passed if token frame to address N + 1 are successfully deferred for a period greater than the UUT RAT value, and if ring admittance is resumed within the second UUT token pass following the cessation or tester message traffic. Any other incorrect or unidentified results shall be considered a test failure.

5.3.3 Token Passing Timer (TPT):

a. PURPOSE: The purpose of these tests is to verify that the TPT is correctly governing the token pass recovery mechanism, and that the TPT value is correct.

b. TEST METHOD: The following tests assume that the HSDB tester node has the capability to monitor HSDB frames and to measure time periods between frames. The HSDB tester must also be capable of transmitting frames or failing to transmit frames, using multiple HSDB addresses. For all tests, the UUT shall be set to HSDB address N and the tester shall be both HSDB addresses N + 1 and N + 2. The UUT ring admittance function shall be disabled by setting the lowest priority TRT (TRT3) to a small value that forces it to be always expired. The MSA shall be set to 127.

(1) Normal Token Passing

Normal bus operation (token passing) shall be established by enabling in succession, the tester, then the UUT. The tester shall monitor token frames on the bus for successive token passes with addresses N, N + 1, N + 2, N, N + 1, N + 2, N, N + 1, N + 2, ... The period of bus inactivity between tokens with addresses N and N + 1 shall be measured by the tester, and shall be recorded for future tests as the UUT response time (T_{resp}).

(2) Token Pass Timer Operation

The tester shall force a token pass failure by disabling its response to HSDB address N + 1 immediately after passing the token to the UUT. The tester shall then monitor token frames on the bus for addresses N, N + 1, N + 1, N + 2, N, N + 2, N, ... The tester shall measure the period of bus inactivity between token passes with address (N + 1, N + 1) and (N + 1, N + 2).

The UUT shall be reprogrammed to a number of different TPT values which have been selected to fully exercise the programmability of the timer. The token pass timer operational test shall be repeated for each value.

(3) Token Pass Wraparound

The tester shall force another token pass failure by disabling its response to HSDB address N + 2 also (tester does not respond to any token pass) immediately after passing the token to the UUT. The tester shall then monitor token frames for successive token pass attempts and retry attempts to all addresses up to the address 127 and then from address 0 up to address N - 1, after which the UUT ceases all transmissions.

c. PASS CRITERIA:

(1) Normal Token Passing

This test shall be considered passed if the specified normal token pass pattern has been established. Any incorrect or unidentified results shall be considered a test failure.

5.3.3 (Continued):

(2) Token Pass Failure

This test shall be considered passed if the measured time (T_{meas}) between token passes (N + 1, N + 1) and (N + 1, N + 2) is TPT < T_{meas} < TPT + T_{resp}. A measured time not meeting this relationship or a failure to detect the specified token pass pattern over a period of time equivalent to T_{meas} shall be considered a test failure.

(3) Token Pass Wraparound

This test shall be considered passed if the specified token pass pattern has been established. Any incorrect or unidentified results shall be considered a test failure.

5.3.4 Bus Activity Timer (BAT):

a. PURPOSE: The purpose of these tests is to verify that the BAT is correctly governing the Claim Token process, and that the BAT value is correct.

b. TEST METHOD: The following tests assume that the HSDB tester node has the capability to monitor HSDB frames and to measure time periods between frames. The HSDB tester must also be capable of transmitting frames or failing to transmit frames. For this test, the UUT shall be set to HSDB address N and the tester shall be both HSDB addresses N + 1 and N + 2.

The UUT and tester nodes shall be enabled onto the HSDB. The period of bus inactivity between tokens with addresses N and N + 1 shall be measured by the tester, and shall be recorded as the UUT response time (T_{resp}). The tester shall force a lost token condition by receiving the token from the UUT and failing to send a token back to the UUT after sending other bus activity. The tester shall monitor the bus for a subsequent transmission of a Claim Token frame by the UUT. The tester shall measure the period of bus inactivity between the start of its token transmission and the reception of the start of the UUT claim token. This period measures the UUT BAT value. This test shall be repeated for N = 0 to N = 127.

c. PASS CRITERIA: This test shall be considered passed if the measured time (T_{meas}) between the start of the tester token transmission and the reception of the start of the UUT claim token is BAT < T_{meas} < BAT + 2 * T_{resp}. A measured time not meeting this relationship or a failure to detect the UUT claim token over a period of time equivalent to T_{meas} shall be considered a test failure.

5.4 Traffic Summary Counters:

This section deals with the testing of the traffic summary counters detailed in AS4074. The tests listed are intended to validate the operation of the traffic summary counters to the requirements of the standard. For cases where the particular test procedure cannot be accomplished due to hardware implementation, PWA/module design or test equipment limitations (e.g., “external loading of values into traffic summary counters”), it shall be demonstrated by analysis or simulation methods that the counter circuits are fully compliant with the requirements of this document (i.e., for the “external loading” example: that they “roll-over” to a zero count when the full count has been reached and the next event occurs, and that they continue on an upward count with each subsequent occurrence of an event.)

Certain tests in this section require that specified lists of messages are transmitted in order to test traffic summary counters. This might be construed to mean that the designer must use unreasonably large transmit message memory storage areas. There is no requirement in any test in this section that these required messages be sent on a single token pass. Multiple token passes with queue loading between tokens is acceptable for purposes of these tests.

5.4.1 Valid Messages Transmitted Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of valid messages which a station transmits on the bus. Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They are tested in other steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test.

(2) The Token Holding Timer (THT) and the Token Rotation Timers (TRTs) shall be set to the maximum value ($FFFF_{16}$).

(3) The test equipment shall transmit a station management message across the LTPB to the UUT commanding a reset of the traffic summary counters. The test equipment shall transmit a station management command across the LTPB requesting a traffic summary report. The Valid Messages Transmitted counter shall read 0000_{16}.

(4) The test equipment shall load the UUT queues with the message traffic indicated in Figure 9 and shall then transmit a valid token to the UUT at the assigned physical address.

5.4.1 (Continued):

(5) When the test equipment receives a valid token returned from the UUT (indicating that the UUT has completed transmission of the message set), it shall transmit a station management message to the UUT across the LTPB requesting the traffic summary report. The value received for the Valid Messages Transmitted shall be 0100_{16}, indicating that the UUT station has correctly initialized the counter and that the message traffic sent by the UUT (messages from Figure 9 and the traffic summary report) were properly recorded.

(6) The test equipment shall then send a station management message across the BIU/Host interface requesting a traffic summary report. The Valid Messages Transmitted counter shall be 0100_{16}.

(7) The test equipment shall then load a value of $EF00_{16}$ into the Valid Messages Transmitted counter. The messages listed on Figure 9 shall be loaded into the UUT queues. The test interface shall then pass a valid token to the UUT at the assigned physical address.

(8) When the test equipment receives a valid token returned from the UUT, it shall transmit a station management message to the UUT requesting the traffic summary report. The value received for the Valid Messages Transmitted shall be $F000_{16}$.

(9) The test equipment shall then send a station management message across the BIU/Host interface requesting a traffic summary. The Valid Messages Transmitted counter shall read $F000_{16}$.

(10) The test equipment shall then transmit a station management command across the BIU/Host interface commanding a clear of all traffic statistics counters. The test interface shall then transmit a station management command to the UUT requesting traffic statistics. The Valid Messages Transmitted shall be 0000_{16}.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

Word Count	Number of Messages in Total Test Transmission
1	20
2	20
5	20
10	10
15	10
20	4
50	4
100	5
200	5
500	4
600	4
1028	50
2046	50
4096	50

FIGURE 9 - Message Traffic Word Counts for Valid Messages Transmitted Test

5.4.2 Claim Tokens Transmitted Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of claim tokens which a station transmits on the bus during the operational time between counter resets. Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They will be tested in later steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The test equipment shall be set to transmit continuous preamble on the bus. The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test.

(2) The test equipment shall transmit a station management command across the BIU/Host interface commanding a traffic summary reset. The test equipment shall then verify reset by transmitting a station management command across the BIU/Host interface requesting a traffic summary report. The Claim Tokens Transmitted counter shall be 0000_{16}.

(3) The test equipment shall transmit a station management command to the UUT across the LTPB requesting the traffic summary. The value received for the Claim Tokens Transmitted count shall be 0000_{16}.

5.4.2 (Continued):

(4) The test equipment shall then cease transmission of the continuous preamble. The UUT shall begin transmitting a claim token frame after the appropriate bus activity timer (BAT) timeout.

NOTE: The function of the BAT is tested elsewhere in this document and the test is not repeated here. Upon detecting the end of the claim token frame, the test equipment shall begin transmitting continuous preamble.

(5) The test equipment shall then transmit a station management message to the UUT across the LTPB requesting a traffic summary report. The value for the Claim Tokens Transmitted counter shall be 0001_{16}. The test equipment shall then send a station management command across the BIU/Host interface to the UUT requesting a traffic summary report. The value for the Claim Token Transmitted counter shall be 0001_{16}.

(6) The test equipment shall then cease transmission of the continuous preamble. The UUT shall begin transmitting a claim token frame after the appropriate bus activity timer (BAT) timeout.

NOTE: The function of the BAT is tested elsewhere in this document and the test is not repeated here. Upon detecting bus activity due to the claim token frame from the UUT, the test equipment shall begin transmitting continuous preamble to force the UUT to abort the claim token frame.

(7) The test equipment shall cease transmission of continuous preamble for a period of one token passing time-out (TPT) to be certain that the UUT has aborted the claim token transmission. The test equipment shall then send a station management command to the UUT across the LTPB requesting a traffic summary report. The station management message shall be followed by the transmission of continuous preamble. The Claim Tokens Transmitted counter shall be 0002_{16}. The test equipment shall send a station management command across the BIU/Host interface requesting a traffic summary report. The value received for the Claim Token Transmitted counter shall be 0002_{16}.

(8) The test equipment shall then transmit a station management message to the UUT across the LTPB requesting a traffic summary report. The value for the Claim Tokens Transmitted counter shall be 0001_{16}. The test equipment shall then send a station management command across the BIU/Host interface to the UUT requesting a traffic summary report. The value for the Claim Tokens Transmitted counter shall be 0001_{16}.

(9) The test equipment shall then transmit a station management message across the LTPB commanding a reset of the traffic summary counters. The test equipment shall then send a station management message across the LTPB requesting a traffic summary report. The value for the Claim Tokens Generated counter shall be 0000_{16}.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

5.4.3 Transmissions Aborted Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of transmissions which a station aborts while having control of the token. Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They will be tested in later steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test.

(2) The test equipment shall load the UUT THT and TRTs with the maximum possible value across the BIU/Host interface. The test equipment will token pass with the UUT continuously during this test so that the TRTs of the UUT are maintained at approximately the maximum specified.

(3) The test equipment shall transmit a station management command to the UUT across the LTPB requesting the traffic summary. The value received should be 0000_{16}, indicating that the UUT reset circuitry has correctly initialized the counter at power-up.

(4) The test equipment shall load the 256 message frames in Figure 10 into the transmit queue across the BIU/Host interface. The message frames will be addressed to stations with physical addresses other than that to which the UUT is assigned and will be caused to be aborted (abnormal termination) during transmission.

(5) The test equipment shall send a station management command across the BIU/Host interface requesting a traffic summary report. The value of the Transmissions Aborted counter shall read 0100_{16}.

(6) The test equipment shall load a value of $EEFF_{16}$ into the Transmissions Aborted counter. The test equipment shall then load the 256 message frames specified in Figure 10 into the transmit queue across the BIU/Host interface. The UUT shall be allowed to transmit all of the message traffic. The test equipment shall then transmit a station management command requesting transmission of the traffic statistics. The Transmissions Aborted counter shall read $EFFF_{16}$.

(7) The test equipment shall then load the 256 message frames specified in Figure 10 into the UUT transmit queue across the BIU/Host interface. The test equipment shall then send a station management command across the BIU/Host interface requesting transmission of the traffic statistics. The Transmission Aborted counter shall read $F0FF_{16}$.

(8) The test equipment shall transmit a station management command across the LTPB to the UUT commanding a reset of the traffic statistics. The Transmissions Aborted Counter shall read 0000_{16}.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

Word Count	Number of Messages in Total Test Transmission
1	20
2	20
5	20
10	10
15	10
20	4
50	4
100	5
200	5
500	4
600	4
1028	50
2046	50
4096	50

FIGURE 10 - Message Traffic Word Counts for Transmissions Aborted Counter Test

5.4.4 Frame Validity Errors Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of messages which the UUT BIU transmits which fail validity checks (word count, MFCS, TFCS, etc) during transmission monitoring. Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They will be tested in later steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test. The function which disables the UUT in the event of two consecutive frame validity errors shall be disabled for this test.

(2) The test equipment shall transmit a station management command to the UUT across the LTPB commanding a reset of the traffic summary. The test equipment shall then transmit a station management command across the LTPB requesting a traffic summary report. The value received for the Frame Validity Errors counter shall be 0000_{16}.

(3) The test equipment shall load the UUT transmit queue with the message frames from Figure 11 across the BIU/Host interface. The message frames shall be addressed to the physical addresses other than that assigned to the UUT. The test equipment shall intercept the message transmitted by the UUT and shall modify the message to insert an error in the frame (e.g., MFCS error, invalid symbol error, message header error) and return it to the receiver port of the UUT.

5.4.4 (Continued):

(4) The test equipment shall then send a station management command across the BIU/Host interface requesting transmission of the traffic statistics. The values of the Frame Validity Error counter shall read 0014_{16}.

(5) The test equipment shall load a value of $EFFF_{16}$ into the Frame Validity Error counter. The test equipment shall then provide 256 clock pulses to the circuitry which clocks the Frame Validity Error counter. The test equipment shall then transmit a station management command requesting transmission of the traffic statistics. The Frame Validity Error counter shall read $F000_{16}$.

(6) The test equipment shall send a station management message to the UUT across the BIU/Host interface commanding a reset of the traffic statistics counters. The test equipment shall send a station management message to the UUT across the BIU/Host interface requesting a traffic summary report. The value in the Frame Validity Error counter shall be 0000_{16}.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

Number of Frames	Number of Words	Error to be Injected
1	256	None
3	30	Encoding (Illegal Symbol)
5	4096	None
1	4000	Toggle 1 Bit—MFCS
5	512	Number of Info Words Don't Match Word Count Field
1	4096	Toggle 1 Bit in any Word in Info Field
4	35	Toggle 1 Bit in Message Header—Frame Type Field
15	128	None
3	450	Toggle 1 Bit in Message Header—Priority Field
5	21	None
1	256	Toggle 1 Bit in Message Header—SMC Field
1	10	None
1	10	Error in End Delimiter
1	50	None
2	10	Error in End Delimiter
15	256	None
2	50	Encoding (Illegal Symbol)

FIGURE 11 - Message Frame/Error Injection for Frame Validity Error Counter Test

5.4.5 Frame Received Errors Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of messages received by a station, from other stations on the bus, which fail validity tests (the same requirements applied to transmission monitoring). Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They are tested in other steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test.

(2) The test equipment shall transmit a station management message to the UUT across the LTPB commanding a reset of the traffic summary. The test equipment shall transmit a station management message across the LTPB requesting a traffic summary report. The Frame Received Errors counter shall be 0000_{16}.

(3) The test equipment shall transmit 256 message frames across the LTPB. The message frames shall be addressed to the physical address that the UUT is assigned. The messages shall have the word counts and errors shown in Figure 12. The test equipment shall then transmit a station management message requesting transmission of the traffic statistics. The value of the Frame Received Errors counter shall read 0014_{16}.

(4) The test equipment shall load a value of $FFFF_{16}$ into the Frame Received Error counter. The test equipment shall then re-transmit the messages and word counts from Figure 12 across the LTPB. The test equipment shall then transmit a station management command across the LTPB requesting transmission of the traffic statistics. The Frame Received Errors counter shall read 0013_{16}.

(5) The test equipment shall transmit a station management message to the UUT commanding reset of the traffic statistics. The test equipment shall transmit a station management command to the UUT requesting transmission of the traffic statistics. The value of the Frame Received Error counter shall be 0000_{16}.

(6) The tests from steps (2) through (5) shall then be repeated. All messages transmitted in this test segment shall be logically addresses. The message filter table in the UUT shall be loaded so that all bits are set to a “valid reception” state (i.e., that all logically addressed messages are to be received). The messages and word counts from Figure 12 shall be transmitted using any logical address. The result shall be the same as the results in the previous paragraphs.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

Number of Frames	Number of Words	Error to be Injected
1	256	None
3	30	Encoding (Illegal Symbol)
5	4096	None
1	4000	Toggle 1 Bit—MFCS
5	512	Number of Info Words Don't Match Word Count Field
1	4096	Toggle 1 Bit in any Word in Info Field
4	35	Toggle 1 Bit in Message Header—Frame Type Field
15	128	None
3	450	Toggle 1 Bit in Message Header—Priority Field
5	21	None
1	256	Toggle 1 Bit in Message Header—SMC Field
1	10	None
1	10	Error in End Delimiter
1	50	None
2	10	Error in End Delimiter
15	256	None
2	50	Encoding (Illegal Symbol)

FIGURE 12 - Message Frame/Error Injection for Frame Received Error Counter Test

5.4.6 Valid Messages Received Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of valid messages which a station receives. Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They will be tested in later steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test.

(2) The test equipment shall send a station management message across the BIU/Host interface commanding a traffic summary reset. The test equipment shall send a station management message across the BIU/Host interface requesting the traffic summary report. The value of the Valid Messages Received should be 0000_{16}.

5.4.6 (Continued):

(3) The test equipment shall transmit the message frames from Figure 13 across the LTPB. The message frames shall be addressed to the physical address of the UUT. the test equipment shall then transmit a station management message across the LTPB requesting transmission of the traffic statistics. The value of the Valid Messages Received counter should be 0100_{16}.

(4) The test equipment shall load a value of $FFFF_{16}$ into the counter. The test equipment shall transmit the 256 messages from Figure 13 across the LTPB. The test equipment shall then transmit a station management message requesting transmission of a traffic summary report. The Valid Messages Received counter shall read $00FF_{16}$.

(5) The test equipment shall send a station management message across the BIU/Host interface commanding a reset of the traffic summary counters. The test equipment shall transmit a station management message across the LTPB to the UUT requesting transmission of the traffic summary report. The value of the Valid Messages Received counter shall read 0000_{16}.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

5.4.7 Receive Queue Overflow Counter:

a. PURPOSE: The purpose of this test is to provide verification of the circuitry which counts the total number of times the stations receive queue overflows due to an excessive number or size of messages being sent to the station or the failure of the Host to retrieve messages from the BIU in a timely fashion. Unless otherwise specified in these tests, the values in the other statistics counters (other than that one under test) should be ignored. They are tested in other steps.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) The UUT shall be powered-up and allowed sufficient time to perform built-in test before beginning this test.

(2) The test equipment shall transmit a station management message to the UUT across the LTPB commanding a reset of the traffic summary counters. The test equipment shall transmit a station management message to the UUT across the LTPB requesting a traffic summary report. The value for the Receive Queue Overflow counter shall be 0000_{16}.

5.4.7 (Continued):

(3) During this test, the test equipment shall monitor the UUT BIU/Host interface to verify that a message ready indication exists but shall not retrieve any messages from the UUT receive queue. The test equipment shall transmit sufficient message traffic (total number of messages frames and words) across the LTPB to the UUT at the assigned physical address to fill 100% of the total available receive queue space at all priorities. After the receive queue has been filled to 100%, send one more message to the UUT.

(4) The test equipment shall send a station management message across the BIU/Host interface to the UUT requesting the traffic summary report. The value received for the Receive Queue Overflow counter shall be the 0001_{16}, indicating that the receive queue was filled and that the last message transmitted by the test equipment caused a receive queue overflow.

(5) The test equipment shall then transmit a station management message across the LTPB to the UUT commanding a BIU reset. This reset will clear the queues for the next test. The test equipment shall then send a station management message across the LTPB to the UUT requesting a traffic summary report. The value for the Receive Queue Overflow counter shall be 0000_{16}.

(6) Step (3) shall then be repeated 256 times using the same message overload criteria. This time, the test equipment shall flush all receive queues between each repeat of the test to empty the queues. After all 256 sets have been completed, the test equipment shall then send a station management message across the BIU/Host interface to the UUT requesting a traffic summary report. The value for the Receive Queue Overflow shall be 0100_{16}.

(7) The test equipment shall then transmit a station management command across the bus commanding a traffic summary reset. The test equipment shall then request a traffic summary report. The value for the Receive Queue Overflow shall be 0000_{16}.

c. PASS CRITERIA: There shall be complete agreement between the statistics reported by the UUT and the required count indicated by each paragraph of the test method.

Number of Messages	Word Count
1	4096
2	1024
25	256
25	128
25	32
25	8
150	2
4	1

FIGURE 13 - Message Traffic for Valid Messages Received Counter Test

5.5 Station Management:

5.5.1 Status Report: These tests shall verify that the UUT exhibits proper operation with respect to creating and formatting the Status Report message. Note that the function of the traffic summary counters are tested elsewhere in this document and are not tested here.

5.5.1.1 BIU Status Register: The purpose of these tests is to verify that the UUT properly creates and formats the BIU Status Register field in the Status Report for all command and media interface modes.

5.5.1.1.1 BIU Commanded Modes:

5.5.1.1.1.1 QUIESCENT Mode (See Figure 15):

a. PURPOSE: The purpose of this test is to verify the formatting of the Status Register when the UUT transitions to and from the QUIESCENT mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

5.5.1.1.1.1 (Continued):

(3) Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $24A0_{16}$. The UUT shall enter the LOOPBACK mode. The format of the Mode Control Command follows:

FT	110
Px	00
SMC	000
DA	Physical address of UUT
SA	Physical address of station other than UUT
WC	1
CMD REG	$24A0_{16}$

(5) Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 1 of Figure 14.

(6) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading as shown in $84A0_{16}$. The UUT shall enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(7) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(8) Transmit across the LTPB to the UUT the following Station Management Frame:

FT	110
Px	00
SMC	010
DA	Physical address of UUT
SA	Physical address of station other than UUT
WC	1
LC	0
RC	0
RS	1
RT	0

Row	Mode	Bus A	Bus B	TME	Rsvd	RXM	RPB
1	001	001	001	0	XXXX	X	X
2	010	001	001	0	XXXX	X	X
3	011	001	001	0	XXXX	X	X
4	100	001	001	0	XXXX	X	X
5	101	111	111	0	XXXX	X	X
6	011	001	001	1	XXXX	X	X

Rsvd = Reserved, X = Ignore

FIGURE 14 - Contents of Status Register for Testing BIU Command Modes

5.5.1.1.1.1 (Continued):

(9) The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

(10) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $84A0_{16}$. The UUT shall enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(11) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(12) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to RESERVED mode 110 (illegal mode transition), the Command Register reading $C4A0_{16}$. The UUT shall remain in the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(13) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to the ENABLED mode (illegal mode transition), the Command Register reading $64A0_{16}$. The UUT shall remain in the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

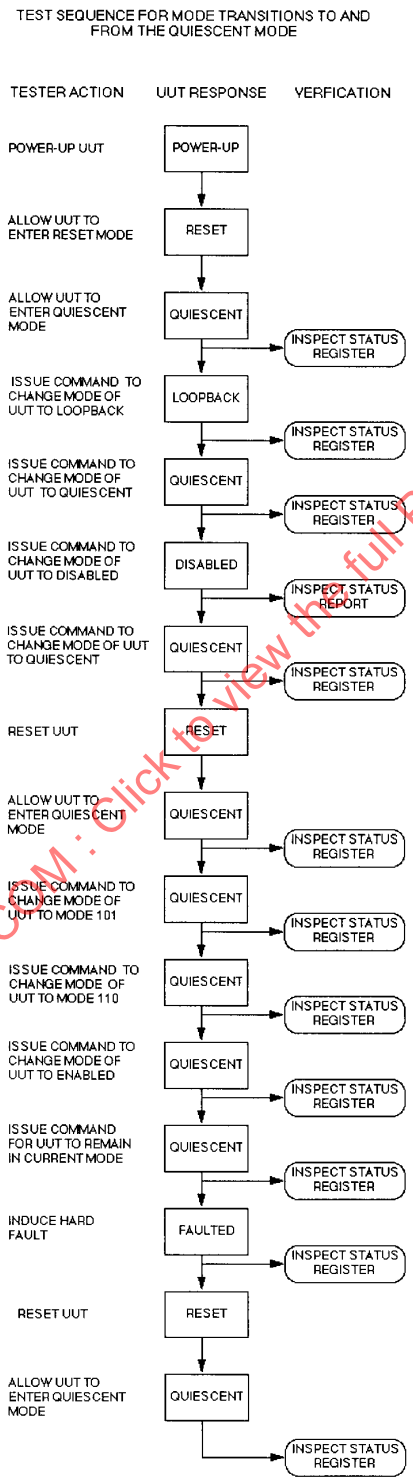

FIGURE 15 - Test Sequence for QUIESCENT Mode

5.5.1.1.1.1 (Continued):

(14) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $04A0_{16}$ (remain in current state). The UUT shall remain in the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(15) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

(16) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.1.2 LOOPBACK Mode (See Figure 16):

a. PURPOSE: The purpose of this test is to verify the creation and formatting of the Status Register field in the Status Report when the UUT transitions to and from the LOOPBACK mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $24A0_{16}$. The UUT shall enter the LOOPBACK mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 1 of Figure 14.

5.5.1.1.1.2 (Continued):

(4) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $84A0_{16}$. The UUT shall enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(5) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $24A0_{16}$. The UUT shall enter the LOOPBACK mode.

(6) Through the BIU/Host interface, transmit the Mode Control Command to change the mode of the UUT to the ENABLED mode (illegal mode transition), the Command Register reading $64A0_{16}$. The UUT shall remain in the LOOPBACK mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 1 of Figure 14.

(7) Through the BIU/Host interface, transmit the Mode Control Command to change the mode of the UUT to the DISABLED mode (illegal mode transition), the Command Register reading $44A0_{16}$. The UUT shall remain in the LOOPBACK mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 1 of Figure 14.

(8) Through the BIU/Host interface, transmit the Mode Control Command to change the mode of the UUT to RESERVED mode 110 (illegal mode transition), the Command Register reading $C4A0_{16}$. The UUT shall remain in the LOOPBACK mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 1 of Figure 14.

(9) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $04A0_{16}$ (remain in current state). The UUT shall remain in the LOOPBACK mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 1 of Figure 14.

(10) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(11) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $24A0_{16}$. The UUT shall enter the LOOPBACK mode.

TEST SEQUENCE FOR MODE TRANSITIONS TO AND FROM THE LOOPBACK MODE

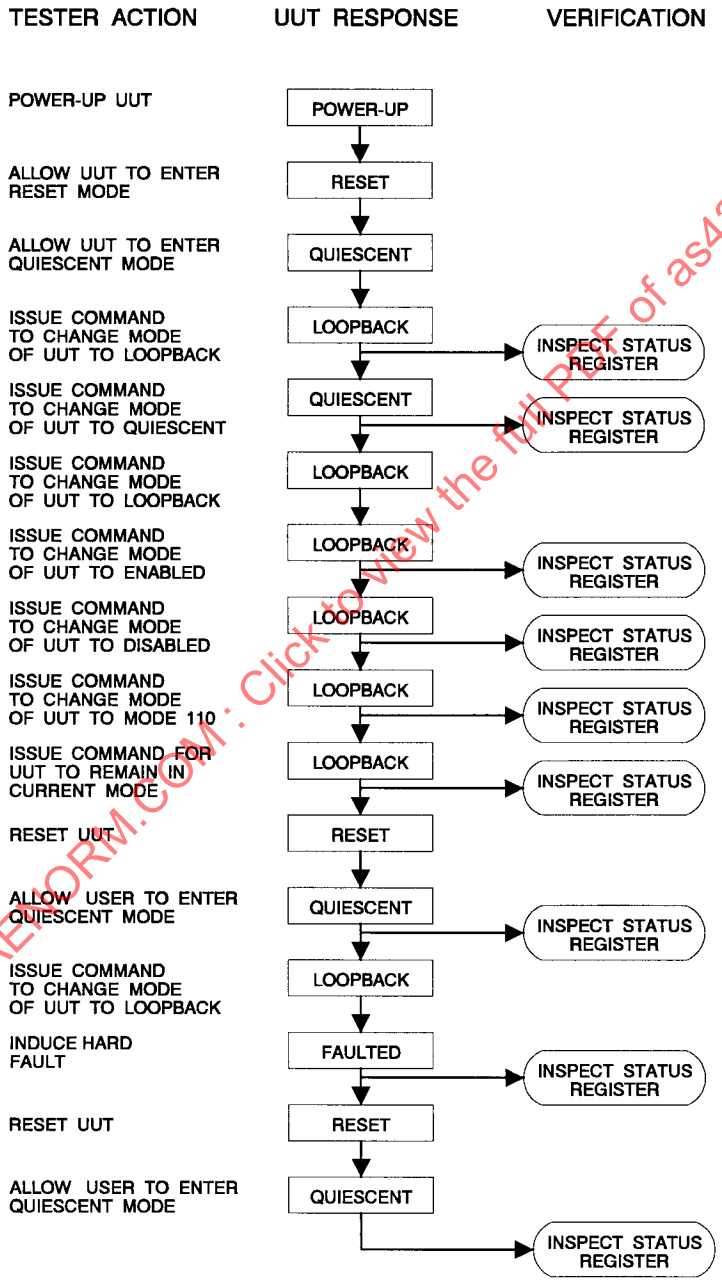

FIGURE 16 - Test Sequence for LOOPBACK Mode

5.5.1.1.1.2 (Continued):

(12) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

(13) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.1.3 DISABLED Mode (See Figure 17):

a. PURPOSE: The purpose of this test is to verify the creation and formatting of the Status Register field in the Status Report when the UUT transitions to and from the DISABLED mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $84A0_{16}$. The UUT shall enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(5) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

5.5.1.1.1.3 (Continued):

(6) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 3 of Figure 14.

(7) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

(8) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to the LOOPBACK mode (illegal mode transition), the Command Register reading $24A0_{16}$. The UUT shall remain in the DISABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 2 of Figure 14.

(9) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to RESERVED mode 110 (illegal mode transition), the Command Register reading $C4A0_{16}$. The UUT shall remain in the DISABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

(10) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $04A0_{16}$ (remain in current state). The UUT shall remain in the DISABLED mode .

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

(11) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the Quiescent mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(12) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

TEST SEQUENCE FOR MODE TRANSITIONS TO AND FROM THE DISABLED MODE

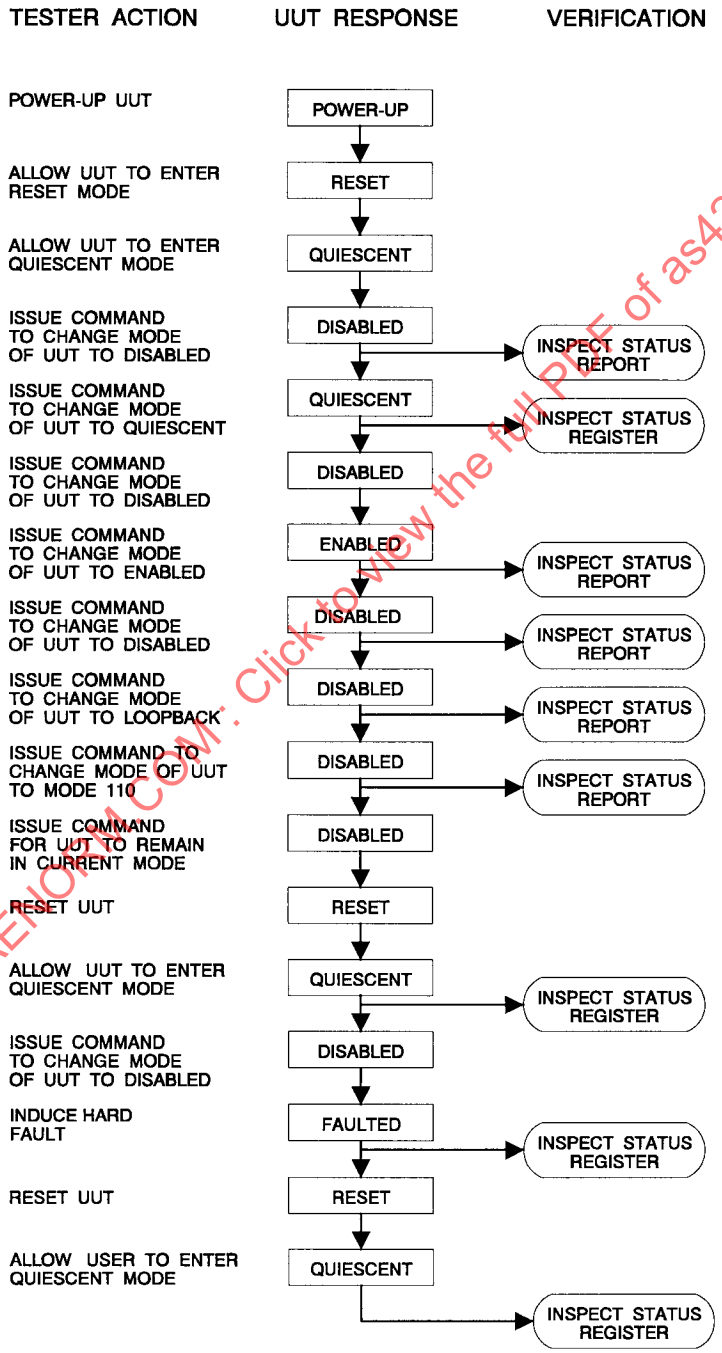

FIGURE 17 - Test Sequence for DISABLED Mode

5.5.1.1.1.3 (Continued):

(13) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

(14) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.1.4 ENABLED Mode (See Figure 18):

a. PURPOSE: The purpose of this test is to verify the creation and formatting of the Status Register field in the status report when the UUT transitions to and from the ENABLED mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

(5) Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 3 of Figure 14.

(6) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(7) Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 2 of Figure 14.

(8) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

5.5.1.1.1.4 (Continued):

(9) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to the QUIESCENT mode (illegal mode transition), the Command Register reading $84A0_{16}$. The UUT shall remain in the ENABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 3 of Figure 14.

(10) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to the LOOPBACK mode (illegal mode transition), the Command Register reading $24A0_{16}$. The UUT shall remain in the ENABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 3 of Figure 14.

(11) Transmit across the LTPB to the UUT the Mode Control Command to change the mode of the UUT to RESERVED mode 110 (illegal mode transition), the Command Register reading $C4A0_{16}$. The UUT shall remain in the ENABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 3 of Figure 14.

(12) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $04A0_{16}$ (remain in current state). The UUT shall remain in the ENABLED mode.

Repeat step (8) of 5.5.1.1.1.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in row 3 of Figure 14.

(13) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(14) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(15) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

(16) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

TEST SEQUENCE FOR MODE TRANSITIONS TO AND FROM THE ENABLED MODE

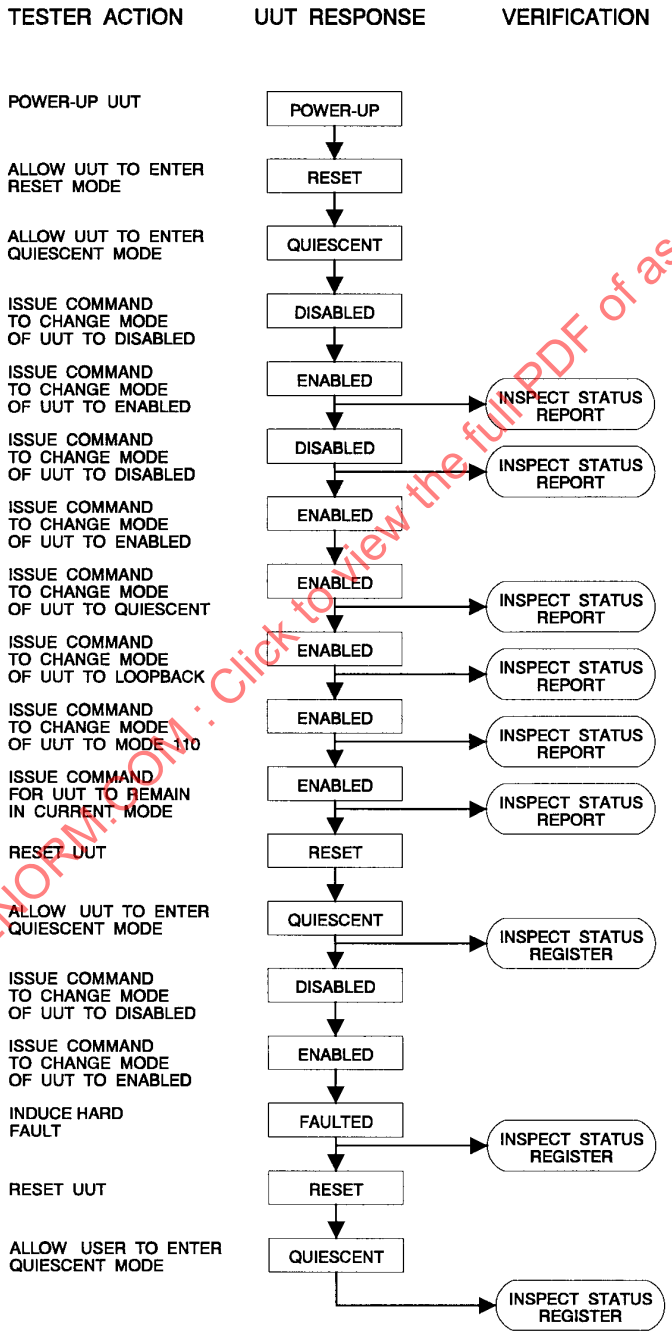

FIGURE 18 - Test Sequence for ENABLED Mode

5.5.1.1.1.4 (Continued):

(17) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register field shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.1.5 RESET Mode (See Figure 19):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT when it transitions to and from the RESET mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLE mode.

(5) Transmit across the LTPB to the UUT a Report Configuration Command:

FT	110
PX	00
SMC	010
SA	Physical address of UUT
DA	Physical address of station other than UUT
WC	1
LC	0
RC	1
RS	0
RT	0

On the following token hold the UUT shall issue a Configuration Report formatted as specified in Figure 3.4.2.1.1 of AS4074. The report shall contain the default initialization timer values specified in the appropriate slash sheet of AS4074.

5.5.1.1.1.5 (Continued):

(6) Transmit across the LTPB to the UUT a Load Configuration Command:

FT	110
PX	00
SMC	010
SA	Physical address of UUT
DA	Physical address of station other than UUT
WC	B_{16}
LC	1
RC	1
RS	0
RT	0
TPT	Max Value ($FFFF_{16}$)
BAT	Max Value ($FFFF_{16}$)
RAT	Max Value ($FFFF_{16}$)
THT	Max Value ($FFFF_{16}$)
TRT1	Max Value ($FFFF_{16}$)
TRT2	$FFFE_{16}$
TRT3	$FFFD_{16}$
MSA	Max Value
TSM Update Rate	Max Value

On the following token hold the UUT shall issue a Configuration Report formatted as specified in Figure 3.4.2.1.1 of AS4074. The report shall contain the loaded values in the corresponding fields.

(7) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(8) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(9) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

TEST SEQUENCE FOR MODE TRANSITIONS TO AND FROM THE RESET MODE

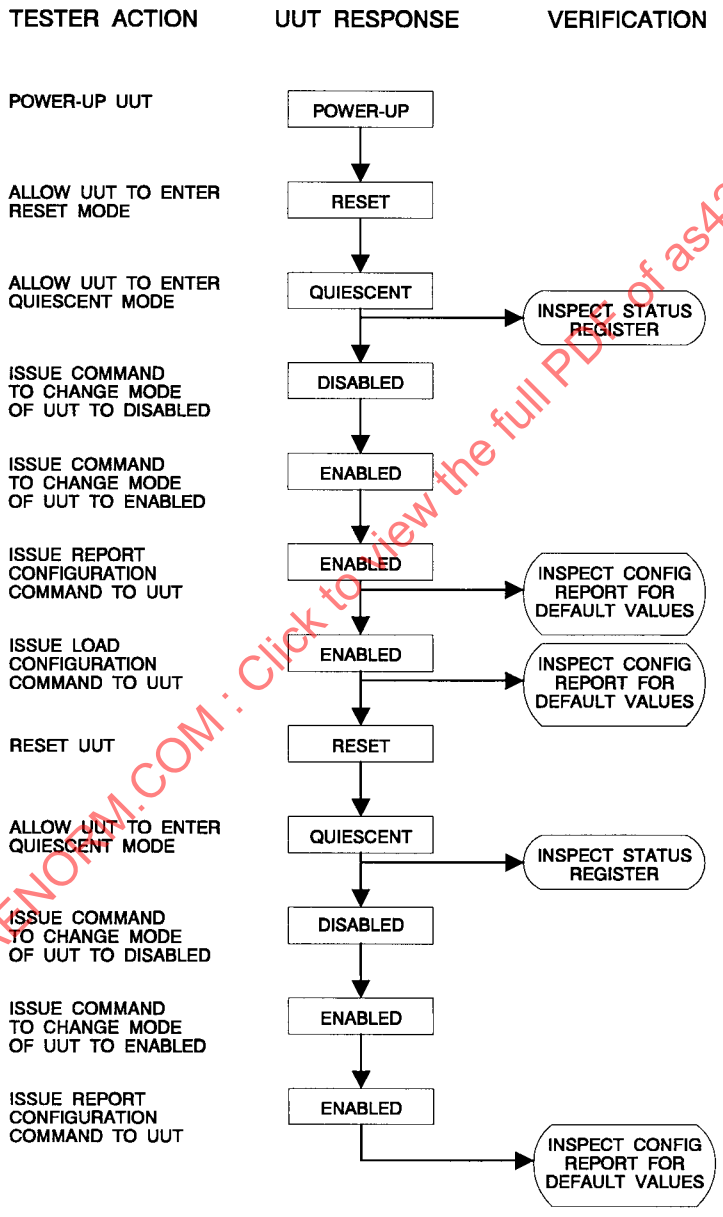

FIGURE 19 - Test Sequence for RESET Mode

5.5.1.1.1.5 (Continued):

(10) Repeat step (5) of this section.

On the following token hold the UUT shall issue a Configuration Report formatted as specified in Figure 3.4.2.1.1 of AS4074. The report shall contain the default initialization timer values specified in the appropriate slash sheet of AS4074.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. In addition, the UUT shall perform initialization and self-test in accordance with AS4074 when a RESET mode control command is received. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.1.6 FAULTED Mode (See Figure 20):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT when it transitions to and from the FAULTED mode.

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

(4) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(5) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $24A0_{16}$. The UUT shall enter the LOOPBACK mode.

(6) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

5.5.1.1.1.6 (Continued):

(7) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(8) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(9) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

(10) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

(11) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(12) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

(13) Induce a hard fault by precluding operation on each path. The UUT shall cease all operations, disable its transmitters and receivers on both paths A and B, and enter the FAULTED mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 5 of Figure 14.

(14) Through the BIU/Host interface, transmit a Mode Control Command with the Command Register reading $E4A0_{16}$. The UUT shall reset, perform self-test, and enter the QUIESCENT mode.

Through the BIU/Host interface, read the contents of the BIU Status Register. The Status Register shall read as shown in row 4 of Figure 14.

b. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

TEST SEQUENCE FOR MODE TRANSITIONS TO AND FROM THE FAULTED MODE

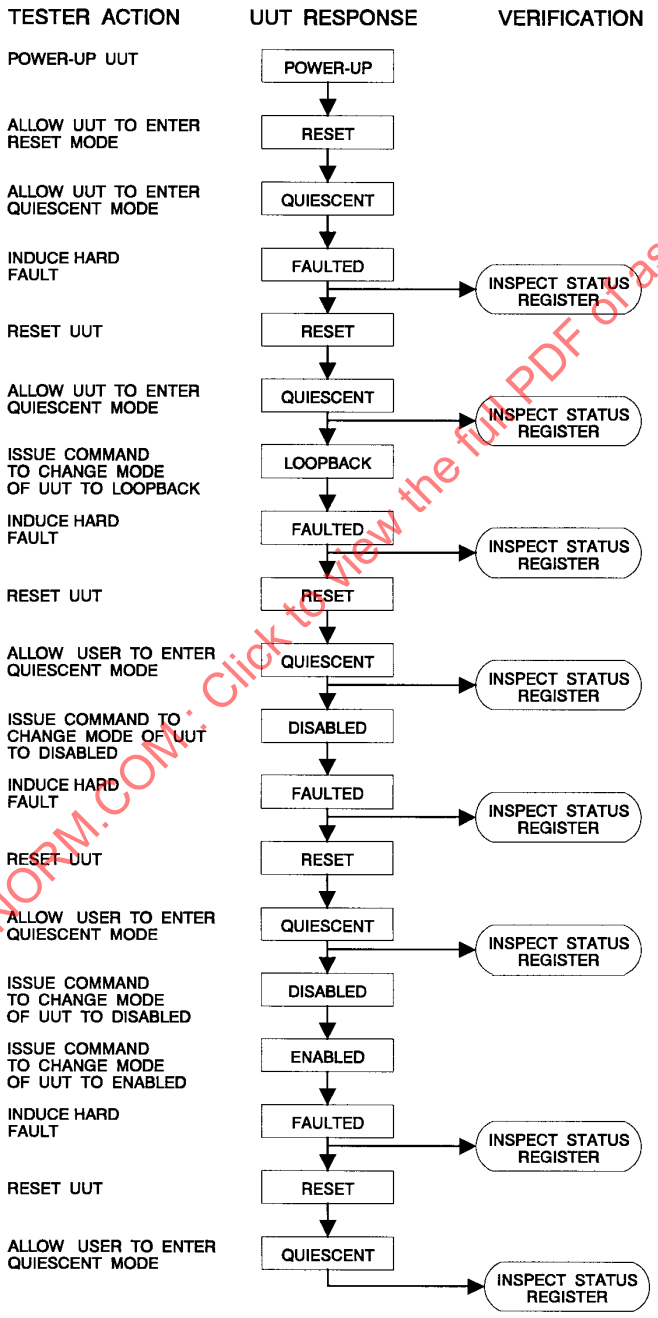

FIGURE 20 - Test Sequence for FAULTED Mode

5.5.1.1.2 BIU Media Interface Operational Modes:

5.5.1.1.2.1 ENABLE BUS Mode:

a. PURPOSE: The purpose of this test is to verify operation of the UUT Bus A and Bus B interfaces while functioning in the ENABLED BUS mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $04A0_{16}$. The Bus A and Bus B transmitters and receivers shall be enabled to full power.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading 4020_{16}. The UUT shall enter the DISABLED mode.

(5) Transmit across the LTPB to the UUT the following Station Management Frame:

FT	110
Px	00
SMC	010
DA	Physical address of UUT
SA	Physical address of station other than UUT
WC	1
LC	0
RC	0
RS	1
RT	0

(6) The UUT shall issue a Status Report and the Status Register field shall read as shown in step 1 of Figure 21.

c. CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

Step	Mode	Bus A	Bus B	TME	Rsvd	RXM	RPB
1	010	001	001	0	XXXX	X	X
2	010	010	001	0	XXXX	X	X
3	010	011	001	0	XXXX	X	X
4	100	100	001	0	XXXX	X	X
5	100	001	001	0	XXXX	X	X
6	010	111	001	0	XXXX	X	X

Rsvd = Reserved, X = Ignore

FIGURE 21 - Contents of Status Register for Testing BIU Media Interface Operational Modes

5.5.1.1.2.2 ENABLE BUS TEST Mode:

a. PURPOSE: The purpose of this test is to verify operation of the UUT Bus A interface while functioning in the ENABLE BUS TEST mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $08A0_{16}$. The Bus A test mode shall be enabled with the transmitter output at half power.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading 4020_{16}. The UUT shall enter the DISABLED mode.

(5) Repeat step (5) of 5.5.1.1.2.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in step 2 of Figure 21.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.2.3 ENABLE RECEIVER ONLY Mode:

a. PURPOSE: The purpose of this test is to verify operation of the UUT Bus A interface while functioning in the ENABLE RECEIVER ONLY mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $0CA0_{16}$. The Bus A receiver shall be enabled and the Bus A transmitter shall be disabled.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading 4020_{16}. The UUT shall enter the DISABLED mode.

(5) Repeat step (5) of 5.5.1.1.2.1. The UUT shall issue a Status Report on path B and the Status Register field shall read as shown in step 3 of Figure 21.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.2.4 DISABLE DATA STREAMING TIMER and ENABLE TPO TEST Mode:

a. PURPOSE: The purpose of this test is to verify operation of the UUT Bus A interface while the Bus A Data Streaming Timer is disabled and the UUT Bus A interface is enabled for TPO test.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $14A0_{16}$. The Bus A Data Streaming Timer shall be disabled.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading 1020_{16}. The TPO Test of Bus A shall be enabled and the UUT shall transmit a continuous preamble.

5.5.1.1.2.4 (Continued):

(5) Through the BIU/Host interface, read the contents of the Status Register. The Status Register shall read as shown in step 4 of Figure 21.

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.2.5 RESET DATA STREAMING TIMER Mode:

a. PURPOSE: The purpose of this test is to verify operation of the UUT Bus A interface while the Bus A Data Streaming Timer is reset.

(1) Repeat steps (1) through (4) of 5.5.1.1.2.4.

(2) Through the BIU/Host interface, transmit the Mode Control Command 1820_{16} to reset the Data Streaming Timer. The UUT shall cease transmission of the continuous preamble after Data Streaming Timer timeout.

(3) Through the BIU/Host interface, read the contents of the Status Register. The Status Register shall read as shown in step 5 of Figure 21.

b. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.1.2.6 DISABLE BUS Mode:

a. PURPOSE: The purpose of this test is to verify operation of the UUT Bus A interface while functioning in the DISABLED mode.

b. TEST METHOD: The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $1CA0_{16}$. The Bus A transmitter and receiver shall be disabled.

(4) Transmit across the LTPB to the UUT, on path B, a Mode Control Command with the Command Register reading 4020_{16}. The UUT shall enter the DISABLED mode.

(5) Repeat step (5) of 5.5.1.1.2.1. The UUT shall issue a Status Report and the Status Register field shall read as shown in step 6 of Figure 21.

5.5.1.1.2.6 (Continued):

c. PASS CRITERIA: There shall be complete agreement between the contents of the Status Register and the mode of the UUT. The Status Report shall be formatted as specified in Figure 3.4.2.2-1 of AS4074. The BIU Status Register shall be formatted as specified in Figure 3.4.2.2.1-1 of AS4074.

5.5.1.2 BIU Error Register:

5.5.1.2.1 BIU Error Register (Receive): The purpose of these tests is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report upon receiving invalid messages(s) from the LTPB.

5.5.1.2.1.1 Receiver Parity Error (Receive):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT receives a message containing a parity error.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. The following steps shall be accomplished in order:

(1) Power up the UUT and allow sufficient time for the UUT to perform built-in test before proceeding.

(2) Allow the UUT to enter the QUIESCENT mode after successful completion of initialization and self-test.

(3) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $44A0_{16}$. The UUT shall enter the DISABLED mode.

(4) Transmit across the LTPB to the UUT a Mode Control Command with the Command Register reading $64A0_{16}$. The UUT shall enter the ENABLED mode.

(5) Transmit a message frame to the UUT containing a parity error.

(6) Transmit across the LTPB to the UUT the following Station Management Frame:

FT	110
Px	00
SMC	010
DA	Physical address of UUT
SA	Physical address of station other than UUT
WC	1
LC	0
RC	0
RS	1
RT	0

5.5.1.2.1.1 (Continued):

c. PASS CRITERIA: The UUT BIU Error Register bits MER and RPE shall be set and the message shall be discarded and not forwarded to the Host. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits MER and RPE set.

5.5.1.2.1.2 Message Word Count Error (Receive):

a. PURPOSE: The purpose of this test is to verify the operation the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT receives a message containing a word count error.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Transmit a message frame to the UUT containing a word count error (word count not equal to the number of words stored in the receive queue). Repeat step (6) of 5.5.1.2.1.1.

c. PASS CRITERIA: The UUT BIU Error Register bits MER and WCE shall be set and the message shall be discarded and not forwarded to the Host. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits MER and WCE set.

5.5.1.2.1.3 Redundant Media Timeout (Receive):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after a redundant media timeout occurs during transmission of a message to the UUT.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Transmit a message frame to the UUT with redundant media timeout on Bus B. Repeat step (6) of 5.5.1.2.1.1.

c. PASS CRITERIA: The UUT BIU Error Register bit RMT shall be set and the BIU shall notify the Host of the fault on physical path B and shall continue normal operation. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bit RMT set.

5.5.1.2.1.4 Redundant Media Skew Error (Receive):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after a redundant media skew error occurs during transmission of a message to the UUT.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Transmit a message frame to the UUT with redundant media skew error on Bus B. Repeat step (6) of 5.5.1.2.1.1.

5.5.1.2.1.4 (Continued):

c. PASS CRITERIA: The UUT BIU Error Register bit RMS shall be set and the BIU shall notify the Host of the fault on physical path B and shall continue normal operation. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bit RMS set.

5.5.1.2.1.5 Bus A Error (Receive):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT receives a message on Bus A containing an error.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. The following steps shall be accomplished in order:

(1) Repeat steps (1) through (4) of 5.5.1.2.1.1. Transmit a message frame with a coding error on Bus A.

(2) Repeat step (6) of 5.5.1.2.1.1.

(3) Transmit a message frame to the UUT with a frame check failure on Bus A.

(4) Repeat step (2).

(5) Transmit a message frame to the UUT with the last word having less than 16 bits on Bus A.

(6) Repeat step (2).

c. PASS CRITERIA: After the UUT receives each message frame the BIU Error Register bits MER and ERA shall be set and the message shall be discarded and not forwarded to the Host. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits MER and ERA set.

5.5.1.2.1.6 Bus B Error (Receive):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT receives a message on Bus B containing an error.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. Repeat the procedure for 5.5.1.2.1.5 for Bus B.

c. PASS CRITERIA: After the UUT receives each message frame the BIU Error Register bits MER and ERB shall be set and the message shall be discarded and not forwarded to the Host. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits MER and ERB set.

5.5.1.2.1.7 Receive Queue Full (Receive):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report when the UUT receive queue is full.

b. TEST METHOD: Each message shall be transmitted across the LTPB using the test equipment and shall have a word count of 256. The following steps shall be accomplished in order:

(1) Repeat steps (1) through (4) of 5.5.1.2.1.1. Transmit sufficient valid message traffic to the UUT to completely fill the receive queue space at all priorities. No received data shall be removed from the UUT receive queue. Repeat step (6) of 5.5.1.2.1.1.

(2) Transmit one message each at all priorities to the UUT. Repeat step (6) of 5.5.1.2.1.1.

c. PASS CRITERIA: For steps a) and b), the UUT BIU Error Register bit RQF shall be set and the UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bit RQF set. For step (2), the UUT shall not queue the new messages.

5.5.1.2.2 BIU Error Register (Transmit): The purpose of these tests is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report upon receiving invalid messages(s) form the LTPB.

5.5.1.2.2.1 Transmit Message Aborted (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT aborts a message transmission.

b. TEST METHOD: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Cause the UUT to abort transmission of a message prior to completion. Repeat step (6) of 5.5.1.2.1.1.

c. PASS CRITERIA: The UUT BIU Error Register bits TXM and TMA shall be set and the BIU shall notify the Host of the fault on physical path A and shall continue normal operation. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits TXM and TMA set.

5.5.1.2.2.2 Transmitter Parity Error (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT transmits a message containing a parity error.

5.5.1.2.2.2 (Continued):

b. TEST METHOD: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Cause the UUT to transmit a message frame with a parity error. Repeat step (6) of 5.5.1.2.1.1

c. PASS CRITERIA: The UUT BIU Error Register bits TXM and TPE shall be set and the UUT shall continue normal operation. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits TXM and TPE set.

5.5.1.2.2.3 Bus A Error (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT transmits on Bus A a message frame containing an error.

b. TEST METHOD: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. The following steps shall be accomplished in order:

(1) Repeat steps (1) through (4) of 5.5.1.2.1.1. Cause the UUT to transmit a message frame with a coding error on Bus A.

(2) Repeat step (6) of 5.5.1.2.1.1. The UUT shall issue a Status Report and the BIU Error Register bits TXM and ERA shall be set.

(3) Cause the UUT to transmit a message frame with a frame check failure on Bus A.

(4) Repeat step (2).

(5) Cause the UUT to transmit a message frame with the last word having less than 16 bits on Bus A.

(6) Repeat step (2).

c. PASS CRITERIA: After the UUT transmits each message frame the BIU Error Register bits TXM and ERA shall be set and the UUT shall continue normal operation. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits TXM and ERA set.

5.5.1.2.2.4 Bus B Error (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report after the UUT transmits a message frame containing an error on Bus B.

5.5.1.2.2.4 (Continued):

b. TEST METHOD: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. Repeat the procedure for 5.5.1.2.2.3 for Bus B.

c. PASS CRITERIA: After the UUT transmits each message frame the BIU Error Register bits TXM and ERB shall be set and the UUT shall continue normal operation. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits TXM and ERB set.

5.5.1.2.2.5 Bus A Transmission Monitor Timeout (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report when a transmission monitor timeout occurs on Bus A.

b. TEST PROCEDURE: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Induce a transmission monitor timeout error (no echo was detected) on Bus A, indicating a media failure. Repeat step (6) of 5.5.1.2.1.1.

c. PASS CRITERIA: The Bus A MIU shall cease transmission, shall generate a fault condition to the TPIU, and shall disable itself. The Error Register bits TXM and TTA shall be set. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits TXM and TTA set.

5.5.1.2.2.6 Bus B Transmission Monitor Timeout (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT, the function of the BIU Error Register, and the formatting of the Error Register field in the Status Report when a transmission monitor timeout occurs on Bus B.

b. TEST PROCEDURE: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. Repeat procedure 5.5.1.2.2.5 for Bus B.

c. PASS CRITERIA: The Bus B MIU shall cease transmission, shall generate a fault condition to the TPIU, and shall disable itself. The Error Register bits TXM and TTB shall be set. The UUT shall issue a Status Report in the form of Figure 3.4.2.2-1 of AS4074 with the Error Register bits TXM and TTB set.

5.5.1.2.2.7 BAT Timeout (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT and the function of the BIU Error Register when a BAT timeout occurs.

b. TEST PROCEDURE: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. Repeat steps (1) through (4) of 5.5.1.2.1.1. Permit HSDB BAT timeout to occur and allow the UUT to perform bus reinitialization.

c. PASS CRITERIA: The TPIU shall notify the BIU that a BAT timeout has occurred and the BAT shall then be reset and restarted. The BIU shall initiate the Claim Token procedure. Through the BIU/Host interface, read the contents of the BIU Error Register. The BIU Error Register bits TXM and BTO shall be set.

5.5.1.2.2.8 TPT Timeout (Transmit):

a. PURPOSE: The purpose of this test is to verify the operation of the UUT and the function of the BIU Error Register when a TPT timeout occurs.

b. TEST METHOD: The test equipment shall load the UUT transmit queue with the messages frames across the BIU/Host interface. The message frames shall be addressed to a physical address other than that assigned to the UUT and shall have a word count of 256. The following steps shall be accomplished in order:

(1) Repeat steps (1) through (4) of 5.5.1.2.1.1.

(2) Permit a token passing timeout to occur. Through the BIU/Host interface, read the contents of the BIU Error Register.

(3) Permit a second token passing timeout to occur. Through the BIU/Host interface, read the contents of the BIU Error Register.

c. PASS CRITERIA: For step (2), the TPIU shall notify the BIU that a TPT timeout has occurred, the TPT shall be reset and restarted, and the UUT shall transmit a token to the current successor address. For step (3), the TPIU shall notify the BIU that a TPT timeout has occurred, the TPT shall be reset and restarted, and the UUT shall hunt for a new successor. The Error Register bits TXM and TTO shall be set for both steps (2) and (3).

5.5.2 Load/Report Configuration Command:

a. PURPOSE: This portion of the test shall verify that the UUT properly loads control parameters from a load/report configuration command addressed to it and transmits a configuration report.