# Enterprise Server Group
# Intel L440GX Box Board
# SCSI Cable Test Report

Version 1.0
March 1999

## Revision History

| Revision | Date | Revision History |
|---|---|---|
| 1.0 | 3/31/99 | Initial revision |
| | | |

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# 1. Single Ended SCSI

## 1.1 Purpose

Validate SCSI bus electrical characteristics provide adequate signal quality for normal operation in SE mode for the Lancewood box board seven connector SCSI cable. Characterize control, data, and parity lines for cross talk and signal quality.

## 1.2 Test Equipment

Server platform configured with six Seagate ST34520W Ultra wide hard drives. LeCroy* LC574AL 1GHz digital oscilloscope.

## 1.3 Test Software

Dos 6.22 and Disk Editor.

## 1.4 Test Method

1. Load channel A SCSI bus with hard drives, termination will be provided by the last drive on the SCSI bus.
2. A floppy boot disk with Disk Editor is used to boot the system and control the read/write bit patterns used for the validation process.
3. REQ., ACK., and 4 data signal lines will be monitored.
4. Data and Parity lines will be tested for cross talk by writing and reading predefined bit patterns. The four bit patterns are,
   - The data line measured is negated while all the other data lines alternate high and low.
   - The data line measured is alternating the opposite direction of all the other data lines as they alternate from high to low.
   - The data line measured is asserted while all the other data lines are alternating from high to low.
   - The data line measured is alternating the same direction of all the other data lines as they alternate from high to low.
5. The Data and Parity lines signals will be captured by triggering the oscilloscope on synchronous data transfer. If the signals are measured next to the Host controller then the signals from a read command will be measured. If the signals are measured at the targets then signals from a write command will be measured.
6. Signals are measured at three locations, the Host controller, the last drive on the SCSI bus, and the first drive on the SCSI bus.
7. Change the SCSI cable to channel B and repeat steps 2 – 6.

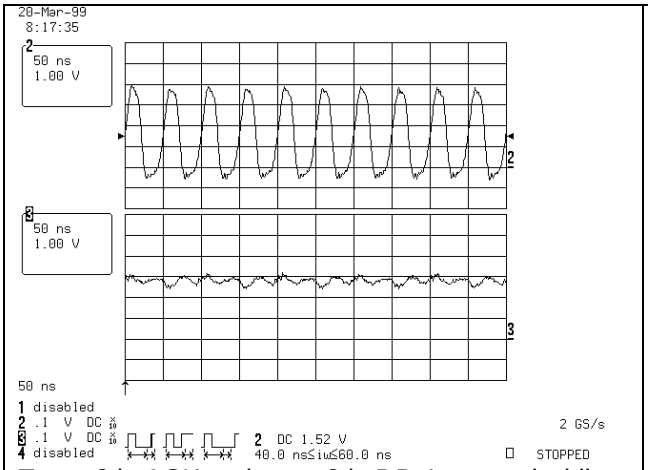
## 1.5 Pass/Fail Criteria

1. Receive timings must meet SCSI specification at the Host controller.
2. Receive timings must meet SCSI specification at the SCSI target devices.
3. Data and parity lines shall not have excessive cross talk.

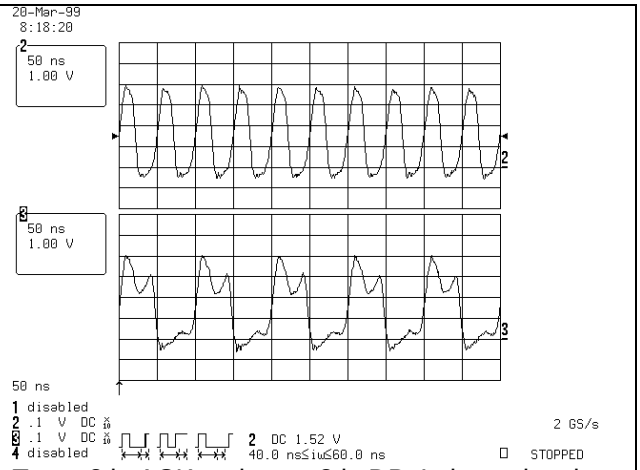
| Host Rcv. Timings Ch A | SCSI Spec. | Measured | Pass | Fail |
|---|---|---|---|---|
| Receive Assertion Period | 11ns | 27.77ns | Pass | |
| Receive Hold Time | 11.5ns | 25.07ns | Pass | |
| Receive Negation Period | 11ns | 14.32ns | Pass | |
| Receive Setup Time | 6.5ns | 14.13ns | Pass | |
| **Host Rcv. Timings Ch B** | | | | |
| Receive Assertion Period | 11ns | 27.17ns | Pass | |
| Receive Hold Time | 11.5ns | 24.52ns | Pass | |
| Receive Negation Period | 11ns | 18.17ns | Pass | |
| Receive Setup Time | 6.5ns | 18.53ns | Pass | |
| **Target Rcv. Timings Ch A** | | | | |
| Receive Assertion Period | 11ns | 27.52ns | Pass | |
| Receive Hold Time | 11.5ns | 25.02ns | Pass | |
| Receive Negation Period | 11ns | 20.87ns | Pass | |
| Receive Setup Time | 6.5ns | 20.33ns | Pass | |
| **Target Rcv. Timings Ch B** | | | | |
| Receive Assertion Period | 11ns | 27.22ns | Pass | |
| Receive Hold Time | 11.5ns | 25.32ns | Pass | |
| Receive Negation Period | 11ns | 21.17ns | Pass | |
| Receive Setup Time | 6.5ns | 20.53ns | Pass | |
| Fall and Rise Time | | | Pass | |
| Cross-Talk | | Minimal | Pass | |

## 1.6 SE mode Pictures channel A

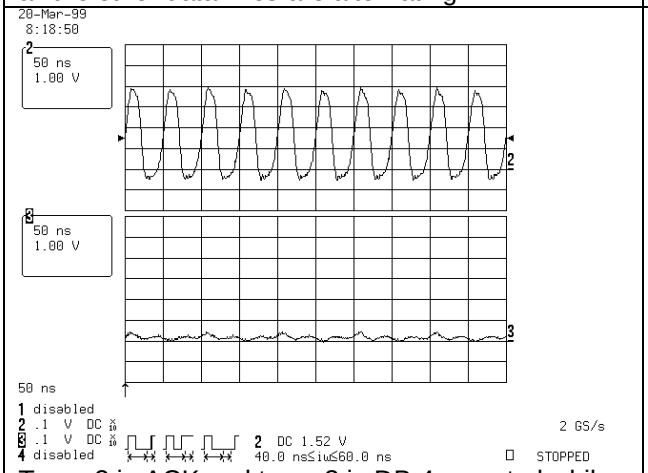
**Signals are measured at the last drive on the SCSI bus, signals originate from the host controller**.



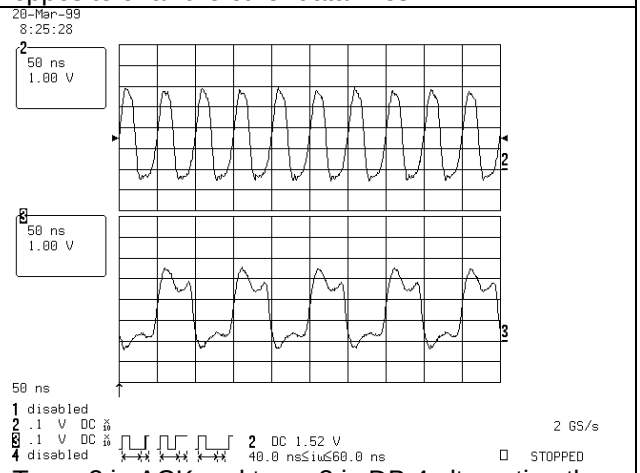

Trace 2 is ACK and trace 3 is DB 4 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 4 alternating the opposite of all the other data lines.

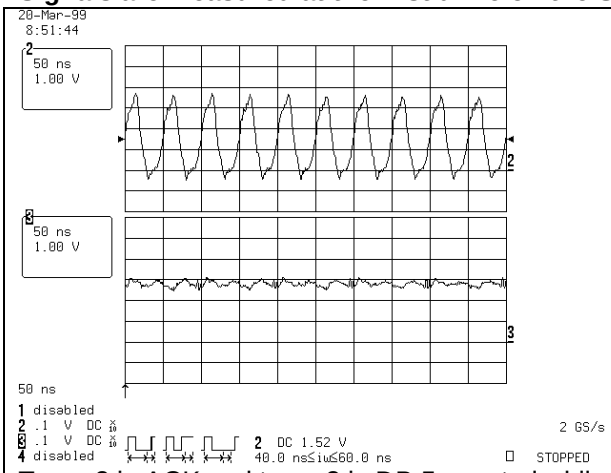



Trace 2 is ACK and trace 3 is DB 4 asserted while all the other data lines are alternating.

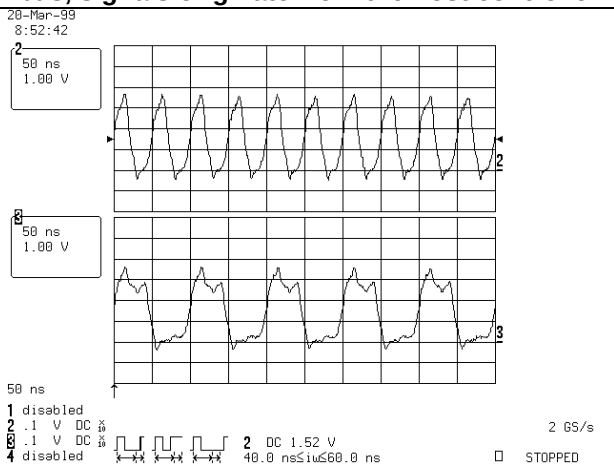



Trace 2 is ACK and trace 3 is DB 4 alternating the same direction of all the other data lines.

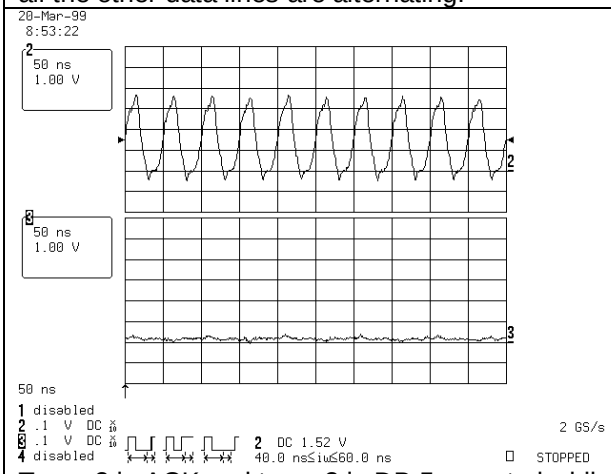
**Signals are measured at the first drive on the SCSI bus, signals originate from the host controller.**



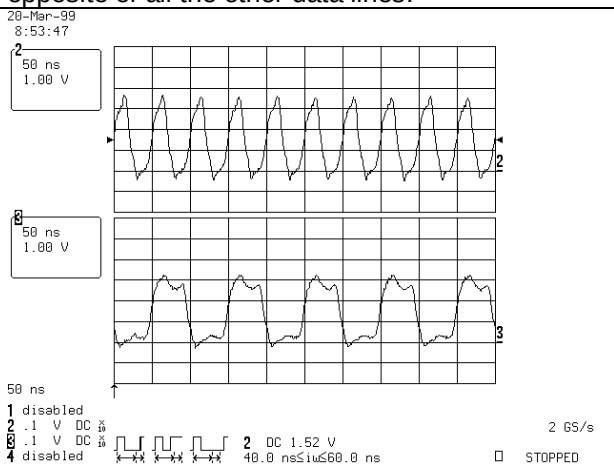

Trace 2 is ACK and trace 3 is DB 5 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 5 alternating the opposite of all the other data lines.

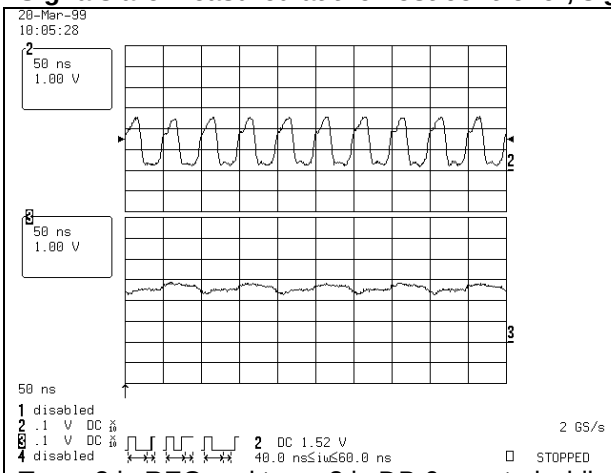



Trace 2 is ACK and trace 3 is DB 5 asserted while all the other data lines are alternating.

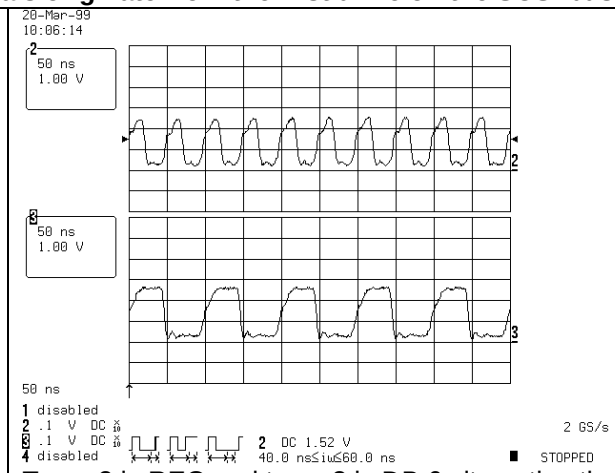



Trace 2 is ACK and trace 3 is DB 5 alternating the same direction of all the other data lines

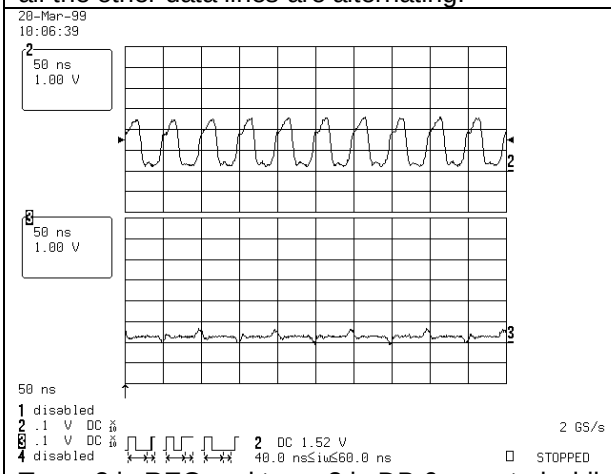
**Signals are measured at the host controller, signals originate from the first drive on the SCSI bus.**



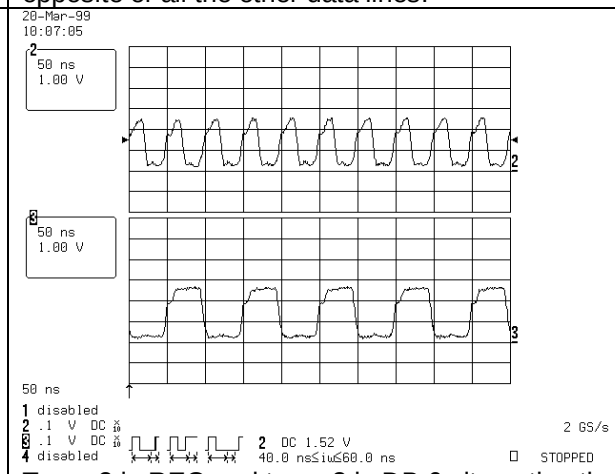

Trace 2 is REQ and trace 3 is DB 6 negated while all the other data lines are alternating.




Trace 2 is REQ and trace 3 is DB 6 alternating the opposite of all the other data lines.



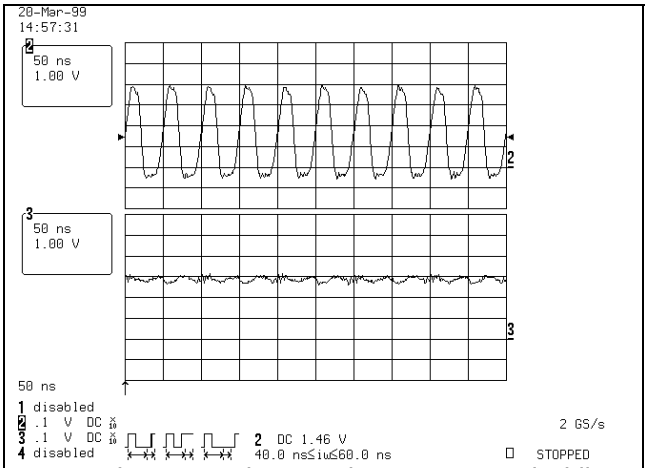

Trace 2 is REQ and trace 3 is DB 6 asserted while all the other data lines are alternating.



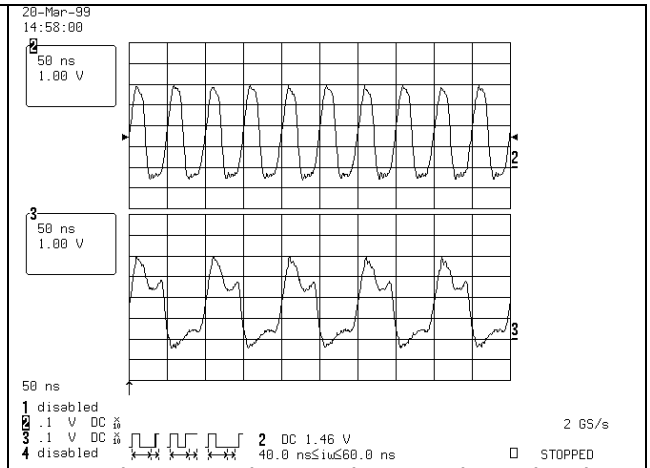

Trace 2 is REQ and trace 3 is DB 6 alternating the same direction of all the other data lines

## 1.7 SE mode Pictures channel B

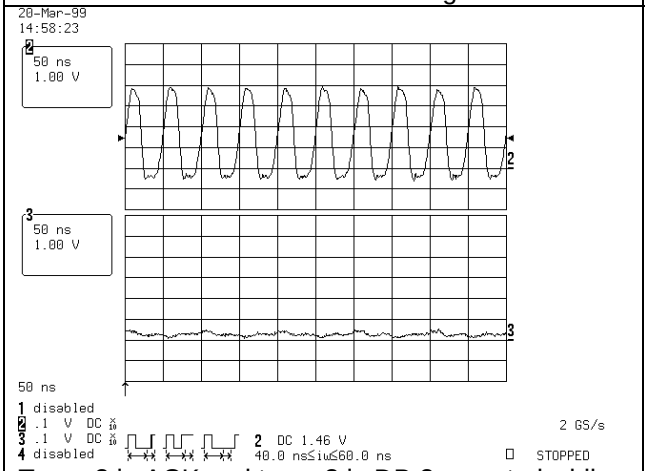
**Signals are measured at the last drive on the SCSI bus, signals originate from the host controller**.



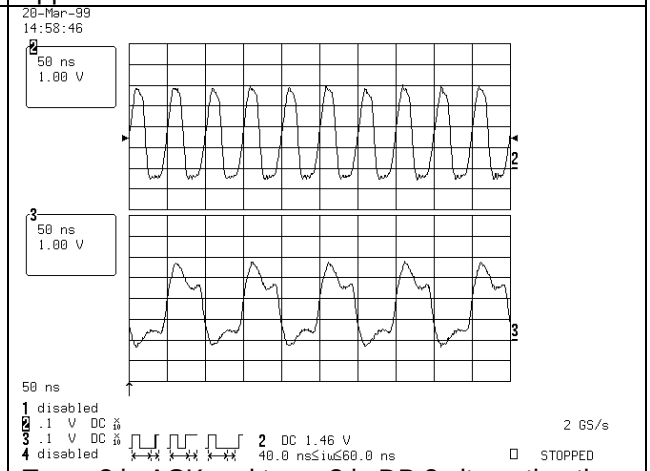

Trace 2 is ACK and trace 3 is DB 2 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 2 alternating the opposite as all the other data lines.

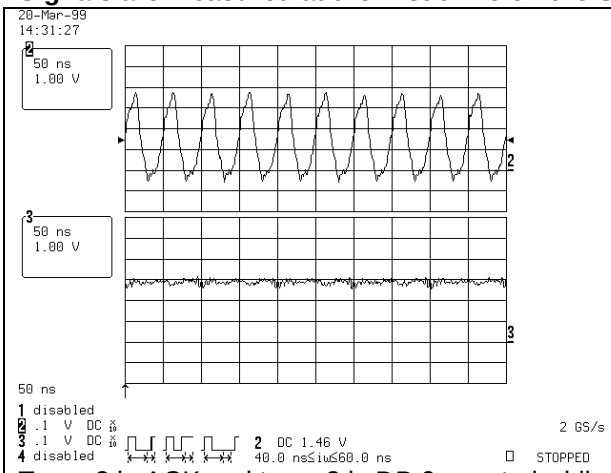



Trace 2 is ACK and trace 3 is DB 2 asserted while all the other data lines are alternating.

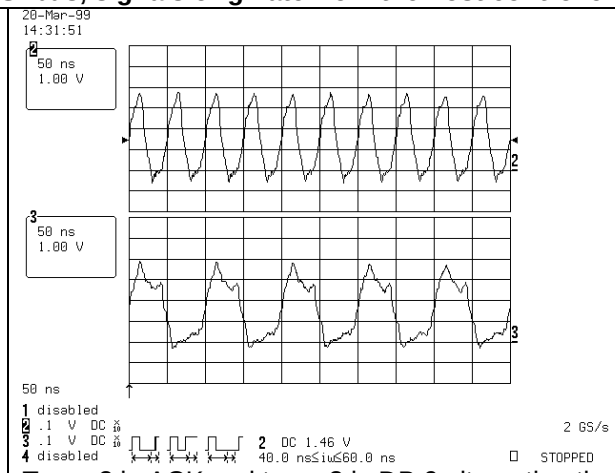



Trace 2 is ACK and trace 3 is DB 2 alternating the same direction as all the other data lines.

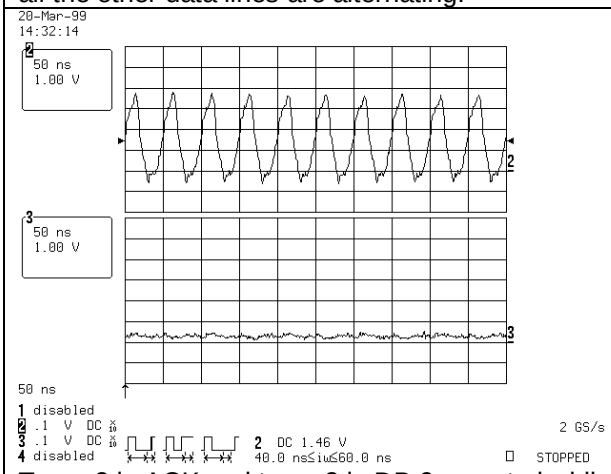
**Signals are measured at the first drive on the SCSI bus, signals originate from the host controller.**



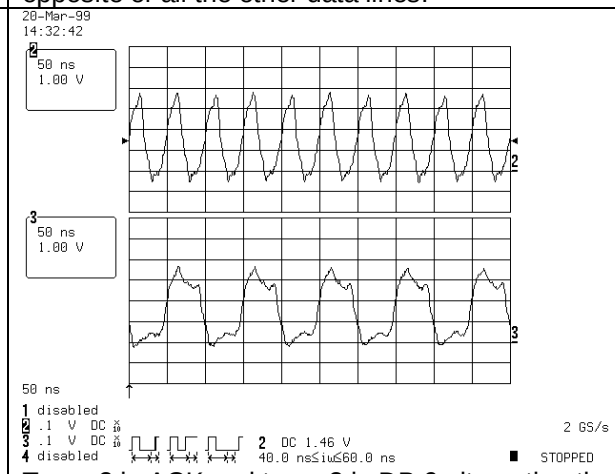

Trace 2 is ACK and trace 3 is DB 9 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 9 alternating the opposite of all the other data lines.

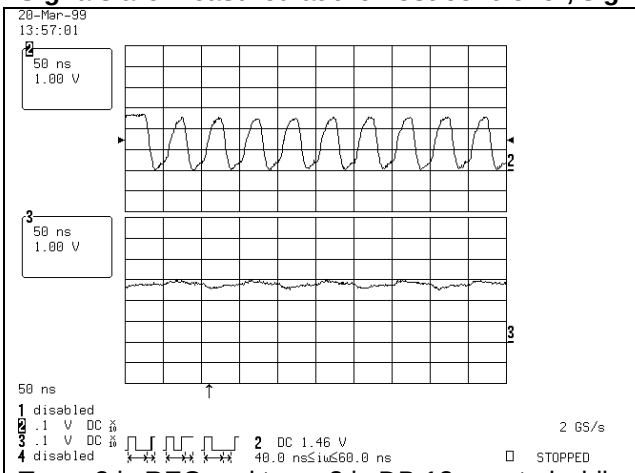



Trace 2 is ACK and trace 3 is DB 9 asserted while all the other data lines are alternating.

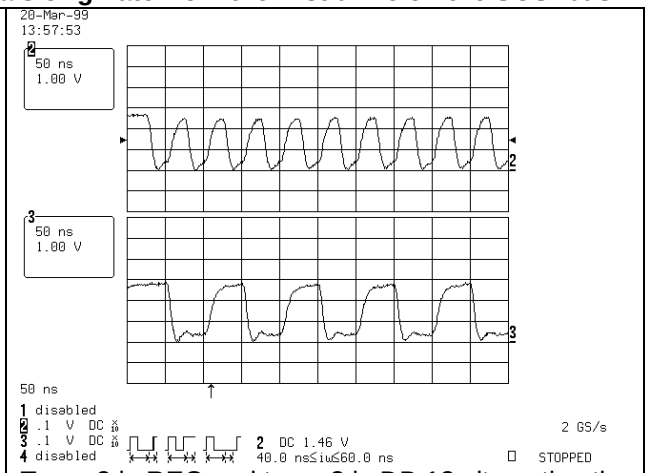



Trace 2 is ACK and trace 3 is DB 9 alternating the same direction of all the other data lines

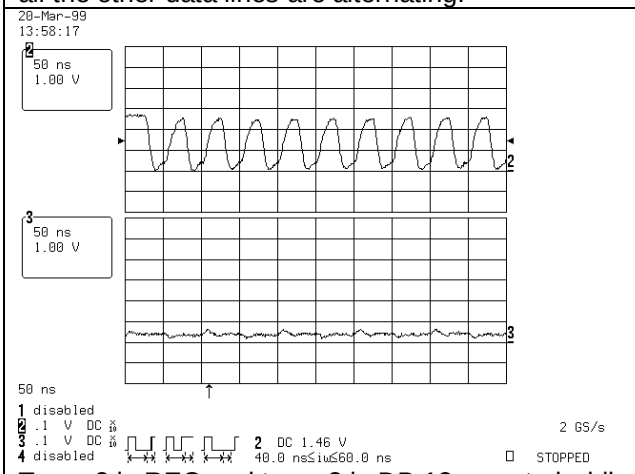
**Signals are measured at the host controller, signals originate from the first drive on the SCSI bus.**



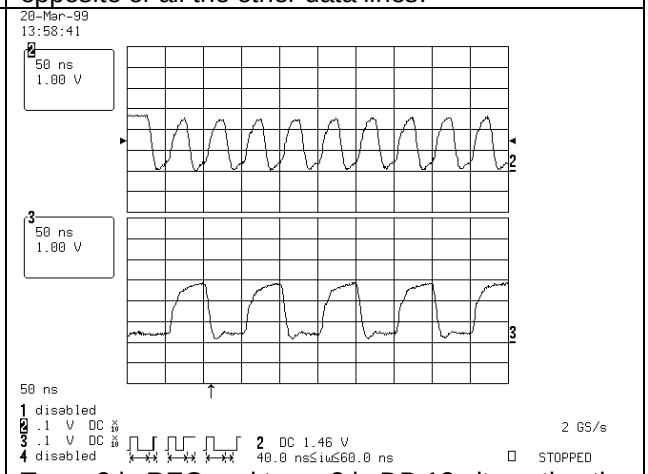

Trace 2 is REQ and trace 3 is DB 12 negated while all the other data lines are alternating.




Trace 2 is REQ and trace 3 is DB 12 alternating the opposite of all the other data lines.




Trace 2 is REQ and trace 3 is DB 12 asserted while all the other data lines are alternating.




Trace 2 is REQ and trace 3 is DB 12 alternating the same direction of all the other data lines

## 1.8 Summary

Since this is the same cable used with Nightshade, and signal quality on all data and control signal lines have been looked at, SE mode signal characteristic for Lancewood are made by sampling 4 data lines along with REQ. and ACK. signal lines. Reflections and ringing, although present, are within acceptable limits. Signal quality for channel A and channel B provides more than enough margin to meet SCSI timing requirements, cross talk is minimal, fall and rise times are nominal.

# 2. LVD SCSI

## 2.1 Purpose

Validate SCSI bus electrical characteristics provide adequate signal quality for normal operation in LVD mode for Lancewood box board seven connector SCSI cable. Check all control, data, and parity lines for cross talk and signal quality.

## 2.2 Test Equipment

Server platform configured with five Seagate ST318203LW Ultra 2 wide hard drives, LeCroy* LC574AL 1GHz digital oscilloscope, Tektronix* P6247 1GHz differential probes.

## 2.3 Test Software

Dos 6.22 and Disk Editor.

## 2.4 Test Method

1. Load the SCSI bus with 5 Seagate ST318203LW hard drives, attach sample 1 terminator to the last connector on the cable.
2. A floppy boot disk with Disk Editor is used to boot the system and control the read/write bit patterns used for the validation process.
3. Data and Parity lines will be tested with a differential probe for cross talk by writing and reading predefined bit patterns. The four bit patterns are,
   - The data line measured is negated while all the other data lines alternate high and low.
   - The data line measured is alternating the opposite direction of all the other data lines as they alternate from high to low.
   - The data line measured is asserted while all the other data lines are alternating from high to low.
   - The data line measured is alternating the same direction of all the other data lines as they alternate from high to low.
4. The Data and Parity lines signals will be captured by triggering the oscilloscope on synchronous data transfer. If the signals are tested next to the Host controller then the signals from a read command will be measured. If the signals are being tested at the targets then signals from a write command will be measured.
5. Signals are measured at three locations, the Host controller, the last drive on the SCSI bus, and the first drive on the SCSI bus.
6. Control lines are measured during a read command.
7. Change terminator to sample 2 and repeat steps 2 – 5.

## 2.5 Pass/Fail Criteria

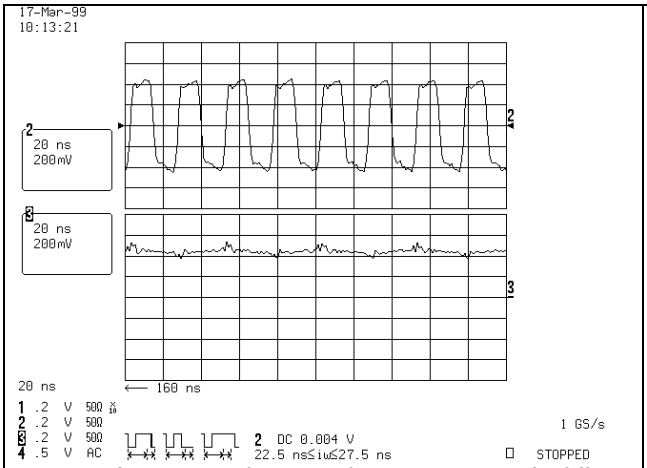
1. Receive timings must meet SCSI specification at the Host controller.
2. Receive timings and must meet SCSI specification at the SCSI target devices.
3. Data and parity lines will not have excessive cross talk.

| Host Receive Timings | SCSI Spec. | Measured | Pass | Fail |
|---|---|---|---|---|
| Receive Assertion Period | 6.5ns | 12.10ns | Pass | |
| Receive Hold Time | 4.75ns | 11.60ns | Pass | |
| Receive Negation Period | 6.5ns | 12.20ns | Pass | |
| Receive Setup Time | 4.75ns | 12.40ns | Pass | |
| **Target Receive Timings** | | | | |
| Receive Assertion Period | 6.5ns | 12.12ns | Pass | |
| Receive Hold Time | 4.75ns | 12.10ns | Pass | |
| Receive Negation Period | 6.5ns | 11.92ns | Pass | |
| Receive Setup Time | 4.75ns | 12.27ns | Pass | |
| Cross Talk | | Minimal | Pass | |

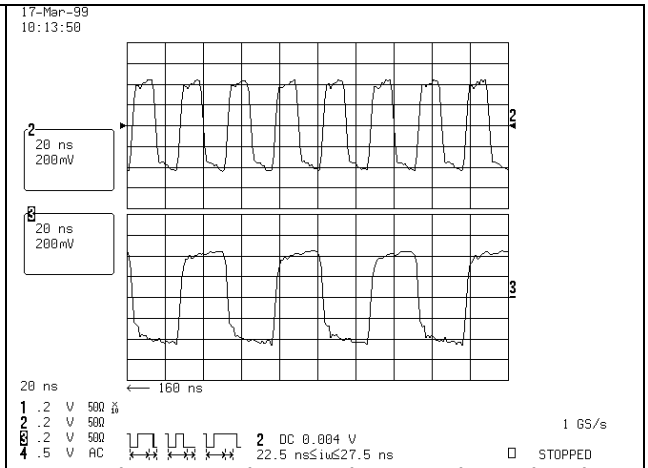
## 2.6 LVD mode Pictures terminator sample 1

Terminator sample 1 is an Amphenol P/N 503380001.

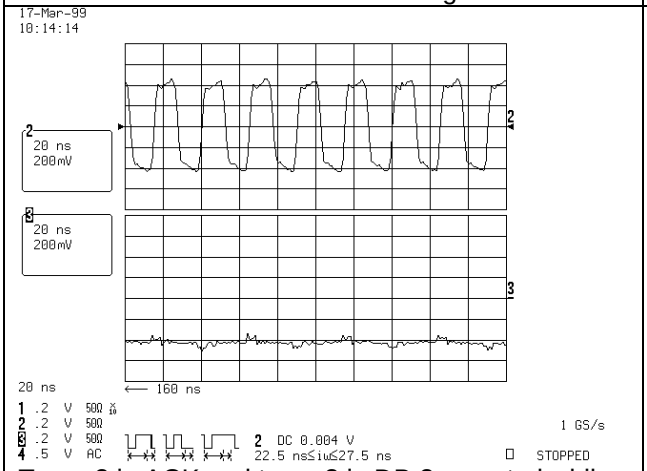
**Signals are measured at the last drive on the SCSI bus, signals originate from the host controller**.



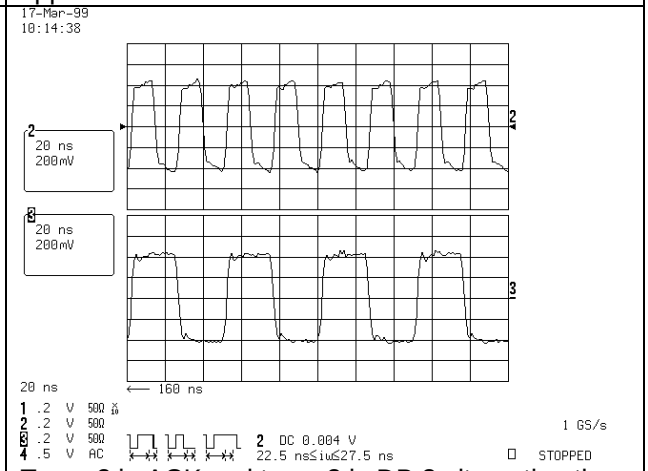

Trace 2 is ACK and trace 3 is DB 3 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 3 alternating the opposite of all the other data lines.

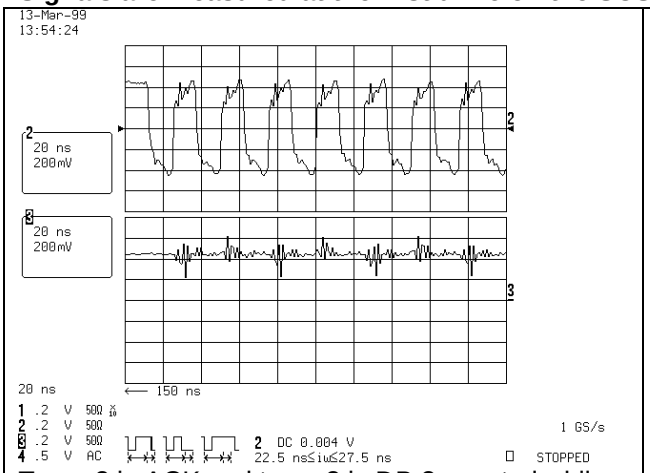



Trace 2 is ACK and trace 3 is DB 3 asserted while all the other data lines are alternating.

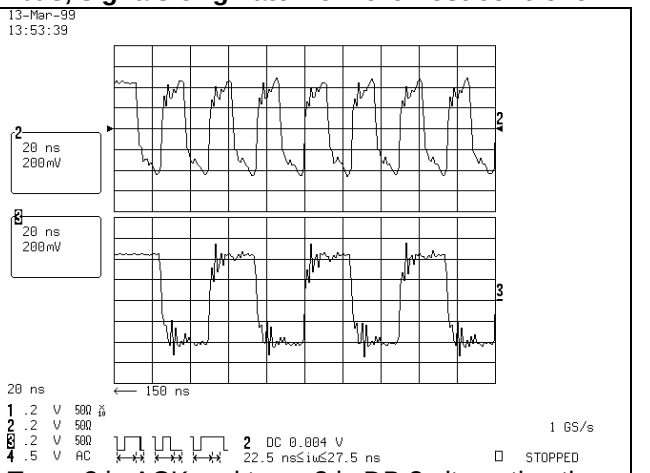



Trace 2 is ACK and trace 3 is DB 3 alternating the same direction of all the other data lines.

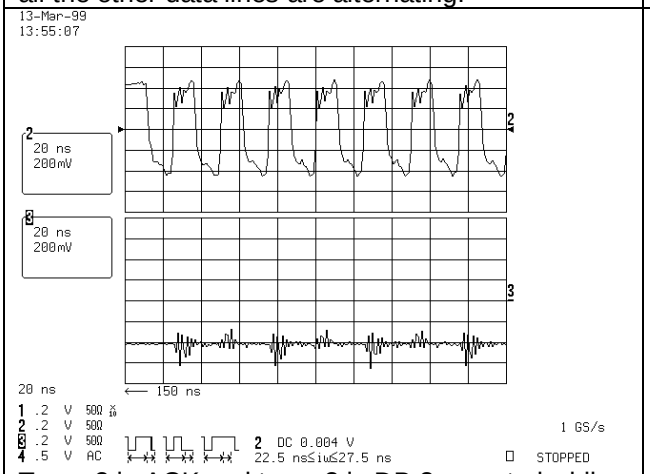
**Signals are measured at the first drive on the SCSI bus, signals originate from the host controller.**



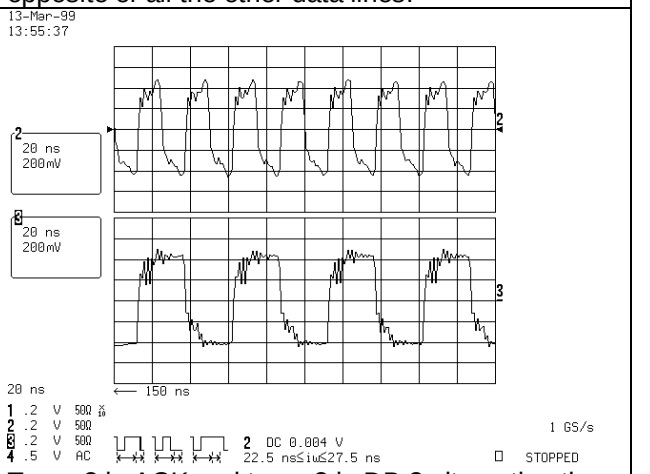

Trace 2 is ACK and trace 3 is DB 3 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 3 alternating the opposite of all the other data lines.

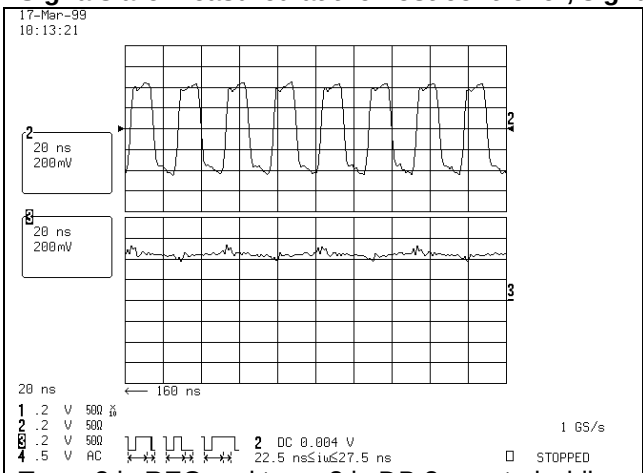



Trace 2 is ACK and trace 3 is DB 3 asserted while all the other data lines are alternating.

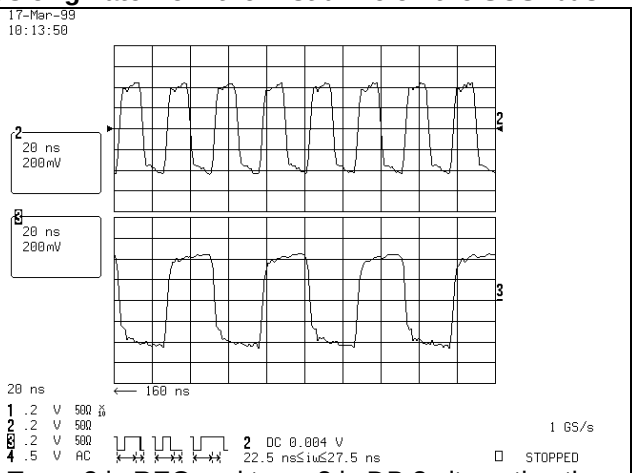



Trace 2 is ACK and trace 3 is DB 3 alternating the same direction of all the other data lines

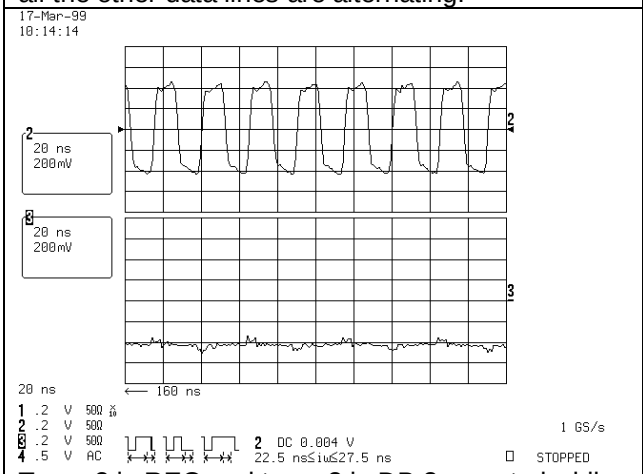
**Signals are measured at the host controller, signals originate from the first drive on the SCSI bus.**



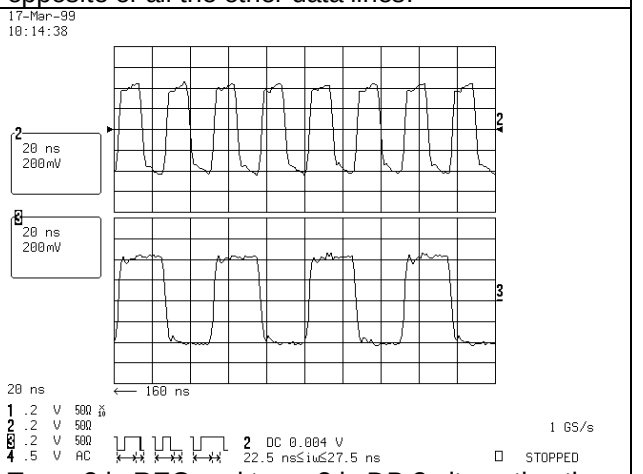

Trace 2 is REQ and trace 3 is DB 3 negated while all the other data lines are alternating.




Trace 2 is REQ and trace 3 is DB 3 alternating the opposite of all the other data lines.




Trace 2 is REQ and trace 3 is DB 3 asserted while all the other data lines are alternating.

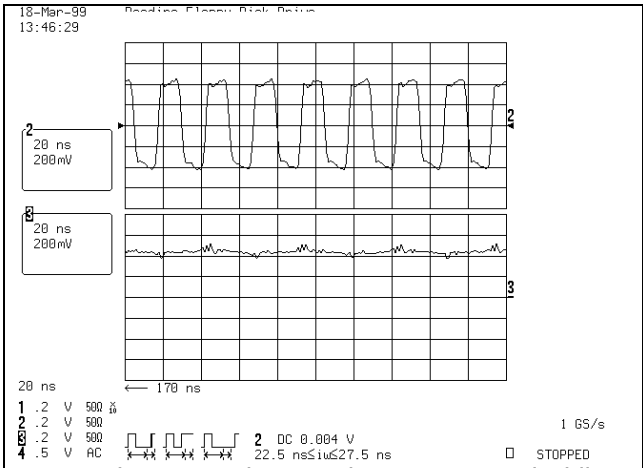



Trace 2 is REQ and trace 3 is DB 3 alternating the same direction of all the other data lines

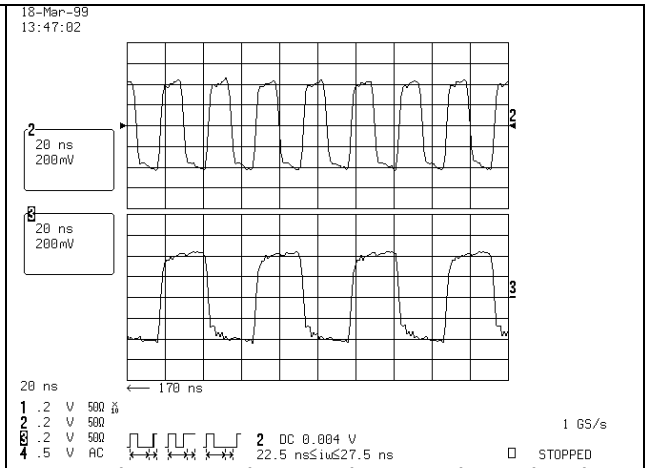
## 2.7 LVD mode Pictures terminator sample 2

Terminator sample 2 is a CS Electronics P/N TRM-8662.

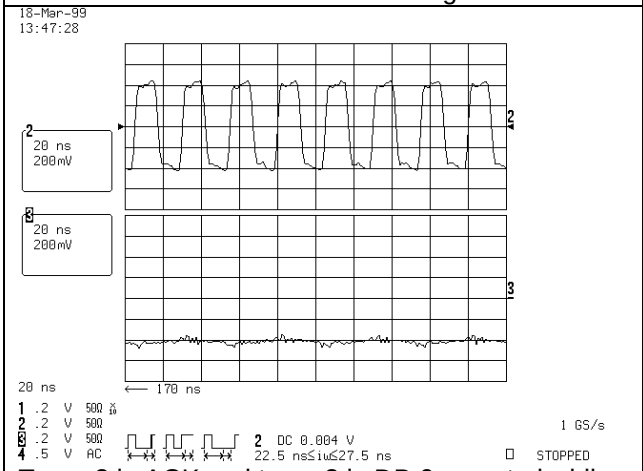
**Signals are measured at the last drive on the SCSI bus, signals originate from the host controller**.



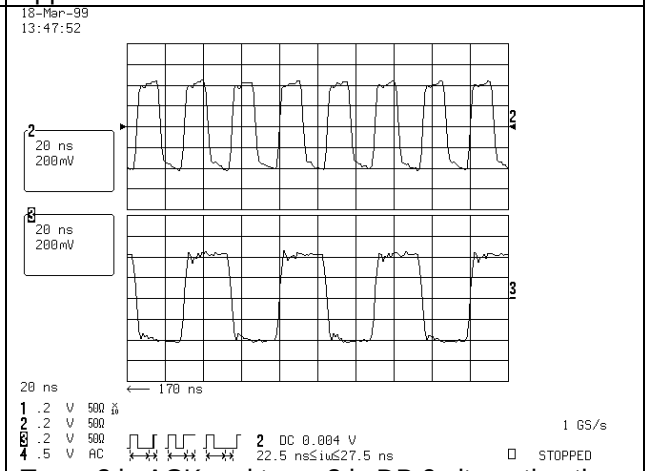

Trace 2 is ACK and trace 3 is DB 0 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 0 alternating the opposite of all the other data lines.

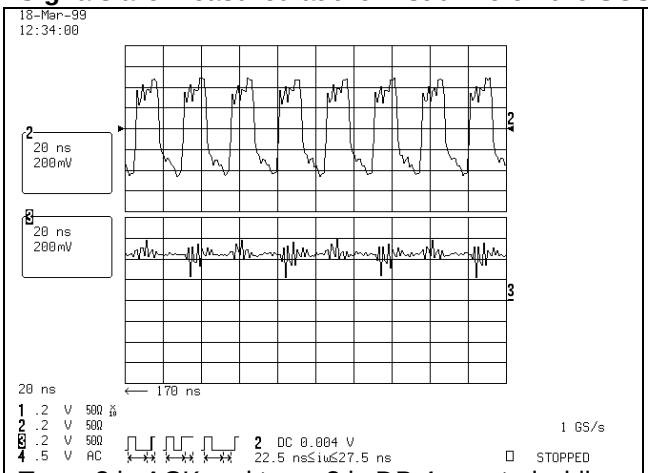



Trace 2 is ACK and trace 3 is DB 0 asserted while all the other data lines are alternating.

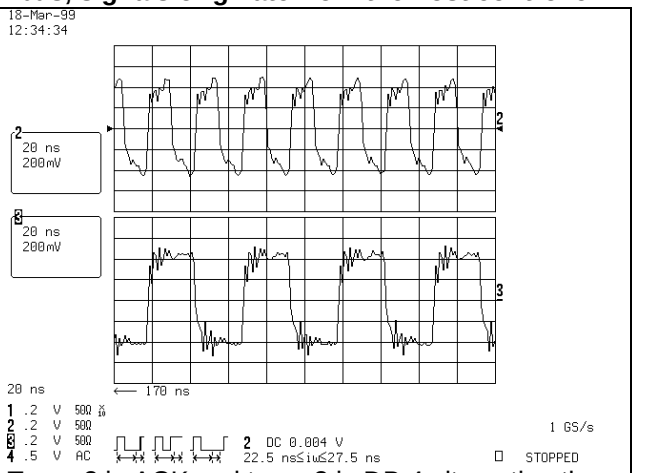



Trace 2 is ACK and trace 3 is DB 0 alternating the same direction of all the other data lines.

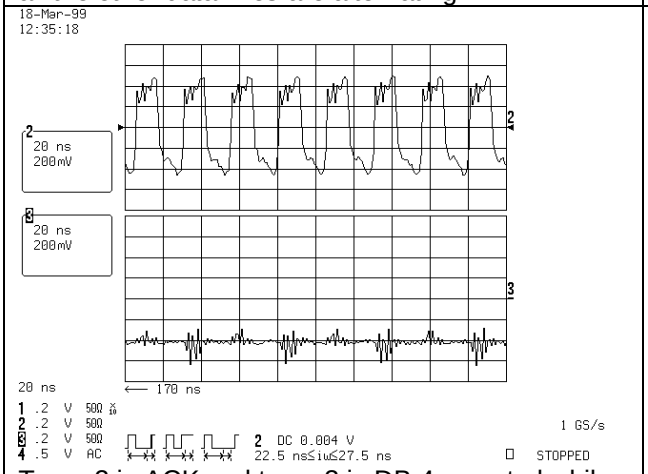
**Signals are measured at the first drive on the SCSI bus, signals originate from the host controller.**



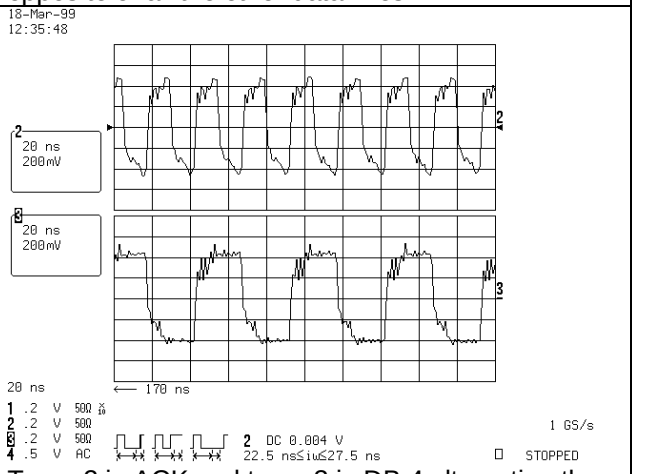

Trace 2 is ACK and trace 3 is DB 4 negated while all the other data lines are alternating.




Trace 2 is ACK and trace 3 is DB 4 alternating the opposite of all the other data lines.

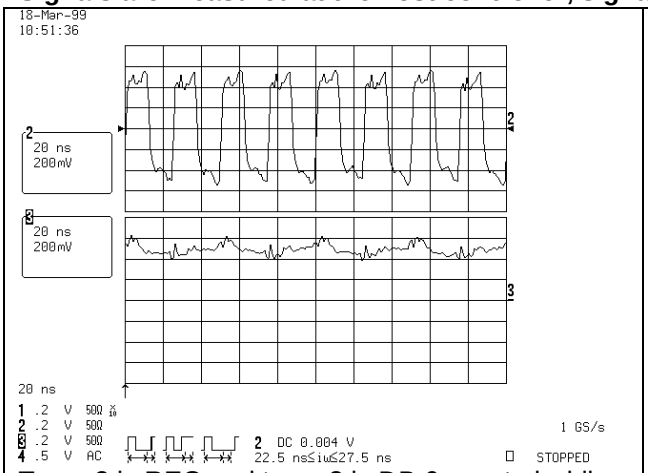



Trace 2 is ACK and trace 3 is DB 4 asserted while all the other data lines are alternating.

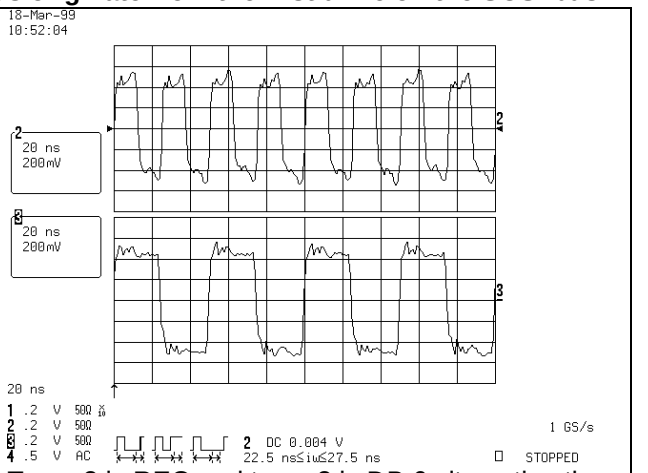



Trace 2 is ACK and trace 3 is DB 4 alternating the same direction of all the other data lines

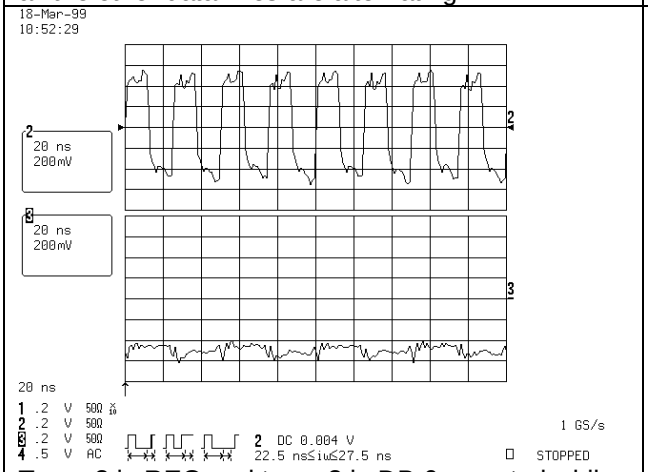
**Signals are measured at the host controller, signals originate from the first drive on the SCSI bus.**



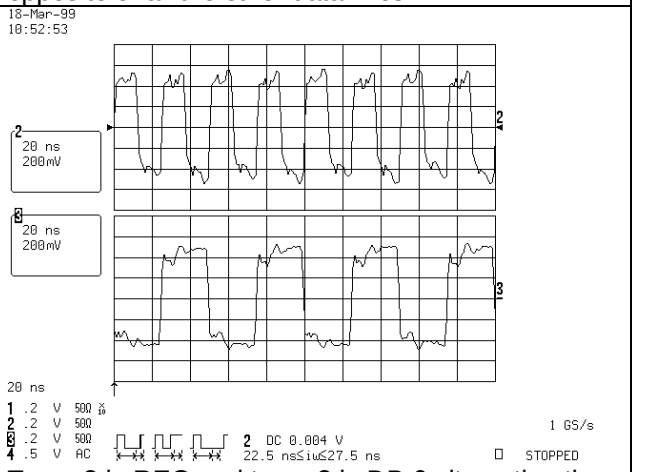

Trace 2 is REQ and trace 3 is DB 6 negated while all the other data lines are alternating.




Trace 2 is REQ and trace 3 is DB 6 alternating the opposite of all the other data lines.




Trace 2 is REQ and trace 3 is DB 6 asserted while all the other data lines are alternating.




Trace 2 is REQ and trace 3 is DB 6 alternating the same direction of all the other data lines

## 2.8 Summary

All data and control signal lines are monitored, the pictures shown are of worst case signal lines. Testing terminator sample 1, Amphenol P/N 503380001, signal quality provides more than enough margin for SCSI timings. Fall and rise times are nominal, cross talk in minimal. Terminator sample 2, CS Electronics P/N TRM-8662, provides adequate margin for SCSI timings. Fall and rise times are nominal, cross talk is minimal. Reflections and ringing, although present, are within acceptable limits.