The Institute for Interconnecting and Packaging Electronic Circuits
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IPC-TM-650
TEST METHODS MANUAL

Number	
2.5.21	
Subject	
Digital Unbalanced Crosstalk, Flat Cable	
Date	Revision
3/84	**A**
Originating Task Group	

1 Scope This test method gives a procedure to determine crosstalk or the magnitude of disturbance that is coupled to one conductor when another conductor in a given cable configuration is activated with a pulse.

2 Applicable Documents None

3 Test Specimen

3.1 3.1 m ± 6.4 m length of cable

4 Equipment/Apparatus

4.1 Fast rise pulse generator

4.2 Sampling plug-in in appropriate oscilloscope (see Figure 1) with a high input impedance probe (≥152 m)

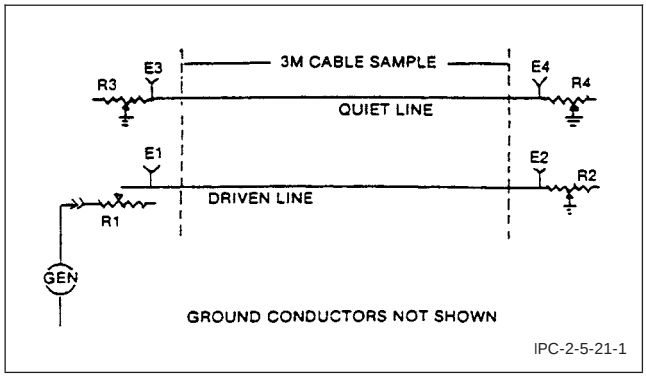

Figure 1 Oscilloscope

4.3 Test fixture to introduce signal, provide oscilloscope pickoff points, impedance matching and terminating potentiometers, and a means of connecting sample (see Figure 2)

4.4 Brackets to hold cable suspended in air and support fixture close to end of cable system

4.5 Styrofoam with rigid backing for ''stacked'' crosstalk (see Figure 3)

4.6 Ohmmeter

5 Procedure

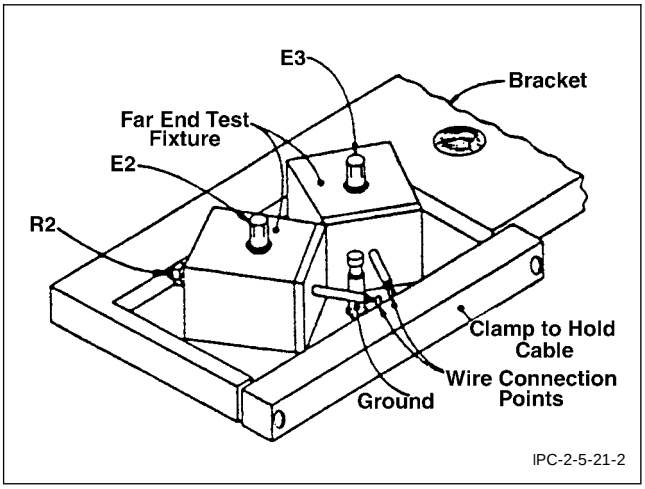

Figure 2 Connecting Sample

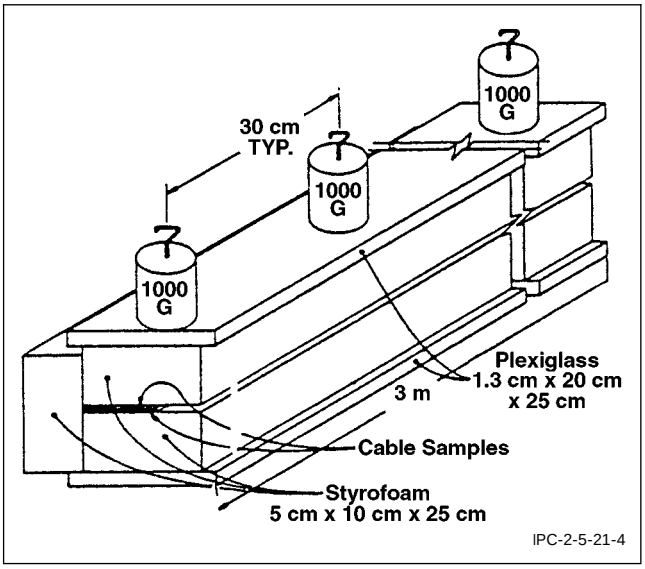

Figure 3 Crosstalk

5.1 Setup

5.1.1 Set pulse generator as follows:

Rep Rate ..... 1 megahertz
Pulse Amp ..... 2 to 5 volts
Pulse Width ..... 1 nanosecond
Rise Time ..... 2.5 nanosecond

5.1.2 Choose configuration and strip wires out one 2.5 cm on each end (for testing stacked configuration, prepare two identical samples).

5.2 Interlayer Crosstalk

5.2.1 Clamp the cable in brackets so that it is suspended in air away from any conductive surface.

5.2.2 Connect the wires to appropriate terminals on the test fixture, taking care to keep lead lengths as short and neatly dressed as possible without shorting.

5.2.3 Apply pulse specified and observe on the oscilloscope connected to E_1 (see Figure 4).

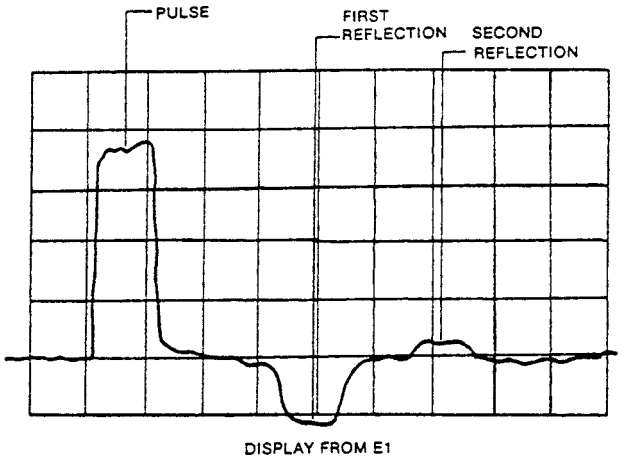

Figure 4 Oscilloscope Display

5.2.4 Set the potentiometer R_2 for minimum resistance, observed on the scope at E_1 as maximum mismatch (i.e., maximum negative first reflection).

5.2.5 Adjust R_1 for minimum second reflection.

5.2.6 Readjust R_2 for minimum first reflection.

5.2.7 Disconnect the signal wires from the far end box (receiver) and read and record the resistance values of R_1 and R_2.

5.2.8 Set the potentiometers R_3 and R_4 to the value and read at R_2.

5.2.9 Reconnect the sample to the receiver boxes and read and record voltages at E_1, E_2, E_3, and E_4. Also read and record the pulse rise time (10% to 90%) at E_1 and E_2.

5.3 Intralayer or Stacked Crosstalk

5.3.1 Place cables on Styrofoam base next to edge alignment block. The cables should be in close vertical alignment (see Figure 3).

5.3.2 Place the Styrofoam cover over the stack and with a thin blade, push the cables against the edge piece all along the length to assure the best possible vertical alignment. One thousand gram weights are then placed at 0.3 m intervals on top of the Styrofoam backing.

Note: The quality of the stack (vertical alignment and intimate contact) should be checked before proceeding. This is done by connecting a TDR to two grounds on the bottom layer and the center signal wire on the top layer.

O S O
G O G

(Unused wires are left open)

Any indication of discontinuities on the scope indicates poor alignment of the cables not in intimate contact.

5.3.3 Place the box holding the bracket on the raisers so that the height can be adjusted to provide a smooth transition from the cables to the test fixtures.

5.3.4 Connect the wires to the appropriate terminals on the test fixtures and proceed as in 5.2.3.

Calculations:

CROSS TALK

Forward $\frac{E_4}{E_1}(100) = \%$

Back $\frac{E_3}{E_1}(100) = \%$

ATTENUATION

Voltage $\frac{E_4 - E_2}{E_1}(100) = \%$

Rise time E_2 (n. sec.) - E_1 (n. sec.) = n. sec.

Report:

Crosstalk is reported in percent for a 3 m sample length. Attenuation is reported in percent voltage and nanoseconds rise time for a 3 m sample length.

The report should also include the values of $R_1$and $R_2$and rise time at E_1.