Entertainment Services and Technology Association

DMX512 Over Category 5 Cable

Task Group Report

Part Two

Shielded Twisted Pair Category 5 (STP) Cable
Radiated Signal Characteristics (vs. EIA-422 Rated Cable)

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ESTA Technical Standards Program
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Introduction

In response to a perceived industry requirement for lower cost DMX512 cable installations, the DMX-over-Category 5 Cable Task Group was formed by ESTA's Control Protocols Working Group (CPWG) at the January 1998 TSP meetings in Dallas. The Task Group's mission was to employ an independent laboratory to carry out a series of comparison tests between a typical cable presently used for hardwired DMX512 installations, and conventional Category 5 data cable. The goal of this testing was to establish whether Category 5 cable, or "generic premises cable" as it has become known, could be used as a low cost substitute in permanently wired DMX512 installations.

Two series of lab tests were conducted in July and November of 1998 at MPB Technologies in Airdrie, Alberta. Additional tests were conducted in December of 1999

Part 1of this report (CP/2000-1024.1) describes the first series of tests which compared the DMX512 handling characteristics of a typical EIA-422 rated data cable with those of a standard Category 5 unshielded twisted pair (UTP) cable. Radiated emissions tests were also done. Results of these tests indicated that Category 5 UTP cable performed as well as conventional DMX512 cable.

This section (Part 2 - CP/2000-1024.2) of the report describes the second series of tests which were carried out with Category 5 shielded twisted pair (STP) cable, and also included radiated and induced signal immunity tests to current IEC standards on all cable types.

Part 3 of this report (CP/2000-1024.3) describes the third of tests which were conducted to determine the effect of combining different types of cable (i.e., Category 5 and EIA-485) on the same wire run. At this time, tests were also done with Rosco/ET IPS equipment to determine whether the use of Category 5 cable caused any timing problems with their talkback data.

Test Conditions & Equipment

MPB Technologies supplied a HP54510A 250MHz Digital Storage Oscilloscope and HP7475 pen plotter to generate the 25 attached oscillograph plots. Radiated emissions and immunity tests were carried out in one of the largest of their five anechoic chambers, and data was acquired by a HP8566B Spectrum Analyzer with HP85685A pre-selector. To generate the required sweep frequencies, a HP8340A Synthesized Sweep Generator was used; this was driven by a HP43314A Function Generator. MPB used a custom software interface to format the output of the Spectrum Analyzer for laser printing. For induced immunity testing, a Velonex V-3300 fast transient burst generator, in conjunction with an MPB-constructed induction clamp conforming to IEC1000-4-4, was employed.

Gray Interfaces supplied the following equipment to facilitate the various tests:

- Goddard Design Li'l DMX'ter (used for DMX512 source and error checking)
- Gray DMX Repeater (isolated 1-in, 6-out buffer unit)
- Tektronix TDS 220 Oscilloscope
- Fluke DSP-100 LANMeter c/w smart remote
- Custom-wired transceiver unit with various EIA-485 transceiver types and switchable termination values
- Custom pulse generator

300 meters (1000 feet) of each of the following cable types was purchased for testing:

- EIA-422 (100 ohm) cable (2-pair with overall shield): Belden 9829
- Category 5 foil shielded twisted pair (STP) cable: Commscope 5NS4LAN568

Investigation

These additional plots are an addendum to the original 18 presented to the DMX-over-Category 5 Task Group on July 10, 1998. These were done using Category 5 STP (shielded twisted pair) cable.

The SRL devices used in these tests were a Sipex SP483ES.

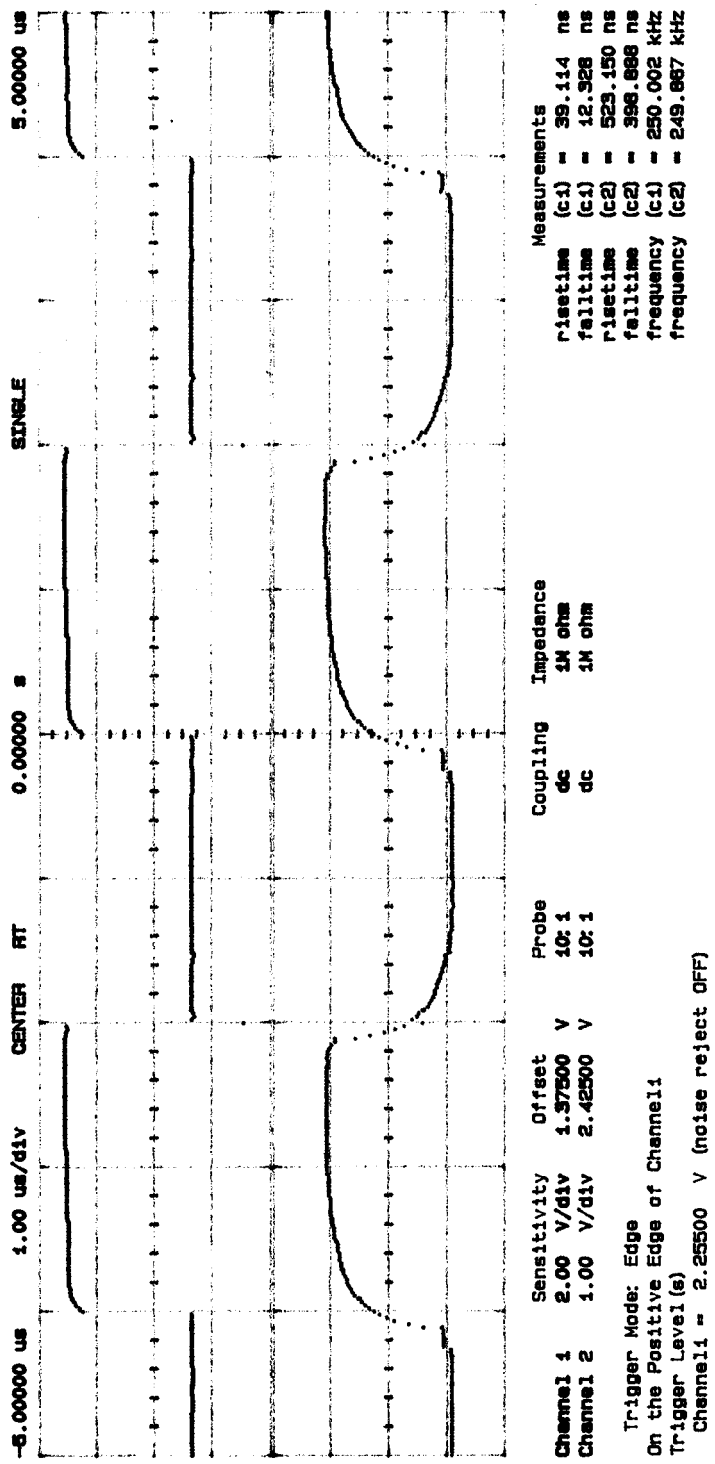
The non-SRL devices used were a T.I. SN75176BP.

Oscillograph Plot Description

Note: In all of these plots, the top trace is the recovered signal at the output of the EIA-485 receiver. The bottom trace is the true signal measured at the (+) input of the EIA-485 receiver. 300 meters of STP cable was used in all cases.

#19 - Driven by the non-SRL transmitter, terminated into 100 ohms, measured at the (+) input of the non-SRL receiver. Shield connected to building ground at both ends.

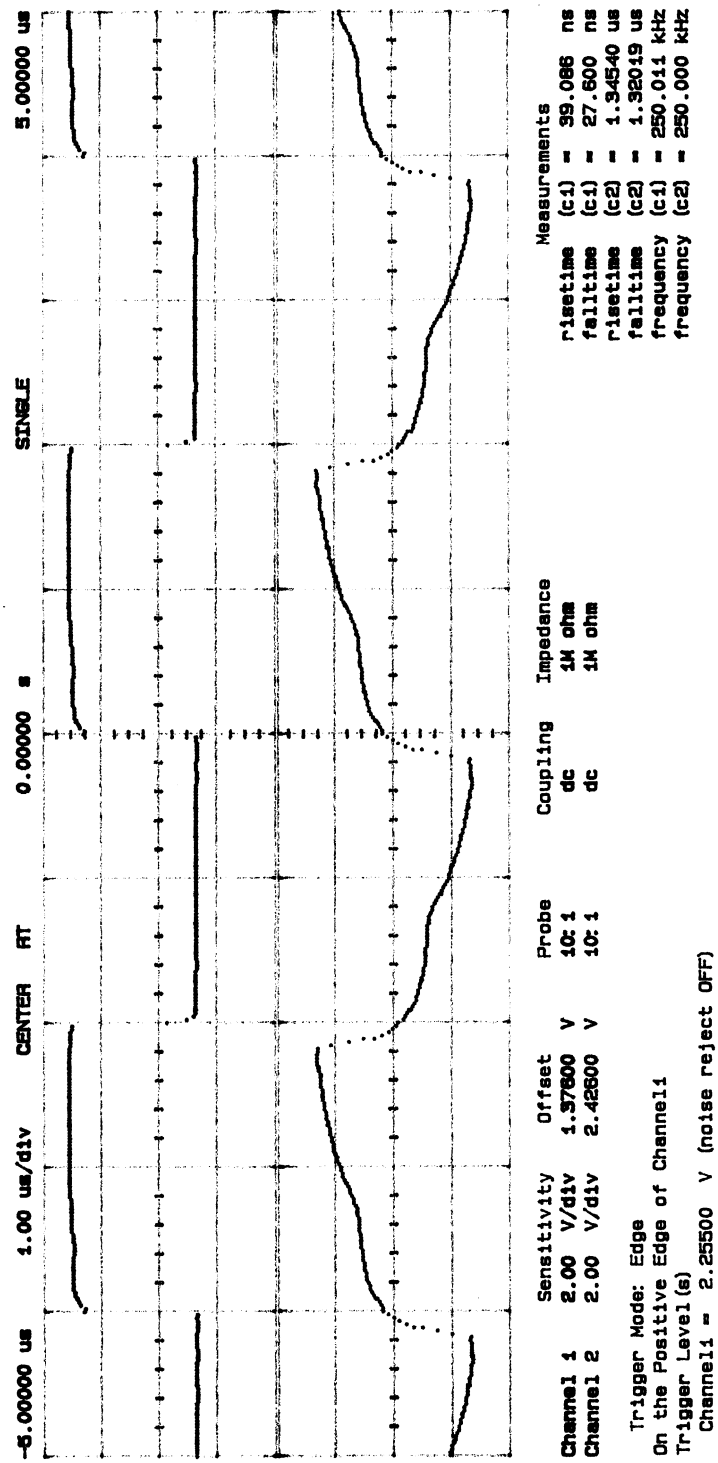
Note the rounding on the leading edge due to cable capacitance.



PLOT #19

#20 - Driven by the non-SRL transmitter, unterminated, measured at the (+) input of the non-SRL receiver. Shield connected to building ground at both ends.

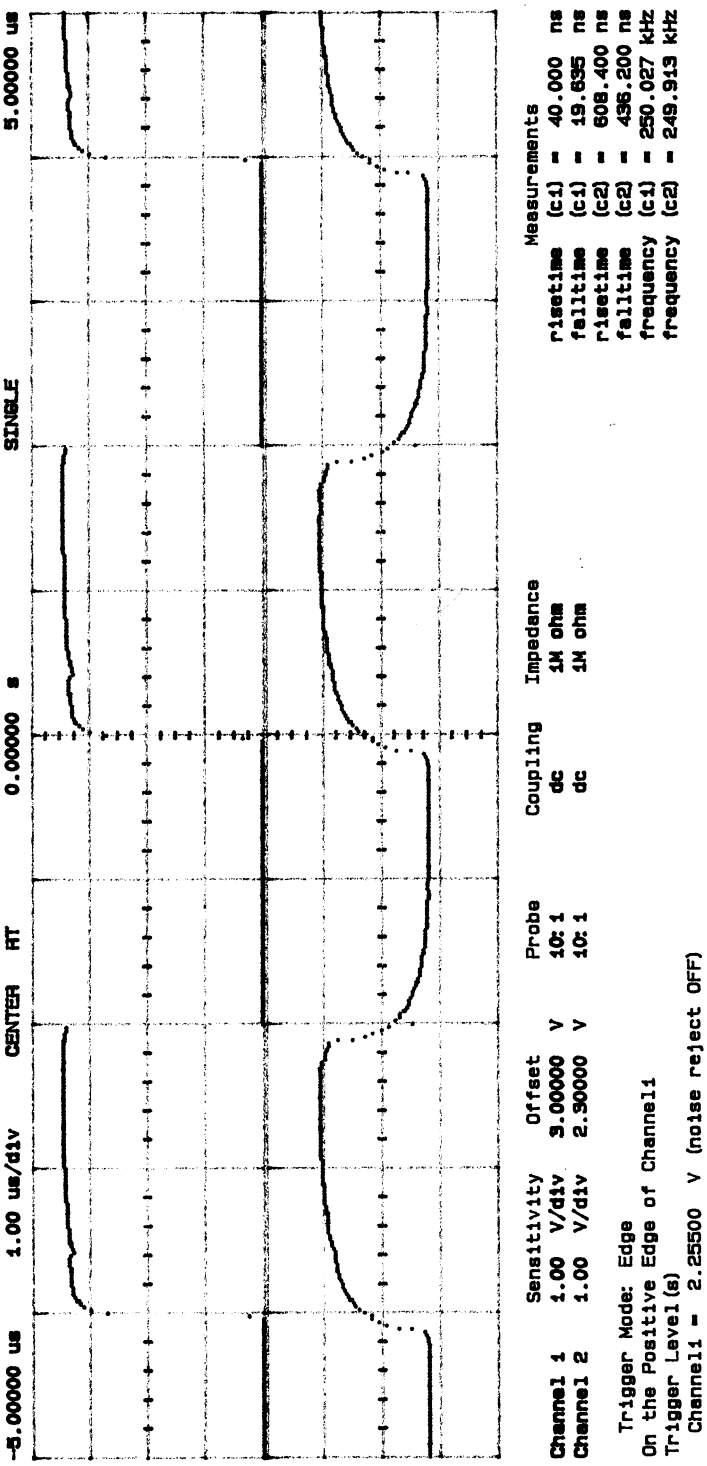
Note that the signal is somewhat distorted, although the recovered waveform is still intact.



Plot #20

#21 - Driven by the SRL transmitter, terminated into 100 ohms, measured at the (+) input of the non-SRL receiver. Shield connected to building ground at both ends.

No significant difference from the non-SRL test.

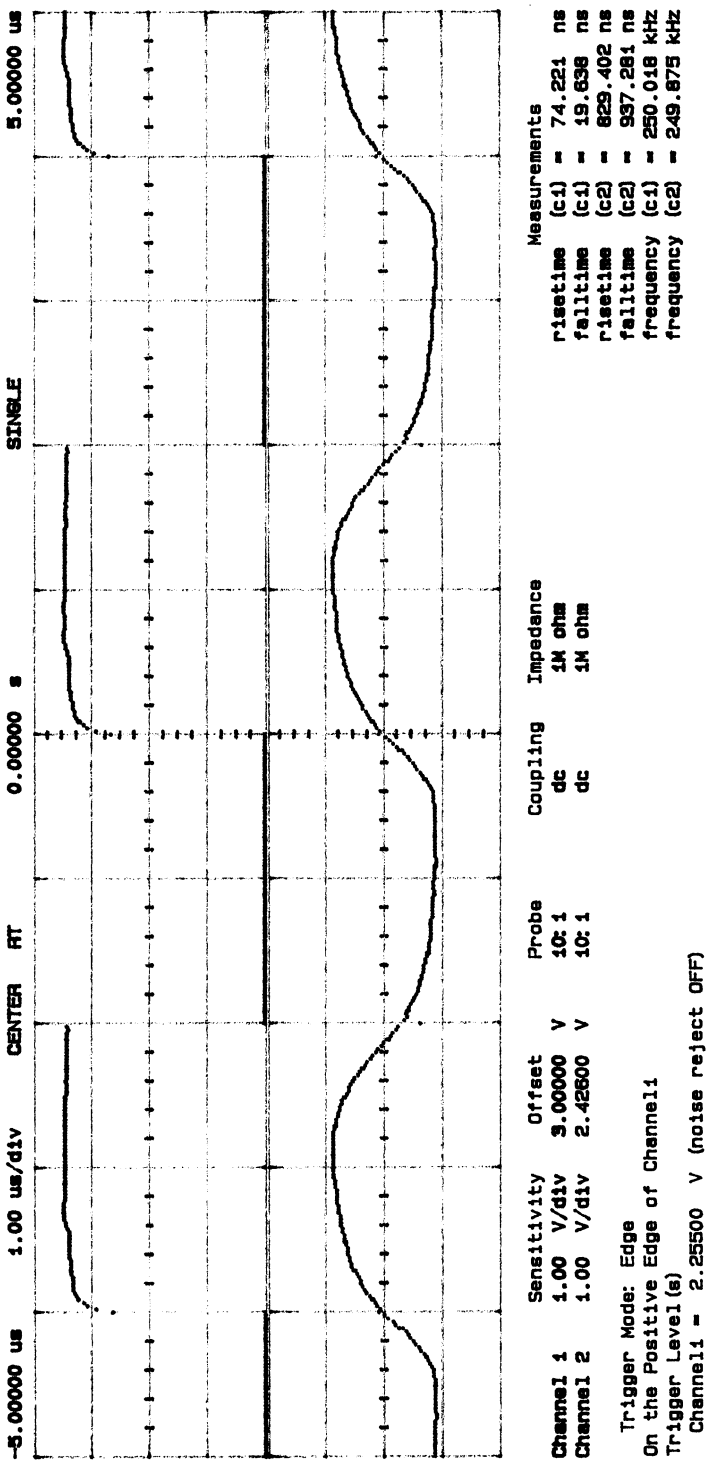


Plot #21

#22 - same as #21, except different scale.

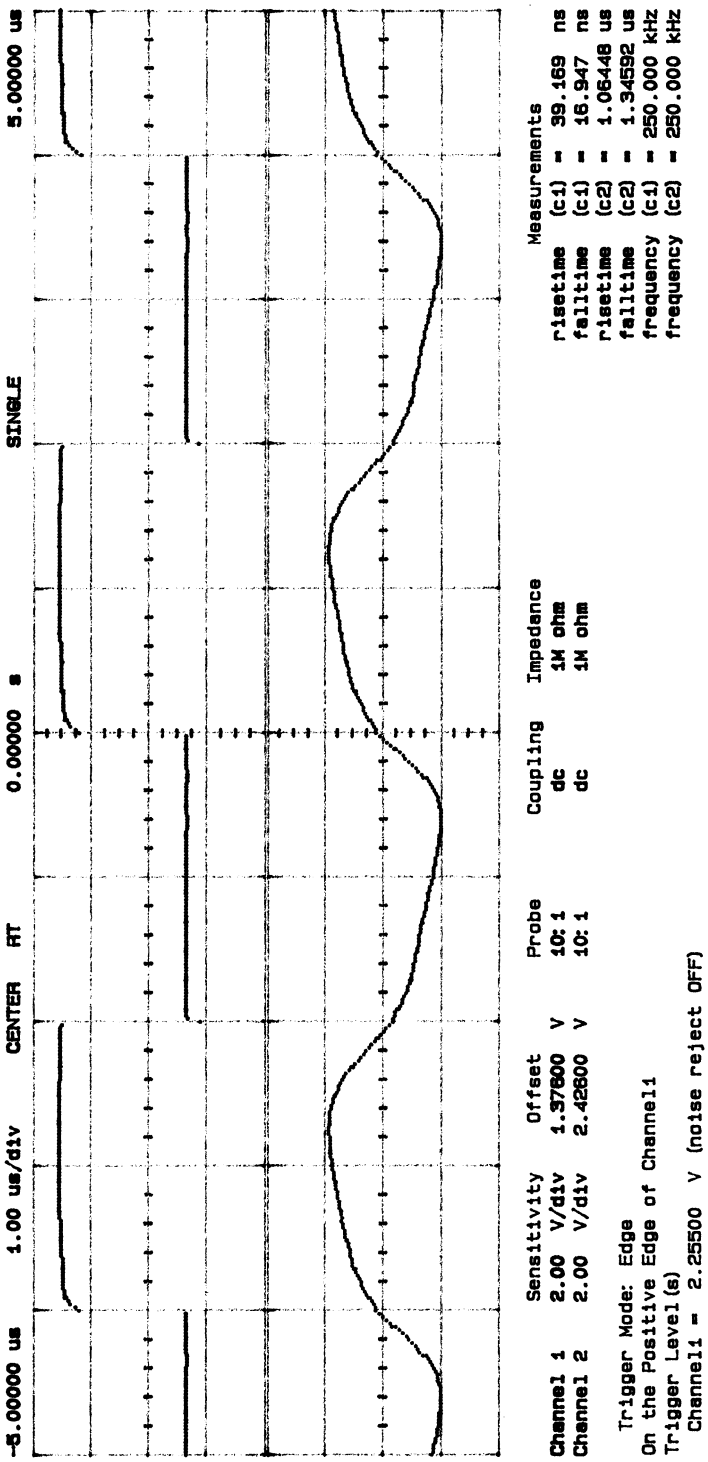
#23 - Driven by the SRL transmitter, terminated into 100 ohms, measured at the (+) input of the non-SRL receiver. Shield not connected to ground (floating).

No significant difference from the results in test #22.



PLOT #23

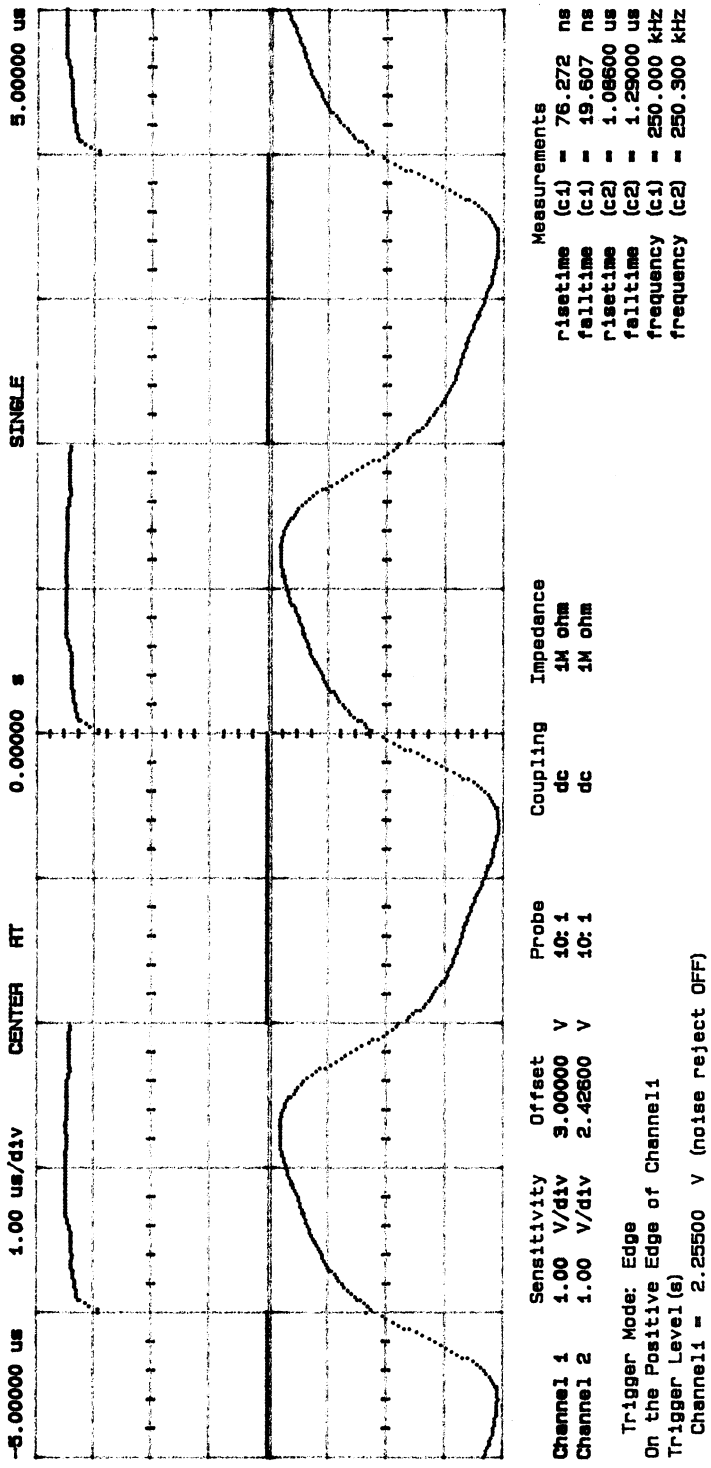
#24 - Driven by the SRL transmitter, unterminated, measured at the (+) input of the non-SRL receiver. Shield connected to building ground at both ends.



PLOT #24

#25 - Driven by the SRL transmitter, unterminated, measured at the (+) input of the non-SRL receiver. Shield not connected to ground (floating).

No significant difference from the results in test #24.



PLOT #25

Radiated Signal Plot Description

Only representative (the best and worst) plots are included here for Category 5 STP cables - the best case plot for the Belden #9829 is included.

Figure E5 - Belden #9829, Slew Rate Limited Line Driver, Terminated, Shield Grounded

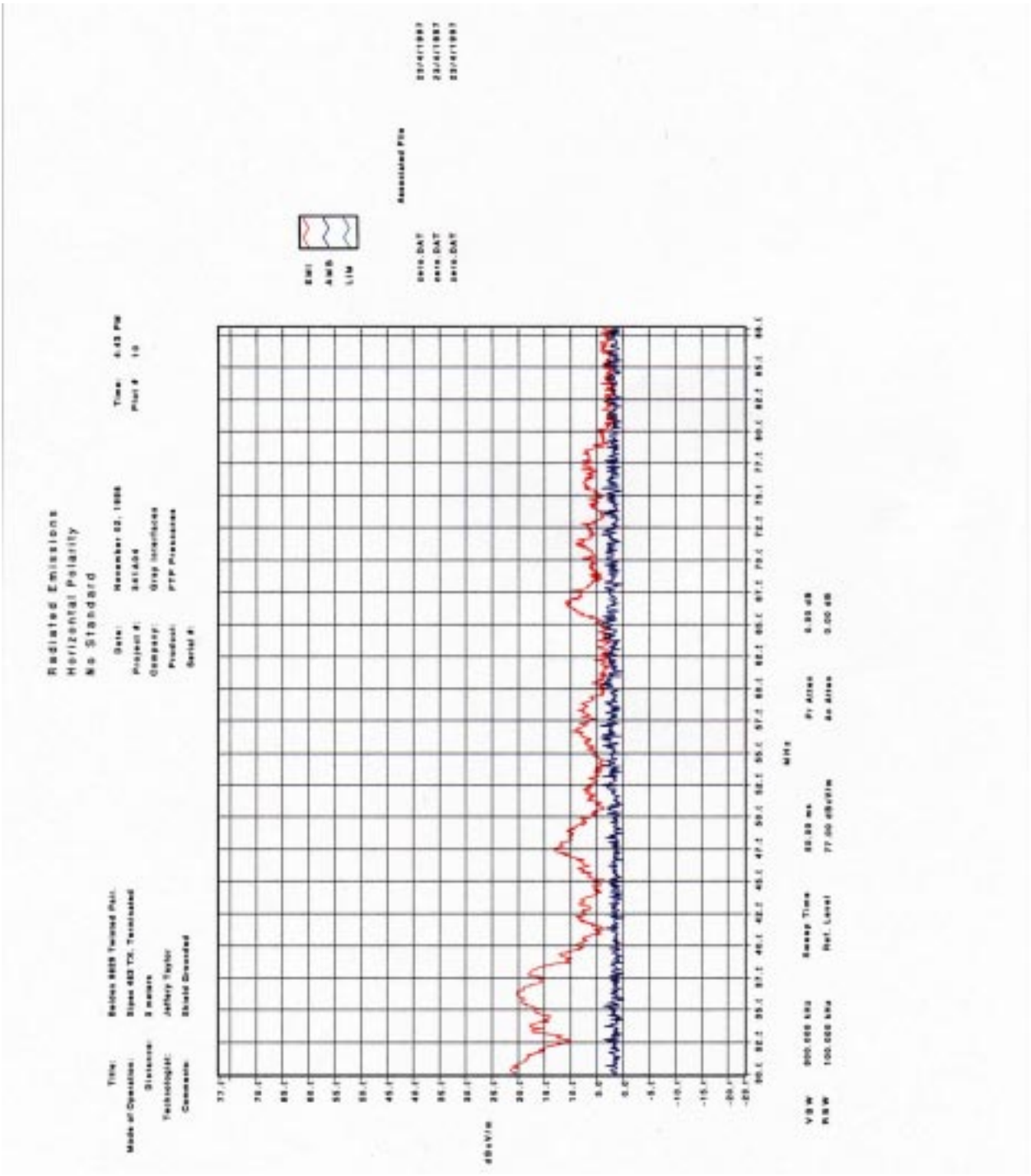


Figure E6 - Category 5 STP, Slew Rate Limited Line Driver, Terminated, Shield Not Grounded

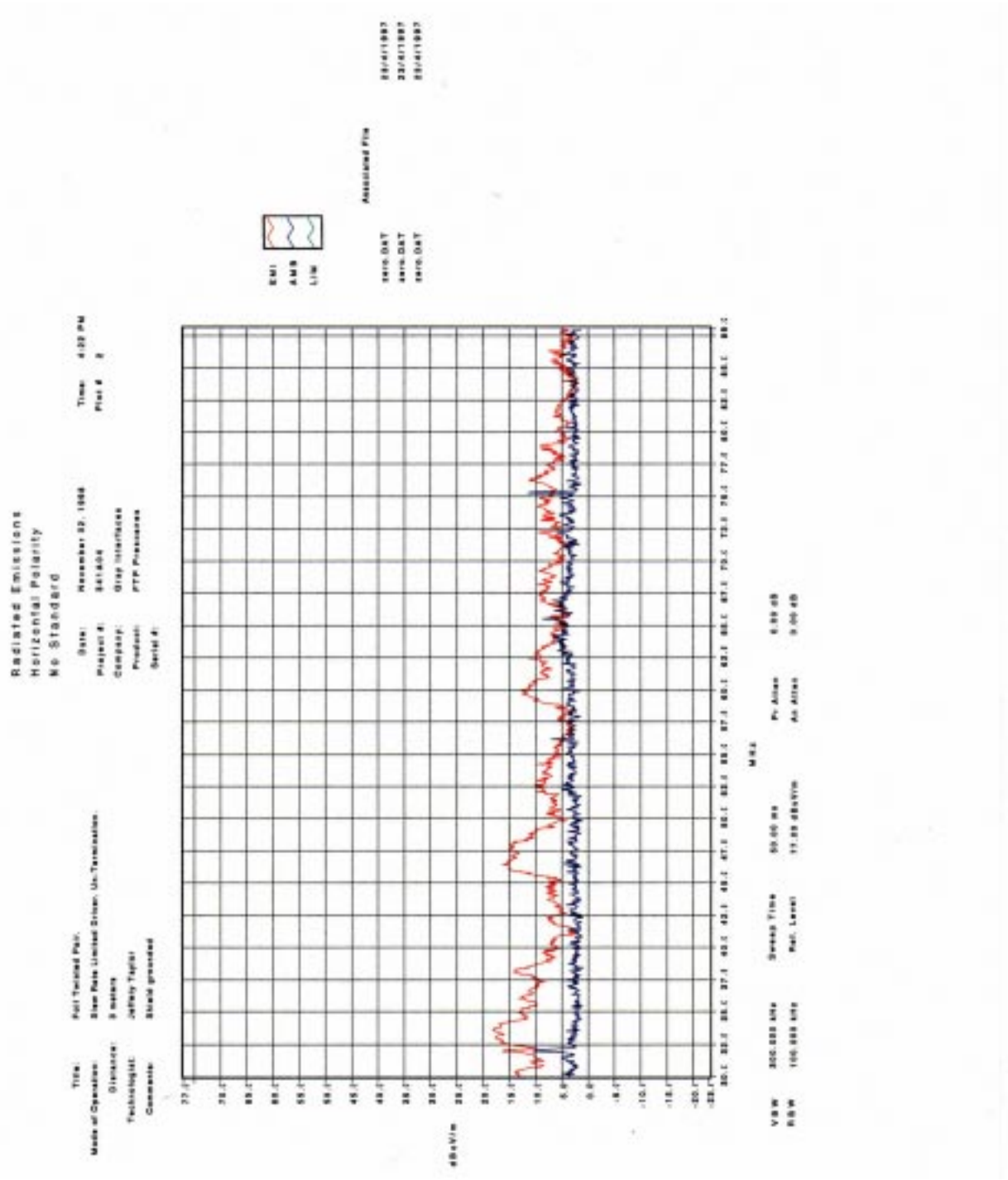
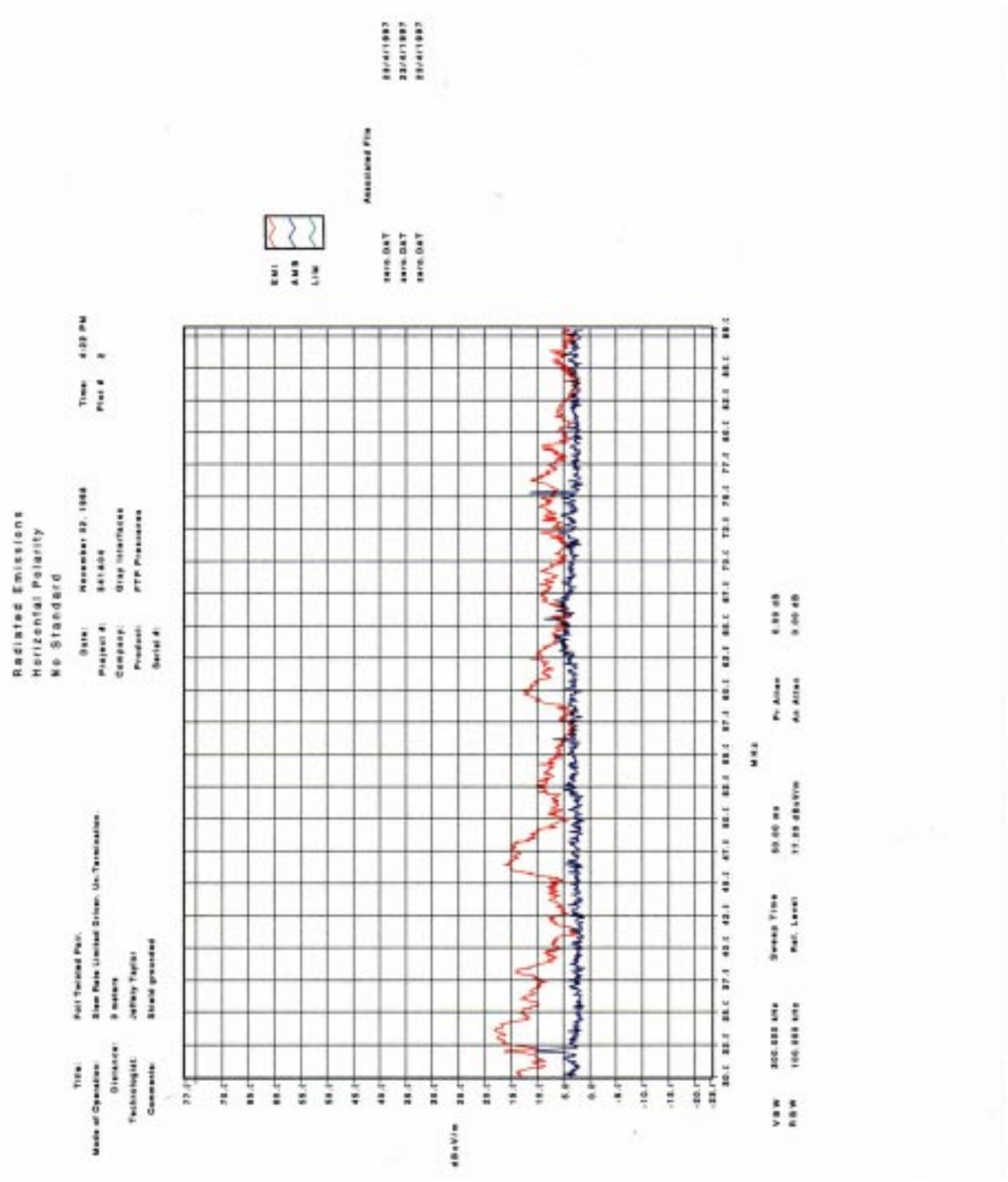


Figure E7 - Category 5 STP, Slew Rate Limited Line Driver, unterminated, Shield Grounded



– End Part Two –