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! d i g i t a l ! I N T E R O F F I C E M E M O R A N D U M

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Subj: Measurements of /REQ & /ACK on:
 Two 3M 90 Ohm SCSI-2 6 meter 50-pin ribbon cable
 Compared against the standard 130 Ohm cable.

Setup: Seven RZ23 100 Mbyte drives were connected to each cable in two different configurations. The initiator is a T D Systems Viking SCSI controller in a MicroVax and is set to unit #7.

The seven drives were connected to the cable so that unit #6 was the drive closest to the initiator and unit #0 was the drive at the end of the cable.

Terminators were on unit #7 and unit #0

Configuration 1: Evenly spaced connectors along the cable

I-----6-----5-----4-----3-----2-----1-----0

Configuration 2: Four connectors at each end of the cable

I----6----5----4-----3----2----1----0

GENERAL OBSERVATION:

The signals at the drives closest to the signal source showed the least amount of undershoot.

All the signals were cleaner when being driven by a drive at either end of the cable than when being driven by a drive in the middle of the cable.

The evenly spaced cable had a glitch on the rising edge of the wave that touched 1.6 Volts and two other glitches that were below 2.0 volts

The evenly spaced cable had less glitches than the other cable but the glitches were closer to the two volt line

The 3M cables did not have any effect on the slope of the wave.

CONCLUSIONS ON UNDERSHOOT BELOW GROUND

EVENLY SPACED CONNECTORS:

Compared to the standard 130 Ohm cable the evenly spaced cable has slightly more undershoot.

4 CONNECTORS AT EACH END:

Compared to the 130 Ohm cable the cable with the connectors on each end has slightly more undershoot.

CONCLUSIONS ON GLITCHES ON THE RISING EDGE OF THE WAVE

EVENLY SPACED CONNECTORS:

The evenly spaced cable had the fewest amount of glitches but the glitches that were there were closer to the two volt line than the standard cable.

This cable had one glitch that went down to 1.6 volts and had two glitches that went below 2 volts (1.8v and 1.9v).

4 CONNECTORS AT EACH END:

This cable had more glitches than the standard cable but only one glitch touched the two volt line.

The glitches came closer to the two volt line when the signal was being driven by a drive at the end of the cable furthest away from the initiator.

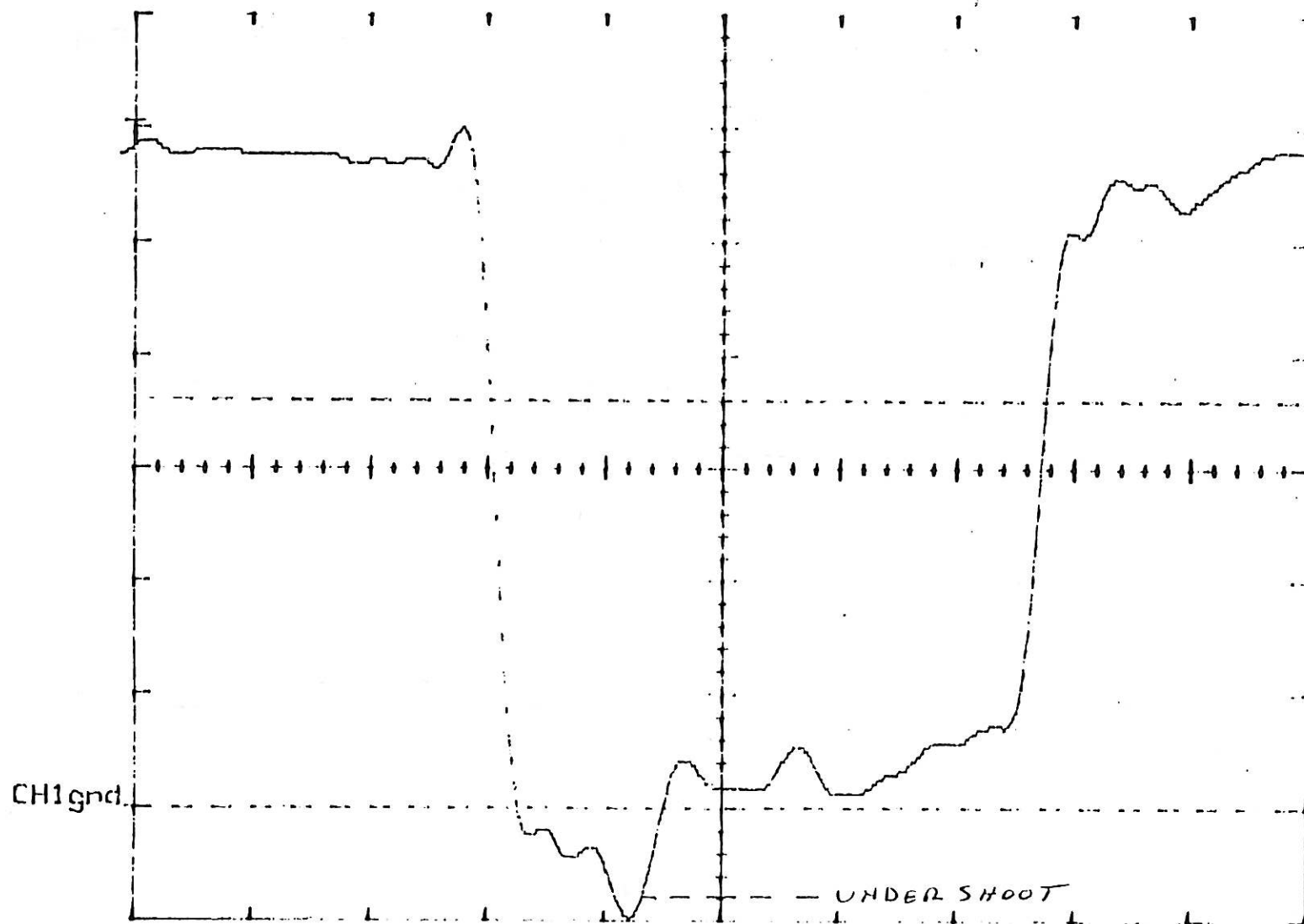
CONCLUSIONS ON SPIKES AT ZERO VOLTS

Both cables showed some spikes that rising from zero volts toward + .8 volts. The spikes on the cable with the connectors on each end came closer to + .8 volts but none of these spikes went higher than .6 volts.

CH1 500mV

A 50ns 1.80 V VERT

1.800 V



ACK

READ @ ϕ

WRITE @ ϕ

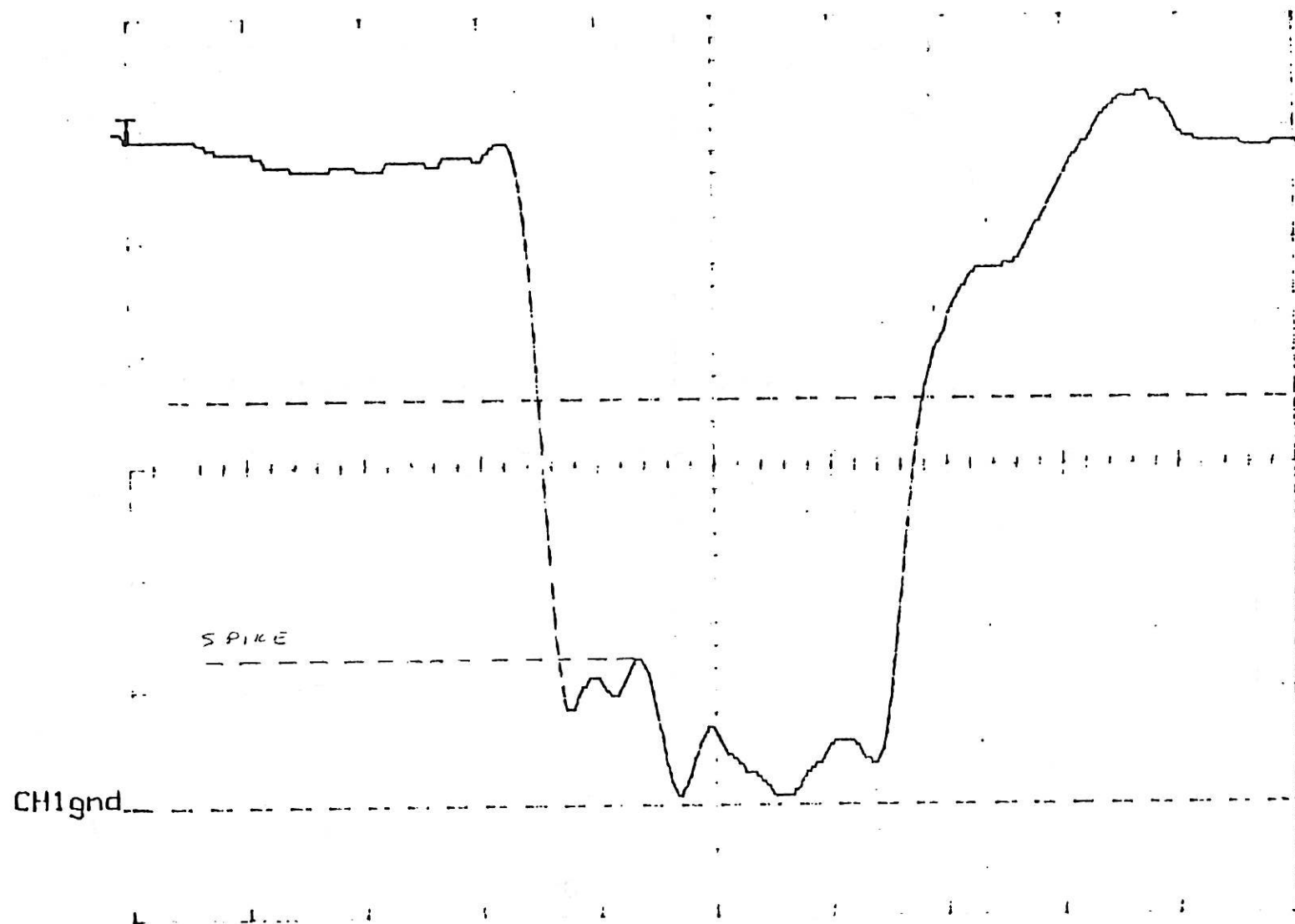
70.5M 3M CHARGE

T AT EACH END

CH1 500mV

A 50ns 1.80V VERT

1.800 V



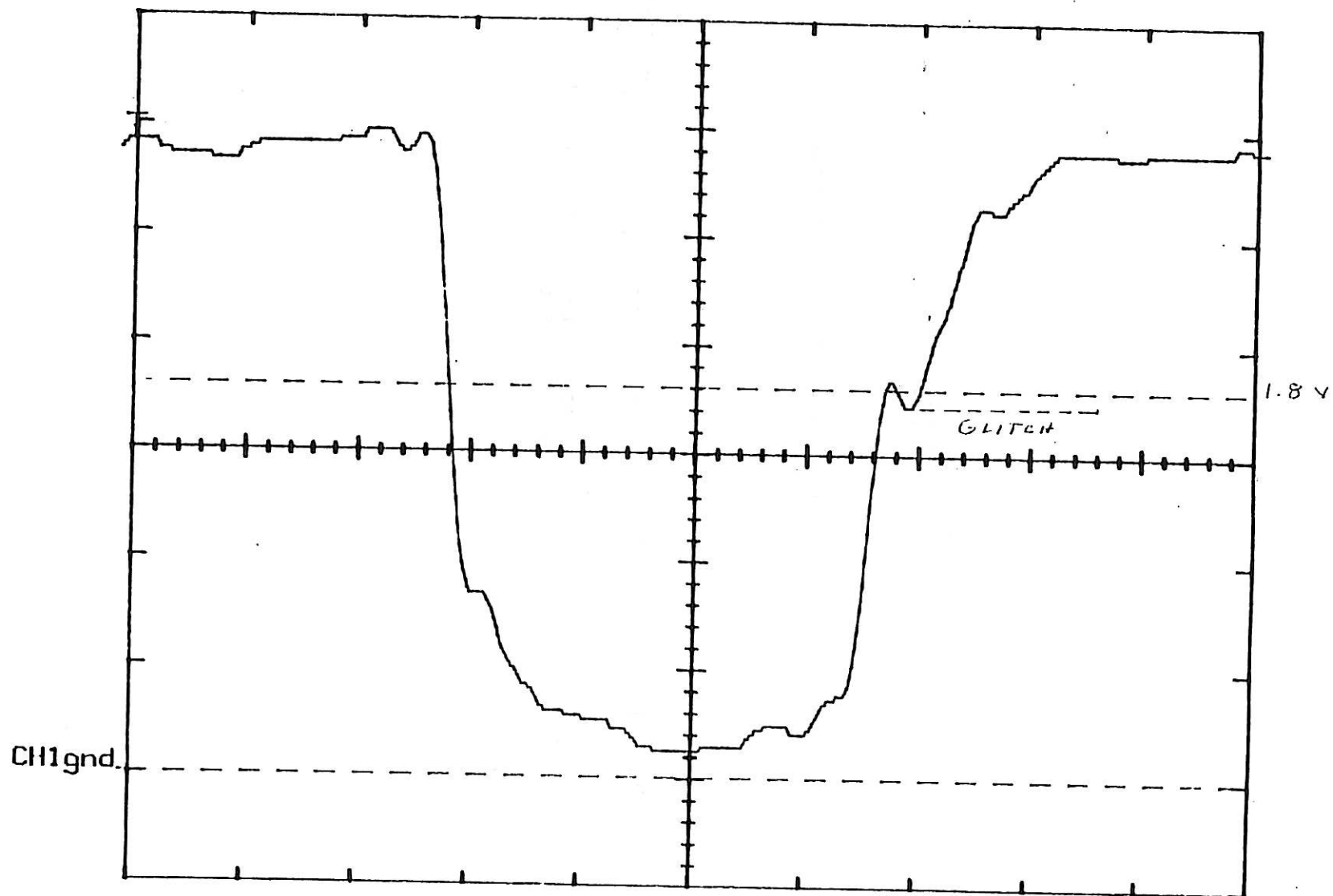
PER READ @ 6
PP @ 4

3 M

CH1 500mV

A 50ns 1.95 V VERT

1.800 V



127

PLQ

1110001
1000001

3 M

Setup: RZ23 100MB Drives
Initiator: uVAX w/T.D. Systems controller
Terminators @ Unit 0, Initiator

Legend: "" UNDERSHOOT ""

Numbers = Undershoot below ground in tenths/volt

'*' = Signal Source

Legend: "" GLITCHES ""

The top of the wave is at 3.9 volts. The glitches were on the rising edge of the wave dropping toward zero volts.

Numbers = In Volts the amount above ground the Glitch pulls the signal down to.

'#' = No Glitch

UNDERSHOOT Standard 130 Ohm (reference) Cable (evenly spaced)

	I	6	5	4	3	2	1	0
REQ 0	0	*0	0	1	2	2	2	1
REQ 1	1	1	*0	1	2	2	3	2
REQ 2	2	4	4	*2	3	5	6	3
REQ 3	3	4	3	4	*2	3	4	4
REQ 2	2	3	2	1	1	*0	0	2
REQ 2	2	2	3	2	1	0	*1	2
REQ 1	1	1	1	1	1	1	0	*0
ACK *6	*6	1	2	4	4	4	3	3

3M Cable "F" 90 Ohm (evenly spaced)

	I	6	5	4	3	2	1	0
REQ 2	2	*1	1	0	2	0	3	1
REQ 0	0	0	*0	1	1	5	2	2
REQ 2	2	0	0	*0	3	2	3	3
REQ 2	2	2	3	1	*0	0	0	0
REQ 2	2	4	2	1	0	*0	0	0
REQ 2	2	2	3	1	0	0	*0	0
REQ 3	3	2	3	3	2	1	0	*0
ACK *0	*0	3	6	4	5	6	4	6

UNDERSHOOT Standard Diameter (reference) Cable (4 connectors at each end)

	I	6	5	4					3	2	1	0
EQ	0	*0	0	0	-	-	-	-	2	1	2	2
EQ	1	0	*0	0	-	-	-	-	3	3		2
EQ	0	0	0	*0	-	-	-	-	2	1	2	1
EQ	3	3	2	2	-	-	-	-	*0	0	0	0
EQ	3	3	3	2	-	-	-	-	0	*0	0	1
EQ	1	3	3	2	-	-	-	-	0	0	*0	0
EQ	4	1	2	3	-	-	-	-	0	0	0	*0
CK	*0	1	1	3	-	-	-	-	5	6	5	4

3M Cable "E" 90 Ohm (4 connectors at each end)

	I	6	5	4					3	2	1	0
REQ	0	* 0	0	0	-	-	-	-	2	2	2	2
REQ	0	0	* 0	0	-	-	-	-	2	2	2	2
REQ	0	0	0	* 0	-	-	-	-	2	3	3	2
REQ	4	3	3	3	-	-	-	-	*	0	0	0
REQ	4	3	3	3	-	-	-	-	0	* 0	0	0
REQ	2	2	2	2	-	-	-	-	0	0	* 0	0
REQ	3	3	3	3	-	-	-	-	2	1	0	* 0
ACK	*1	2	3	4	-	-	-	-	5	6	5	5

GLITCHES Standard Cable Evenly Spaced Glitches

	I	6	5	4	3	2	1	0
REQ	#	#	#	#	#	#	#	#
REQ	2.4	#	* #	#	#	#	#	3.7
REQ	#	#	#	* #	3.5	3.8	3.7	3.7
REQ	#	3.6	#	3.2	* #	2.9	3.3	3.5
REQ	3.6	3.5	#	#	#	* #	#	2.9
REQ	3.4	3.4	3.5	3.4	#	#	* 2.9	2.6
REQ	3.4	3.6	3.4	3.4	3.0	2.8	2.8	* 2.5
ACK	*2.4	2.9	#	3.2	3.1	#	#	3.6

3M Cable "F" 90 Ohm (evenly spaced)

	I	6	5	4	3	2	1	0
REQ	2.4	* 1.8	#	#	#	#	#	#
REQ	#	#	* #	#	#	#	#	#
REQ	2.2	#	#	* 1.6	#	#	3	#
REQ	#	#	#	#	* 1.9	#	#	2.4
REQ	3.4	#	#	#	#	* #	#	2.4
REQ	3.2	#	#	#	#	2.2	* #	2.4
REQ	#	#	#	2.4	#	2.2	2.4	* #
ACK	* 2.1	#	2.2	2.4	2.1	2.3	3.2	3.2

GLITCHES Standard Cable 4 Connectors at Each End

	I	6	5	4					3	2	1	0
REQ	2.8 *	#	2.8	3.0	-	-	-	-	3.8	3.8	3.8	#
REQ	2.8	2.8 *	3.0	#	-	-	-	-	3.8	3.8	3.8	3.8
REQ	2.8	2.6	# *	2.8	-	-	-	-	3.8	3.8	3.8	3.3
REQ	3.9	#	#	#	-	-	-	*	3.0	2.8	3.0	3.0
REQ	3.8	#	#	#	-	-	-	-	3.0	* #	#	#
REQ	3.6	3.6	3.6	3.8	-	-	-	-	3.0	3.1 *	2.8	2.8
REQ	3.6	3.6	3.6	3.0	-	-	-	-	3.0	#	3.0	* #
ACK *	2.6	2.8	3.0	3.0	-	-	-	-	3.4	3.4	3.2	3.4

3M Cable "E" 90 Ohm (4 connectors at each end)

	I	6	5	4					3	2	1	
REQ	2.6 *	2.8	#	#	-	-	-	-	#	#	#	#
REQ	3.6	3.6 *	3.6	#	-	-	-	-	#	2.6	2.6	2.6
REQ	2.4	2.6	2.8 *	2.6	-	-	-	-	#	#	#	#
REQ	3.4	3.4	#	#	-	-	-	-	* 2.4	2.4	2.4	2.6
REQ	3.4	3.4	#	#	-	-	-	-	2.4	* 2.4	2.4	2.4
REQ	3.4	3.4	3.4	3.4	-	-	-	-	2.5	2.4	* 2.4	2.4
REQ	3.4	3.4	3.4	3.4	-	-	-	-	2.6	2.4	2.4	* 2.4
ACK*	2.0	2.4	2.4	2.4	-	-	-	-	#	3.2	3.2	3.2