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SOURCE:	Sterling Vaden	
CONTACT:	Full Name: Sterling Vaden Company: Optical Cabling Corporation Phone Number: +1 828 298-2260 Email: sterling.vaden@occfiber.com	
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ABSTRACT: Port designations and nomenclature including example cable types and measurement configurations		

Portions of this document are extracted from ANSI/TIA 1183 August 2012. For use in IEEE 802.3bp 40GBASE-T channel modeling adhoc only.

General port labeling for a two-port device.

Figure 1 shows signal flow for definition of two port S parameters.

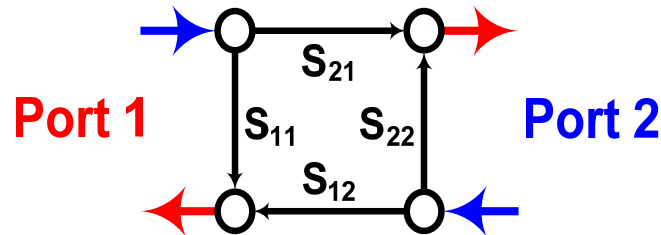


Figure 1 S-parameter notation for a two port device

Figure two shows a conventional numbering scheme for an 8 port (four pair) device. This numbering scheme follows the conventional flow definition for a two-port device above. It also allows an easy extension to more than four pairs.

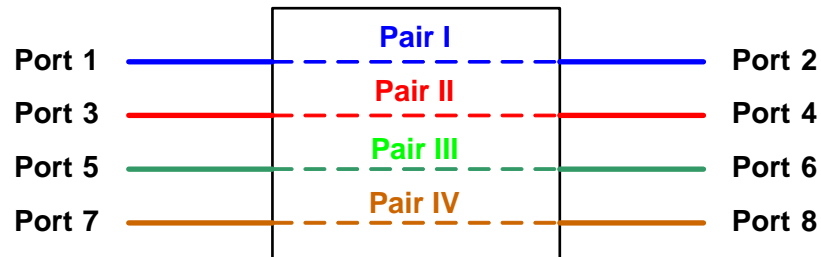


Figure 2 Four pair DUT port numbering

Each port is a differential pair. There is also a ground conductor for each pair. The ports may be driven differentially or common mode. When driven common mode, the two conductors of the pair have equal potential with respect to the ground conductor. The received signal may be expressed as a differential signal or common mode signal.

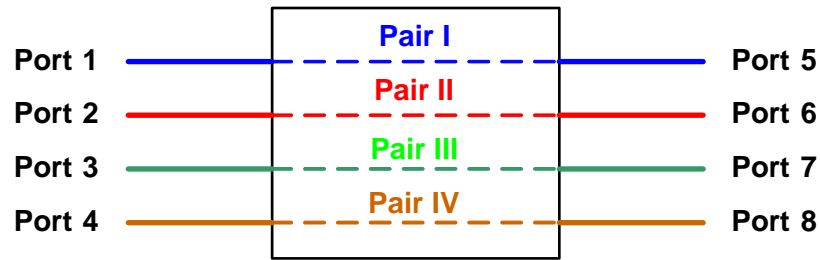


Figure 3 Conventional four 8 port numbering

Stimulus and response designations for ports 1 and 2

		Differential-mode stimulus		Common-mode stimulus	
		Port 1	Port 2	Port 1	Port 2
Differential-mode response	Port 1	S_{DD11}	S_{DD12}	S_{DC11}	S_{DC12}
	Port 2	S_{DD21}	S_{DD22}	S_{DC21}	S_{DC22}
Common-mode response	Port 1	S_{CD11}	S_{CD12}	S_{CC11}	S_{CC12}
	Port 2	S_{CD21}	S_{CD22}	S_{CC21}	S_{CC22}

Where:

S_{DD} Is the ratio of the differential mode response to the differential mode stimulus.

S_{DC} Is the ratio of the differential mode response to the common mode stimulus.

S_{CD} Is the ratio of the common mode response to the differential mode stimulus.

S_{CC} Is the ratio of the common mode response to the common mode stimulus.

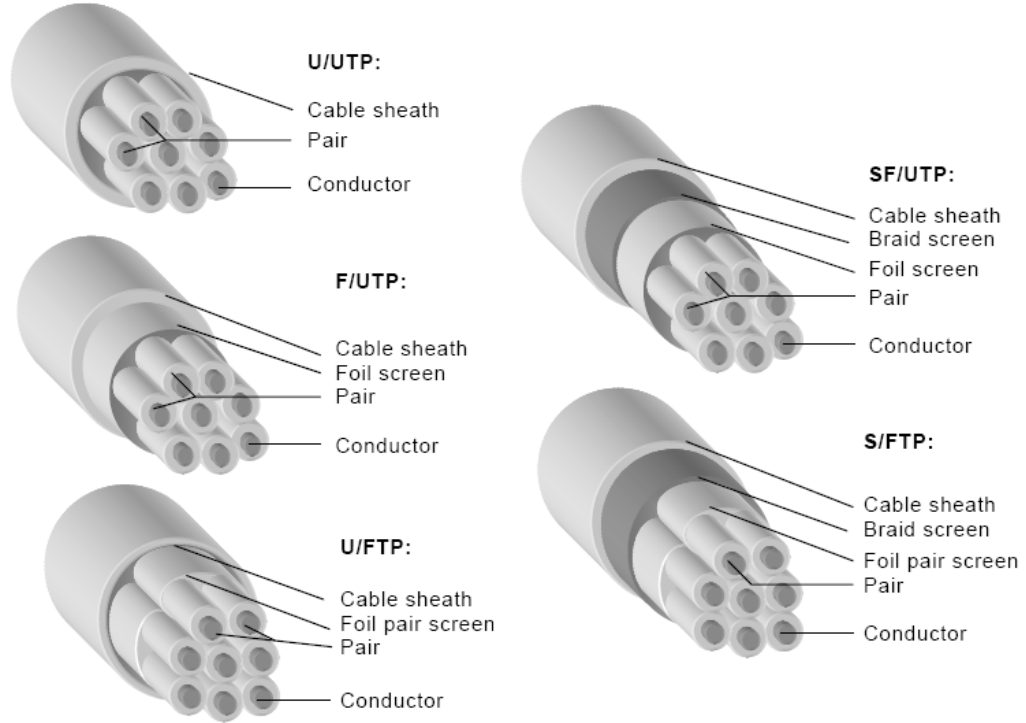


Figure 4 Example cable types

S-parameters and nomenclature for 8 port parameters

Port		Port 1		Port 2		Port 3		Port 4		Port 5		Port 6		Port 7		Port 8	
1	dd	Sdd11	RLdd11	Sdd12	ILdd12	Sdd13	NEXTdd13	Sdd14	FEXTdd14	Sdd15	NEXTdd15	Sdd16	FEXTdd16	Sdd17	NEXTdd17	Sdd18	FEXTdd18
2	dd	Sdd21	ILdd21	Sdd22	RLdd22	Sdd23	FEXTdd23	Sdd24	NEXTdd24	Sdd25	FEXTdd25	Sdd26	NEXTdd26	Sdd27	FEXTdd27	Sdd28	NEXTdd28
3	dd	Sdd31	NEXTdd31	Sdd32	FEXTdd32	Sdd33	RLdd33	Sdd34	ILdd34	Sdd35	NEXTdd35	Sdd36	FEXTdd36	Sdd37	NEXTdd37	Sdd38	FEXTdd38
4	dd	Sdd41	FEXTdd41	Sdd42	NEXTdd42	Sdd43	ILdd43	Sdd44	RLdd44	Sdd45	FEXTdd45	Sdd46	NEXTdd46	Sdd47	FEXTdd47	Sdd48	NEXTdd48
5	dd	Sdd51	NEXTdd51	Sdd52	FEXTdd52	Sdd53	NEXTdd53	Sdd54	FEXTdd54	Sdd55	RLdd55	Sdd56	ILdd56	Sdd57	NEXTdd57	Sdd58	FEXTdd58
6	dd	Sdd61	FEXTdd61	Sdd62	NEXTdd62	Sdd63	FEXTdd63	Sdd64	NEXTdd64	Sdd65	ILdd65	Sdd66	RLdd66	Sdd67	FEXTdd67	Sdd68	NEXTdd68
7	dd	Sdd71	NEXTdd71	Sdd72	FEXTdd72	Sdd73	NEXTdd73	Sdd74	FEXTdd74	Sdd75	NEXTdd75	Sdd76	FEXTdd76	Sdd77	RLdd77	Sdd78	ILdd78
8	dd	Sdd81	FEXTdd81	Sdd82	NEXTdd82	Sdd83	FEXTdd83	Sdd84	NEXTdd84	Sdd85	FEXTdd85	Sdd86	NEXTdd86	Sdd87	ILdd87	Sdd88	RLdd88
1	dc	Sdc11	LCLdc11	Sdc12	LCTLdc12	Sdc13	NEXTdc13	Sdc14	FEXTdc14	Sdc15	NEXTdc15	Sdc16	FEXTdc16	Sdc17	NEXTdc17	Sdc18	FEXTdc18
2	dc	Sdc21	LCTLdc21	Sdc22	LCLdc22	Sdc23	FEXTdc23	Sdc24	NEXTdc24	Sdc25	FEXTdc25	Sdc26	NEXTdc26	Sdc27	FEXTdc27	Sdc28	NEXTdc28
3	dc	Sdc31	NEXTdc31	Sdc32	NEXTdc32	Sdc33	LCLdc33	Sdc34	LCTLdc34	Sdc35	NEXTdc35	Sdc36	FEXTdc36	Sdc37	NEXTdc37	Sdc38	FEXTdc38
4	dc	Sdc41	FEXTdc41	Sdc42	FEXTdc42	Sdc43	LCTLdc43	Sdc44	LCLdc44	Sdc45	FEXTdc45	Sdc46	NEXTdc46	Sdc47	FEXTdc47	Sdc48	NEXTdc48
5	dc	Sdc51	NEXTdc51	Sdc52	FEXTdc52	Sdc53	NEXTdc53	Sdc54	FEXTdc54	Sdc55	LCLdc55	Sdc56	LCTLdc56	Sdc57	NEXTdc57	Sdc58	FEXTdc58
6	dc	Sdc61	FEXTdc61	Sdc62	NEXTdc62	Sdc63	FEXTdc63	Sdc64	NEXTdc64	Sdc65	LCTLdc65	Sdc66	LCLdc66	Sdc67	FEXTdc67	Sdc68	NEXTdc68
7	dc	Sdc71	NEXTdc71	Sdc72	FEXTdc72	Sdc73	NEXTdc73	Sdc74	FEXTdc74	Sdc75	NEXTdc75	Sdc76	FEXTdc76	Sdc77	LCLdc77	Sdc78	LCTLdc78
8	dc	Sdc81	FEXTdc81	Sdc82	NEXTdc82	Sdc83	FEXTdc83	Sdc84	NEXTdc84	Sdc85	FEXTdc85	Sdc86	NEXTdc86	Sdc87	LCTLdc87	Sdc88	LCLdc88
1	cd	Scd11	TCLcd11	Scd12	TCTLcd12	Scd13	NEXTcd13	Scd14	FEXTcd14	Scd15	NEXTcd15	Scd16	FEXTcd16	Scd17	NEXTcd17	Scd18	FEXTcd18
2	cd	Scd21	TCTLcd21	Scd22	TCLcd22	Scd23	FEXTcd23	Scd24	NEXTcd24	Scd25	FEXTcd25	Scd26	NEXTcd26	Scd27	FEXTcd27	Scd28	NEXTcd28
3	cd	Scd31	NEXTcd31	Scd32	NEXTcd32	Scd33	TCLcd33	Scd34	TCTLcd34	Scd35	NEXTcd35	Scd36	FEXTcd36	Scd37	NEXTcd37	Scd38	FEXTcd38
4	cd	Scd41	FEXTcd41	Scd42	FEXTcd42	Scd43	TCTLcd43	Scd44	TCLcd44	Scd45	FEXTcd45	Scd46	NEXTcd46	Scd47	FEXTcd47	Scd48	NEXTcd48
5	cd	Scd51	NEXTcd51	Scd52	FEXTcd52	Scd53	NEXTcd53	Scd54	FEXTcd54	Scd55	TCLcd55	Scd56	TCTLcd56	Scd57	NEXTcd57	Scd58	FEXTcd58
6	cd	Scd61	FEXTcd61	Scd62	NEXTcd62	Scd63	FEXTcd63	Scd64	NEXTcd64	Scd65	TCTLcd65	Scd66	TCLcd66	Scd67	FEXTcd67	Scd68	NEXTcd68
7	cd	Scd71	NEXTcd71	Scd72	FEXTcd72	Scd73	NEXTcd73	Scd74	FEXTcd74	Scd75	NEXTcd75	Scd76	FEXTcd76	Scd77	TCLcd77	Scd78	TCTLcd78
8	cd	Scd81	FEXTcd81	Scd82	NEXTcd82	Scd83	FEXTcd83	Scd84	NEXTcd84	Scd85	FEXTcd85	Scd86	NEXTcd86	Scd87	TCTLcd87	Scd88	TCLcd88
1	cc	Scd11	RLcc11	Scd12	ILcc12	Scd13	NEXTcc13	Scd14	FEXTcc14	Scd15	NEXTcc15	Scd16	FEXTcc16	Scd17	NEXTcc17	Scd18	FEXTcc18
2	cc	Scd21	ILcc21	Scd22	RLcc22	Scd23	FEXTcc23	Scd24	NEXTcc24	Scd25	FEXTcc25	Scd26	NEXTcc26	Scd27	FEXTcc27	Scd28	NEXTcc28
3	cc	Scd31	NEXTcc31	Scd32	NEXTcc32	Scd33	RLcc33	Scd34	ILcc34	Scd35	NEXTcc35	Scd36	FEXTcc36	Scd37	NEXTcc37	Scd38	FEXTcc38
4	cc	Scd41	FEXTcc41	Scd42	FEXTcc42	Scd43	ILcc43	Scd44	RLcc44	Scd45	FEXTcc45	Scd46	NEXTcc46	Scd47	FEXTcc47	Scd48	NEXTcc48
5	cc	Scd51	NEXTcc51	Scd52	FEXTcc52	Scd53	NEXTcc53	Scd54	FEXTcc54	Scd55	RLcc55	Scd56	ILcc56	Scd57	NEXTcc57	Scd58	FEXTcc58
6	cc	Scd61	FEXTcc61	Scd62	NEXTcc62	Scd63	FEXTcc63	Scd64	NEXTcc64	Scd65	ILcc65	Scd66	RLcc66	Scd67	FEXTcc67	Scd68	NEXTcc68
7	cc	Scd71	NEXTcc71	Scd72	FEXTcc72	Scd73	NEXTcc73	Scd74	FEXTcc74	Scd75	NEXTcc75	Scd76	FEXTcc76	Scd77	RLcc77	Scd78	ILcc78
8	cc	Scd81	FEXTcc81	Scd82	NEXTcc82	Scd83	FEXTcc83	Scd84	NEXTcc84	Scd85	FEXTcc85	Scd86	NEXTcc86	Scd87	ILcc87	Scd88	RLcc88

Terminations.

In any measurement system, the terminations are critical to measurement of correct values for the various parameters.

Figures 5 through 9 show basic measurement configurations for measurement using balun based measurement systems.

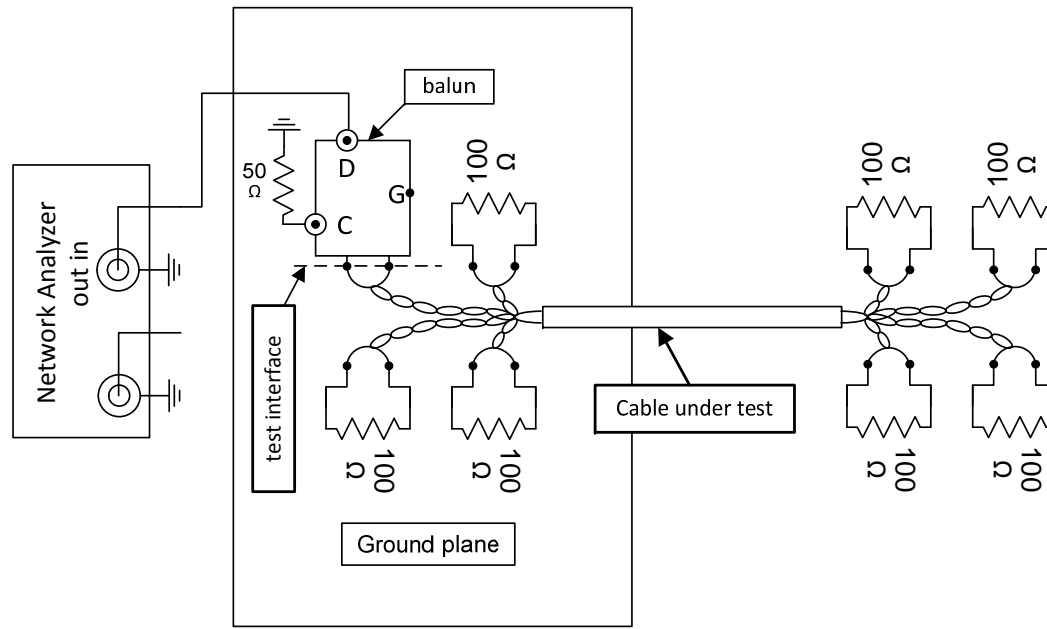


Figure 5 terminations for measurement of return loss

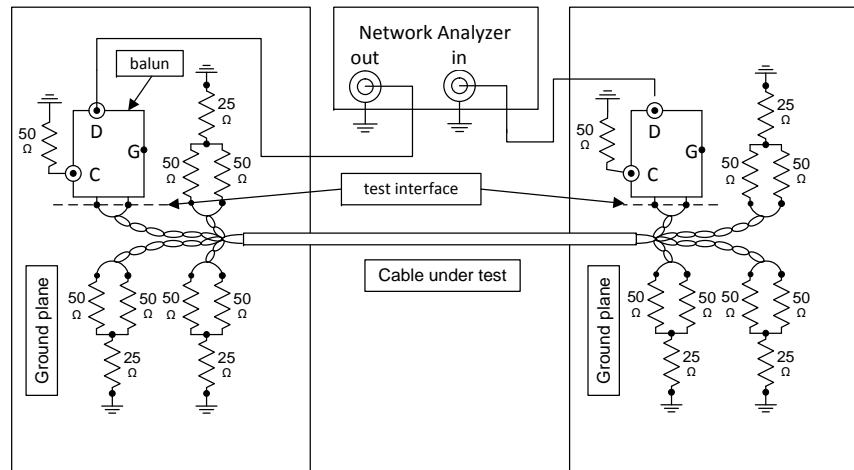


Figure 6 Terminations for measurement of for insertion loss, FEXT loss, ACRF, and propagation delay

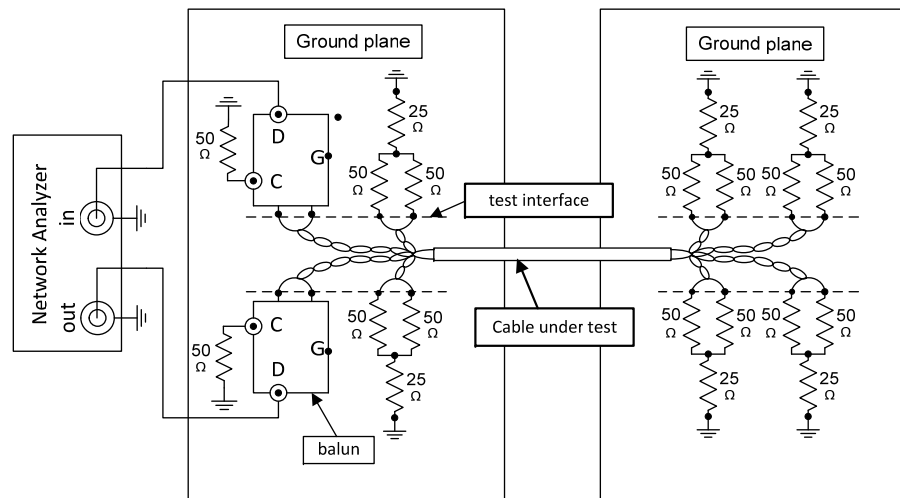


Figure 7 Terminations for measurement of NEXT loss.

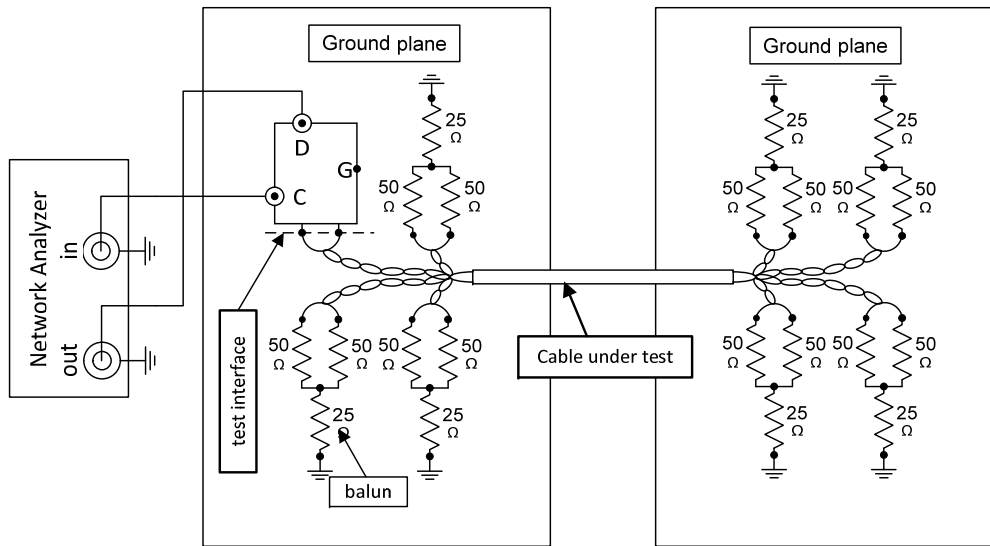


Figure 8 Terminations for measurement of TCL

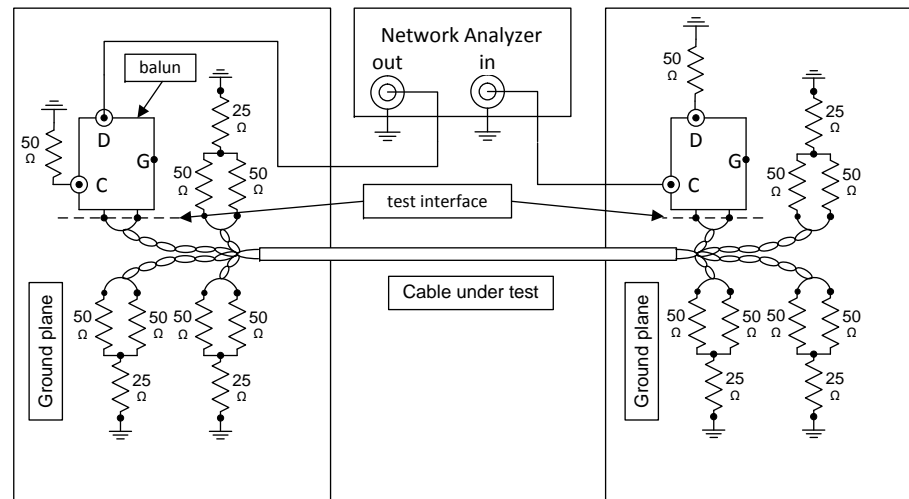


Figure 9 Terminations for measurement of TCTL

Figure 10 shows the basic measurement configuration for insertion loss, FEXT loss, ACRF, and propagation delay with a balunless measurement system.

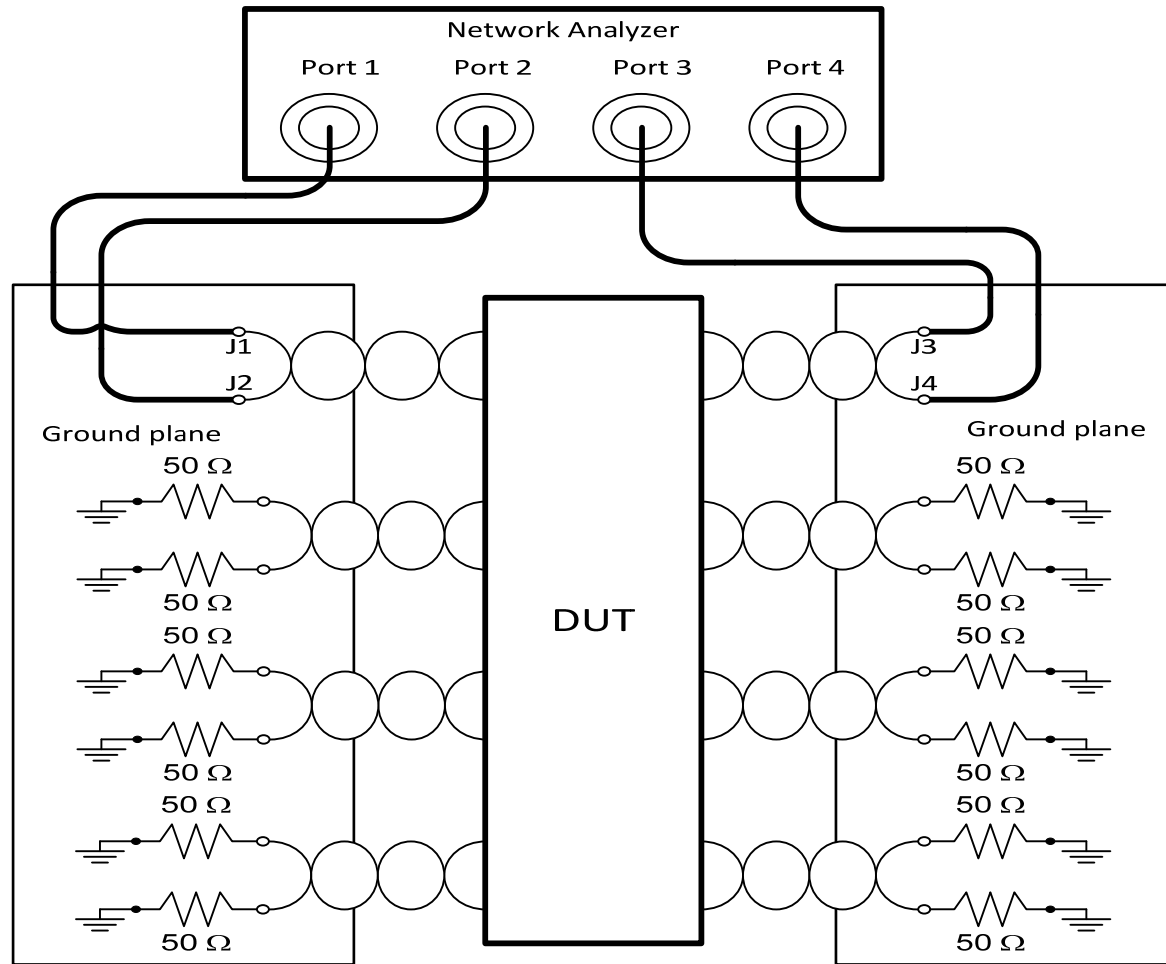


Figure 10 Terminations for measurement of insertion loss, FEXT loss, ACRF, and propagation delay using a balunless measurement system.

Figure 10 shows the basic measurement configuration for return loss and NEXT loss with a balunless measurement system.

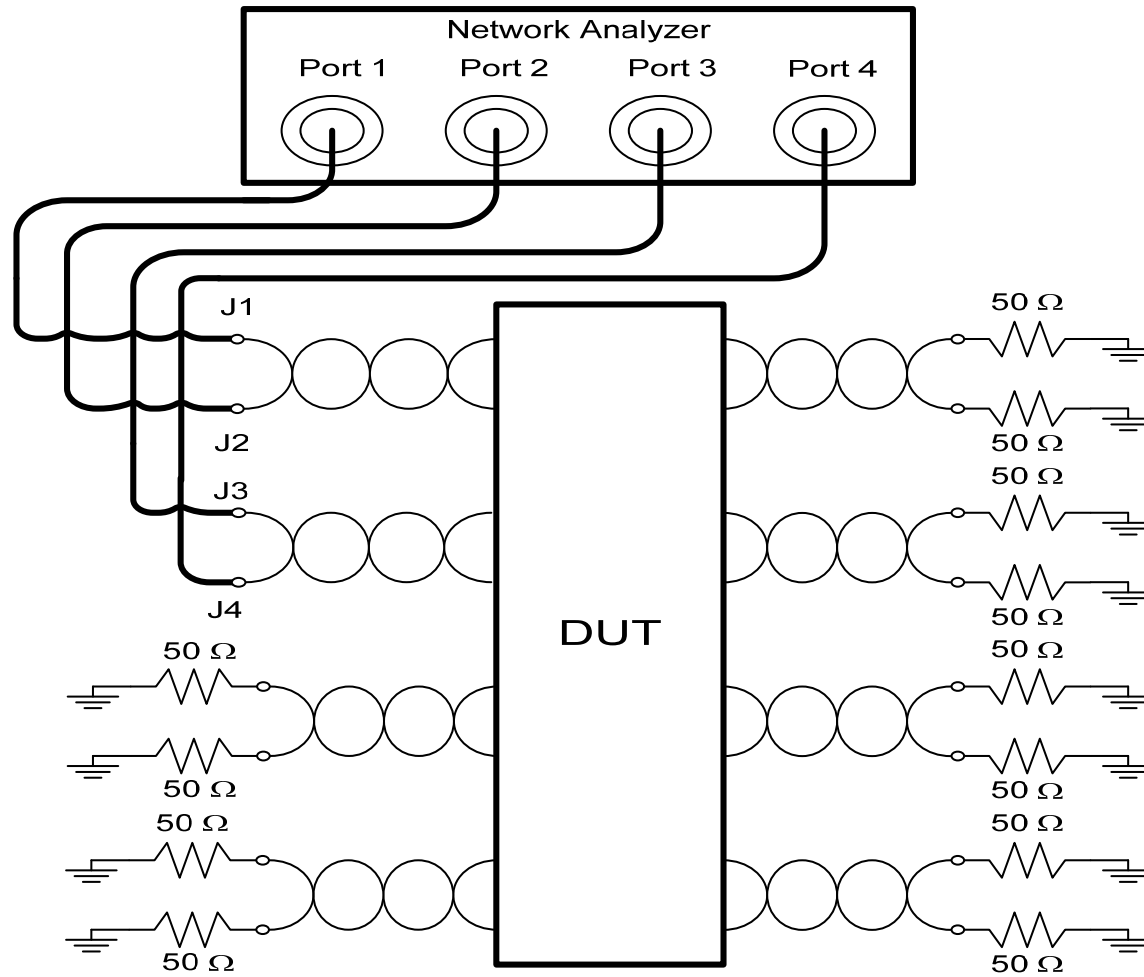


Figure 11 Return loss and NEXT loss measurement configuration using a balunless measurement system