Digital Cable Testing at LouisianaTech University

Dick Greenwood

Run 2B Silicon Electronics & Readout

7/29/02

Members of the LaTech D0 Group Working on Run2b Readout Testing

- Dick Greenwood, Faculty
- Prabir Roy, EE Post Doc (1/3 of his time)
- Grad. Student, plus undergraduate students
  - This summer: Moreshwar Dhole, Nathan Scott, with assistance from Thomas Larry
- Tom Emory, EE Technician: consultant

<u>Purpose of our work</u>: Testing and Quality Assurance

Digital Jumper & Twisted Pair Cable WBS Tasks

Test prototypes (L0-L1)	**1.1.2.6.3 ; 1.1.2.7.3**
Test production cables (L0-L1)	**1.1.2.6.8; 1.1.2.7.8**
Test preproduction cables (L2-L5)	**1.1.2.8.6**
Test production cables (L2-L5)	**1.1.2.8.11**
Test prototypes (twisted pairs)	**1.1.2.12.3**
Test preproduction cables	**1.1.2.12.6**
Test production cables	**1.1.2.12.12**

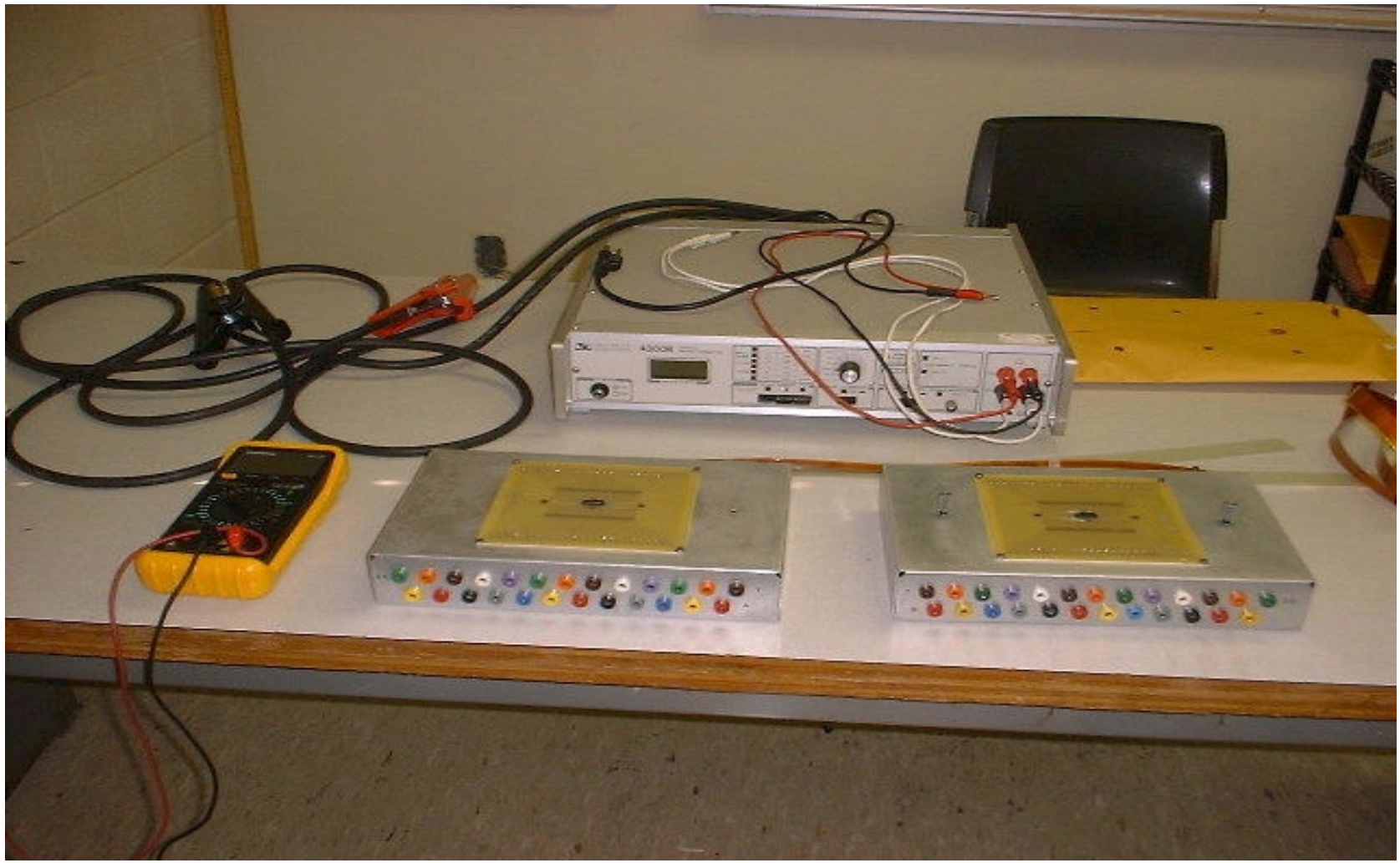
Initial Task: Tests on Two Prototype Digital Jumper (50cm) Cables

- Measure resistance
- Measure impedance
- Check for cross-talk
- …other tests ?

Today, will focus on resistance measurements

- Gearing up for measuring and documenting the resistances of many cables once production copies are available
- Borrowed from EE a Digital Micro-ohmmeter: Valhalla Scientific 4300B
  - Interface to PC via GPIB interface
  - Features 4-wire readout to eliminate lead wire and contact resistances

Digital Jumper Cable Readout Setup



Jumper Resistance Measurements (Resistance of cable + readout board)

Resistance of cable + readout board

Resistance of readout boards only

DATA

Pin No.	Line Name	Measurement without cable	Measurement with Cable No. 1-4	Measurement with Cable No.2-3
1	HV	0.4737	2.284	2.306
3	Empty	0.4790	Empty	Empty
5	Empty	0.4626	Empty	Empty
7	GND	0.4445	0.516	0.513
9	GND(S)	0.4368	2.472	2.443
11	VCAL	0.4218	2.441	2.457
13	TEMP1	0.4058	2.376	2.420
15	TEMP2	0.3863	2.373	2.451
17	GND	0.3711	0.442	0.446
19	CALSR	0.3572	2.282	2.298
21	GND	0.3451	0.415	0.415
23	PRI_IN	0.3596	2.325	2.371
25	FE_MOD	0.3229	2.298	2.317
27	GND	0.3295	0.401	0.405
29	BE_MOD	0.3572	2.380	2.357
31	CHG_MOD	0.3695	2.389	2.342

Pin No.	Line Name	Measurement without cable	Measurement with Cable No. 1-4	Measurement with Cable No.2-3
33	GND	0.3843	0.454	0.459
35	AVDD(S)	0.3972	2.433	2.411
37	AVDD	0.4165	0.550	0.564
39	AVDD	0.4314	0.564	0.570
41	GND	0.4441	0.517	0.512
43	DVDD(S)	0.4491	2.457	2.489
45	DVDD	0.4695	0.594	0.618
47	DVDD	0.4777	0.604	0.614
49	GND	0.5053	0.591	0.586
2	Empty	0.4861	Empty	Empty
4	Empty	0.6510	Empty	Empty
6	/PRI_OUT	0.4556	2.473	2.498
8	PRI_OUT	0.4236	2.345	2.476
10	/SVXD7	0.4123	2.318	2.386
12	SVXD7	0.3996	2.328	2.370

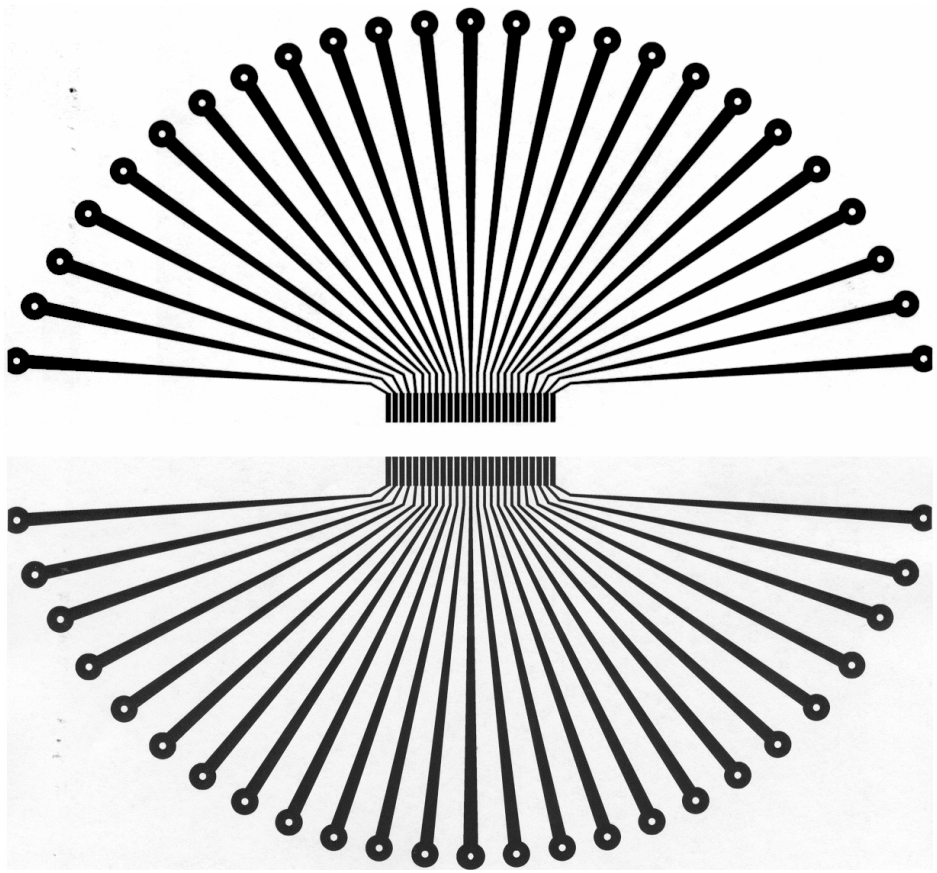
Pin No.	Line Name	Measurement without cable	Measurement with Cable No. 1-4	Measurement with Cable No.2-3
14	/SVXD6	0.4030	2.311	2.373
16	SVXD6	0.3666	2.321	2.331
18	/SVXD5	0.3523	2.278	2.325
20	SVXD5	0.3470	2.255	2.299
22	/SVXD4	0.3256	2.240	2.269
24	SVXD4	0.3042	2.214	2.290
26	/SVXD3	0.3004	2.208	2.305
28	SVXD3	0.3179	2.230	2.287
30	/SVXD2	0.3469	2.274	2.300
32	SVXD2	0.3376	2.269	2.311
34	/SVXD1	0.3557	2.276	2.360
36	SVXD1	0.3711	2.287	2.367
38	/SVXD0	0.3853	2.315	2.374
40	SVXD0	0.3991	2.352	2.380
42	/SVXOBDV	0.4104	2.367	2.381
44	SVXOBDV	0.4199	2.344	2.409
46	GND	0.4382	0.510	0.508
48	/CLK	0.4492	2.392	2.436
50	CLK			2.210

Traces on one of the readout boards and cables damaged!

Measured Resistances of Power Traces: good agreement with specs!

Pin #	Trace	Cable 1 Resistance	Cable 2 Resistance	*Specified in*: dj_section_27 nov01
37	AVDD	0.133 Ω	0.148 Ω	0.168 Ω/m
39	AVDD	0.133 Ω	0.139 Ω	0.168 Ω/m
45	DVDD	0.125 Ω	0.149 Ω	0.144 Ω/m
47	DVDD	0.126 Ω	0.136 Ω	0.144 Ω/m
7	GND	0.0715 Ω	0.0685 Ω	0.068 Ω/m

Lessons learned and Plans

- Be careful! Spoiled readout trace probably due to excessive test current
- Maintain closer contact with KSU designers and Fermilab mentors
- Participate in weekly meetings--would welcome VRVS
- Will buy new Mico-ohmmeter with temperature compensation; also scope probes, etc. Suggestions?
- Will employ a newly designed readout board with lower and more uniform trace resistances

New Board Design (Tom Emory, ZDG)-- Currently being made by Johnny Green