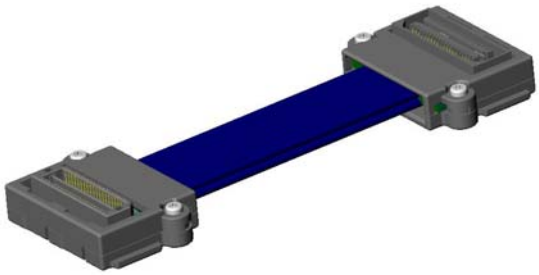
Project Number: NA	Tracking Code: TC0412--0394		
Requested by: John Reid	Date: 3/17/2004	Product Rev: 0	
Part #: EQDP-014-12.00-TTR-STL-1	Lot #: 03/17/04	Tech: TR & TC	Eng: John Tozier
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch			Qty to test: 15
Test Start: 04/14/2004	Test Completed: 6/15/2004		



DVT

PART DESCRIPTION

EQDP-014-12.00-TTR-STL-1

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: DVT

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
5) The automated procedure is used with aqueous compatible soldering materials.
6) The ultrasonic procedure can be used with either aqueous or non-aqueous soldering components and follows:
   a) Sample test boards are to be ultrasonically cleaned after test lead attachment, preparation and/or soldering.
   b) Sample test boards are immersed into Branson 3510 cleaner containing Kyzen Ionox HC1 (or equivalent) with the following conditions:
      i) Temperature: ----------55° C+/- 5° C
      ii) Frequency:----------40 KHz
      iii) Immersion Time: ----------5 to 10 Minutes
   c) Sample test boards are removed and placed into the Branson 3510 cleaner containing deionized water with the following conditions:
      i) Temperature: ----------55° C +/- 5° C
      ii) Frequency:----------40 KHz
      iii) Immersion Time: ----------5 to 10 Minutes
   d) Sample test boards are removed and placed in a beaker positioned on a hot plate with a magnetic stirrer containing deionized water warmed to 55° C +/- 5° C for 1/2 to 1 minute.
   e) Upon removal, the sample boards are rinsed for ½ to 1 minute at room temperature with free flowing deionized water.
   f) After the final rinse, the sample test boards are dried in an air-circulating oven for 10 to 15 minutes at 50° C +/- 5° C.
   g) Sample test boards are then allowed to set and recover to room ambient condition prior to testing.
7) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
8) Any additional preparation will be noted in the individual test sequences.

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

FLOWCHARTS

TEST	GROUP 1		
STEP	Cable Center, Both Cables Powered		
	6 adjacent DP lines		
01	CCC		
Tabulate calculated current at RT, 65° C, 75° C and 95° C			
	after derating 20% and based on 105° C		
CCC, Temp rise = EIA-364-70			

TEST	GROUP 1			
STEP	Sig-Gnd			
01	IR			
02	Data Review			
03	Thermal Aging			
04	IR			
05	Data Review			
06	Humidity			
07	IR			
Thermal Aging = EIA-364-17, Test Condition 4, 105 deg C;				
	Time Condition 'B' (250 hours)			
Humidity =EIA-364-31, Test Condition B (240 Hours)				
	and Method III (+25 ° C to +65 ° C @ 90%RH to 98% RH)			
	delete steps 7a and 7b			
IR = EIA-364-21				

TEST	GROUP 1A	GROUP 1B	GROUP 1C	
STEP	Sig-Gnd	Sig-Gnd	Sig-Gnd	
	Ambient	Thermal	Humidity	
01	DWV/Working Voltage	Thermal Aging	Humidity	
02		DWV/Working Voltage	DWV/Working Voltage	
Thermal Aging = EIA-364-17, Test Condition 4, 105 deg C;				
	Time Condition 'B' (250 hours)			
Humidity =EIA-364-31, Test Condition B (240 Hours)				
	and Method III (+25 ° C to +65 ° C @ 90%RH to 98% RH)			
	delete steps 7a and 7b			
DWV = EIA-364-20				

FLOWCHARTS Continued, SUPPLEMENTAL TESTING

TEST	GROUP 1	GROUP 2
STEP		
	Gnd 0°	Gnd 90°
01	Pull test, Continuity	Pull test, Continuity
Secure both cables in the center.		
Monitor continuity resistance and		
	record forces when continuity fails.	

TEST	GROUP 1	GROUP 2	GROUP 3	GROUP 4
STEP	Test w/8 Oz. weight	Test w/8 Oz. weight	Test w/8 Oz. weight	Test w/8 Oz. weight
_	Sig ±90° Bend	Sig ±35° Bend	Gnd ±90° Bend	Gnd ±35° Bend
01	Resistance	Resistance	Resistance	Resistance
02	5000 Cycles	5000 Cycles	5000 Cycles	5000 Cycles
03	Data Review	Data Review	Data Review	Data Review
04	Resistance	Resistance	Resistance	Resistance
05	10000 Cycles	10000 Cycles	10000 Cycles	10000 Cycles
06	Data Review	Data Review	Data Review	Data Review
07	Resistance	Resistance	Resistance	Resistance
08	15000 Cycles	15000 Cycles	15000 Cycles	15000 Cycles
09	Data Review	Data Review	Data Review	Data Review
10	Resistance	Resistance	Resistance	Resistance
11	20000 Cycles	20000 Cycles	20000 Cycles	20000 Cycles
12	Data Review	Data Review	Data Review	Data Review
13	Resistance	Resistance	Resistance	Resistance
14	25000 Cycles	25000 Cycles	25000 Cycles	25000 Cycles
15	Resistance	Resistance	Resistance	Resistance
	Monitor Cable Continuity Resistance			

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL AGING:

1) EIA-364-17, *Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors.*
   a) Test Condition 4 at 105° C.
   b) Test Time Condition B for 250 hours.
2) Connectors are mated.

HUMIDITY:

1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors.*
   a) Test Condition B, 240 Hours.
   b) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
2) Connectors are mated.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
4) The size of the temperature probe can affect the measured temperature.
5) Copper traces on PC boards will contribute to temperature rise:
   a) Self heating (resistive)
   b) Reduction in heat sink capacity affecting the heated contacts
6) A de-rating curve, usually 20%, is calculated.
7) Calculated de-rated currents at three temperature points are reported:
   a) Ambient
   b) 65 ^{o} C
   c) 75 ^{o} C
   d) 95 ^{o} C
8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
12) Hook-up wire length is longer than the minimum specified in the referencing standard.

ATTRIBUTE DEFINITIONS Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

1) PROCEDURE:
   a) Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
   b) Test Conditions:
      i) Between Adjacent Contacts (Sig-Gnd)
      ii) Mated with QTE-DP
      iii) Mounted to PC board
      iv) Rate of Application 500 V/Sec
      v) Test Voltage (VAC) until breakdown occurs
2) MEASUREMENTS/CALCULATIONS
   a) The breakdown voltage shall be measured and recorded.
   b) The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
   c) The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

1) PROCEDURE:
   a) Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
   b) Test Conditions:
      i) Between Adjacent Contacts (Sig-Gnd)
      ii) Mated with QTE-DP
      iii) Mounted to PC board
      iv) Electrification Time 2.0 minutes
      v) Test Voltage (VDC) corresponding to calibration settings for measuring resistances
2) MEASUREMENTS:
   a) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

SUPPLEMENTAL TESTS, Typical setup pictures and not necessarily of product under test:

1. **Connector Pull … Secure cable near cable center and pull on connector and monitor continuity resistance**
   a. **At 90°, right angle to cable**

   b. **At 0°, in-line with cable**

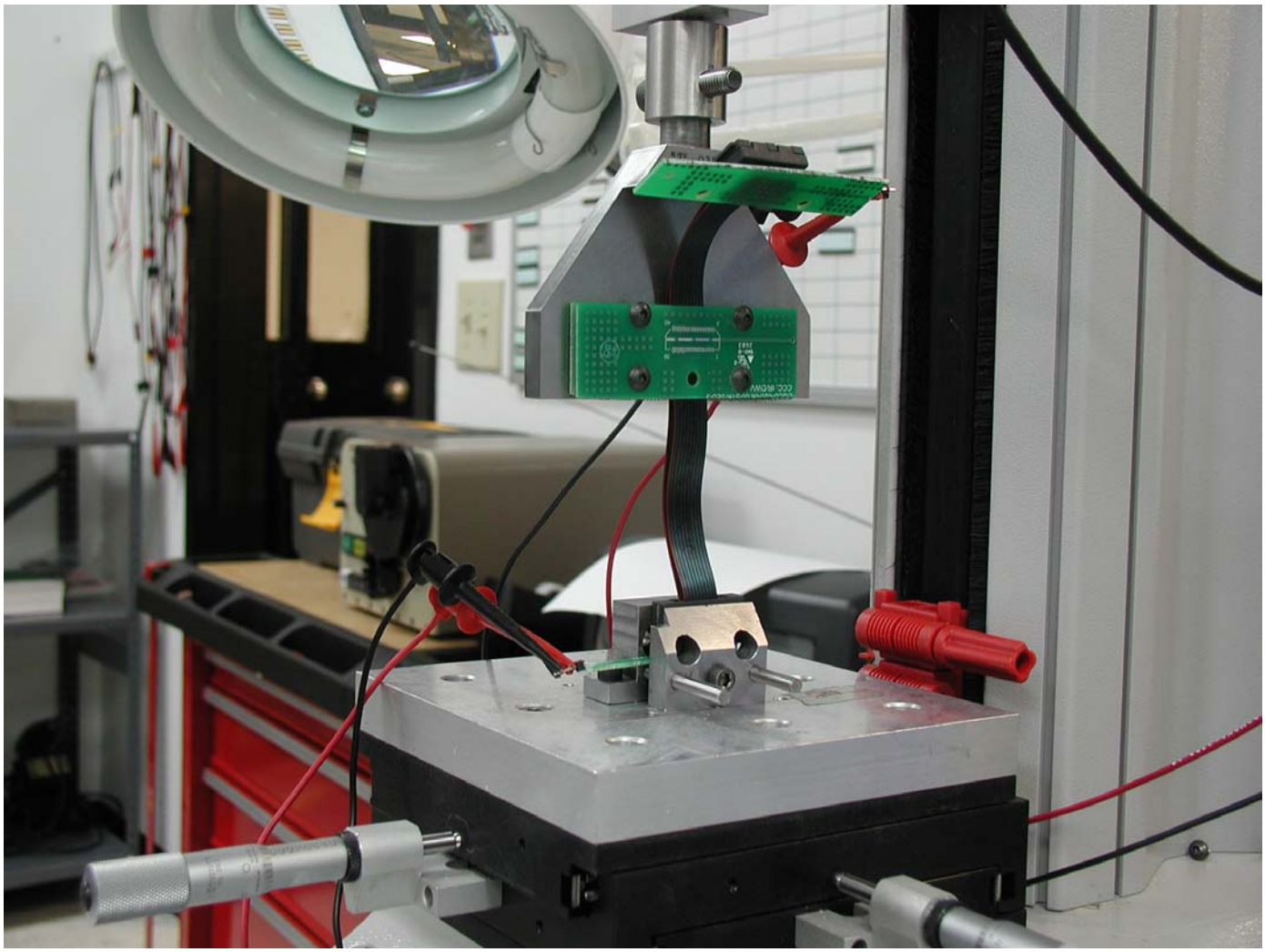


Fig. 1
(Typical set-up, actual part not depicted.)
0° Connector pull, notice the electrical continuity hook-up wires.

2. Cable Durability, Bend up to 25,000 cycles with an 8 oz. load on cable end and monitor continuity resistance

a. ± 35° Pendulum Mode

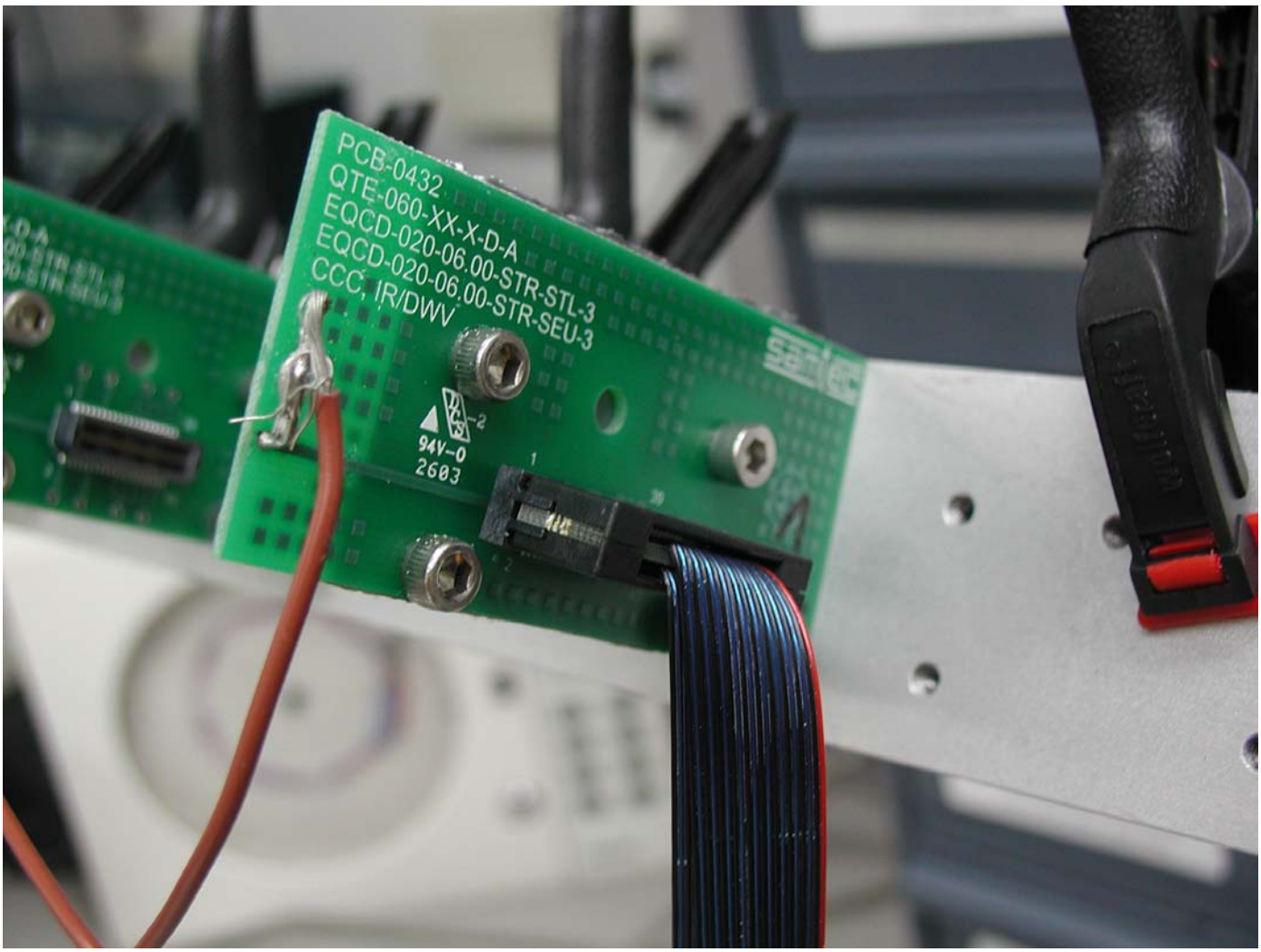


Fig. 2
(Typical set-up, actual part not depicted.)

b. ± 90° Flex Mode

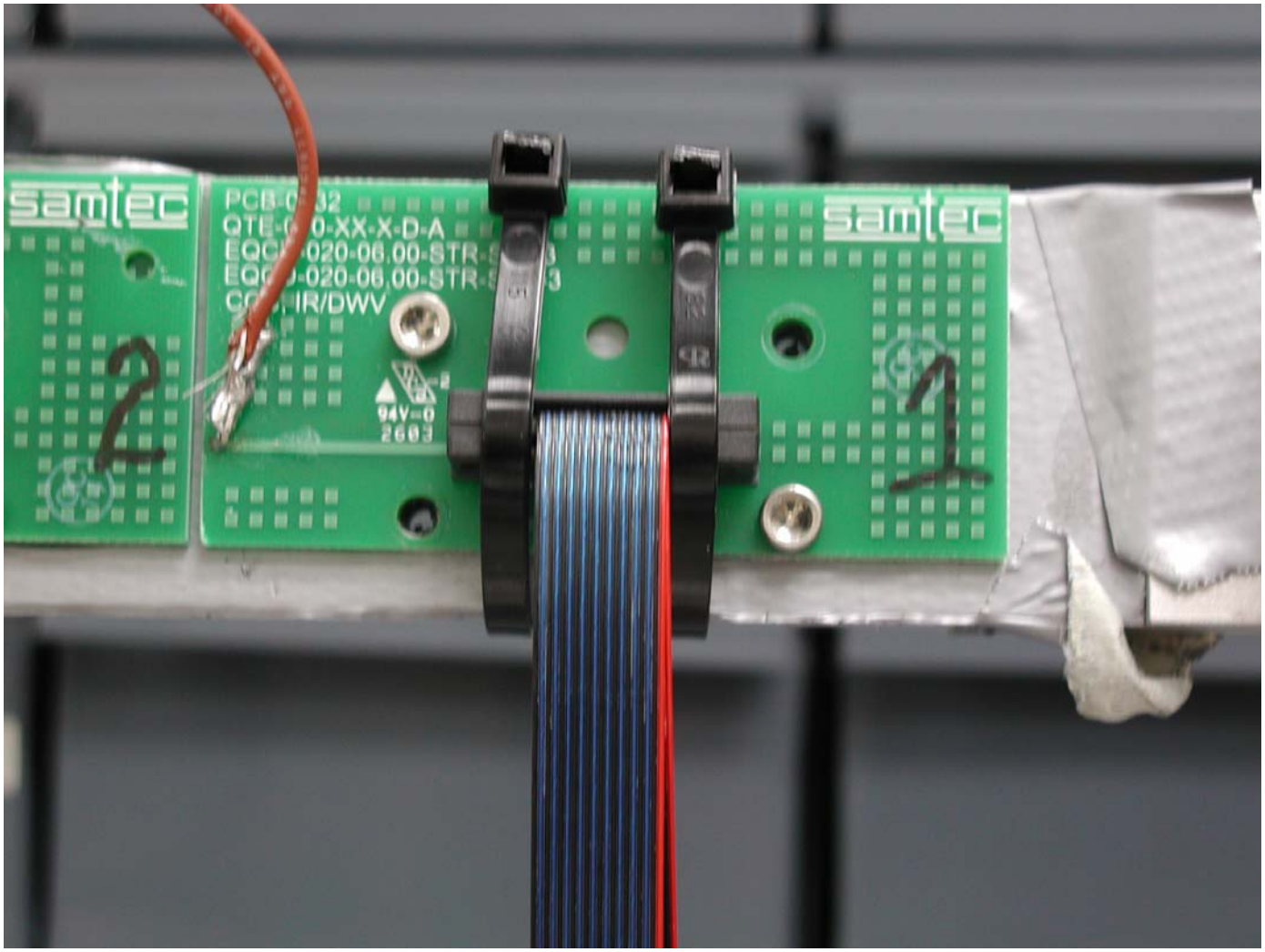


Fig. 3
(Typical set-up, actual part not depicted.)

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

RESULTS

Temperature Rise, CCC At 95°C, relative to 105°C and 20% de-rated

- **6 Adjacent Conductors Powered in each cable---------- 0.5 A**

Insulation Resistance minimums, IR – Sig-Gnd

- **Initial ---------- 25,000 Meg Ω ---------- Pass**
- **Thermal---------- 50,000 Meg Ω**
- **Humidity---------- 50,000 Meg Ω**

Dielectric Withstanding Voltage minimums, DWV – Sig-Gnd

- **Initial**
  - **Breakdown ---------- 1100 VAC**
  - **DWV----------825 VAC**
  - **Working voltage----------275 VAC**
- **Thermal**
  - **Breakdown ---------- 1600 VAC**
  - **DWV---------- 1200 VAC**
  - **Working voltage----------400 VAC**
- **Humidity**
  - **Breakdown ---------- 1600 VAC**
  - **DWV---------- 1200 VAC**
  - **Working voltage----------400 VAC**

Supplemental – Connector/Cable Pull

- **0° ----------210.0 lbs min**
- **90° ----------199.5 lbs min**

Supplemental – Cable Bend 25,000 Cycles

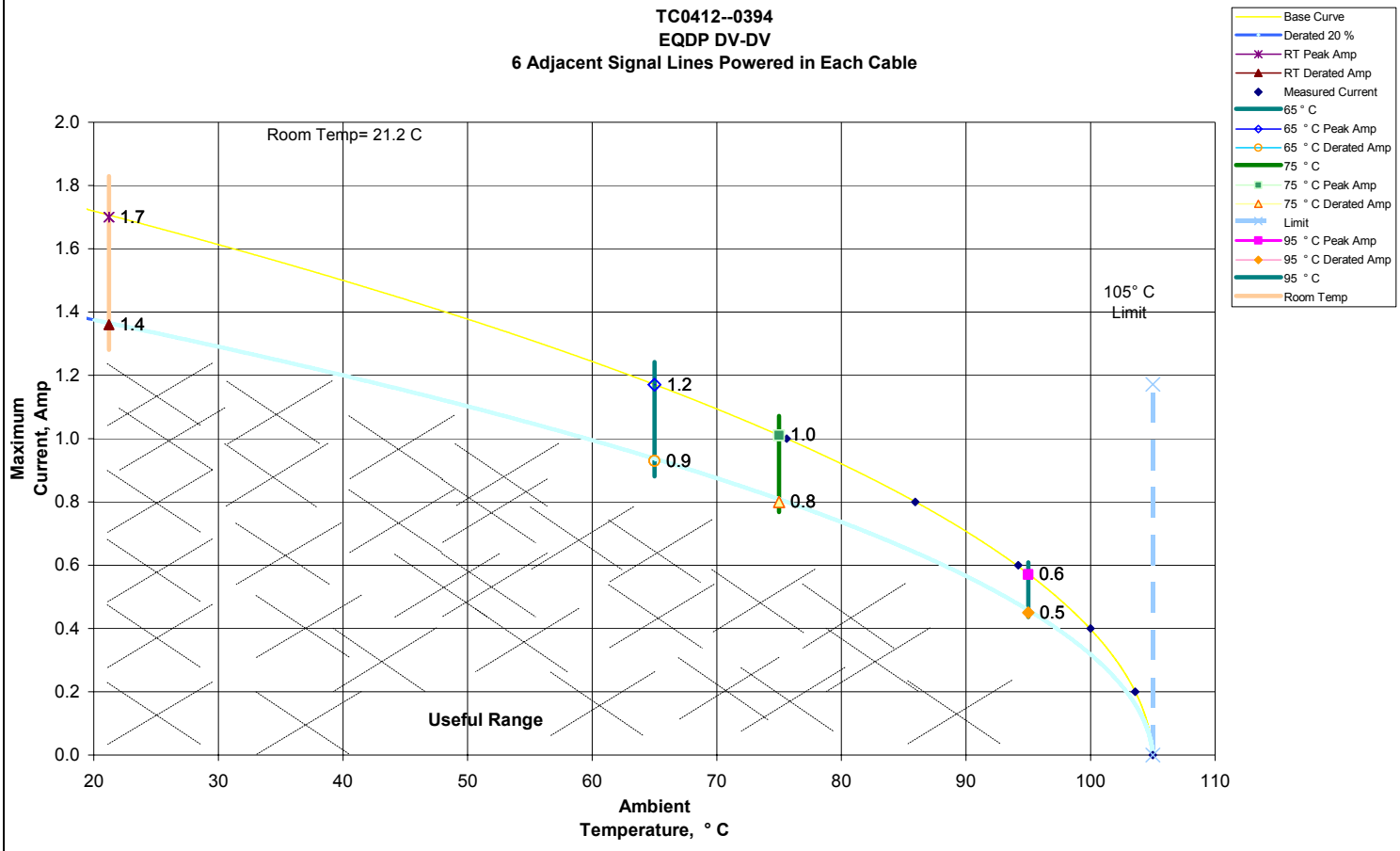
- **35° Pendulum Mode**
  - **Sig ---------- Up to 1,253 Cycles (open circuit)**
  - **Gnd ---------- Up to 25,000 Cycles**
- **90° Flex Mode**
  - **Sig ---------- Up to 1,553 Cycles (open circuit)**
  - **Gnd ---------- Up to 25,000 Cycles**

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1° C (computer controlled data acquisition).
4) One configuration was tested and temperatures were monitored at a point near the center of the cables, remote from the PCB:
   a) Six adjacent signal lines powered in each cable



DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

Electrification Time ***Two (2) minutes***

Initial, Meg Ohms

	Mated
	Insulation Resistance
Average	25000
Min	25000
Max	25000

Thermal, Meg Ohms

	Mated
	Insulation Resistance
Average	50000
Min	50000
Max	50000

Humidity, Meg Ohms

	Mated
	Insulation Resistance
Average	50000
Min	50000
Max	50000

DATA SUMMARIES Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rate ***500 VAC Per Sec.***
Test Voltage ***Until Breakdown Occurs***

	Initial, VAC Mated		
	Breakdown Voltage	**DWV**	**Working Voltage**
Average	1100	825	275
Min	1100	825	275
Max	1100	825	275
	Thermal, VAC Mated		
	Breakdown Voltage	**DWV**	**Working Voltage**
Average	1600	1200	400
Min	1600	1200	400
Max	1600	1200	400
	Humidity, VAC Mated		
	Breakdown Voltage	**DWV**	**Working Voltage**
Average	1600	1200	400
Min	1600	1200	400
Max	1600	1200	400

DATA SUMMARIES Continued

SUPPLEMENTAL TESTS: Connector Pull

Pull, 0 Degrees	
	Force (Lbs)
Minimum	210.00
Maximum	*220.30*
Average	***215.2***

Pull, 90 Degrees	
	Force (Lbs)
Minimum	199.50
Maximum	*199.50*
Average	***199.5***

DATA SUMMARIES Continued

SUPPLEMENTAL TESTS: Cable Durability, Bend ± 35° Pendulum Mode

Sig 35 degree						
Cable	Sig Resistance, milli-Ohms/Signal Conductor					
	Initial Resistance	5000 Cycles	10000 Cycles	15000 Cycles	20000 Cycles	25000 Cycles
1	80.3	80.8	80.8	80.6	79.7	79.4
2	81.5	Failed at 1253 Cycles	Failed at 1253 Cycles	Failed at 1253 Cycles	Failed at 1253 Cycles	Failed at 1253 Cycles

Gnd 35 degree						
Cable	Gnd Resistance, milli-Ohms					
	Initial Resistance	5000 Cycles	10000 Cycles	15000 Cycles	20000 Cycles	25000 Cycles
1	50.8	47.4	51.2	50.2	48.2	54.6
2	63.8	60.4	65.2	64	64.2	65.4

DATA SUMMARIES Continued

SUPPLEMENTAL TESTS: Cable Durability, Bend ± 90° Flex Mode

Sig 90 degree						
Cable	Sig Resistance, milli-Ohms/Signal Conductor					
	Initial Resistance	5000 Cycles	10000 Cycles	15000 Cycles	20000 Cycles	25000 Cycles
1	54.7	Failed at 1553 cycles	Failed at 1553 cycles	Failed at 1553 cycles	Failed at 1553 cycles	Failed at 1553 cycles
2	54.7	Failed at 1761 cycles	Failed at 1761 cycles	Failed at 1761 cycles	Failed at 1761 cycles	Failed at 1761 cycles

Gnd 90 degree						
Cable	Gnd Resistance, milli-Ohms					
	Initial Resistance	5000 Cycles	10000 Cycles	15000 Cycles	20000 Cycles	25000 Cycles
1	29.3	26.1	25.7	27.8	31.0	28.0
2	27.3	27.2	28.1	27.3	27.8	27.5

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

DATA

INSULATION RESISTANCE (IR):

Test Date:	5/24/2004
Operator:	Troy Cook
Temperature (C):	23
Humidity (RH):	44%
Equipment ID:	HPM-01

Electrification Time ***Two (2) minutes***

Initial, Meg Ohms

	Mated
Sample #	**Insulation Resistance**
1	25000

Test Date:	6/4/2004
Operator:	Troy Cook
Temperature (C):	24
Humidity (RH):	49%
Equipment ID:	HPM-01

Electrification Time ***Two (2) minutes***

Thermal, Meg Ohms

	Mated	Unmated
Sample #	**Insulation Resistance**	**Insulation Resistance**
1	50000	

Test Date:	6/14/2004
Operator:	Troy Cook
Temperature (C):	23
Humidity (RH):	44%
Equipment ID:	HPM-01

Electrification Time ***Two (2) minutes***

Humidity, Meg Ohms

	Mated	Unmated
Sample #	**Insulation Resistance**	**Insulation Resistance**
1	50000	

DATA Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Test Date:	4/14/2004
Operator:	TR
Temperature (C):	23
Humidity (RH):	30%
Equipment ID:	HPM-01

Voltage Rate ***500 VAC Per Sec.***

Test Voltage ***Until Breakdown Occurs***

	Initial, VAC Mated		
Sample #	**Breakdown Voltage**	**DWV**	**Working Voltage**
1	1100	825	275

Test Date:	4/28/2004
Operator:	Troy Cook
Temperature (C):	23
Humidity (RH):	33%
Equipment ID:	HPM-01

Voltage Rate ***500 VAC Per Sec.***

Test Voltage ***Until Breakdown Occurs***

	Thermal, VAC Mated		
Sample #	**Breakdown Voltage**	**DWV**	**Working Voltage**
1	1600	1200	400

Test Date:	6/14/2004
Operator:	Troy Cook
Temperature (C):	23
Humidity (RH):	44%
Equipment ID:	HPM-01

Voltage Rate ***500 VAC Per Sec.***

Test Voltage ***Until Breakdown Occurs***

	Humidity, VAC Mated		
Sample #	**Breakdown Voltage**	**DWV**	**Working Voltage**
1	1600	1200	400

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

DATA Continued

SUPPLEMENTAL: Connector Pull

Test Date:	4/12/2004	
Operator:	TR	
Temperature (C):	22	
Humidity (RH):	31%	
Pressure (In. Hg):	NA	
Equipment ID:	TCT-03	
Load Cell:	LC-2500N(icell)	
Pull, 0 Degrees		
Sample#	Maximum Force (Lbs)	Failure Mode
1	210.00	*both cables pulled out*
2	220.30	*both cables pulled out*

Test Date:	4/12/2004	
Operator:	TR	
Temperature (C):	22	
Humidity (RH):	31%	
Pressure (In. Hg):	NA	
Equipment ID:	TCT-03	
Load Cell:	LC-2500N(icell)	
Pull, 90 Degrees		
Sample#	Maximum Force (Lbs)	Failure Mode
1	199.5	*both cables pulled off*

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THL-02
Description: Temperature/Humidity Chart Recorder
Manufacturer: Dickson
Model: THDX
Serial #: 00120351
Accuracy: Temp: +/- 1C; Humidity: +/-2% RH (0 - 60%) +/- 3% RH (61 - 95%).
… Last Cal: 6/02/04, Next Cal: 6/02/05

Equipment #: MO-02
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0780546
Accuracy: See Manual
… Last Cal6/12/03, Next Cal: 6/12/04

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 6/12/03, Next Cal: 6/12/04

Equipment #: TC090601-103/105
Description: IC Thermocouple-103/105
Manufacturer: Samtec
Serial #: TC090601-103/105
Accuracy: +/- 1 degree C

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 6/12/03, Next Cal: 6/12/04

Equipment #: OV-03
Description: Cascade Tek Forced Air Oven
Manufacturer: Cascade Tek
Model: TFO-5
Serial #: 0500100
Accuracy: Temp. Stability: +/-.1C/C change in ambient
… Last Cal: 6/20/03, Next Cal: 6/30/04

Tracking Code: TC0412--0394	Part #: EQDP-014-12.00-TTR-STL-1
Part description: Twin-ax High Speed Cable Assy, 0.8 mm Pitch	

Equipment #: THC-01
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SM-8-7800
Serial #: 30676
Accuracy: See Manual
… Last Cal: 4/22/2004, Next Cal: 5/22/2005

Equipment #: TCT-03
Description: Dillon Quantrol TC2 Test Stand
Manufacturer: Dillon Quantrol
Model: TC2
Serial #: 02-1033-03
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.
… Last Cal: 6/12/03, Next Cal: 6/12/04

Equipment #: LC-2500N(icell)
Description: 2500 N Load Cell for Dillon Quantrol
Manufacturer: Dillon Quantrol
Model: icell
Serial #: 01-0132-01
Accuracy: .10% of capacity
… Last Cal: 4/27/04, Next Cal: 4/27/05

Equipment #: HDR - 01
Description: HDR Flex Tester
Manufacturer: Samtec Inc.
Model: AT-1440-000
Serial #: AT-1440-000
Accuracy: N/A
… Last Cal: Calibration Not Required