

**J.S.T.**

TE-2204

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September 2, 1994

Title Subject: VH CONNECTOR (PHOSPHOR BRONZE)

Issued by:
Engineering Dept.

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This report contains the results of general performance tests for
VH connector(Phosphor Bronze).

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1. PART NAME & PART NUMBER

Part Name		Part Number
Contact		SVH-21T-P1.1
Housing		VHR-*N
		VHR-*M
	Top entry type	B*P-VH
	Side entry type	B*PS-VH
Header		S*P-VH

Note: * represents one or two figures indicating number of circuits.
 Ex. 6-circuit housing --- VHR-6N

2. CONSTRUCTION, DIMENSIONS, MATERIAL & SURFACE FINISH

Construction and dimensions shall be in accordance with the referenced drawings. Material and surface finish shall be as specified below.

		Material	Surface Finish, etc.
Contact		Phosphor Bronze	Tin-plated
Housing		6 Nylon	UL 94V-0
Header	Post	Brass	Copper-underplated
	Wafer	66 Nylon	Tin/Lead alloy-plated
			UL 94V-0

3. CHARACTERISTICS

Current rating: 7 A AC, DC (When AWG #18 is applied)

Voltage rating: 250 V AC, DC

Temperature range: -25 °C to +85 °C (Including temperature rise.)

Applicable wire:

Conductor construction size: AWG #22, #20, #18

Wire insulation O.D.: 1.7 mm to 3.0 mm

Applicable printed circuit board (PCB): Thickness: 1.6 mm

Hole size: 1.65 +0.1/0 mm *1

Notes: *1 Recommended value in applying paper base, epoxy resin for PCB material and drill hole. Tolerance depends on PCB material and the work method.

2 Wire conductor shall be tin-plated soft copper wire (stranded wire).

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4. SPECIMEN

Part Name	Part Number
Contact	SVH-21T-P1.1
Housing	VHR-*N
Header Top entry type	B*P-VH

Note: * denotes number of circuits.

5. TEST CONDITIONS

- 5.1 Unless otherwise specified, tests and measurements shall be conducted under the following ambient conditions.

Temperature: 15 to 35 °C
 Relative humidity: 25 to 85 %

- 5.2 For environmental test, connector assembled for actual use shall be used. Wire of AWG #20 UL1007 style shall be used.

6. REQUIREMENTS, TEST METHODS & TEST RESULTS**6.1 Appearance**

Requirements: There shall be no crack, no deformation nor discoloration which may affect the performance.

Test method: Inspected with naked eyes before and after the environmental tests.

Test results: Good.

6.2 Mechanical Test**6.2.1 Insertion Force(I.F.) & Withdrawal Force(W.F.)**

Requirements:

Number of circuits	At initial		(N) At 50th
	I.F. [max.]	W.F. [min.]	W.F. [min.]
Single	9.8	1.96	0.98
2	19.6	3.92	1.96
3	29.4	5.88	2.94
4	39.2	7.84	3.92
5	44.1	9.80	4.90
6	53.9	12.7	6.86
7	58.8	15.7	8.82
8	68.6	18.6	10.8
9	73.5	21.6	12.7
10	78.4	24.5	14.7

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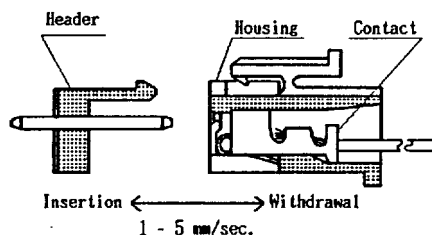
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Test method: A housing with contact(s) and a header shall be mated and unmated on a same axis. Initial insertion and withdrawal forces and withdrawal force at 50th shall be measured. Housing lock shall be removed.



Test results:

No. of circuits		At Initial		(N) At 50th
		I.F.	W.F.	W.F.
Single	Max.	4.90	4.90	4.90
	Min.	3.92	2.94	1.96
	Ave.	4.31	3.82	3.33
2	Max.	10.8	10.8	7.68
	Min.	7.84	6.86	4.90
	Ave.	9.41	8.33	6.76
3	Max.	14.7	13.7	13.7
	Min.	12.7	10.8	8.82
	Ave.	13.8	11.9	10.5
4	Max.	19.6	19.6	15.7
	Min.	13.7	13.7	10.8
	Ave.	18.2	16.3	13.1
5	Max.	27.4	23.5	25.5
	Min.	23.5	19.6	16.7
	Ave.	25.2	21.7	20.2
6	Max.	31.4	32.3	24.5
	Min.	28.4	24.5	15.7
	Ave.	29.2	28.3	20.0
7	Max.	41.2	33.3	25.5
	Min.	30.4	28.4	29.6
	Ave.	25.6	30.5	22.5
8	Max.	41.2	41.2	31.4
	Min.	37.2	34.3	21.6
	Ave.	39.9	37.2	27.0
9	Max.	50.0	43.1	38.2
	Min.	43.1	36.3	27.4
	Ave.	46.9	40.9	33.5
10	Max.	54.9	51.9	34.3
	Min.	48.0	37.2	23.5
	Ave.	51.1	43.4	28.5

N=20

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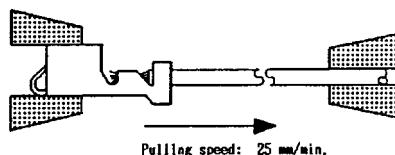
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6.2.2 Crimp Tensile Strength

Requirements:

AWG #22 (0.33mm ²)	44.1 N min.
AWG #20 (0.52mm ²)	63.7 N min.
AWG #18 (0.82mm ²)	78.4 N min.

Test method: Pulling load shall be applied between a correctly crimped contact and wire at the constant speed of 25 mm per minute. The load to pull the wire out of the contact or break the wire shall be measured.



Test results:

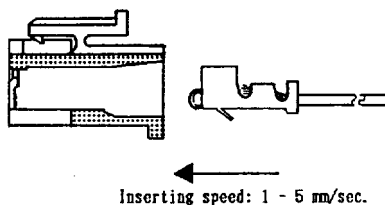
Wire size	Max.	Min.	Ave.
AWG #22	98.0	82.3	90.5
AWG #20	143	136	139
AWG #18	200	188	194

(N)
N=20

6.2.3 Contact Insertion Force

Requirements: 14.7 N max.

Test method: The force required to insert a crimped contact into a housing shall be measured. Inserting speed shall be 1 to 5 mm per second.



Test results:

Max.	Min.	Ave.
6.86	4.90	5.98

(N)
N=20

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6.2.4 Contact Retention Force

Requirements: 29.4 N min.

Test method: A crimped contact mounted in a housing shall be pulled in an alignment at a constant speed of 1 to 5 mm per second. The load to pull the contact out of the housing shall be measured.

Test results:

(N)			N=20
Max.	Min.	Ave.	
94.1	54.9	71.1	

6.2.5 Post Retention Force

Requirements: 29.4 N min.

Test method: The end of a post shall be pushed in a perpendicular to wafer at the constant speed of 1 to 5 mm per second. The load to make the post start moving shall be measured.

Test results:

(N)			N=20
Max.	Min.	Ave.	
80.4	51.9	67.5	

6.2.6 Housing Lock Strength
 Requirements: 2-circuit: 14.7 N min.
 3 to 10-circuit: 49.0 N min.

Test method: Pulling load shall be applied to a housing in the direction that the housing separates from a header at the constant speed of 1 to 5 mm per second. The load required to separate shall be measured.

Test results:

(N)				N=20
No. of circuits	Max.	Min.	Ave.	
2	26.5	24.5	25.3	
3 to 10	100	87.2	93.8	

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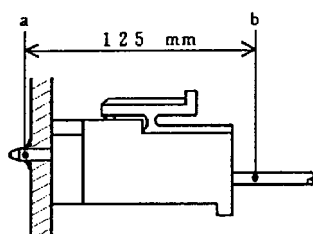
6.3 Electrical Test

6.3.1 Contact Resistance

Requirements: Initial: 10 mΩ max.

After environmental tests: 20 mΩ max.

Test method: Electrical resistance between points a and b shown in the figure below shall be measured under the following conditions.



Test current: 10 mA (DC)

Open voltage: 20 mV max.

Wire: AWG #20

Test results: See items 6.4.1 - 6.4.7.

6.3.2 Current Continuity

Requirements: There shall be no current discontinuity longer than 1 microsecond during a vibration test.

Test method: Each circuit of a connector shall be connected in series. Current discontinuity longer than 1 microsecond during a vibration test shall be detected by continuity meter.

Test results: See item 6.4.2.

6.3.3 Insulation Resistance

Requirements: Initial: 1000 MΩ min.

After humidity test: 500 MΩ min.

After thermal shock test: 500 MΩ min.

Test method: 500 V DC shall be applied between the outer surface of a housing and a contact and also between adjacent contacts to measure insulation resistance.

Test results: See items 6.4.3 and 6.4.5.

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6.3.4 Dielectric Withstanding Voltage

Requirements: There shall be no breakdown nor flashover.

Test method: Initially 1500 V AC (rms) and after a humidity and a thermal shock tests 1000 V AC(rms) shall be applied between the outer surface of housing and a contact and also between adjacent contacts for one minute.

Test results: See items 6.4.3 and 6.4.5.

6.4 Environmental Test

6.4.1 Durability

Requirements: Contact resistance shall be 20 milliohms max. after the test.

Test method: A housing with contacts and a header shall be mated and unmated. After repeated 50 cycles, contact resistance shall be measured.

Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.4	5.2	5.28	6.0	5.3	5.50

N=20

* Data show the values after 100 cycles.

6.4.2 Vibration

Requirements: Contact resistance shall be 20 milliohms max. after the test. There shall be no current discontinuity longer than 1 microsecond during the test.

Test method: A mated connector shall be mounted on a PCB and subjected to a vibration test of the following conditions. During the test, current continuity shall be checked. After the test, contact resistance shall be measured.

Frequency: 10-55-10 Hz/min.

Amplitude: 1.52 mm

Direction: 1. Axis of up and down
2. Axis of right and left
3. Axis of front and back

Period: 2 hours for each direction

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Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.4	5.1	5.27	5.6	5.4	5.50

N=20

Current continuity:

There was no current discontinuity during the test.

6.4.3 Humidity (Steady State)

Requirements: Contact resistance shall be 20 milliohms max. after the test. Insulation resistance shall be 500 megohms min. after the test. There shall be no breakdown nor flashover on the dielectric withstanding voltage test.

Test method: A mated connector shall be placed in a humidity chamber of the following conditions. After the test, contact resistance, insulation resistance and dielectric withstanding voltage shall be measured.

Temperature: 40 ± 2 °C
 Relative humidity: 90 to 95 %
 Period: 240 hours continuously

Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.4	5.2	5.31	5.5	5.2	5.29

N=20

Test item	Housing-Contact		Contact-Contact	
	Initial	After test	Initial	After test
Insulation resistance	10000 min.	5000 min.	10000 min.	5000 min.

N=10

Test item	Housing-Contact		Contact-Contact	
	Initial	After test	Initial	After test
D.W.V.*	Good	Good	Good	Good

N=10

* D.W.V.: Dielectric withstanding voltage

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6.4.4 Heat Aging

Requirements: Contact resistance shall be 20 milliohms max. after the test.

Test method: A mated connector shall be placed in a heat oven of the following conditions. After the test, contact resistance shall be measured.

Temperature: 85 ± 2 °C
 Period: 250 hours continuously

Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.5	5.2	5.35	5.5	5.2	5.35

(mΩ)
N=20

6.4.5 Thermal Shock

Requirements: Contact resistance shall be 20 milliohms max. after the test. Insulation resistance shall be 500 megohms min. after the test. There shall be no breakdown nor flashover on the dielectric withstanding voltage test.

Test method: A mated connector shall be subjected to a thermal shock test of the following conditions. After the test, contact resistance, insulation resistance and dielectric withstanding voltage shall be measured.

1 cycle consists of:
 -25 0/-3 °C for 30 minutes
 +85 +3/0 °C for 30 minutes
 Times of cycles: 25 cycles

Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.5	5.1	5.32	5.5	5.1	5.35

(mΩ)
N=20

Test item	Housing-Contact		Contact-Contact	
	Initial	After test	Initial	After test
Insulation resistance	10000 min.	5000 min.	10000 min.	5000 min.

(MΩ)
N=10

Test item	Housing-Contact		Contact-Contact	
	Initial	After test	Initial	After test
D.W.V.*	Good	Good	Good	Good

N=10

* D.W.V.: Dielectric withstanding voltage

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6.4.6 Salt Spray

Requirements: Contact resistance shall be 20 milliohms max. after the test.

Test method: A mated connector shall be subjected to a salt spray test of the following conditions. After the test, the specimen shall be washed with running water and dried naturally before the measurement of contact resistance.

Temperature: 35 ± 2 °C
 Density: 5 % in weight
 Period: 48 hours

Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.4	5.2	5.23	5.5	5.2	5.29

(mΩ)
N=20

6.4.7 Hydrogen Sulfide Gas

Requirements: Contact resistance shall be 20 milliohms max. after the test.

Test method: A mated connector shall be subjected to hydrogen sulfide gas of the following conditions. After the test, contact resistance shall be measured.

Density: 3 ± 1 ppm
 Temperature: 40 °C
 Period: 96 hours continuously

Test results:

Test item	Initial			After test		
	Max.	Min.	Ave.	Max.	Min.	Ave.
Contact resistance	5.5	5.3	5.34	5.4	5.3	5.33

(mΩ)
N=20

* Data show the values after 240 hours.

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6.4.8 Ammonia Gas

Requirements: There shall be no defect such as crack caused by season cracking.

Test results: A mated connector shall be placed in a desiccator to be subjected to an ammonia gas test of the following conditions.

Ammonia solution: 1 % in weight
Solution volume: 25 ml per one liter of desiccator volume
Period: 72 hours

Test results: There was no defect. N=10

6.4.9 Solderability

Requirements: Plating surface of solder-dipping section shall be covered with smooth solder.

Test method: Fluxed soldering section of header shall be dipped in solder of the following conditions.

Solder temperature: 230 ± 5 °C
Immersion period: 3 ± 0.5 seconds
Flux: Rosin (25%) methanol solution

Test results: Good. N=10

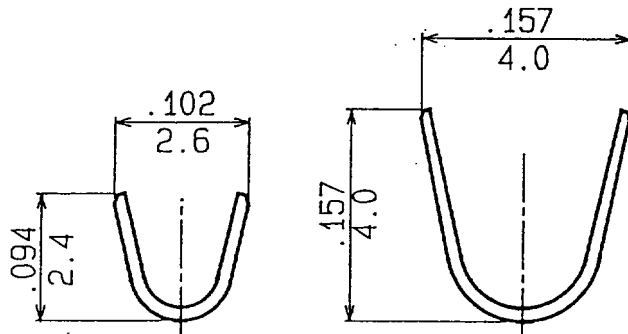
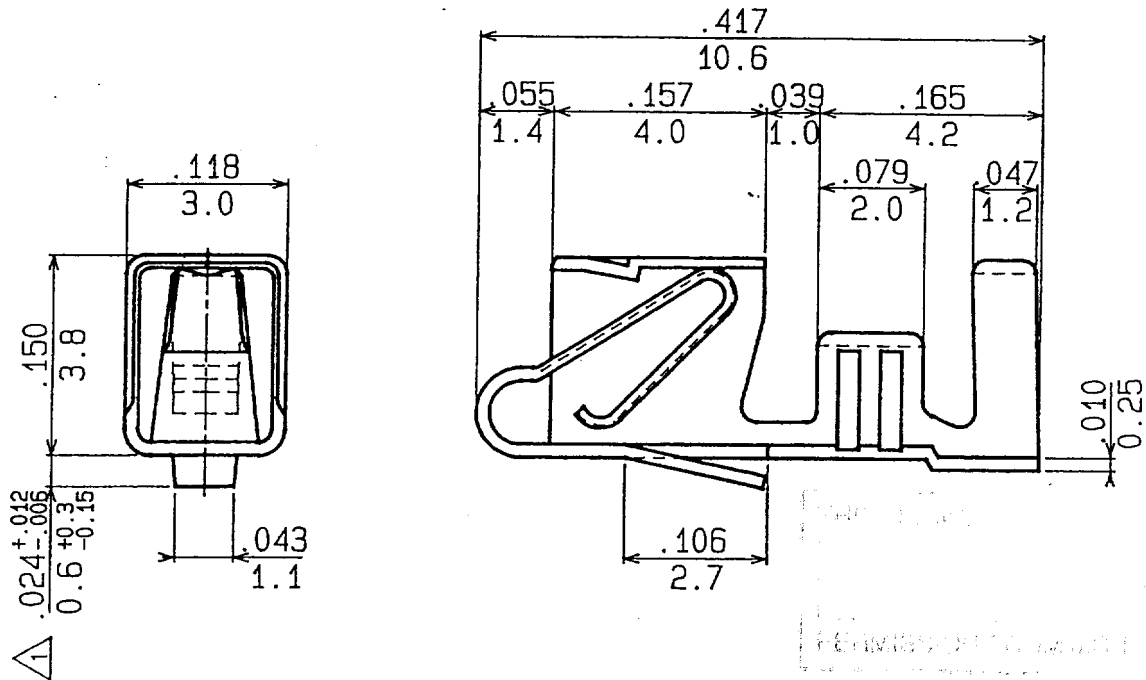
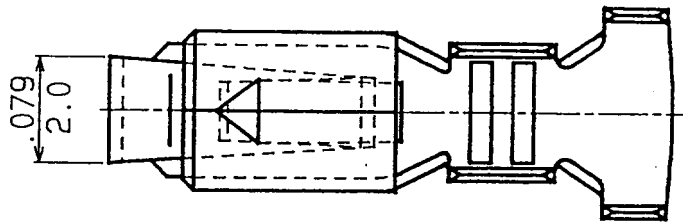
6.4.10 Resistance to Soldering Heat

Requirements: There shall be no deformation nor damage which may affect the performance.

Test method: A specimen shall be mounted on a PCB (inserted only) and subjected to a resistance to soldering heat test of the following conditions.

Solder temperature: 260 ± 5 °C
Immersion period: 5 ± 0.5 seconds

Test results: Good. N=10



NOTE

1. Unless otherwise specified, tolerances are:

L= 0~.197/5.0: ± .012/±0.3

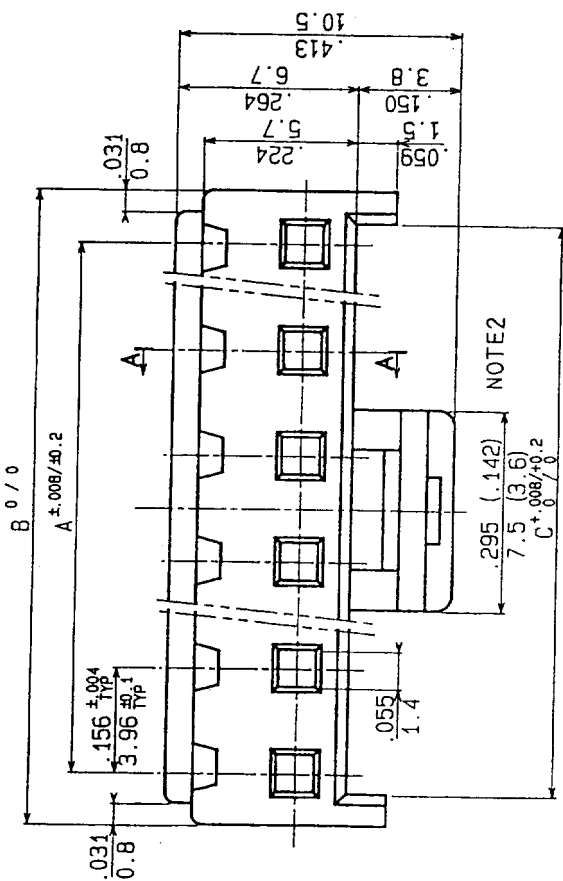
L=.201/5.1~ : ± .016/±0.4

2. Dimensions are in INCH/MM.

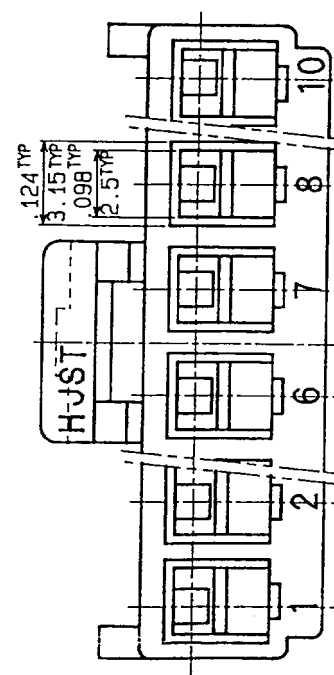
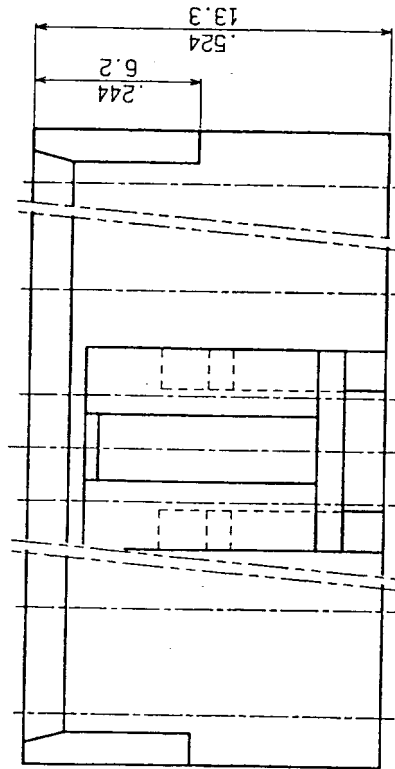
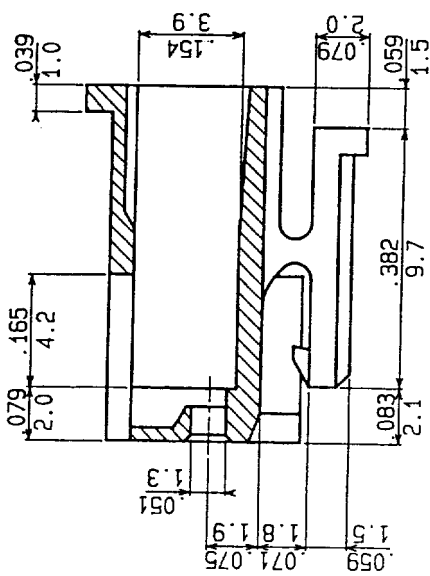
WIRE BARREL

INSULATION BARREL

				REVISIONS		△ ... 91.11.5 Y.0	
CONTACT		PHOSPHOR ±.010 BRONZE to.25		TIN-PLATED			
No.	NAME	MATERIAL	REMARKS				
J. S. T.				PART NAME		VH CONNECTOR	
APPROVED BY	CHECKED BY	DRAWN BY	SCALE	PROJECTION	DATE	PART No.	SVH-21T-P1.1
NH	KM	Y.0	3rd	Aug. 25 1991		DRAWING No.	KRD- 4711-2
						ISSUE	



A-A SEC



	A	B	C
10	1.403/35.64	1.557/39.54	1.462/37.14
9	1.247/31.68	1.401/35.58	1.306/33.18
8	1.091/27.72	1.245/31.62	1.150/29.22
7	.935/23.76	1.089/27.66	.994/25.26
6	.780/19.80	.933/23.70	.839/21.30
5	.624/15.84	.777/19.74	.683/17.34
4	.468/11.88	.621/15.78	.527/13.38
3	.312/ 7.92	.465/11.82	.371/ 9.42
2	.156/ 3.96	.309/ 7.86	.215/ 5.46
Circuit			

NOTE

1. Unless otherwise specified, tolerances are $\pm .012/\pm 0.3$.
2. () dimension is for 2-circuit housing.
3. Dimensions are in INCH/MM.

REVISIONS		PART NAME		VH CONNECTOR	
HOUSING		PART No.		VHR-() N	
NAME		DATE		JUN, 7 1991	
J. S. T.		PROJECTION		3rd	
CHECKED BY		SCALE		Y.O	
DRAWN BY		MATERIAL		6 NYLON	
APPROVED BY		REMARKS		UL94V-0	
No.		DRAWING No.		KRD- 3934-2	
ISSUE		DRAWING No.		KRD- 3934-2	