

SynJet Cooler Power & Control Cable - Details to Design or Build Custom Cables

Overview

This Application Note provides information to help the user design a custom cable to connect the SynJet Cooler to its power and control signal source, for applications where the SynJet standard WALLS cable is not the user's preferred solution.

Details

Three documents are edited and merged to provide this information.

1. The Nuventix engineering drawing used to manufacture the series of WALLS Cables (edited) gives connector layout and wiring configuration. Its footnotes give additional information.
2. JST data sheet for the EH Series of connectors and crimp pins used to build the WALLS Cable to mate with the SynJet connector. (EHR-4)
3. The last page of the App Note - SynJet Cooling Level Control (PWM & CVC) is included here. It gives additional connector information and several wire harness related suggestions.

The same cables and connections are used for the PWM or the Level Select models of the SynJet Coolers. The standard WALLS-C4600-001 Cable is a 4 wire cable with 600mm length. Other standard lengths are available, refer to product specification.

For cable lengths longer than 600mm, the user should plan to review the design and routing with Nuventix Applications Engineering to be sure the power reaching the SynJet remains within specification (see product specification). Also, careful consideration should be used when routing the cable to avoid coupling excessive noise into the power and control inputs.

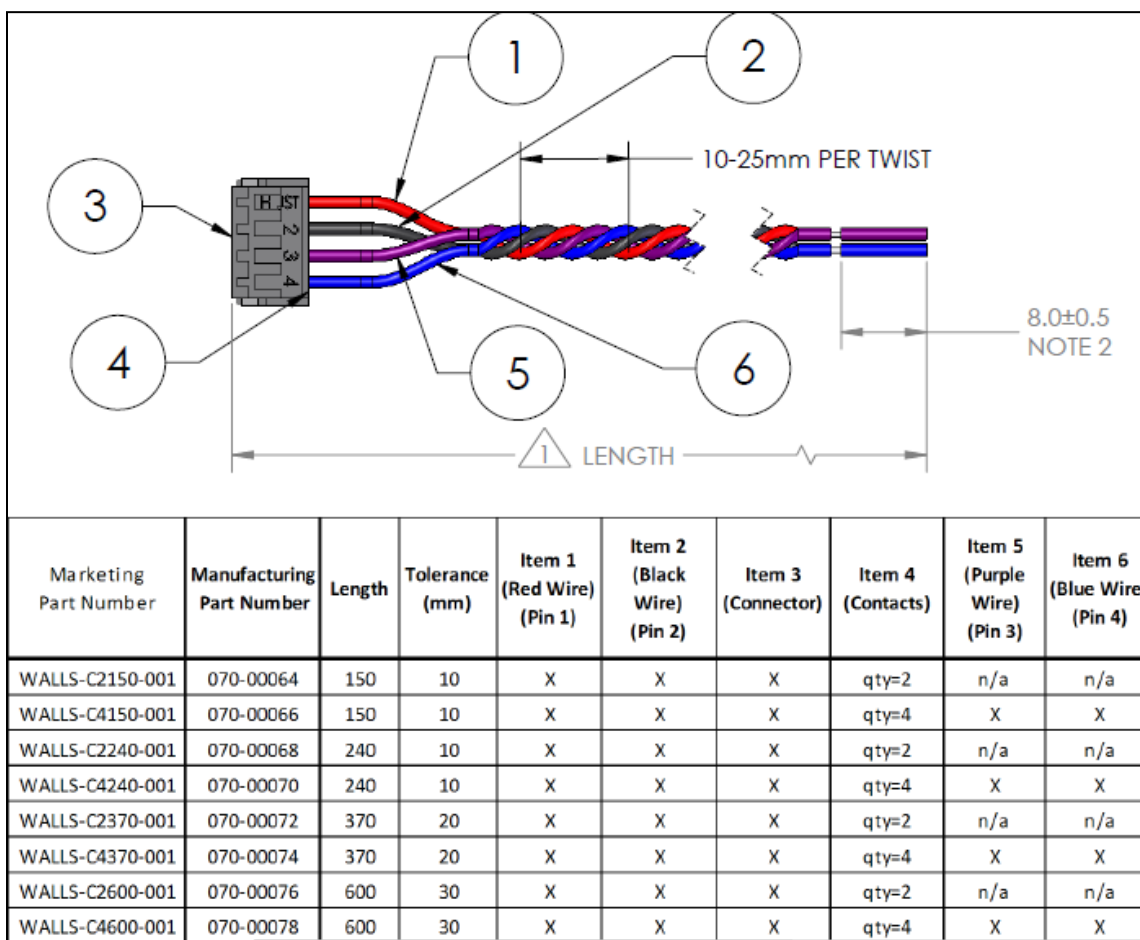
For the SynJet PWM, only 3 wires are needed (+12V or 5V/RED/pin1, GND/BLACK/pin2, PWM Signal/BLUE/pin4). Cable and connections are the same for 12V or 5V SynJet Cooler models. Users often simply cut off the Purple/pin3 wire at the connector since it is not used. For SynJet PWM Fixed at 100% Cooling Level, the Blue wire/pin4 can be cut off at the connector. This would give a two wire cable, +V/Red & GND/Black. This reduces the wire bundle diameter and may make cable routing easier. The Crimp Pin can also be removed carefully from the connector if the wire is not needed. The connector has a lock when pushed fully into the mating connector, so only 2 or 3 pins of the 4 positions can be used with no worry of it pulling apart. When building a custom cable, the positions for pins 3 and/or 4 can be left empty.

The connector & crimp pins shown in the JST Data Sheet, and used for the SynJet Walls Cable, will also crimp #26AWG wire. If wire bundle diameter is a consideration, the user may want to make a custom cable using smaller diameter #26AWG wire as an option. Note: The Legacy SynJets use 26AWG wires hard soldered to the PCBA.

APPLICATION NOTE

Similarly, the SynJet Coolers using Level Select cooling control may have two, three, or four wires in the connector and cable bundle. For Standard Level Cooling, only the +V/Red & GND/Black wires are needed. High Performance Cooling uses three wires, +V/Red & GND/Black & Blue. Silent Cooling uses three wires, +V/Red & GND/Black & Purple. All four wires may be used in applications using dynamic selection of cooling level.

WALLS Cable: SynJet Cooler to Power Source and Control Signals – Overview



(Continued on Next Page)

APPLICATION NOTE

Selected Notes from Nuventix WALLS Cable Drawing - Relevant for User Custom Cable Fabrication:

2. CUT INSULATION BUT LEAVE IT ON THE WIRE TO BE REMOVED BY THE CUSTOMER.
3. WIRES SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
 - 24 AWG
 - INSULATION O.D.: 1.9mm MAX
 - VOLTAGE RATING: 300V MIN
 - OPERATING TEMP: -40 TO +85 °C
 - STORAGE TEMP: -40 TO +85 °C
 - RELATIVE HUMIDITY: 5% TO 95% CONDENSING
 - FLAMMABILITY RATED TO UL VW-1 or CAS FT-1
4. MINIMUM RETENTION FORCE PER WIRE: 20N APPLIED FOR 30 SECONDS. THE WIRE SHALL NOT PULL OUT OF THE CRIMP. THE CRIMP SHALL NOT PULL OUT OF THE HEADER.
7. UL RECOGNIZED ACCORDING TO UL CATEGORY ZPFW2 OR VZQC2.
8. ALL PARTS SHALL BE ROHS COMPLIANT.

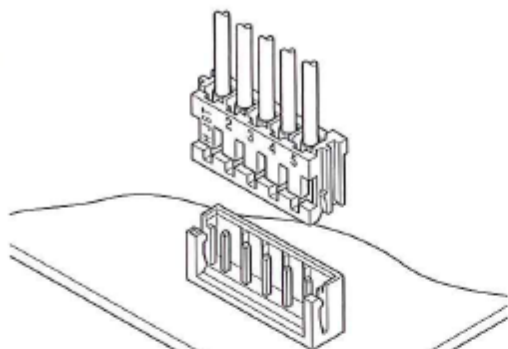
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EH CONNECTOR

2.5mm pitch/Disconnectable Crimp style connectors



This, the thinnest, 2.5mm pitch connector, is 8.1mm in height after mounting and 3.8mm in width. It is designed to meet the demand for the high-density connection of internal wires to printed circuit boards. It is compact, highly reliable and low in cost.

- Compact and slim
- Highly reliable contact
- Polarizing guides
- Easy and effective crimping

Specifications

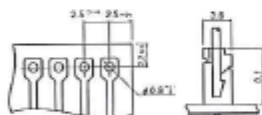
- Current rating: 3A AC, DC (AWG #22)
- Voltage rating: 250V AC, DC
- Temperature range: -25°C to +85°C
(including temperature rise in applying electrical current)
- Contact resistance: Initial value/10m Ω max.
After environmental testing/20m Ω max.
- Insulation resistance: 1,000M Ω min.
- Withstanding voltage: 800V AC/minute
- Applicable wire: AWG #32 to #22
- Applicable PC board thickness: 0.8 to 1.6mm
- Compliant with RoHS.
- Refer to "General Instruction and Notice when using Terminals and Connectors" at the end of this catalog.
- Contact JST for details.

Standards

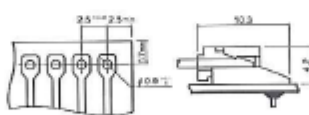
- Recognized E60389
- Certified LR20812
- R50082349

PC board layout (viewed from soldering side) and Assembly layout

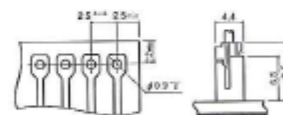
Top entry type



Side entry type



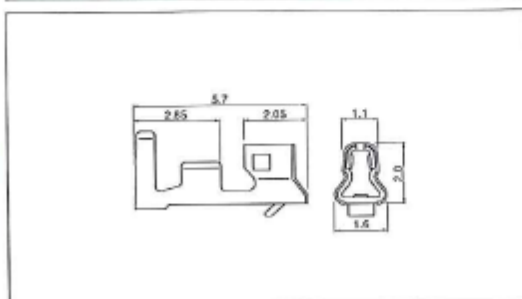
Radial-tape



Note: 1. Tolerances are non-cumulative: $\pm 0.05\text{mm}$ for all centers.

2. Hole dimension differ according to the kind of PC board and piercing method. If PC boards made of hard material are used, the hole dimensions should be larger. The dimensions above should serve as a guideline. Contact JST for details.

Contact



Model No.	Applicable wire		Insulation O.D. (mm)	Qty / reel
	mm ²	AWG#		
SEH-001T-P0.6	0.05 ~ 0.33	30 ~ 22	1.0 ~ 1.9	
*SEH-001T-P0.6L	0.13 ~ 0.93	26 ~ 22	0.8 ~ 1.9	8,000
*SEH-002T-P0.6L	0.05 ~ 0.13	30 ~ 26	0.8 ~ 1.3	
*SEH-003T-P0.6L	0.032 ~ 0.08	32 ~ 28	0.5 ~ 1.1	10,000

Material and Finish

Phosphor bronze, tin-plated (yellow treatment)

RoHS compliance

- Note: 1. Contact JST for gold-plated products.
2. SEH-001T-P0.6L is low-insertion force type contact, for easier insertion/withdrawal, which would be less resistant to the vibration. The crimp height is different from the standard contact.
3. *Marked products are not TÜV approved.
4. Contact JST for details.

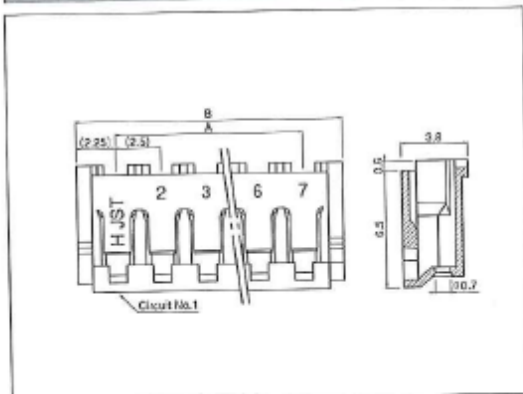
Contact	Crimping machine	Applicator		
		Crimp applicator	Dies	Crimp applicator with die
SEH-001T-P0.6	AP-K2N	MKS-L5 + MKS-L	MK/SEH-001-06	APLMK SEH001-06
		*MKS-SC	SC/SEH-001-06	APLSC SEH001-06
SEH-001T-P0.6L	AP-K2N	MKS-L5 + MKS-L	MK/SEH-001-06L	APLMK SEH001-06L
		*MKS-SC	SC/SEH-001-06L	APLSC SEH001-06L

Note: *Strip-crimp applicator

Contact	Crimping machine	Applicator		
		Crimp applicator	Dies	Crimp applicator with dies
SEH-002T-P0.6L	AP-K2N	MKS-L5 + MKS-L	MK/SEH-002-06L	APLMK SEH002-06L
		---	---	---
SEH-003T-P0.6L	AP-K2N	MKS-L-10	MK/SEH-003-06L	APLMK SEH003-06L
		*MKS-SC-10	SC/SEH-003-06L	APLSC SEH003-06L

EH CONNECTOR

Housing



Circuits	Model No.	Dimensions (mm)		Qty / bag
		A	B	
2	EHR-2	2.5	7.0	1,000
3	EHR-3	5.0	8.5	1,000
4	EHR-4	7.5	12.0	1,000
5	EHR-5	10.0	14.5	1,000
6	EHR-6	12.5	17.0	1,000
7	EHR-7	15.0	19.5	1,000
8	EHR-8	17.5	22.0	1,000
9	EHR-9	20.0	24.5	1,000
10	EHR-10	22.5	27.0	1,000
11	EHR-11	25.0	29.5	1,000
12	EHR-12	27.5	32.0	1,000
13	EHR-13	30.0	34.5	1,000
14	EHR-14	32.5	37.0	1,000
15	EHR-15	35.0	39.5	1,000

Material

PA 66, UL94V-0, natural (white)

RoHS compliance

<For reference> As the color identification, the following alphabet shall be put in the underlined part.
For availability, delivery and minimum order quantity, contact JST.

ex. **EHR-2-00**

(blank)...natural (white)

K...black R...red TR...tomato red E...blue Y...yellow

L...lemon yellow M...green O...orange N...brown PL...purple

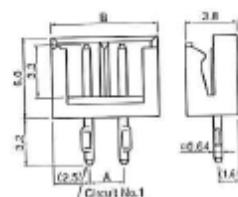
PK...pink H...gray LE...light blue FY...vivid yellow

Shrouded header

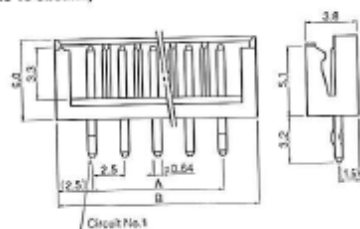
The shrouded headers are interchangeable with those of the HR crimp style and insulation displacement connectors.

Top entry type

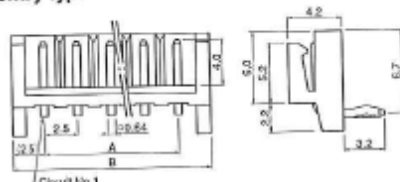
(2 circuits)



(3 to 15 circuits)



Side entry type



Circuits	Model No.		Dimensions (mm)		Qty / box	
	Top entry type	Side entry type	A	B	Top entry type	Side entry type
2	B2B-EH-A	S2B-EH	2.5	7.5	1,000	1,000
3	B3B-EH-A	S3B-EH	5.0	10.0	1,000	1,000
4	B4B-EH-A	S4B-EH	7.5	12.5	1,000	1,000
5	B5B-EH-A	S5B-EH	10.0	15.0	1,000	1,000
6	B6B-EH-A	S6B-EH	12.5	17.5	1,000	500
7	B7B-EH-A	S7B-EH	15.0	20.0	1,000	500
8	B8B-EH-A	S8B-EH	17.5	22.5	500	500
9	B9B-EH-A	S9B-EH	20.0	25.0	500	500
10	B10B-EH-A	S10B-EH	22.5	27.5	500	500
11	B11B-EH-A	S11B-EH	25.0	30.0	500	250
12	B12B-EH-A	S12B-EH	27.5	32.5	500	250
13	B13B-EH-A	S13B-EH	30.0	35.0	250	250
14	B14B-EH-A	S14B-EH	32.5	37.5	250	250
15	B15B-EH-A	S15B-EH	35.0	40.0	250	250

Material and Finish

Post: brass, copper-undercoated, tin-plated (yellow treatment)
Wafer: PA 66, UL94V-0, natural (white)

RoHS compliance This product displays (LF)(SN) on a label.
Note: Also available and identified as model BxxB-EH is a top entry type having a post extension length of 4.0mm

<For reference> As the color identification, the following alphabet shall be put in the underlined part.
For availability, delivery and minimum order quantity, contact JST.

<Top entry type>

ex. **B2B-EH-A-00**

(blank)...natural (white)

K...black R...red E...blue Y...yellow M...green

<Side entry type>

ex. **S2B-EH-00**

(blank)...natural (white)

K...black R...red TR...tomato red E...blue Y...yellow

L...lemon yellow M...green O...orange N...brown PL...purple

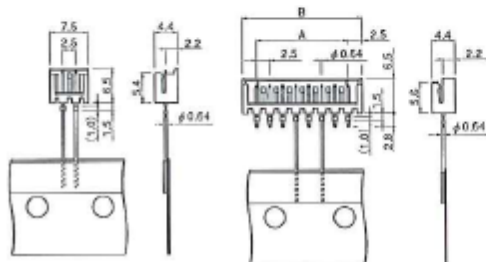
PK...pink H...gray LE...light blue FY...vivid yellow

Shrouded header on radial-tape

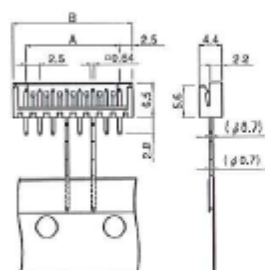
●TS type

(2 circuits)

(3 to 8 circuits)



●TV4 type



Circuits	Model No.		Dimensions (mm)		QTY / box
	TS type	TV4 type	A	B	
2	B2B-EH-TS	—	—	—	1,400
3	B3B-EH-TS	B3B-EH-TV4	5.0	10.0	1,400
4	B4B-EH-TS	B4B-EH-TV4	7.5	12.5	700
5	B5B-EH-TS	B5B-EH-TV4	10.0	15.0	700
6	B6B-EH-TS	B6B-EH-TV4	12.5	17.5	700
7	B7B-EH-TS	B7B-EH-TV4	15.0	20.0	700
8	B8B-EH-TS	B8B-EH-TV4	17.5	22.5	700

Material and Finish

Pin/Pack: Brass, copper-undercoated, tin-plated (reflow treatment)
Wedge: PA 66, UL94V-0, natural (white)

RoHS compliance This product displays (LF)(SN) on a label.

<For references> As the color identification.

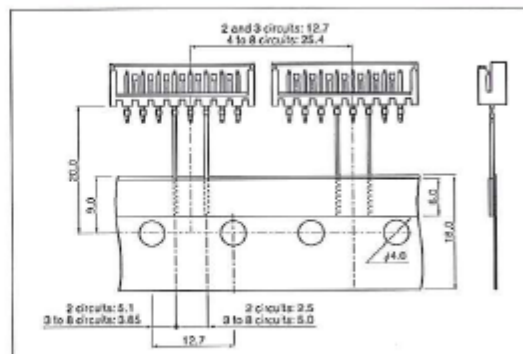
the following alphabet shall be put in the underlined part.
For availability, delivery and minimum order quantity, contact JST.

ex. B2B-EH-TS-00

(blank)...natural (white)

K...black R...red E...blue Y...yellow M...green N...brown

Taping specifications

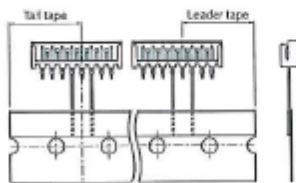


Note: Conforms to JIC C 0806 of "Tape packaging of components with unidirectional leads on continuous tapes".

Packaging specifications



Distance between the end of the tape and the first connector's center line (either end)

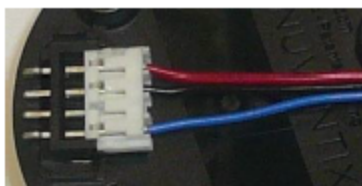


Package type		Flat pack (zigzag folded)
Distance between folds		24 insulating holes per fold (304.8mm)
Box size		316(W)X451(D)X330(H)mm
Distance between the end of the tape and the first connector's center line (either end)		19.05mm
Quantity	2, 3 circuits	1,400 pcs./box
	4~8 circuits	700 pcs./box

Note: Products of different packaging specifications are also available.
Contact JST for details.

Visit www.JST.com for additional information and updates

SynJet 4 Wire Cable and Connector Information



Power and PWM or CVC		
Pin 1	RED	Power (5V or 12V)
Pin 2	Black	GND
Pin 3	N/C	None
Pin 4	Blue	CTL 1 (PWM or CVC)



Figure 10. SynJet Power and Control Electrical Interface to User System

SynJet - Connector and Wire Details	
4 Pin Connector Molded into Housing	Manufacturer: JST Part Number: S4B-EH
Mating 4 Pin Connector on End of Cable	Manufacturer: JST Part Number: EHR-4
Wire	24AWG, stranded, Insulation O.D. is 1.9mm
Wire: UL Recognized	Category 7ZPFW2 or VZQC2



Connector Detail: Pin Numbers are molded into the cable connector

Comments and Suggestions

1. **IMPORTANT** - Connect SynJet to Power Source: Make the Black Wire (-V) connection first, & the Red Wire (+V) last. Disconnect in reverse order, the Red Wire (+V) first.
2. Refer to Product Specification Sheet and Technical Design Guide for additional details.
3. Depending upon the attachment mechanism at the Power Source terminal, the User may want to "tin" the ends of the stranded & stripped wires for easier insertion/attachment.
4. If building a custom cable, the User can insert only the needed wires, i.e., 2 or 3 or 4 wires, into the connector, instead of adding wire and cutting it off. The connector has a locking mechanism to hold it in place independent of contact friction.
5. The crimped pins lock into place when inserted into the black connector. Individual pins can be carefully removed from the connector, if desired, instead of cutting the wire off at the edge where it emerges from the connector.
6. Note – Early production of this cable used a white connector. Present production uses the same connector in black color. Both colors are the same form-fit-function.