

## AEDC-55xx / AEDC-56xx

### High Resolution Two or Three Channel Quick Assembly Encoders With Connector Latch



## Data Sheet



### Description

The AEDC-5xxx series encoders, while similar to the industry standard HEDS-5xxx series kit encoder, provides a connector latch on the cover housing to improve connector retention. This device is built upon the Avago AEDT-9810 series encoder module, and provides the same performance, low cost, high reliability, high resolution, and ease of assembly customers have come to expect.

Each encoder contains a LED source with lens, an ASIC with integrated photo detector arrays, LED current regulation, interpolator and output driver circuitry, and a code wheel which rotates between the emitter and detector ASIC. The outputs of the AEDC-5xxx are two square waves in quadrature. In addition, a third channel offers index signal, which is a 90 electrical degree, true index pulse which is generated once for each full rotation of the code wheel. The AEDC-5xxx series utilizes a film code wheel allowing for resolutions up to 5000 CPR and accommodating shaft diameters from 2mm to 8mm.

This kit encoder may be quickly and easily mounted to a motor. The electrical interface is through five (single ended) or ten (differential versions) 0.025 inch square pins on 0.100 inch centers. Interface cable assemblies to meet customer requirements are available also.

The differential (line driver) version offers enhanced performance when the encoder is used in noisy environments, or when it is required to drive long cables. It uses an industry standard RS422 compatible line driver IC, AEIC-7272, which provides differential outputs for each of the encoder channels. Suggested line receivers are 26LS32 and 26LS33.

### Features

- Available in two or three channel encoder A,B and I
- Latching connector design
- Single 5V supply
- Resolution of up to 5000 CPR
- TTL compatible, with single ended or differential output.
- Quick assembly
- No signal adjustment required
- Small size
- -40 °C to 85 °C operating temperature

### Applications

High volume applications such as printers, plotters, tape drives, textile machines, positioning tables and also automatic handlers among others.

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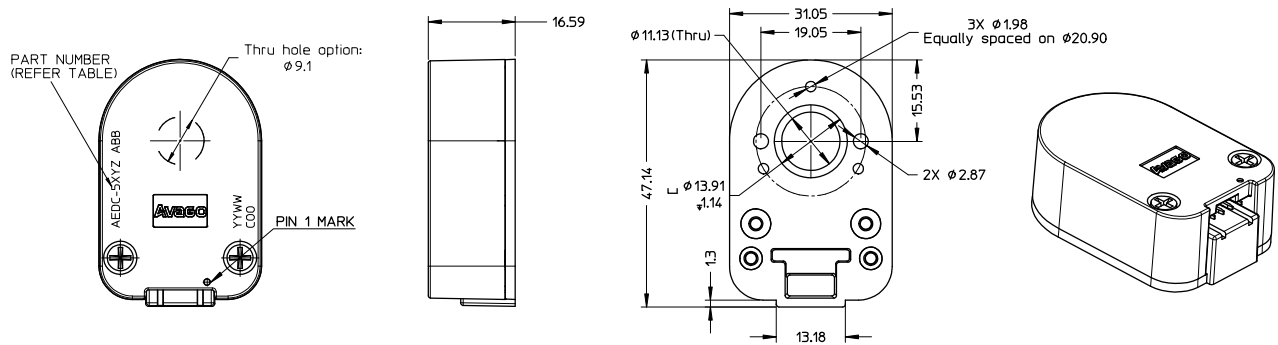
Note: Avago Technologies encoders are not recommended for use in safety critical applications, e.g., ABS braking systems, power steering, life support systems and critical care medical equipment. Avago's products and software are not specifically designed, manufactured or authorized for sale as parts, components or assemblies for the planning, construction, maintenance or direct operation of a nuclear facility or for use in medical devices or applications. Customers are solely responsible, and waive all rights to make claims against Avago or its suppliers, for all losses, damage, expense or liability in connection with such use. Please contact your local sales representative if more clarification is needed.

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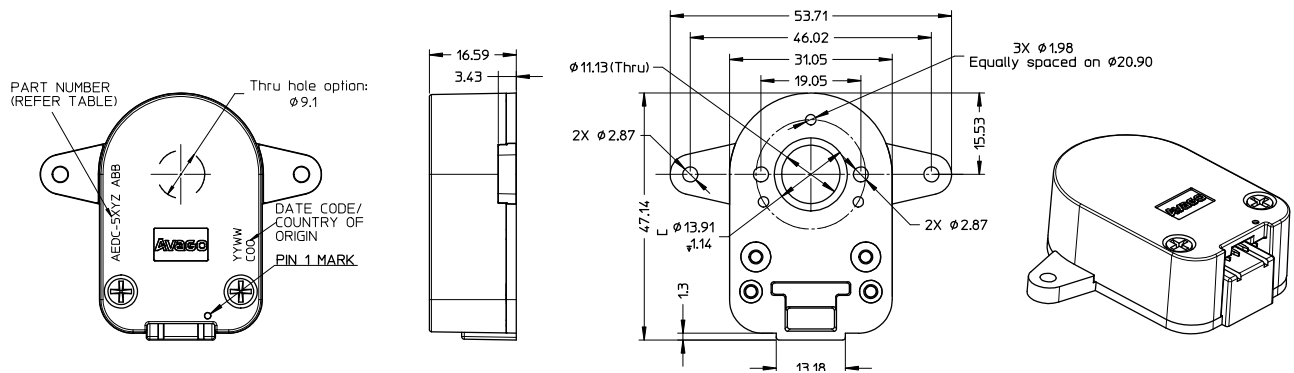
**CAUTION:** It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD.

## Package Dimensions – Single Ended Output Options

### Standard Mounting Considerations



### External Ear Mounting Considerations



### Package Dimensions

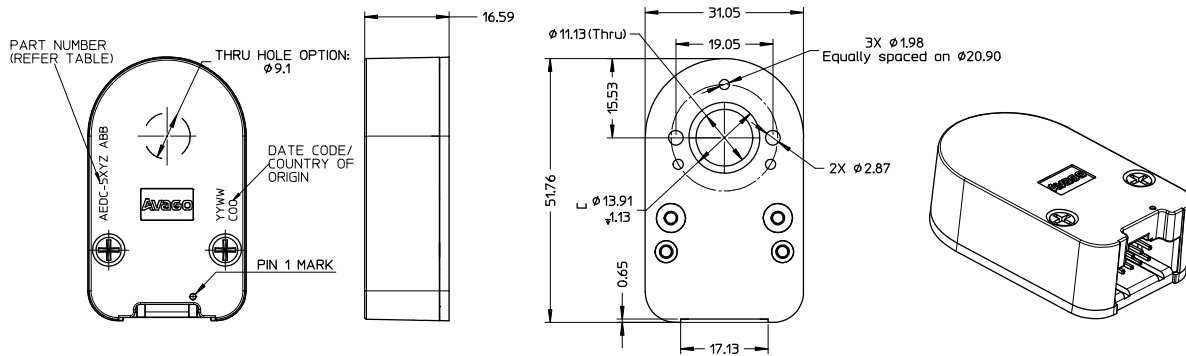


| Dimension | Single Ended | unit |
|-----------|--------------|------|
| Width     | 31.05        | mm   |
| Height    | 16.59        | mm   |
| Length    | 47.14        | mm   |

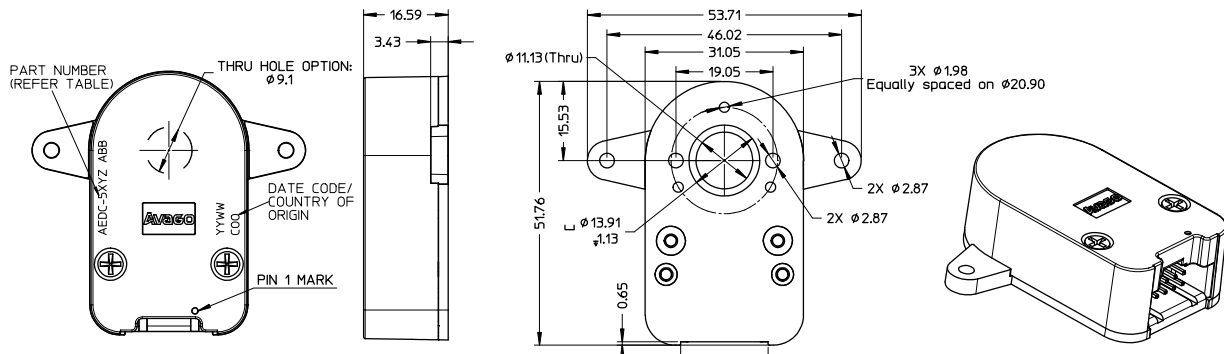
Note: All dimensions are in millimeters

## Package Dimensions – Differential Line Driver Output Options

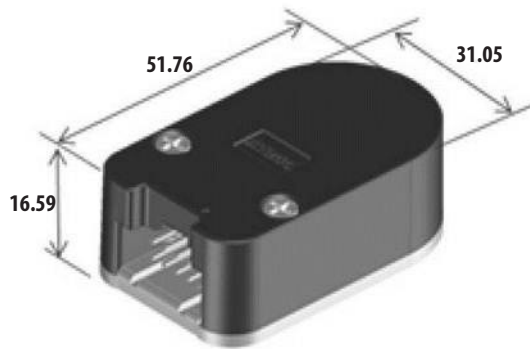
### Standard Mounting Considerations



### External Ear Mounting Considerations



### Package Dimensions



| Dimension | Differential/Line driver | unit |
|-----------|--------------------------|------|
| Width     | 31.05                    | mm   |
| Height    | 16.59                    | mm   |
| Length    | 51.76                    | mm   |

Note: All dimensions are in millimeters

## Absolute Maximum Ratings

| Parameter  |                              |
|--|------------------------------|
| Storage Temperature, T <sub>S</sub>                                      | -40°C to +85°C               |
| Operating Temperature, T <sub>A</sub>                                    | -40°C to +85°C               |
| Supply Voltage, V <sub>CC</sub>  | -0.5 V to 7 V                |
| Output Voltage, V <sub>O</sub>   | -0.5 V to V <sub>CC</sub>    |
| Output Current per Channel, I <sub>OUT</sub> (Single ended)              | ± 5 mA                       |
| Output Current per Channel, I <sub>OUT</sub> (Differential Line drivers) | ± 20 mA                      |
| Vibration  | 20 g, 5 to 1000 Hz           |
| Shaft Axial Play   | ±0.15mm (±0.006in)           |
| Shaft Eccentricity Plus Radial Play                                      | 0.1mm (0.004in)              |
| Velocity   | Max 12,000 RPM **            |
| Acceleration   | 250,000 rad/sec <sup>2</sup> |

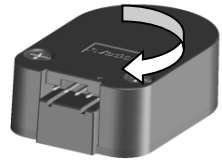
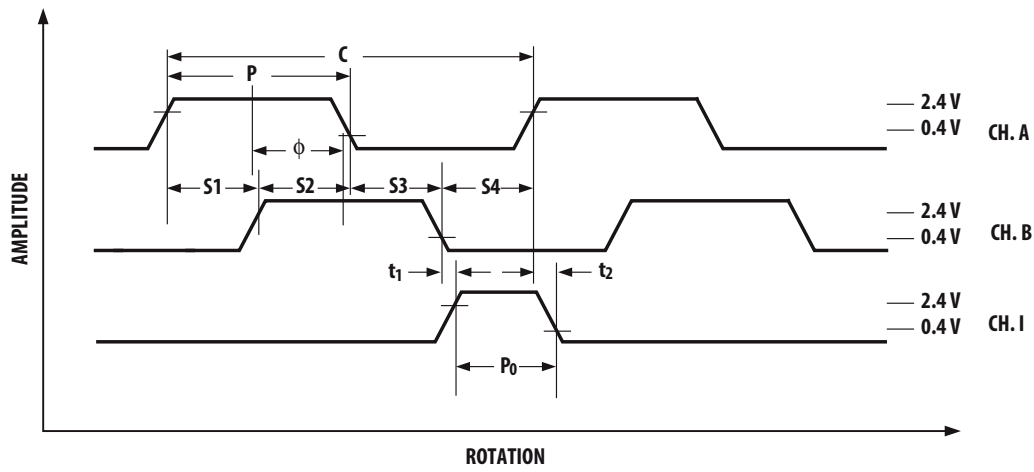
Note \*\*: Velocity 12000 RPM applies to 5000 Count per Revolution

## Recommended Operating Conditions

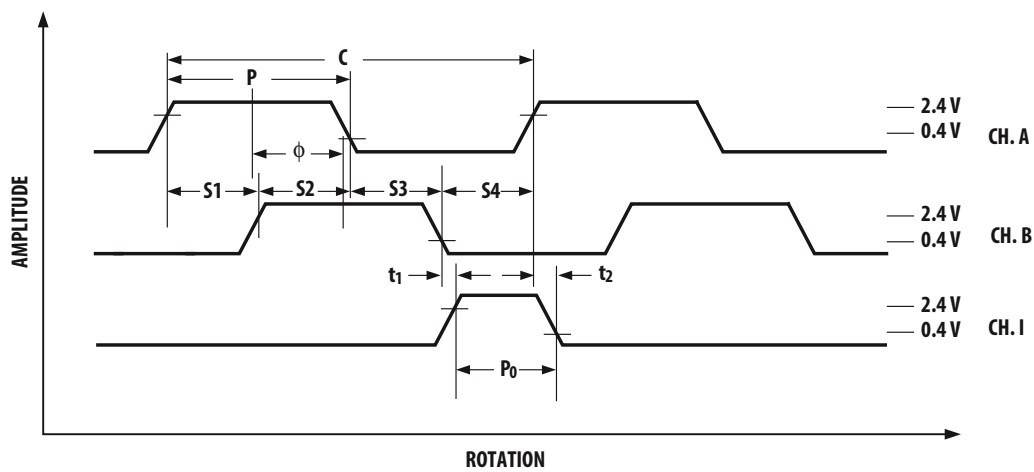
| Parameter       | Sym.            | Min. | Typ. | Max.           | Units | Notes              |
|-----------------|-----------------|------|------|----------------|-------|--------------------|
| Temperature     | T <sub>A</sub>  | -40  |      | +85            | °C    |                    |
| Supply Voltage  | V <sub>CC</sub> | 4.5  | 5.0  | 5.5            | Volts | Ripple < 100 mVp-p |
| Count Frequency | f               | 500  | kHz  | 2000 – 2500CPR |       |                    |
|                 |                 | 1000 | kHz  | 4000 – 5000CPR |       |                    |

\* These are tolerances required of the user. Axial and radial play affects encoder performance and should be minimized.

**Output Waveform Phase Diagram (Single Ended Output Options)**  
**Clockwise Rotation – A leads B**



**Output Waveform Phase Diagram (Differential Line Driver Options)**  
**Counter Clockwise Rotation – A leads B**



## Electrical Characteristics

### Electrical Characteristics over Recommended Operating Range

| Part No.                    | Parameter                 | Sym.            | Min | Typ.* | Max. | Units | Notes                      |
|-----------------------------|---------------------------|-----------------|-----|-------|------|-------|----------------------------|
| 3 channel<br>Single Ended   | Supply Current            | I <sub>CC</sub> |     | 25    | 80   | mA    |                            |
|                             | High Level Output Voltage | V <sub>OH</sub> | 2.4 |       |      | V     | I <sub>OH</sub> = -5mA max |
|                             | Low Level Output Voltage  | V <sub>OL</sub> |     |       | 0.4  | V     | I <sub>OL</sub> = +5mA max |
|                             | Rise Time                 | t <sub>r</sub>  |     | 10    |      | ns    | C <sub>L</sub> = 100pF     |
|                             | Fall Time                 | t <sub>f</sub>  |     | 10    |      | ns    |                            |
| Differential<br>Line Driver | Supply Current            | I <sub>CC</sub> |     | 35    |      | mA    |                            |
|                             | Rise/Fall time            | t <sub>r</sub>  |     | 120   |      | ns    | C <sub>L</sub> = 40pF      |
|                             |                           | t <sub>f</sub>  |     |       |      | ns    | R <sub>L</sub> = 100Ω      |

\* Typical values specified at V<sub>CC</sub> = 5.0V and 25°C and for single ended, unless otherwise stated

\*\* Applicable for line driver output version with AEIC 7272 Line driver.

## Mechanical Characteristics

| Parameter                               | Symbol                 | Dimension                        | Tolerance           | Units  |
|---|------------------------|----------------------------------|---------------------|--|
| Codewheels Fit These Shaft<br>Diameters |                        | 4, 5, 6, 8                       | +0.000<br>-0.015    | mm   |
|   |                        | 1/4                              | +0.0000<br>-0.0007  | in   |
| Moment of Inertia                       | J                      | 0.6<br>(8.0 x 10 <sup>-6</sup> ) |                     | g-cm <sup>2</sup><br>(oz-in-s <sup>2</sup> ) |
| Required Shaft Length                   |                        | 14.0<br>(0.55)                   | ± 0.5<br>(± 0.02)   | mm<br>(in.)                                  |
| Bolt Circle[3]                          | 2 screw mounting       | 19.05<br>(0.750)                 | ± 0.13<br>(± 0.005) | mm<br>(in.)                                  |
|   | 3 screw mounting       | 20.90<br>(0.823)                 | ± 0.13<br>(± 0.005) | mm<br>(in.)                                  |
|   | external mounting ears | 46.0<br>(1.811)                  | ± 0.13<br>(± 0.005) | mm<br>(in.)                                  |
| Mounting Screw Size                     | 2 screw mounting       | M 2.5 or<br>(2-56)               |                     | mm<br>(in.)                                  |
|   | 3 screw mounting       | M 1.6 or<br>(0-80)               |                     | mm<br>(in.)                                  |
|   | external mounting ears | M 2.5 or<br>(2-56)               |                     | mm<br>(in.)                                  |
| Encoder Base Plate Thickness            |                        | 0.33<br>(0.130)                  |                     | mm<br>(in.)                                  |
| Hub Set Screw                           |                        | (2-56)                           |                     | (in.)  |

### Notes

1. An optional cover provides an 8.9mm (0.35 inch) diameter hole through the housing for longer motor shaft.
2. Encoder must be aligned as shown in the "Encoder Mounting and Assembly" instructions.
3. The recommended mounting screw torque for 2 screw mounting is 1.0 kg-cm (0.88 in-lbs). The recommended mounting screw torque for 3 screw mounting is 0.50 kg-cm (0.43 in-lbs).

## Encoding Characteristics

Encoding characteristics are applicable per the Recommended Operating Conditions, unless otherwise specified. Values are for the worst case error over the full rotation.

### Encoder Resolution $\geq 4000$ CPR

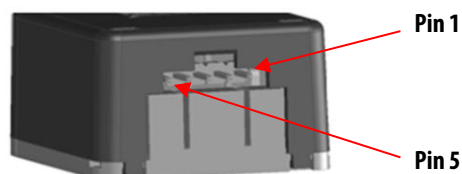
| Parameter               | Symbol       | Min | Typ.* | Max | Units       |
|-------------------------|--------------|-----|-------|-----|-------------|
| Pulse Width Error       | $\Delta P$   |     | 21    | 45  | $^{\circ}e$ |
| Logic State Width Error | $\Delta S$   |     | 17    | 45  | $^{\circ}e$ |
| Phase Error             | $\Delta\phi$ |     | 12    | 25  | $^{\circ}e$ |
| Cycle Error             | $\Delta C$   |     | 36    | 60  | $^{\circ}e$ |
| Index Pulse Width       | $P_0$        | 65  | 90    | 115 | $^{\circ}e$ |

### Encoder Resolution $\leq 2500$ CPR

| Parameter               | Symbol       | Min | Typ.* | Max | Units       |
|-------------------------|--------------|-----|-------|-----|-------------|
| Pulse Width Error       | $\Delta P$   |     | 20    | 30  | $^{\circ}e$ |
| Logic State Width Error | $\Delta S$   |     | 15    | 25  | $^{\circ}e$ |
| Phase Error             | $\Delta\phi$ |     | 10    | 15  | $^{\circ}e$ |
| Cycle Error             | $\Delta C$   |     | 17    | 30  | $^{\circ}e$ |
| Index Pulse Width       | $P_0$        | 72  | 90    | 108 | $^{\circ}e$ |

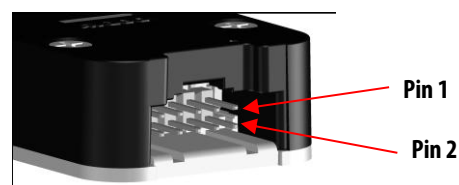
\* Typical values specified at  $V_{CC} = 5.0V$  and  $25^{\circ}C$  and for single ended, unless otherwise stated

## Pin-out descriptions



### 5 Pin (Single Ended) Version

| Pin # | Description |
|-------|-------------|
| 1     | Ground      |
| 2     | CH I (*)    |
| 3     | CH A        |
| 4     | + 5 VDC     |
| 5     | CH B        |



### 10 Pin (Differential Line Driver) Version

| Pin # | Description Standard | Description HP/Agilent Option |
|-------|----------------------|-------------------------------|
| 1     | Ground               | No connection                 |
| 2     | Ground               | + 5 VDC                       |
| 3     | Ch I- (*)            | Ground                        |
| 4     | Ch I+ (*)            | No connection                 |
| 5     | Ch A-                | CH A -                        |
| 6     | Ch A+                | CH A +                        |
| 7     | +5VDC                | CH B -                        |
| 8     | +5VDC                | CH B +                        |
| 9     | CH B-                | CH I - (*)                    |
| 10    | CH B+                | CH I + (*)                    |

(\*) Applies to 3 channel units only

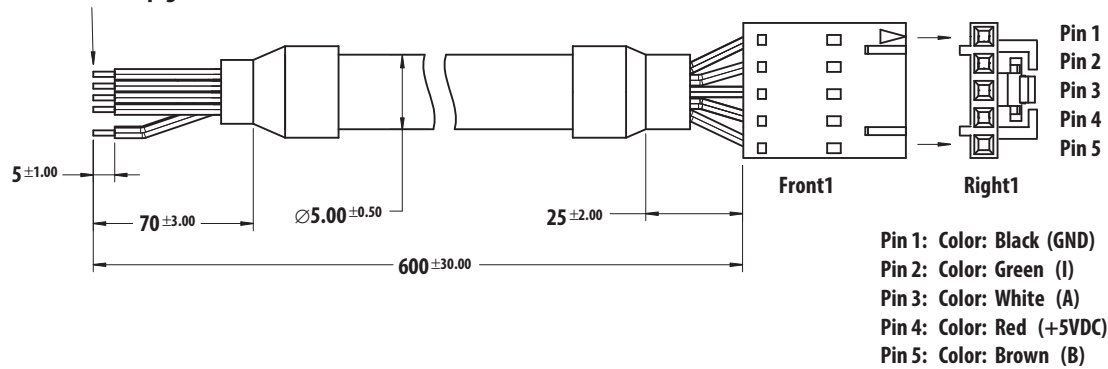
## Standard Cable Options

| Cable Description*  | Part Number    | Shielded Cable Length |
|---|----------------|-----------------------|
| 5 conductor, unshielded 22ga (for single ended use)                         | HEDC-8520-0060 | 600mm                 |
| 8 conductor, shielded, 24ga (for line driver use) – Standard option         | HEDC-8850-0060 | 600mm                 |
| 8 conductor, shielded, 24ga (for line driver use) – HP/Agilent/Avago option | HEDC-8851-0060 | 600mm                 |

\* All include one end terminated with the mating latching connector, and other end has flying leads.  
For other cable options or customization request, please contact your Avago representative or distributor.

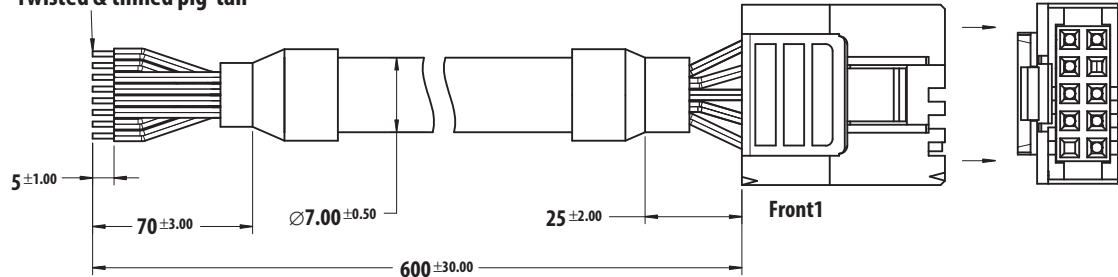
### Connector (HEDC-8520-0060)

Twisted & tinned pig tail

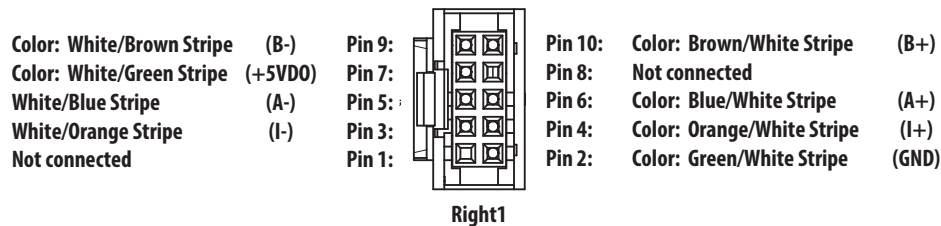


### Connector (HEDC-88xx-0060)

Twisted & tinned pig tail



### Standard connector pin out (HEDC-8850-0060)



### HP/Agilent/Avago connector pin out (HEDC-8851-0060)

