

### Delphi Flexible Beam Technology (FBT) for Connectors

Delphi Flexible Beam Technology (FBT) for Connectors enables a simplified connection system that provides terminal position assurance using only one piece of plastic. This represents the industry's first application of FBT in a vehicle connection system. The patented FBT allows stream lined connections with fewer parts. Connection systems equipped with Delphi FBT consist of a single piece of plastic, reducing complexity, mass, and cost while helping to provide improved warranty.

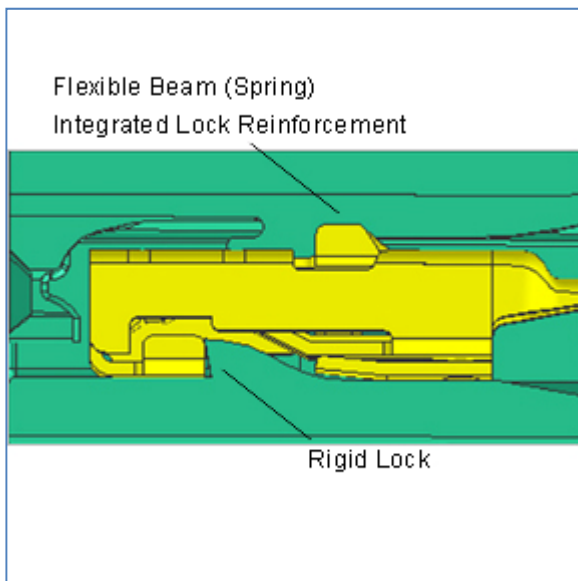


Delphi's Flexible Beam Technology (FBT) for Connectors provides terminal position assurance using one-piece plastic.

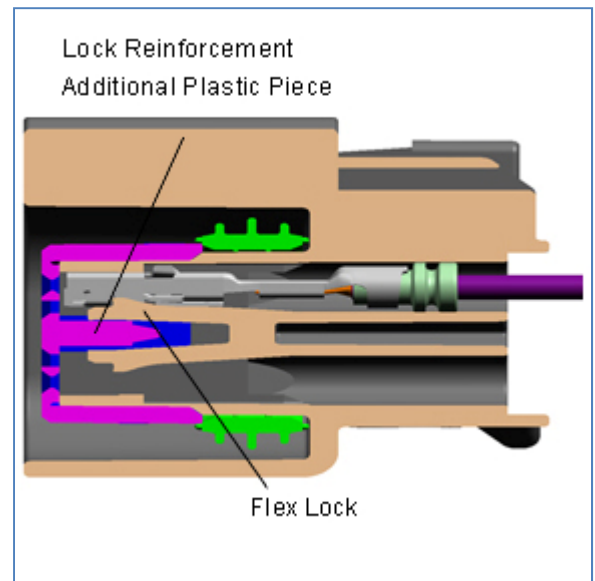
Delphi's FBT product offering extends Delphi's GT and 090II product lines. FBT is available for both the terminal-to-connector cavity interface and the connector build fixture. The FBT series includes 1.5, 2.3, 2.8 mm sealed and unsealed female connectors, including standard USCAR (United States Council for Automotive Research) footprints. The FBT series features enhanced quality and reliability performance, simplified wiring assembly, and straightforward service procedures.

#### ▶ Terminal-to-Connector Interface Comparison

##### Flexible Beam Cavity

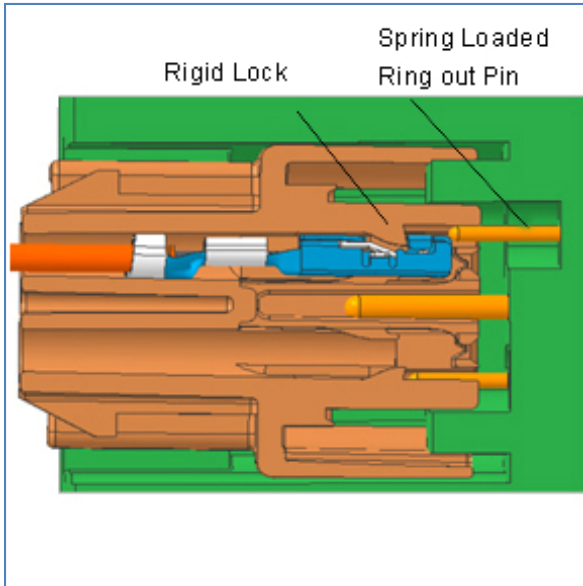


##### Conventional Cavity



- FBT uses a rigid lock to provide the terminal primary lock
- A flexible beam opposite the lock holds the terminal against the lock and provides audible and tactile feedback during terminal installation

▶ **Electrical Ring Out Feature**



**Electrical ring out fixtures with FBT utilize the relationship between the electrical ring out pin and the lock ramp to verify terminal position and presence in the cavity. This is in contrast to other systems that only verify terminal presence.**

▶ **Benefits**

- Terminal position assurance without additional plastic pieces
- Improved terminal retention vs. a conventional two piece assembly
- Improvement in harness first time quality vs. a conventional two piece assembly
  - Up to 10%
- Mass reduction vs. a conventional two piece assembly
  - Up to 28%
- Warranty improvement on terminal unseat vs. a conventional two piece assembly
  - 0 IPTV (Incidents per thousand vehicles)
- Simple and easy servicing
  - No secondary pieces to remove/damage
  - Uses industry standard repair tools

▶ **Typical Applications**

The Delphi FBT series of connection systems is designed for general vehicle power and signal applications. The series consists of sealed and unsealed connections, including USCAR standard footprints.

Delphi can also design connection systems with FBT to meet specific customer requirements for unique applications.

▶ **Performance Advantages**

- Meets ISO (International Organization for Standardization) and USCAR electrical, mechanical, and environmental performance criteria
- Package size suited to fit tight space requirements of today's vehicles
- Enables the transportation market to increase plant efficiencies and eliminate labor related to secondary plastic pieces
- The system includes:
  - Tangless terminals with stamped serrations and compatible with ISO or SAE blades
  - Connector lock with features for optional Connector Position Assurance (CPA)
  - Low engage force for improved reliability and ergonomics

▶ **Application Guidelines**

	<b>150 Series</b>	<b>280 Series</b>	<b>090II Series</b>
Cable range	0.35 – 1.0 mm <sup>2</sup>	0.35 – 5.0 mm <sup>2</sup>	0.3 – 2.0 mm <sup>2</sup>
Current range	0 – 15 A	0 – 25 A	0 – 25 A
Temperature range	-40°C to 125°C	-40°C to 125°C	-40°C to 125°C
Resistance	<10mΩ @ 20 mV	<10mΩ @ 20 mV	<10mΩ @ 20 mV
Voltage drop	<10.0 mV/A	<4.0 mV/A	<4.0 mV/A
Centerline spacing – unsealed	3.5 mm	5.0 mm	4.0 mm
Centerline spacing – sealed	4.5 mm	6.5 mm	not available
Blade width	1.5 mm	2.8 mm	2.3 mm
Terminal-to-terminal engage force	3N tin-plated	6N tin-plated	6N tin-plated

The general application guidelines above are for reference only and my not account for all variables that would be present in an actual application. For additional detailed product performance information, contact Delphi.

▶ **Patent Information**

Delphi has been awarded several U.S. patents for its FBT:

- 5,980,318, Connector with a flexible beam for holding a terminal down and in position
- 7,048,584, Electrical connector
- 7,179,136, Electrical connector
- 7,252,553, Ring out system providing terminal position assurance
- 7,252,559, Two piece electrical terminal
- Additional patents are pending