CAMBRIDGE CONNECTORS
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Closer Connections for the Broadcast Industry.

Introduction.

Driven by the dual influences of consumer demand and transmission regulation, the video broadcast industry has undergone dramatic changes in the last few years. Peter Fayers, Technical Director of Cambridge Electronic Industries Ltd., considers how RF connector manufacturers have tackled the technical challenges to date and what changes must be undertaken to deliver solutions for the future.

The digital revolution

The Broadcast industry is undergoing a significant revolution as it morphs from being a passive supplier of analogue audio visual content to a provider of ultra high quality digital data services. This encompasses multi-channel audio systems, high definition visual content, interactive services and in the near future 3D TV in the home. The technological changes coupled with the increasing number of TV channels has created an insatiable consumer demand for additional high quality digital content. This, in turn, is driving the industry to augment its traditional program sources, i.e. motion pictures, TV productions and 'set piece' sports events, to include additional services and coverage such as viewer selectable camera angles, 3D versions and a larger gamut of sports and social events not commercially or technically viable a few years ago.

All of this inevitably equates to the gathering of additional data simultaneously at the point of production which in turn impacts the rest of the broadcast distribution chain. A greater number of individual source inputs mean more connectors and more cables; however studios and outside broadcast vehicles haven't suddenly grown larger to accommodate all this extra equipment. *Something is going to have to give!*

Traditional RF Connectors

The BNC has always been the Broadcast Industry's connector of choice and with good reason; it is robust, easily terminated and has a simple, secure mating/ unmating system. With good design and manufacturing methods it has been possible for the BNC connector to keep pace with the 3GHz band width demands of High Definition TV and, soon to arrive, 3D TV. However, as RF connectors go, there is no denying the fact that it is not the most compact of connectors.

Typically the pitch between adjacent BNC connectors on a piece of equipment has come down from 25 mm to 16 mm; this is considered by most to be the practical limit to the packing density for this connector. Designers and producers of high quality 3G-SDi BNC connectors, are now focussing their connector design expertise on alternative RF connector options so as to address the growing requirement for increased connection capacity in less space.

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Alternative RF Connectors

In identifying suitable RF connectors capable of providing increased wiring densities the foremost consideration is acceptability in the broadcast industry. Over the past few years two smaller RF connector types have emerged as suitable candidates; one is the 1.0/2.3 connector and the second, more recent addition, is the Mini BNC. Both offer an opportunity for the pitch between connectors to be reduced from that of 16 mm; importantly, both can be redesigned to be made capable of 3G-SDi electrical performance requirements. Additionally, they have had some exposure in broadcast applications and gained acceptability. *(See pictures 1,2 and 3 showing size comparison)*

DIN 1.0/2.3

The 1.0/2.3 connector was initially designed as an out-and-out 50 ohm device but with its compact size and 8mm pitch it soon found its way into slow 75 ohm applications. By careful redesign of the internal structure of the connector it has been possible to obtain a PCB mounting true 75 ohm connector. However, the cable terminated mating half is not readily available as a true 75 ohm part. Consequently, there is a need to compromise the design of the PCB mount connector to take into account the likelihood that it may be connected to a standard 50 ohm 1.0/2.3 cable connector. Fortunately, even with this compromise, the connector is still capable of meeting 3G-SDI returns loss performance criteria. Further advantages are that the connector uses similar assembly methods to those used by standard BNC connectors. The tooling required is generally more expensive but is straight forward to use. However, assembly can be quite fiddly due to the very fine centre contacts.

The lack of readily available mating parts has been the primary stumbling block up to the present time. This is being addressed by the connector industry, including Cambridge Connectors, and compatible mating 1.0/2.3 connectors suitable for a variety of true 75 ohm cable types are now being manufactured. As a consequence it is likely that this connector series will be universally adopted by the Broadcast industry for true 75 ohm 3G SDI applications.

(See diagram (a) for BNC - 1.0/2.3 pitch comparison)

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Mini BNC

The Mini BNC was original conceived as a 75 Ohm device for relatively low speed telecom applications. So when looking for a small form factor replacement for the existing standard BNC, we are at least starting with a connector which is already approximately 75 ohms. With judicious design changes to the internal structure of the connector, true 75 ohm performance is achievable. Although its pitch of 12 mm is greater than that of the DIN 1.0/2.3 it offers considerably higher wiring densities over the standard BNC. Furthermore, there is a ready supply of 75 ohm cable mount connectors in the market, which use similar assembly methods and tooling to that of the standard BNC connector. Exhibiting the same appearance, bayonet lock and robustness as its larger brother, the mini BNC stands a good chance of gaining widespread acceptance in the broadcast industry.
(See diagram (a) for BNC – Mini BNC pitch comparison)

Summary

Broadcasters, network providers, production companies, are all contributing to the dramatic increase in programme content; meeting this demand requires an ever increasing number of physical connections. Given that the broadcast equipment producers are already beginning to feel pressure to increase the wiring density of switches, routers, mixers and other associated equipments, it is inevitable that the use of smaller form factor connectors will become increasingly widespread, particularly considering that there is no obvious downside. The connectors are smaller, lighter, higher performing and in the case of the Mini BNC, are very similar physically to the current entrenched standard BNC.

No one is suggesting that the standard BNC will disappear overnight; it is a rugged reliable device which has served the needs of the broadcast industry for decades. Only time will tell when the transition away from the standard BNC will take place and what will replace it; Cambridge Connectors has the key competences to meet the market needs for both 1.0/2.3 and Mini BNC options.

Peter Fayers, Technical Director
Cambridge Electronic Industries Ltd.,
13th January, 2010

Picture 1
BNC; 1.0/2.3; mini BNC connector size comparison straight PCB mounting style**Picture 2**
BNC; 1.0/2.3; mini BNC connector size comparison PCB edge mounting style**Picture 3**
BNC; 1.0/2.3; mini BNC connector size comparison Right Angle PCB mounting style
Diagram (a)
Pitch comparison between BNC; 1.0/2.3; mini BNC connectors

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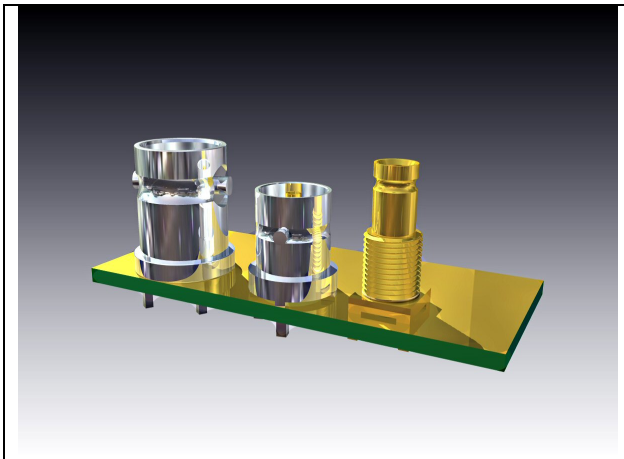
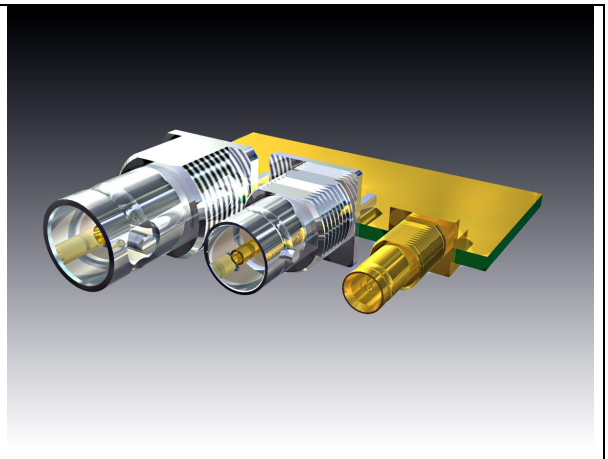
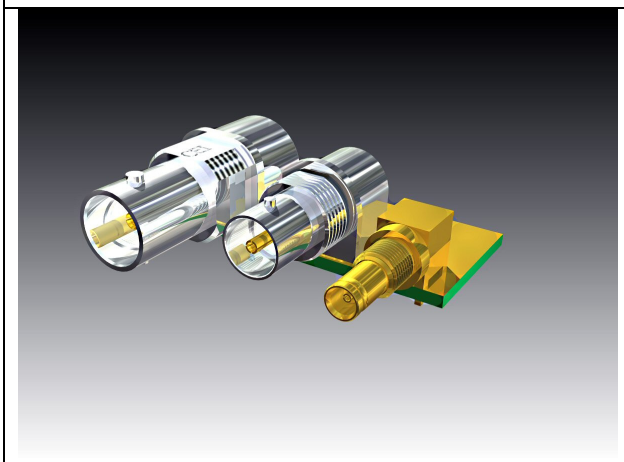
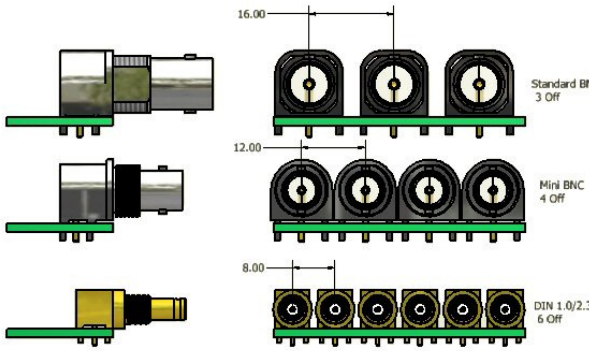
	
BNC; 1.0/2.3; mini BNC connector size comparison straight PCB mounting style	BNC; 1.0/2.3; mini BNC connector size comparison PCB edge mounting style
	
BNC; 1.0/2.3; mini BNC connector size comparison Right Angle PCB mounting style	Pitch comparison between BNC; 1.0/2.3; mini BNC connectors