

A photograph of a red fire truck at night with its emergency lights flashing. The truck is the central focus, with a blurred background of city lights. A large white arrow graphic points downwards from the top left corner towards the truck.

#22019

**INFOCUS:**

PARAMEDIC

## Reliable PCBs

– Key factor that determines the quality of the end product



The reliability of the PCBs at the heart of an electronics product are key to ensuring that the product performs as it is designed to. If a PCB fails, the likelihood is that the product will cease to function. This newsletter focuses on ways of attaining the desired reliability.

Reliability is a key factor right from the start of the PCB production process. If a PCB has a reliability issue, the end product itself is at risk. The important thing is getting it right first time. Trying to improve reliability once the product is designed and in production can lead to massively high costs for the product owner. In some cases, for example, medical equipment or motor vehicles, it could even become a matter of life and death.



Ryan Pellow, Sales Director, NCAB Group UK.

“Once the finished-product has been assembled and delivered, the PCB could be said to be a forgotten component. The software is there, as are the other components and it can at that stage be easy to forget that it’s the small hidden things like a PCB that can impact the reliability of the finished item,” explains Ryan Pellow, Sales Director at NCAB in the UK.

### PREVENT PROBLEMS IN TIME

Creating reliable PCBs is very much about considering all aspects that can affect reliability as early as possible in the production process. If there are problems with the PCB design, that is the best time to tackle them.

**“A better design increases the reliability of the product and reduces the risk of failure.”**

**RYAN PELLOW, SALES DIRECTOR, NCAB GROUP UK**

“You can’t compare a PCB to other components, its design has been tailored to a specific product and specific application. As a component, its role is critical. A good board design improves the reliability of the end product and lessens the risk of failure,” says Ryan Pellow.

“To ensure the reliability of the boards, we need to apply design guidelines based on what the PCB manufacturers can achieve in practice. In this way, we can show the customer the best layout of the board and basically make sure that our customers get the most cost-effective and reliable product that we can provide,” explains Steve Shipway, Technical Manager at NCAB in the UK.



Steve Shipway, Technical Manager, NCAB Group UK.

As technology advances, you are getting increasingly complex solutions. Today everything on the boards is incredibly small, and you can fit more technology on them. The more technology that



If a PCB has a reliability issue, the end product itself is at risk. In some cases, for example, medical equipment or motor vehicles, it could even become a matter of life and death. “You can’t compare a PCB to other components, its design has been tailored to a specific product and specific application. A good board design improves the reliability of the end product and lessens the risk of failure,” says Ryan Pellow.



Suntak outside Shenzhen, China, is one of the factories that NCAB uses to manufacture certain circuit boards. Our factories are approved through our comprehensive sourcing process and continuously audited and quality assured by our Factory Management organization.

can be placed on a board, the more complex both construction and manufacturing becomes.

“Perhaps the most important thing to focus on is ensuring that the track and gap on the board is appropriate to the required copper thickness. With the type of components we are getting today, you need smaller track and gap, which means you need to use less (thinner) copper,” emphasizes Steve Shipway.

### “The higher the technology, the greater the effort required to design the board optimally for manufacturing.”

**STEVE SHIPWAY, TECHNICAL MANAGER, NCAB GROUP UK**

Before you go too far into any design, it is vital the designers know exactly what is achievable with the specified copper weight requirements. If changes are needed to the layer stack up, for example if some high power areas are needed on the board, it should be designed to ensure that those high power sections are in the inner layers. You need to avoid the outer layers, since that is where the fine-pitch components are located. This approach makes the board easier to produce.

“The higher the technology, the greater the effort required to design the board optimally for manufacturing. That is the only way you can make sure they will ultimately function reliably,” says Steve Shipway.

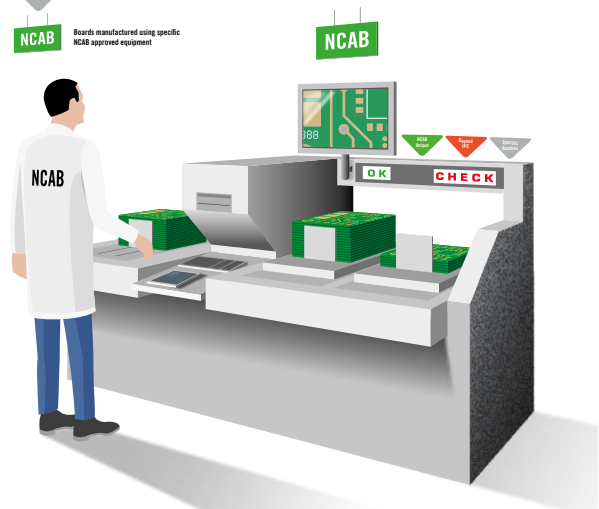
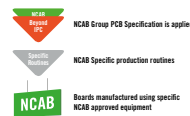
“In high-technology products there is far less room for errors, with less tolerances applied in every single process. That’s why all aspects of the PCB design needs to be strengthened. A better design increases the reliability of the product and reduces the risk of failure,” says Ryan Pellow.

### THE RIGHT FACTORY FOR THE TYPE OF BOARD IN QUESTION

Once the design is completed, you normally can’t turn to the same factory and just ask them to manufacture a more advanced board. You have to make sure the manufacturer has the appropriate capa-

bility and competence to produce the kind of board in question.

“Although the manufacturing processes for a 2 layer & HDI PCB are similar to each other, the technology is very different. To ensure reliability, the factory needs a higher level of understanding and control of the manufacturing process,” says Steve Shipway.



The “final inspection” is the penultimate step in the production process. Here, the PCB undergoes an ocular examination by NCAB-approved quality controllers, using our standard specifications requirements. The board is compared to the Gerber file using AVI, which is faster than the human eye - the process is, however, monitored by our controllers.

At the same time, one should strive to design boards in a way that they can be manufactured reliably by as many factories as possible. In this way, you can attain better lead times and a better cost picture, while maintaining quality.

“Manufacturing PCB’s is often challenging when it comes to apply-

## “PCBs cannot be treated like other components because there are so many levels to take into consideration.”

**RYAN PELLOW, SALES DIRECTOR, NCAB GROUP UK**

ing the very latest technology required by the component manufacturers. That’s why it is important to avoid the hassle of doing things unnecessarily,” says Steve Shipway and cites an example: “If you can avoid designs containing, six or seven different layers of blind or buried vias to track out a BGA [component] and reduce it to a standard multi-layer board, you should do so. This does away with all the extra drilling and plating processes and significantly reduces costs, whilst at the same time improving the manufacturability of the product.

“If you keep your manufacturing options as open as possible through a smart design, this will also allow you to switch production from one factory to another, which reduces the risks one is exposed to.

If one factory is under-performing or dealing with some kind of issue, you would be able to move the production to another facility. The last thing you want is a PCB design that limits you to using a single factory,” Steve Shipway states.

### TOUGH DEMANDS ABOVE AND BEYOND INDUSTRY STANDARDS

One factor behind achieving reliable circuit boards is to ensure that they meet the industry standard IPC requirements. NCAB Group has taken this a step further and produced its own standard product specification. At present, it comprises up to 103 different requirements and criteria that the factories must follow when manufacturing for NCAB. It is a real time document that is being continuously built on and improved in cooperation with customers. Several of the requirements are considerably tougher than those stated in IPC class 2.

“PCBs cannot be treated like other components because there are so many levels to take into account. The industry standard IPC applies to many different types of products, requirements and performance

levels. In the case of PCBs, it is unable to cover everything. But for the product owner, an unreliable board involves huge risks and that’s why it is worth taking all aspects into consideration,” Ryan Pellow explains.

“Through all the years that NCAB has been supplying PCBs, it has built up a wealth of knowledge covering factors affecting the boards’ quality and reliability. It might involve such things as material selection, true hole copper thickness or the solder mask used in manufacturing, or selecting the peelable mask that gives the best end result, and so on. This is the kind of knowledge that NCAB has compiled in its standard requirements specification.

## “NCAB’s factories know why we apply these high standards and why we go beyond IPC.”

**STEVE SHIPWAY, TECHNICAL MANAGER, NCAB GROUP UK**

“It covers specific areas where a higher degree of control is necessary. For example, the factories must use only approved brands for the materials that are used in manufactured. For the plating of the hole wall, 25 µm thickness of the copper must be achieved, which exceeds IPC class 2. No track welding or open circuit repairs are allowed if the boards are to be approved and there are requirements for factors such as cleanliness.

“In fact, we also define clear cosmetic requirements for the PCBs. Multiple scratches on the board can suggest accuracy and care issues during the manufacturing process, which could affect reliability,” Ryan Pellow continues.

### FREEDOM UNDER RESPONSIBILITY - AND CONTROL

It is not always easy to navigate through the demands to be placed on a factory. For example, it may seem like a good idea to specify an exact material of a precise brand to ensure adequate control. It may sound like a contradiction, but in such a case, it might be safer to settle for an IPC standard (IPC 4101) and a number of approved brands.



Wendy Liu, Quality Manager and Jerry Zheng, Production Quality Engineer NCAB Group China outside Sunkat, Jiangmen. “Having your own staff and expertise in place at the factories is also important as a means of checking that the specifications are met. This also means that you can help the factories grow their business if needed. Just as we strive to be a partner for our customers, for example by helping them with the design of PCBs, we work closely with the factories to help them improve their offering and reliability,” says Ryan Pellow.



Anna Lothsson, Sustainability Manager at NCAB Group, holding a seminar for customers and employees. Seminars are part of our work to disseminate knowledge and facilitate the process of PCB production for our customers. You will find a list of some of our available seminars at [www.ncabgroup.com/seminars/](http://www.ncabgroup.com/seminars/)

“The factory will then be free to choose the material that it has the greatest experience with and which is best suited to its manufacturing processes. Forcing a specific choice on to the factory can create problems, since it could impact the reliability of their processes, compared to if they had used a material they are familiar with,” Ryan Pellow explains.

Having your own staff and expertise in place at the factories is also important as a means of checking that the specifications are met. This also means that you can help the factories grow their business if needed.

“NCAB’s factories know why we apply these high standards and why we go beyond IPC. We help them live up to our high demands

and they can improve their manufacturing ability in general. Our model leads to a win-win-win relationship that our customers, factories and ourselves will benefit from,” says Steve Shipway.

“Just as we strive to be a partner for our customers, for example by helping them with the design of PCBs, we also work closely with the factories to help them improve their offering and reliability,” says Ryan Pellow.

“While a factory may just be focused on a specific technology, NCAB has built up an enormous breadth of knowledge that includes almost all types of PCBs. We are ready to share this experience, to the benefit of both our customers and the factories,” he concludes.



**“As a producer of life critical products we depend on the reliability of all parts in the product, and the PCB is our most critical component.”**

**BALAZS CSUHANICS, SUPPLIER QUALITY ENGINEER, APOLLO**

Apollo Fire Detectors specialize in the design and manufacture of high-quality fire detection products for commercial and industrial applications and is a customer of NCAB Group.



# Knowledge and experience – the basis for reliable circuit boards

HANS STÄHL  
CEO NCAB GROUP




Making sure that the end product works as it should, both in the short and long term, the crucial factor is high reliability.

As Steve and Ryan mention, we at NCAB have developed our own standard specification for PCBs - a measure that enables the production of circuit boards that offer optimum reliability. In those areas where we consider the requirements set in IPC class 2 to be too low (or non-existent) to achieve reliability and quality of the circuit board, we have raised the bar higher.

We are happy to share our knowledge and experience with our


customers in order to facilitate their process. We have produced a film to illustrate some sections of our standard. We also hold seminars on various technical areas, and our design guidelines for different types of PCB can be downloaded from the web.

If we turn our attention away from the technology and focus on the process as a whole, we see that reliability is every bit as important here. Our customers should feel that we are a reliable partner when it comes to the whole, from quotes, via advice, to logistics solutions.



**Read more about reliable PCBs**

- » [NCAB Groups PCB Specification](#)
- » [NCAB Group Design Guidelines](#)
- » [NCAB Group PCB Specification film](#)

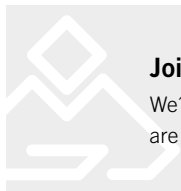


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where we immerse ourselves in the versatile world of circuit boards!

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**Join us!**

We're always looking for competent people. If you are a well skilled technician, customer service or sales person, don't hesitate to contact us or send your resume to: [career@ncabgroup.com](mailto:career@ncabgroup.com)

## Subjects we have covered earlier

Do read our earlier newsletters. You will find them all on our website, [www.ncabgroup.com/newsroom/](http://www.ncabgroup.com/newsroom/)

- » **The electronics industry in Europe**  
2019 03 18 | NEWSLETTER 1 2019
- » **The PCB Industry in the United States**  
2018 12 14 | NEWSLETTER 4 2018
- » **More advanced boards and shorter product life cycles**  
2018 10 23 | NEWSLETTER 3 2018
- » **A better future**  
2018 06 18 | NEWSLETTER 2 2018
- » **Factory management**  
2018 04 12 | NEWSLETTER 1 2018
- » **More electronics in smaller spaces**  
2017 12 15 | NEWSLETTER 4 2017

## Are we taking up the wrong subjects?

We are always looking for interesting subjects that we could take a more in depth look at.

If there is something you would like to learn more about, or perhaps you would like to comment on anything we have written, do get in touch with us and tell us more.

Mail: [sanna.magnusson@ncabgroup.com](mailto:sanna.magnusson@ncabgroup.com)