



The European Institute for the PCB Community

EIPC NEWS

A Webinar with Walt Custer

2nd October 2020

Limited seats available!

*Business Outlook for Global Electronics Industry with Emphasis on Europe
October 2, 2020 at 16:00 hrs Standard European Time
Free of Charge*

The Directors of The European Institute for the PCB Community invite you one again to join the second Free of charge Webinar which they will be holding on Friday October 2nd 2020 at 16.00 hrs Standard European Time.

The Webinar is limited to 75 registrations. The first 30 registrations are exclusive to EIPC members, most of whom will be familiar with the unique experience that is a presentation from Walt Custer, who is the fount of all knowledge about our market and our industry.

Walt will lead off with the Business Outlook for Global Electronics Industry, with particular emphasis on Europe, followed by a look at electronic industry supply chains, electronic equipment, process equipment, material and components, as well as a view of the PCB industry nationally and internationally.

Of specific pertinence will be his current economic outlook including leading indicators that will predict timing and magnitude of recovery.

In order to ensure that this event does not pass you by, please register free of charge online on our website www.eipc.org , use the registration form or send an email to kwestenberg@eipc.org

Your registration will be confirmed by the EIPC office via email. You will receive a ZOOM invitation to log in for the Webinar. The presentation will be distributed by Mr. Walt Custer himself after the online event has taken place.



The European Institute for the PCB Community

EIPC SPEeDNEWS

*The Weekly On-Line Newsletter from the European Institute of Printed Circuits.
Issue 23– September 2020*

NEWS FROM CHINA

Fire breaks out at Unimicron China plant

DIGITIMES

A fire broke out at Unimicron Technology's factory in Kunshan, China on September 7, with details of the losses still being evaluated and cause of the fire under police investigation, according to the Taiwan-based IC substrate and PCB maker.

The damaged plant is dedicated to production of traditional PCB and HDI products mainly for automotive applications, Unimicron said, adding that it is coordinating capacity support from its other plants in China to maintain normal shipments to clients.

Industry sources said the fire would not much affect Unimicron's business performance as automotive PCB is not a major product line for the firm and current market demand is not too strong.



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EIPCSPeDNEWS

Issue 23— September 2020

NEWS FROM GERMANY

electronica 2020 to be held digitally

- Virtual concept for electronica virtual will replace the in-person trade fair in Munich
- Expansion of digital offering
- Online conference program planned

Messe München will organize the world's leading trade fair and conference for electronics as



a virtual event this year. The current travel restrictions in Europe, which are becoming more stringent, have required a re-thinking of planning. The digital format for electronica in November will give exhibitors the opportunity to book digital trade fair booths. electronica virtual will also provide all customers additional ways to

interact and network. A large portion of the conference and supporting program will also be available digitally.

New developments related to the coronavirus pandemic prompted Messe München to decide to hold electronica as a virtual event this year. In light of travel restrictions that have been imposed by a large number of visitor and exhibitor countries, electronica would have lost its character as a world-leading trade fair if it had been held as an in-person event in November. Falk Senger, Managing Director of Messe München, said: "Even though an in-person trade fair could have been conducted with the help of our safety and hygiene concept, the latest developments related to travel restrictions in many countries forced us to rethink our plans. We are adapting these plans to this dynamic situation and are now

focusing solely on our virtual format. International exhibitors and visitors are the heart of electronica. In light of current Covid-19 conditions, we would not have been able to meet the expectations with an in-person trade fair.”

Kurt Sievers, the CEO of NXP Semiconductors and the Chairman of the electronica Advisory Board, added: “After reevaluating the situation, I consider the decision of Messe München to be very appropriate and responsible. We are pleased that, with electronica virtual, a concept is now offered for 2020 that allows exhibitors to reach their international customers, even in the continuing difficult pandemic period. Via this digital platform, exhibitors can present their innovations, learn about industry trends and efficiently network with customers and suppliers.”

Christoph Stoppok, the Head of Components, Mobility & Systems at the German Electrical and Electronic Manufacturers’ Association, said: “The electronics industry and the solutions it provides are one of the major driving forces behind digitalization. Let’s put the industry’s ingenuity to use and get together this year at a virtual fair. This is exactly the right time to foster a dialogue in the industry and generate economic momentum once again.”

Online trade fair with virtual product presentations and supporting program

The virtual format of electronica will provide the electronics industry with a platform for global industry discussions this November. Its opportunities will include virtual trade fair booths, which will enable exhibitors to continue to communicate with their international customers and sell them on their products and solutions. The virtual event will be complemented by a digital conference and supporting program. Individual talks and panel discussions on trend topics like the automotive industry, embedded systems, IIoT, 5G, medical electronics and smart energy will be available online.

You will soon find more information and offers on the trade fair’s website at:

www.electronica.de



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NEWS FROM THE NETHERLANDS

Adeon adds on a new final inspection system to their AOI range

Snappily titled the Fi option, this offers Integration with CIMS AOI systems, combines final inspection with regular inspection, and also supports both sampling and 100% inspection. It has a dedicated user interface for final inspection, and offers easy and intuitive setup

OPTICAL FINAL INSPECTION – the Fi (Final Inspection) option allows the inspection of finished boards with CIMS AOI. It is supplied as an add-on option suitable for all CIMS Phoenix & Galaxy AOI models extending their capabilities to final inspection.

Fi can reliably detect common defects on gold, copper and solder mask. The setup is easy and intuitive: operator chooses proper solder and silk layers, then the software takes care of combining them and generating high resolution reference which will be compared with the scanned image.

Systems equipped with Fi option feature a dedicated final inspection interface for operating parameters set-up. Indeed, the Fi option adds a new level of versatility to all AOI systems enhancing their inspection capabilities to more applications and PCB manufacturing process stages.

Interested in an online demo, or demo at on-line?

For more information please contact

Adeon Technologies

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NL-4824 AS Breda

0031 (0) 76 541 00 08

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NEWS FROM THE UK



IMAPS-UK MicroTech 2020 Online - 16 September 2020

Advanced Electronics Packaging

System in Package, 3D and Wafer Level Assembly, Advanced Thermal Management Materials and

Plastic Packaging for Electronics and Photonics.

Keynote Speakers from Yole Developpement and IMEC on the latest worldwide technology trends.

Free for IMAPS Members *

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* Free to Attend for the following categories of IMAPS-UK Members (Individual, Corporate, Academic, Student) and Members of IMAPS Worldwide.

** Non-Members of IMAPS (including those only registered on IMAPS-UK website)

[Register Here](#)



For any other details or information please contact:

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Tel: +44 0131 2029004
e-mail: Office@imaps.org.uk

FUTURE HORIZONS MARKET TRENDS WEBINAR

When? Tue 15 September 2020 - 3 pm BST / 7 am PST / 11 pm JST

Where? https://us02web.zoom.us/webinar/register/4615973210720/WN_lusAvZ2cRGyfO4HZSwl39g

Why? We understand there is a lot of uncertainty ahead which makes it hard to make strategic decisions.

The one-hour broadcast will cover a subset of the normal 4½-hour proceedings, focusing primarily on the semiconductor industry forecast and outlook. Attendees will gain:

- Valuable insight about the industry's post-crisis evolution
- How demand will shift in the short and medium-term
- An understanding of the industries exposure, vulnerabilities and opportunities
- Data and analysis to inform resilient strategies and reimagine business models
- Answers to questions like 'why is the chip industry so strong given the economic crisis?'
- Increased confidence, enhanced job satisfaction and improved operational efficiency
- Optional access to the full 4½-hour slide set

The COVID-19 pandemic and rapid economic decline make this webinar a must-attend event for any leader within the semiconductor, electronics and related industries. Can the semiconductor industry emerge from the Coronavirus stronger than ever? Find out at Future Horizons' IFS2020 Industry Market Forecast Webinar - A mid-term review of the global semiconductor and electronics industry (<https://www.futurehorizons.com/page/133/>).

Now in its 32nd year, we are committed, more than ever, to providing you with high quality, cost-effective market research and analysis to help semiconductor leaders prepare themselves for the next normal. Just like our live events, there will be ample opportunity to ask questions during and after the webinar. We are not afraid to stick our necks out and go against the tide to ensure you get the right information, and this event will be no exception.

Who Should Attend?

- Key decision-makers engaged in the design, fabrication or supply of semiconductors
- Senior marketing executives planning a post COVID marketing strategy
- Those involved in investing or banking within the electronics industry
- Government organisations involved in trade and investment

Book Your Seat Today (Spaces are limited)

Go

to: https://us02web.zoom.us/webinar/register/4615973210720/WN_lusAvZ2cRGyfO4HZSwl39g

- For a small investment of £95 you will gain accurate industry insight to make good strategic decisions in these uncertain times
- Discount available for 3 or more attendees from the same company/organisation
- Webinar can also be held in-house for your added convenience and flexibility
- Please pass to a colleague if already attended or not suitable for you

Malcolm Penn
Chairman & CEO

P.S. Why Future Horizons?

We have been in the business of forecasting and analysing the semiconductor market for over 50 years and have been a trusted advisor to most of the top global semiconductor firms. Time and time again we have saved our clients time and money with our forensic and accurate analysis. In 2018 we were the only industry analyst to correctly forecast the 2018 double-digit super-cycle growth at a time when all other analysts were incorrectly predicting, single-digit industry growth.

Twitter

Follow us on Twitter, like us on Facebook and join our Linked In Group and receive regular industry news, information and comments.

Registered Company: 4380991



Free Online "Fundamentals of Electronics Packaging" Tutorial

Reminder

"Circuit Nano-Surgery and Failure Analysis"

Friday 18 September 2020: 13:00 - 13:30

Lloyd Peto - Nanoscope Services

Learn how **Focused Ion Beam (FIB)** can be used to cut and connect metal nodes on **prototype semiconductor devices** to correct **design faults** without the **expense of mask re-manufacture** before volume manufacture

*Registration is **free** for this event, but limited to 100 places.*

[Register Here](#)

Forthcoming IMAPS-UK Online Events

Please Click on the Links below for More Information

[MicroTech 2020 Online Conference](#)

Wednesday 16 September 2020 09:30 - 15:00

For any other details or information please contact:

IMAPS-UK Secretariat
125 High Street Chesterton
Cambridge CB4 1NL UK
Tel: +44 0131 2029004
e-mail: Office@imaps.org.uk



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NEWS FROM THE USA

PCB INDUSTRY MARKET RESEARCH REPORT

8th September 2020 - **Advanced Printed Circuit Board (PCB) Market 2020 Industry Trends, Size, Growth Insight, Share, Emerging Technologies, Share, Competitive, Regional, And Global Industry Forecast To 2026**

Advanced Printed Circuit Board (PCB) Market 2020 Global Industry Market research report provides key analysis on the market status of the Advanced Printed Circuit Board (PCB) manufacturers with market size, growth, share, trends as well as industry cost structure. Advanced Printed Circuit Board (PCB) Market Report will add the analysis of the impact of COVID-19 on this industry.

Sep 08, 2020 (The Expresswire) -- Global "**Advanced Printed Circuit Board (PCB) Market**" (2020-2026) Research Report is deep analysis by historical and current status of the market/industries for Global Advanced Printed Circuit Board (PCB) industry. Also, research report categorizes the global Advanced Printed Circuit Board (PCB) market by Segment by Player, Type, Application, Marketing Channel, and Region. Advanced Printed Circuit Board (PCB) Market report also tracks the latest market dynamics, such as driving factors, restraining factors, and industry news like mergers, acquisitions, and investments. Advanced Printed Circuit Board (PCB) Market Research Report provides market size (value and volume), market share, growth rate by types, applications, and combines quantitative methods to make micro and macro forecasts.

Get a sample PDF of the report at-

<https://www.researchreportsworld.com/enquiry/request-sample/16352145>

The global Advanced Printed Circuit Board (PCB) market is anticipated to rise at a considerable rate during the forecast period, between 2020 and 2026. In 2020, the market was growing at a steady rate and with the rising adoption of strategies by key players, the market is expected to rise over the projected horizon.

The Advanced Printed Circuit Board (PCB) research report has been curated after observing and studying various factors that determine regional growth such as economic, environmental, social, technological, and political status of the particular region. Analysts have studied the data of revenue, production, and manufacturers of each region. This section analyses region-wise revenue and volume for the forecast period of 2015 to 2026. These analyses will help the reader to understand the potential worth of investment in a particular region.

Global Advanced Printed Circuit Board (PCB) Market Report 2020 provides exclusive vital statistics, data, information, trends and competitive landscape details in this niche sector.

To Know How COVID-19 Pandemic Will Impact Advanced Printed Circuit Board (PCB) Market/Industry- Request a sample copy of the report-

<https://www.researchreportsworld.com/enquiry/request-covid19/16352145>

List Of TOP KEY PLAYERS in Advanced Printed Circuit Board (PCB) Market Report are -

- **AtandS**
- **Advanced Circuits**
- **Cmk**
- **Compeq**
- **Dynamic Electronics**
- **Xcerra**
- **I3 Electronics**
- **Meiko Electronics**
- **Nan Ya Pcb**
- **Nippon Mektron**
- **Samsung**
- **Sanmina**
- **Shengyi Technology**
- **Shinko Electric Industries**
- **Sumitomo Electric Industries**
- **Tripod**
- **Ttm Technologies**
- **Unimicron Technology**
- **Zhen Ding Technology Holding**

This section of the Advanced Printed Circuit Board (PCB) report identifies various key manufacturers of the market. It helps the reader understand the strategies and collaborations that players are focusing on combat competition in the market. The comprehensive report provides a significant microscopic look at the market. The reader can identify the footprints of the manufacturers by knowing about the global revenue of manufacturers, the global price of manufacturers, and production by manufacturers.

[Get a Sample Copy of the Advanced Printed Circuit Board \(PCB\) Market Report 2020](#)

With tables and figures helping analyze worldwide Global Advanced Printed Circuit Board (PCB) Market Forecast provides key statistics on the state of the industry and is a valuable source of guidance and direction for companies and individuals interested in the market.

Advanced Printed Circuit Board (PCB) Market Segment by Type:

- **One-to-Two-Layer Rigid**
- **Multilayer Rigid**
- **Microvia**
- **Flex**

Advanced Printed Circuit Board (PCB) Market Segment by Applications:

- **Healthcare**
- **Defense**
- **Energy**
- **Consumer Electronics**
- **Industrial**
- **Automotive and Transportation**

- **Retail**

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Key Questions Answered in The Report:

- What will the Advanced Printed Circuit Board (PCB) market growth rate?
- What are the key factors driving the global Advanced Printed Circuit Board (PCB) market?
- Who are the key manufacturers in Advanced Printed Circuit Board (PCB) market space?
- What are the market opportunities, market risk and market overview of the Advanced Printed Circuit Board (PCB) market?
- What are sales, revenue, and price analysis of top manufacturers of Advanced Printed Circuit Board (PCB) market?
- Who are the distributors, traders and dealers of Advanced Printed Circuit Board (PCB) market?
- What are the Advanced Printed Circuit Board (PCB) market opportunities and threats faced by the vendors in the global Advanced Printed Circuit Board (PCB) Industry?
- What are sales, revenue, and price analysis by types and applications of Advanced Printed Circuit Board (PCB) Industry?
- What are sales, revenue, and price analysis by regions of Advanced Printed Circuit Board (PCB) industry?

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ELECTRONIC INDUSTRY NEWS

DESIGNLINES

E-Wasted on the Way

By [Rebecca Day](#)

I wish I had a dollar for every pound of audio and video, computer, smartphone, tablet, peripheral and digital camera e-waste I've discarded over the years. Oh, and all those cables, power adaptors and earphones I've scrapped, too. I do it as responsibly as possible — trading in or giving away gear that still works and finding a recycling event for the rest. I don't even want to think about how much I spent for all the obsolete gear that was once shiny and new.

Multiply my contribution times millions of people per year. The Environmental Protection Agency [website](#) says that in 2014, over 720 million new electronic products were sold and 3.36 million tons of used electronics were ready for end-of-life management in the U.S.

A 2019 World Economic Forum report said e-waste is the fastest-growing waste stream in the world, reaching 50 million tons the year before. Globally, society only deals with 20% of e-waste appropriately, "and there is little data on what happens to the rest, which for the most part ends up in landfill, or is disposed of by informal workers in poor conditions."

A 7-year-old [chart](#) from the Electronics TakeBack Coalition seemed to show a positive recycling trend at the time: 40% of the 3.1 million tons of e-waste generated in in the U.S. in 2013 was recycled, it said. The bad news was it was "unclear whether the large increase in the electronics recycling rate from 2012 to 2013 is due to an actual increase in recycling or the result of improved and expanded data."

It's also unclear what falls into the category "e-waste" in studies, but my trail of expired electronics over the years spans generations of chips and circuit boards. Besides smartphones I've traded in to wireless carriers, I've discarded obsolete cassette, CD, laserdisc and DVD players; stereo and AV receivers, loudspeakers, headphones; CRT and plasma TVs; desktops, laptops, monitors, printers, scanners, keyboards and surge-protecting power strips; fax machines and phones; e-readers, a DirecTV receiver and a WebTV — and then all the cables and remote controls required to make them work. That's a jot of e-junk.

Electronics recycling laws are a state-by-state thing. Twenty-five states and Washington, D.C. have passed laws related to electronics recycling, says recycler ERI, whose [website](#) links consumers to their states' e-disposal programs. My state, New York, uses the Producer Responsibility approach: Manufacturers pay for recycling costs, as it should be.



New York State pointed me to Staples and Best Buy as e-cyclers in my area, and a map showed plenty of locations where we could dump our electronics responsibly. When I clicked through, I found e-cycling is another way of life put on hold due to Covid-19. The recycling program has been “temporarily suspended” at Staples “to keep our customers and associates safe.” Best Buy’s appears to be up and running, according to a recorded message at my local store. I wasn’t able to get a live person to confirm that.

Among manufacturers, Apple and Samsung have taken leadership roles in e-cycling. Apple has committed to someday sourcing 100% recycled and renewable materials across all of its products and packaging. The company accepts unwanted Apple products in stores for recycling. Next time I want to upgrade an iPad — and it’s too old for a trade-in — I can take the tablet and chargers to an Apple store and let them handle the dirty work.

Samsung’s website directed me to [Call2recycle](#), where I learned that all those dead alkaline batteries I’ve been saving can’t be recycled like rechargeable batteries, whose recycling is funded by device manufacturers. There’s currently no national stewardship solution to allow for free recycling of single-use batteries, “except in Vermont,” it says. Other states may charge a small fee for it, says the recycling company.

Rumor has it Apple will ship the next generation of iPhones without adapters or those starter earphones that everyone tosses to upgrade to better ones. If it’s true, that’s a money-saver for Apple, but I also see it as a good thing for the environment — *if* I can use my existing lightning cables and chargers. Otherwise, I’ll have to trash my existing chargers and cables and buy new ones on top of the pricey upgrade phone.

Apple has a tendency to force transitions to new technologies, leaving more collateral e-waste damage. I still lament the demise of the iPod and I had a few cute iPod mini music players along the way, which wound up at recycling events. I hate when I don’t upgrade fast enough to have any value left for a trade-in; that happened a couple of times with iPads.

I’m still smarting from when I bought an integrated amplifier with a 30-pin dock built into the top that allowed me to pop in my iPod, or a pre-2012 iPhone, as a direct source. The iPod is long gone, but the dock is still there, mocking me. I cringe when I see one of those old

30-pinner docks atop a hotel room's clock radio. The industry was so young and innocent then, thinking the 30-pin connector would carry us from generation to generation.

My mind is on electronics cycling because I'm contemplating another audio migration, forced by a transitioning manufacturer. Then it'll be out with the old, in with the new, as another generation of feeds and speeds enters the picture. That brings a whole other set of thoughts and aggravation for another day. Meanwhile, time to hunt down a place to recycle.

The Importance of Electronics in Formula 1

Maurizio Di Paolo Emilio

What provides the better edge in Formula 1 — a driver's skills or finely-tuned machine? This debate broke out in the 1980s with the growth of electronic systems on Formula 1 cars. Engineers toil ceaselessly to optimize race-cars, tweaking the configuration of the over 18,000 components [including sensors, ECUs](#), and mechanical parts.



Lando Norris, McLaren MCL35

Formula 1 engineering crews span scientific fields, from mechanics and electronics to data analysis and aerodynamics. The competition between race teams translates into a technological tour de force to improve their understanding of the dynamic behavior of the cars, down to the microsecond.

The strict regulations of the FIA (Federation Internationale de l'Automobile) have severely limited the technology, in order to ensure that the driver's ability still remains an important element. Many solutions found in commercial cars such as ABS and automatic gearboxes are banned in the Formula 1 environment.

Racing cars have radically changed in recent years. Thanks to telemetry, race engineers can monitor and improve the performance of the car by analyzing data from over 300 sensors from different devices located at various points in an F1 car. Hundreds of parameters can be measured in real-time. All data are collected by a logger and sent to the teams via radio, using the antenna in the front of the car.

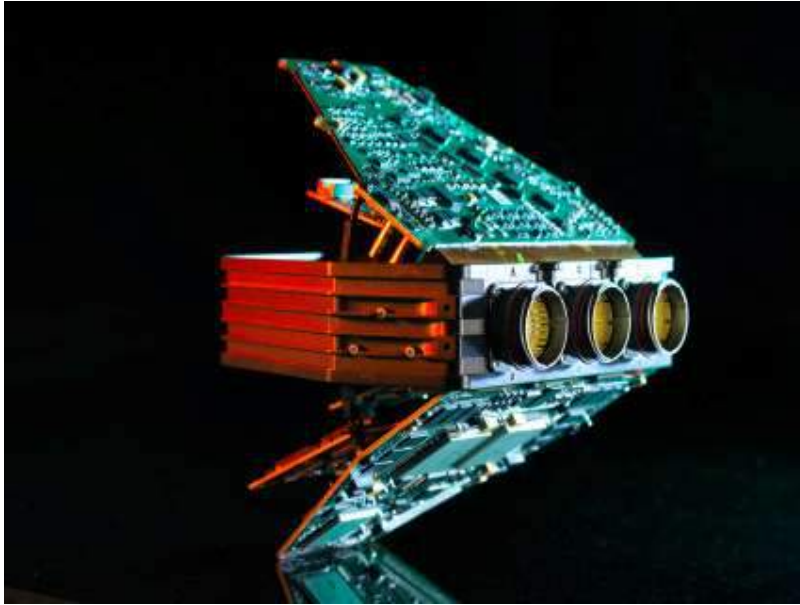
Speaking to EE Times, Stephen Watt, head of electronics at McLaren Racing, said “The car on track is only the tip of the iceberg; teams are now heavily data-driven, feeding on data received over the paddock-wide 5 Mbps telemetry link as well as offloaded from various onboard loggers to allow the engineers at the trackside and back at the factory to analyze the performance of the car in isolation as well as perform strategic analysis by studying the performance of other teams.” The modern Formula 1 car is an intelligent, connected data system that can travel at over 200 km per hour. A lot of data are sent from the cars to the teams every second, transmitting various types of information about everything from tire wear to engine temperature.

ECUs and sensors

Each car is studded with multiple ECUs. At the center of the system is the standard ECU or SECU. The SECU is essentially a small but very powerful computer that controls, processes, and transmits large amounts of data from F1 cars to teams. The SECU consists of optimizing the exchanges with the engine, gearbox, and differential, but also with the aerodynamic system. The SECU is also the main data storage and acquisition service that provides real-time values via telemetry to teams and race control. This allows teams to visualize the performance of their cars in real-time, checking engine health, tire degradation, and fuel consumption.

The SECU is provided by the McLaren Applied (sister company of McLaren Racing) TAG-320B and being mandated in the regulation it must be run by all Formula 1 teams. The TAG-320B provides a shared platform used by the team, the power unit provider and the FIA. The TAG-320B hosts functions ranging from the core operation of the power unit to the often taken for granted seamless shifting of the 8-speed gearbox as well as allowing the FIA to restrict the functionality of the control software to ensure that driver aids such as traction control cannot be implemented — or at least their effect can be detected if teams were to use them.

The car has around 300 sensors and the SECU monitors over 4,000 parameters. During the course of a typical race the car will transmit around 3 GB of telemetry data as well as around 4 GB of logging, however this is just the seed for computation. When processed and combined with other sources such as audio and video analysis it can mean a team leaves a typical race weekend with over a terabyte of valuable data — data that is drawn on again and again before and during future events and seasons.



Standard ECU

The sensors placed on the single-seater are used to monitor for potential problems; engineers can make immediate decisions based on the data collected. For example, if an increase in engine temperatures is detected, it may be because the driver is too close to the car ahead; the driver's team can alert him to get out of the hot trail of exhaust until the temperatures drop below sensitive values.

There are 3 categories of sensors: control sensors associated with drive-by-wire functions such as accelerator pedal sensor; monitoring sensors to monitor the health of the car such as hydraulic system pressure; and then instrumentation sensors such as non-contact temperature sensors to monitor friction material.

"A Formula 1 car has many lives; during qualifying and the race, it becomes a lightweight racing car with only the minimum of equipment fitted to it that we need to complete the race but even in this configuration the car will have over 1.5Km of wiring onboard and over 200 sensors. At the opposite extreme is winter testing when we're proving out the car and it almost becomes a test lab on wheels.

The demand for high-quality data shapes a lot of what we do. The changes in both the technical and sporting regulations over the years and the reduction of track testing has put an increased emphasis on having a deep understanding of the car every time it is running on track.

"The recent changes in the Formula 1 regulations following the COVID-19 pandemic aimed at reducing spending by freezing certain areas of car developments are again reshaping that challenge and making us look harder than ever at cost and supply chain aspects as well as maximizing the benefits from the areas of freedom we still have," said Watt.

Since 2014, the FIA has started to require the use of fluid flow meters (FFMs). FFMs also use ultrasound to measure fluid flow, which ensures a very accurate reading and instantaneous analysis of the fuel performance of the vehicle. Ultrasonic fluid flow measurement requires the use of two piezoelectric transducers. These transducers send ultrasonic pulses back and forth to each other and use flight time calculations to determine the fluid flow rate.

Telemetry

Telemetry was introduced in the late 1980s and has developed considerably over the years. A much greater wealth of data is now being collected and transmitted within just a few hundredths of a second, allowing race technicians give drivers tactical advice in near real-time.

The areas involved using a Telemetry and Data Analysis system are different. Engine, engine brake, torque control, engine injection, and ignition are parameters that can be managed thanks to this technology. Other components, closely related to the use of Telemetry and Data Analysis systems, are the chassis, tires, accelerator operation, vehicle speed, and aerodynamics regulation through the penetration coefficient of the mechanical vehicle.

Talking with Stephen Watt about telemetry in Formula 1 he offered the following: "Telemetry can sometimes be a misused term in Formula 1 but it is usually used to refer to the wireless transmission of on car data generated in the ECU and sent to the team trackside in the pits. The telemetry systems used in Formula 1 have been subject to some very pragmatic changes in recent years.

"It used to be the case that each team took its own independent radio telemetry system to the trackside," he continued, "and the pits ended up looking like a forest of pump up masts of ever-increasing heights. Of course, the radio spectrum became increasingly congested and when you think that this has to be taken around the world and subject to regional radio spectrum regulations it was starting to become a nightmare," Watt said.

"On top of this these systems often couldn't support full coverage at certain tracks such as Monaco and Singapore so some teams started to deploy repeaters on the roofs of hotels and alike. Fortunately, the FOM and FIA stepped in and introduced the Standard Communication System that provides both driver voice radio and telemetry link for all teams. The FOM now places a shared system of access points around the track and delivers the encrypted data from each car to the team's garage via a fiber link," he said.

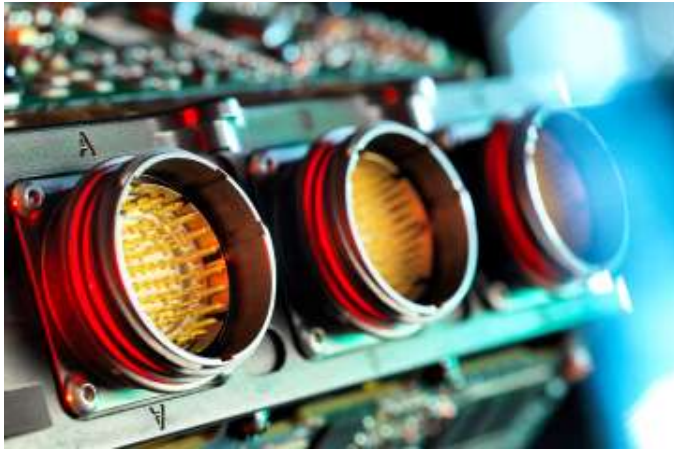
He added, "...these days the telemetry link is a critical part of the operation of all Formula 1 teams. Due to a combination of the complexity of the cars and the power units and the sporting regulations meaning that teams have to keep engines and gearboxes for multiple races, teams will almost certainly not run a car on track without the visibility of the car's health that the combination of sensors, ECU and telemetry link gives and the resultant possibility for the trackside engineers to intervene before a fault leads to catastrophic damage of valuable power train components. If not prevent, such an incident could result in a loss of valuable track running or even future penalties for the team."

The sensors help to monitor, control, and optimize both the car and the driver by collecting data on braking, cornering speed, gearbox, wheel rotation, gearbox life, and the range of speeds in which the engine runs most efficiently. The acquired data are used for real-time analysis of engine performance so that team engineers can act accordingly, to solve problems remotely and thus improve the efficiency of the car.

One of the biggest obstacles to success is the harsh environment that racing offers in terms of excessive temperatures and vibrations that destroy the accuracy of the sensors and, ultimately, the device itself. The electronic components must operate at maximum efficiency, designed with a low design error such as drift reduction. Drift is the tendency of a sensor to lose accuracy over time, resulting in permanent component damage and

irreversible engine failure. With a hundred or so sensors in a typical racing car, the total burden of data acquisition accuracy can be enormous.

The racing environment also introduces dust, oil, and moisture. The solution to this challenge leads to high demand for materials and, therefore, to a science that can produce components with highly reliable materials under difficult conditions. Conventional vibration protection is focused on mounting hardware. Reliability is compromised over time if electronic components are not protected against vibration or are not inherently designed with critical material fatigue resistance.



connectors

Data acquisition system

The measurements recorded by a data acquisition system are actually taken by sensors installed throughout the machine. For example, the speed of the vehicle can be measured by a Hall effect magnetic sensor installed on the wheel, a Correvit optical sensor, a Pitot tube (a typical Formula One car uses the three sensors at the same time).

“Air speed sensors in the form of a Pitot tube are also used by Formula 1 cars but of course the wind has to be factored in. So even asking how fast an F1 car is going can be a difficult question to answer accurately and usually involves statistical analysis of multiple sources of data combined with models and post-processing, said Watt.

The rotation speed of each wheel is measured with a standard model to account for slippage. Other sensors are optical sensors that watch the track and GPS.

Specific sensors can measure temperatures, angular and linear velocity, angular and linear displacements, pressures, material stresses, accelerations, magnetic field variations, and so on. Accelerometers are used to measure lateral G-force, also called “cornering,” or can be used to detect longitudinal forces such as braking in a range from 0 to 4G.

The position of the sensor determines which direction is detected. A dual-axis sensor measures both steering and braking forces. Non-contact temperature detection is often directed at the braking, motor, and tire devices. Infrared MEMS sensors are used for temperature measurement, allowing non-contact temperature testing. Usually, these sensors use a thermopile material to absorb the infrared energy emitted by the object being measured, and the change in voltage determines the temperature of the object. A series of thermal cameras aimed at the contact areas of the tires allows wearing monitoring and heating control.

Some parameters, such as transmission torque and load cells, are recorded at frequencies of the order of 200Hz, i.e. 200 times per second. If there is a strong vibration, it is possible to put an extra log on the machine and change the rate to get a vibration analysis on various parts of the machine. As a precaution, F1 engineers collect the data every time the car returns to the box by uploading it to a dedicated server. "When it comes to analyzing suspension movement sampling rates of 1KHz are common and these can rise to 100KHz or higher when performing vibration analysis that is often part of reliability validation work," said Watt.

Telemetry and correct data acquisition are important factors in F1 because they allow engineers to collect a huge amount of data during a race. The data can then be interpreted and used to ensure that the car is running at its best. An F1 car can use two types of telemetry: real-time information, which is sent in small packets, a microwave burst, which is sent as the car enters the pits.



Maurizio Di Paolo Emilio

Maurizio holds a Ph.D. in Physics and is a telecommunication engineer and journalist. He has worked on various international projects in the field of gravitational wave research. He collaborates with research institutions to design data acquisition and control systems for space applications. He is the author of several books published by Springer, as well as numerous scientific and technical publications on electronics design.



Issue 23 – September 2020

NEWS FROM THE IPC

IPC E-Textiles 2020 Virtual Summit Offers Top-notch Education

Virtual summit to help turn concepts into real-world applications

The IPC E-Textiles 2020 Virtual Summit, to be held Oct. 1 and 2, is a two-day event consisting of educational workshops, interactive panel discussions, and a tour of the University of Minnesota Wearable Technology Lab. IPC E-Textiles 2020 Virtual Summit is an ideal event for companies actively involved in e-textiles development, such as EMS and OEM companies, or product innovators and materials suppliers investigating how to apply e-textiles technologies to future products.

Registrants get early access to new IPC e-textiles education community

IPC is launching a new online educational community within IPC EDGE for the e-textiles industry and wants IPC E-Textiles 2020 Virtual Summit registrants to be the first to take advantage of this new offering. IPC will send exclusive passes to registrants this month.

The following is the agenda for IPC E-Textiles 2020 Virtual Summit. Workshops will be split into morning and afternoon sessions, and IPC will record all workshops for attendees who can't attend all four sessions.

Workshops

October 1:

E-Textiles Products for Consumer and Medical Applications

Speakers: Madison Maxey, LOOMIA; Md. Tahmidul Islam Molla, Cornell University; and Paul J. Wagner, Minnesota Wire

Material Issues and Wash Factors

Speakers: Chuck Kinzel, Liquid Wire; Lauren Cantley, MIT Lincoln Laboratory; and Mary Johnson, P+G Fabric and Air Care

October 2:

E-Textiles for Defense and Government Applications

Speakers: Brian Farrell, Human Systems Integration and Carole Winterhalter, U.S. Army Combat Capabilities Development Command

University of Minnesota Wearable Technology Lab Demonstrations

During this session, students and faculty will provide demonstrations and discussions on recent projects and lab capabilities, as well as a virtual tour of the Wearable Technology Lab.

Registration for IPC E-Textiles 2020 is \$120 for IPC members, \$150 for nonmembers. Sponsorships are available, starting at \$500. For more information about the conference, visit www.ipc.org/E-Textiles-NA or e-mail [Chris Jorgensen](mailto:Chris.Jorgensen@ipc.org), IPC director of technology transfer.



The European Institute for the PCB Community

EIPC SPEeDNEWS

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International Diary

2020

IPCA Expo

23-25 September
India

3rd EIPC Webinar -Business Outlook for Global Electronics Industry with Emphasis on Europe- Walt Custer

2 October

TPCA Exhibition

21-23 October
Taipei, Taiwan

Electronica 2020 VIRTUAL

10-13 November
München, Germany

KPCA

24-26 November
Incheon, Korea

ECWC15, WECC World Electronics Circuits Council

Webinar
30 November-2 December

HKPCA Exhibition

2-4 December
Hong Kong, China

2021

IPC APEX EXPO

March

San Diego, USA

EIPC @ SMTconnect

4-6 May

Nuremberg, Germany