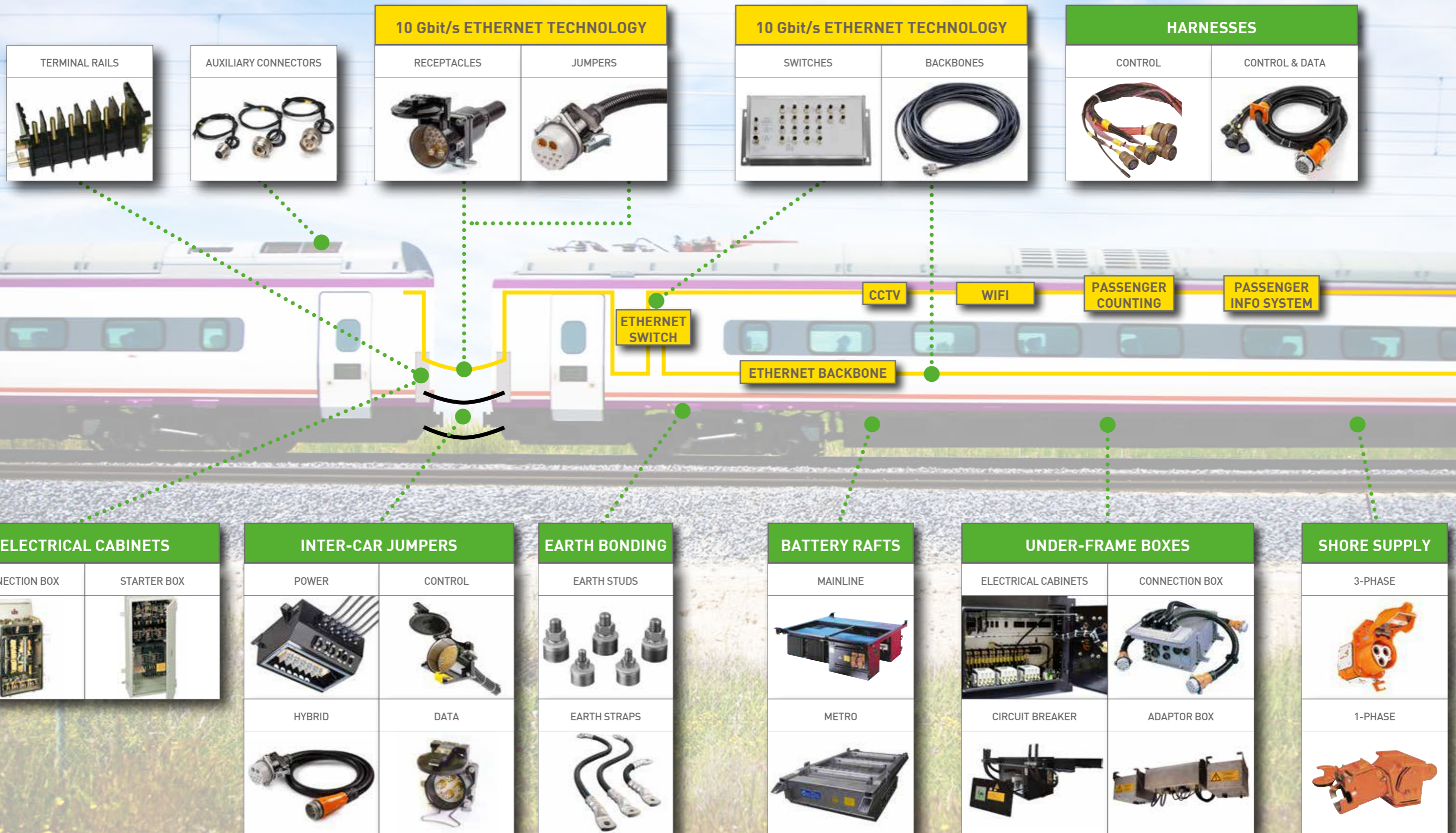




Long Life Reliability
does not cost the earth





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Inter-car Jumpers & Connection Systems

Jumper Systems, Underframe Connections & Equipment Cabinets



- Hybrid Jumper range provides combined power and data transfer
- Ingress Protection up to IP66 and IPx7
- Multiple power options available
- Ethernet: up to 10 Gbit/s

Jumper Systems

LPA JUMPERS RECEPTACLE

The hybrid flange mounted receptacle is normally body end mounted and has either spring clips or bolts as a retaining method for securing the plug to the receptacle. When the plug is not fixed, a spring operated cover maintains the integrity of the fitting to IP66 and IPx7 rating. Dummy receptacles are available for plug storage purposes.

PLUG

A compact robust plug with a versatile range of planforms that enable the use of both data and power contacts. The plug can accommodate both composite cables and conduited cable solutions and ensures a complete IP66 and IPx7 seal when mated with the receptacle.

JUMPER SYSTEMS

LPA Inter-car jumpers are installed in over 10,000 UK rail vehicles in service today.

A common source of potential water ingress is from inside the coach, not between the plug and receptacle. To combat this LPA have chosen a sealant that provides a watertight seal that also promotes ease of maintenance.

Applications

LPA's range of jumper systems are compatible with its underframe boxes. The bespoke connectors can incorporate power, control and data capabilities, providing a hybrid solution which reduces the number of jumper systems required. LPA's 4S-10G™ connectors have been fitted to mainline and Metro trains since 2009 and there have been no connectivity losses.

Range

Designed for multiple applications, in response to diminishing space envelopes:

- Module 22: A hybrid connector combining power, control & data capabilities
- Module 32: A hybrid connector combining power, control & data capabilities
- Module 42: A hybrid connector combining power, control & data capabilities
- Module 52: A hybrid connector combining power, control & data capabilities

Features

- Power:
 - 1-Phase or 3-Phase, with Auxiliary Power and interlock circuits
- Control:
 - Module 32: up to 19 contacts
 - Module 42: up to 61 contacts
 - Module 52: up to 108 contacts
- Data:
 - Ethernet, up to 10 Gbit/s
 - Co-Ax, Tri-Ax, RF connectors
 - Microwave
- Fixings: bolted or clipped
- Termination: crimped
- Operating temperatures: -40°C to +70°C
- Ingress Protection to IP66 and IPx7
- Shock and vibration: tested to EN 61373



Vehicle End, Underframe & Equipment Cabinets

VEHICLE END/UNDERFRAME BOXES

Features

- Bespoke designs to fit available space envelope within vehicle body end
- Available in mild steel, stainless steel or aluminium
- Finish in low smoke and low toxicity polyester paint, as required
- Standard connectors to interface with internal harness
- LPA's rail connectors provide rugged inter-car connections
- Ingress Protection: up to IP66 and IPx7
- Shock and vibration: tested to EN 61373



ELECTRICAL EQUIPMENT CABINETS

Features

- Mild steel or stainless steel enclosure
- Bespoke design to match customers specification and space envelopes
- Mountings to suit vehicle
- Wiring to mainline or LUL standard as per customer requirements
- Ingress Protection: up to IP66 and IPx7
- Low smoke and halogen free to EN 45545 and BS 6853



Bespoke solutions to suit customer requirements



Harness Solutions

Harnesses, Terminal Rail Assemblies & Earthing Components



- Rail approved to current and legacy standards - including fire
- Automatic cable cutting for accurate and cost effective manufacture
- Variety of cable available to meet specification compliance
- Complex branching to meet vehicle design layout
- Wire identification to match individual requirements
- Cable harness available in up to 50m lengths

Harnesses & Terminal Rail Assemblies

HARNESSES AND LOOMS

Features

- Available up to 50m in length
- Connectors fitted to suit requirements
- Automatic cable cutting machine for accurate and cost effective manufacture
- Wire IDs to meet customers requirements
- Cable selected to comply with specification
- Complex branching to match vehicle layout
- Low smoke and halogen free to EN 45545 and BS 6853



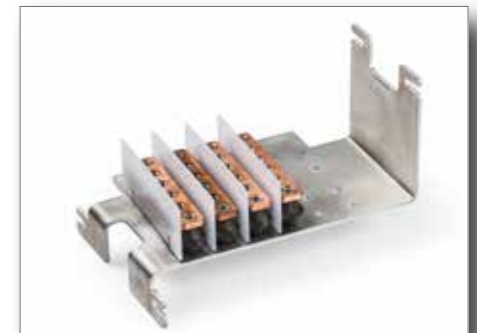
TERMINAL RAIL ASSEMBLIES

LPA Connection Systems terminal blocks are manufactured from proven designs and have been used in applications throughout the UK, Europe, America and the Far East.

The terminals are Grade 8.8 steel offering a consistently high quality thread. Rail assemblies are suitable for overground, underground and tunnel applications.

Features

- Supplied fully assembled or as loose components
- Metric sizes and UNC options are available
- M4 to M12 studs
- Fused and push-on terminals
- 5-way faston
- Integral fixing bolts or brushes for rapid installation
- Low smoke and halogen free to EN 45545 and BS 6853



Earth Studs & Earth Straps

EARTH STUDS

LPA Earth Studs are manufactured from high quality materials and designed to maximise the conduction of electricity through mild and stainless steel.

These studs are suitable for welding or brazing on to enclosures or structures of the same material to avoid galvanic corrosion issues and are available in a number of sizes to suit various fault currents.

Features

- Mild and stainless steel options
- Suitable for welding
- 6 sizes from M6 up to M20
- Brass electrical connection parts, silver soldered to parent material
- Provided with high temperature protective washer (to be removed post welding and painting)
- Rail industry approved and proven
- Soft solder tinning to mating surface ensures conformal contact to the terminal lugs



EARTH STRAPS

LPA Earth Straps are designed and manufactured to provide a highly reliable, flexible earth bond on trains and rolling stock.

Earth straps are typically used to provide earth bonding between cabinet-to-body and bogie-to-body and suitable for conducting fault currents. Our earth straps can be custom made to your customer requirements and supplied with in-line flat, in-line angled or 90° lugs.

Features

- High integrity electrical continuity for effective earth bonding capabilities
- Tin plated copper lug terminals suitable for high current ratings.
- Straps are provided with hexagonal crimps
- Fully sealed between lug and cable to prevent water ingress corrosion and mechanical support of the cable at termination protects the conductors
- Flexible and easily laid in multiple directions
- Variable terminal offset angle
- Rail industry approved and proven



Long life & low maintenance

Space Saving



Auxiliary Systems

Battery Rafts, Connectors & Electric Train Supply/Shore Supply



- Ingress Protection up to IP66 and IPx7
- Low smoke and toxicity PMC interiors
- Bespoke product design options to match specific application requirements
- Tailor-made to fit space envelope
- Connects to interface with internal harness

Battery Rafts & Niphan Connectors

BATTERY RAFTS

Features

- Optimised to fit within under-frame space envelope, ensuring easy access to componentry for efficient maintenance
- Available in mild steel, stainless steel or aluminium
- Finished in low smoke and low toxicity polyester paint (if required)
- Standard connects to interface with internal harness
- LPA's rail connectors provide rugged and reliable connections to the vehicle
- Delivery on transportation jig, direct to customer's assembly line
- Ingress Protection: up to IP66 and IPx7
- Shock and vibration: tested to EN 61373



AUXILIARY CONNECTORS

Features

- Enables quick release of power and control connections to auxiliary systems
- Durable electroless nickel-plated brass casing
- Up to 500 V and 200 Amps
- Up to 12 poles
- Operating temperature: -40°C to +70°C
- Ingress Protection: up to IP66 and IPx7
- Fire Performance:
 - EN 50200 PH120 & BS 8434-2
 - BS 6853 (C, W, Z)
 - NFF 16-101
- Shock and vibration: tested to EN 61373

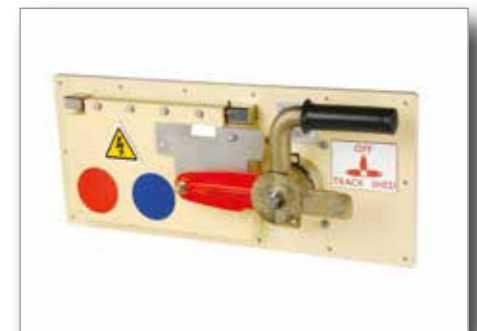


Shore Supply

SHORE SUPPLY & ELECTRIC TRAIN SUPPLY

Features

- Train power functions
- Industry leading space saving functionality and life time performance
- Wide range of AC and DC voltages up to 1.5 kV AC and 3 kV DC
- High current capability up to 800 Amps
- Multiple keyway protection
- Multiple electrical interlock options
- 3-Phase circuit protection breaker option
- Enclosures manufactured in stainless steel, mild steel and aluminium
- Ingress Protection: up to IP66 and IPx7
- Interiors moulded in house with low smoke and toxicity PMC



10GBASE-T capability

Future proof technology



10 Gbit/s Ethernet Technology

10GBASE-T Compatible



- Incorporated into our range of standard rail connectors
- Offers combined data and communication transmission across inter-car gaps
- Compatible with existing Railcat Ethernet cables
- Enables Wi-Fi service provision
- Provides backbone for high definition CCTV

Ethernet Connectors

ETHERNET 10GBASE-T CAPABILITY

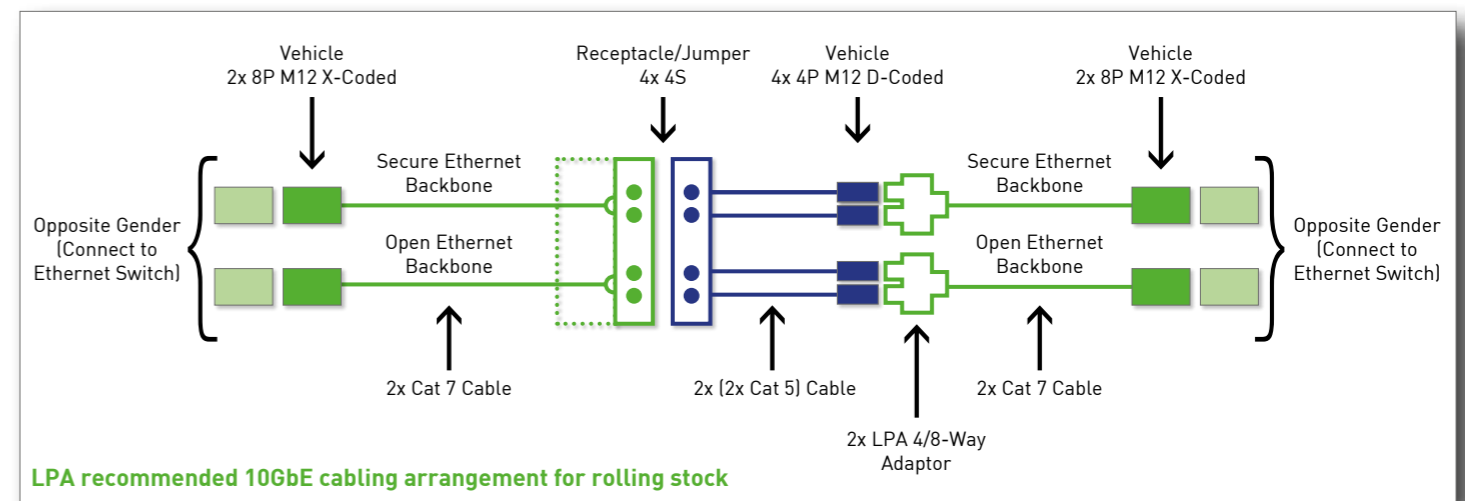
LPA has standardised its 1 Gbit/s and 10 Gbit/s connectors and cabling to ensure future proofing up to 10 Gbit/s. As such, each connector is cabled with 2x Cat 5 tin plated cables, with cross-sectional area of 0.5mm².

The Module 22, 32, 42 & 52 jumpers are high quality, rugged and robust connectors, designed specifically for the rail market. In order to provide fast Ethernet speeds of 10GbE, 2x 4S-10G™ connectors are required within the jumper.

LPA Ethernet cable flex testing found Cat 5e cables were the most robust cables for jumpers, able to withstand the

continual flexing faced during the life of an inter-car jumper. LPA recommends the installation of Cat 5e cables for inter-car gaps, and Cat 7 cables for fixed, intra-car harnesses. This configuration ensures reliable data transfer across the product life-time, while reducing total ownership cost.

Under EMC immunity testing, data transmission through LPA's 4S-10G™ connectors is unaffected by control circuits in a hybrid data & control jumper.



10 Gbit/s ETHERNET SWITCHES OVER COPPER

LPA's Ethernet Switches can discover the current IP address and ensure any replaced car is assigned with the proper IP address of the original topology without resetting. Link Train Discovery Protocol allows the replaced switch to inherit the configuration of the old switch.

LPA's 10 Gbit/s Ethernet Switches incorporate smart bypass technology, enabling the system to bypass any malfunctioning or deactivated switches, preventing system failure.

Our bespoke designs can be ordered with 5 to 24 ports, PoE/ non-PoE, 100 Mbit/s, 1 Gbit/s, 10 Gbit/s and 12V, 24V, 72V, 110V, Wide Voltage power supplies.

Features

- Aluminium housing is lightweight and oxidation resistant to ensure high performance and stability
- Data stream prioritisation
- Automatic re-routing of Ethernet backbone if primary backbone fails
- Bypass relay
- EN 50155/EN 45545-2 certified
- Operating temperature range: -40°C to +75°C
- 10GBASE-T compatible switches and connectors
- Port to upload & download configuration files



Ethernet Capability

10GbE HARNESS

10GBASE-T performance offers high bandwidth and future proofed installations using copper cabling, for maximum reliability and robustness in harsh rolling stock applications.

LPA have also designed a 4/8-Way Adaptor, to enable connectivity between 2x Cat 5e inter-car cables and 1x Cat 7 harness cables.

Features

- High bandwidth availability, ensuring passenger safety and security, which enables:
 - 'always-on' CCTV
 - failover capability
 - Passenger Information Systems
 - high speed Wi-Fi connectivity
 - seat reservation/occupancy systems
 - next station information
 - seat locator services

10GbE INTER-CAR JUMPERS FEATURES

- 4 contacts plus screen: 4S-10G™
- Transmission rates: up to 10 Gbit/s
- 100 Ω up to 600 MHz
- Modular design compatible with LPA interiors
- Compatible with RAILCAT Cat 5 & Cat 5e cables
- EMC certified:
 - EN 50121-3-2: 2006 & BS EN 61000-4-3
 - RIA 12: Clause 11
- Shock and vibration: tested to EN 61373
- Standard or bespoke to suit customer requirements

Features

- Train-to-Shore communications
- Passenger Wi-Fi
- Infotainment & Media
- HD CCTV
- Passenger Information Systems
- Passenger Counting
- Radio Frequency systems



Vertically integrated manufacturing capabilities

Product servicing & refurbishment

Manufacturing Services & Capabilities

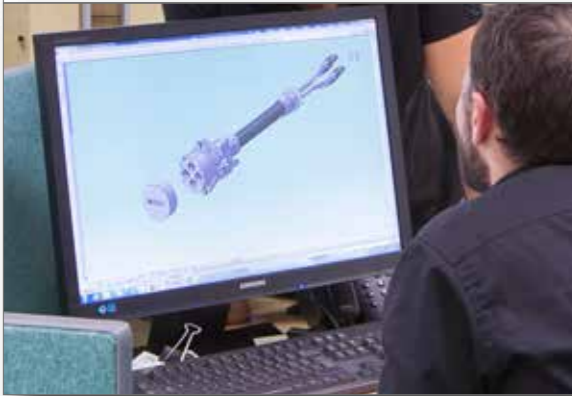


LPA has extensive experience in the rolling stock connection systems industry. Offering modular, bespoke and turnkey solutions which address the customer needs for existing and next generation transportation.

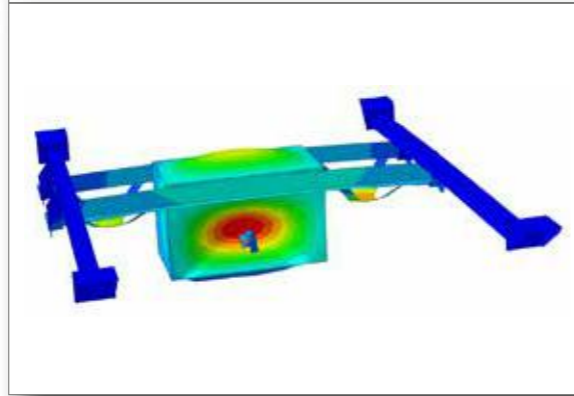
LPA work from concept design and manufacture, through to finished product assembly.

Vertically Integrated Manufacturing

3D CAD MODELLING



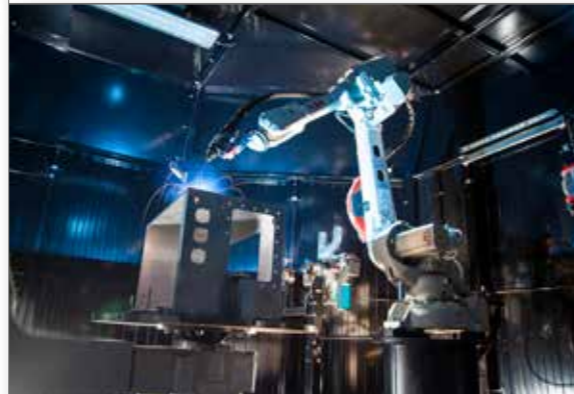
FINITE ELEMENT ANALYSIS



CNC PRECISION MACHINING
& LASER CUTTING



EN 15085 & ISO 3834 MANUAL
& ROBOTIC WELDING



AUTOMATIC CABLE
CUTTING & PREPARATION



AUTOMATIC ELECTRICAL & MECHANICAL
DYNAMIC TESTING



FINITE ELEMENT ANALYSIS

- Preliminary Finite Element Analysis (FEA) utilised to optimise design, reduce mass where possible and select optimum materials
- Formal FEA conducted by 3rd party in line with customer requirements, including maximum stresses and resonance frequency sweep

STATIC MOCK-UP

- LPA recommend conducting a physical mock-up of any new or revised jumper installation. Physical mock-up is based on inter-vehicle geometry and track geometry, representing movements experienced by the fleet over nominated routes, (switches/crossings and curves)
- The mock-up is used to determine correct jumper length and exit/entry angles while ensuring any gauge requirement is not infringed
- Mock-ups also ensure that:
 - jumpers are not unduly strained or stretched
 - minimum bend radii requirements are observed
 - jumpers do not clash with each other or nearby projections
- Mock-ups ensure long life and reliability

DYNAMIC LIFE TEST

- Dynamic testing of jumpers and associated equipment on the LPA in-house 2-axis dynamic test rig
- Testing based on track geometry, representing movements experienced by fleet over switches/crossings and curves on nominated routes
- Represents a day-in-the-life of the train
- Number of cycles agreed with the customer to represent jumper life span
- Testing validates LPA mock-up (or customer design) and verifies that jumpers are of the correct length and are not unduly stressed through their expected life

SHOCK & VIBRATION TESTING

- Independent certification obtained to ensure reliable operation in the hostile environment of rolling stock service
- Shock and vibration third party testing conducted to EN 50155

INGRESS PROTECTION

- Independent certification to ensure reliable operation in hostile environments
- Ingress protection conducted to IEC 60529

PRODUCT REFURBISHMENT, SERVICING & REPAIRS

- In-house or on-site product repair and refurbishment
- Product replacement, modification & upgrade options available
- Dedicated team of service engineers with extensive rail experience
- Fully managed repair contracts

We offer a comprehensive product repair and refurbishment service for many of LPA's and Amphenol rail products. Product repairs and refurbishments are completed in-house. We also offer on-site servicing where our team of service engineers work directly with our customers. LPA engineers are experienced in working on-site and are trained and compliant with all safety regulations in the rail industry.

LPA's product development ethos is to design and manufacture products with long life cycles. We provide a repair and refurbishment service to further extend the life of our customer's products. We also offer product modifications and upgrades for some of our range. This extends the life of the product but also provides an economic solution to our customers.



lpa connection systems

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