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PAPER



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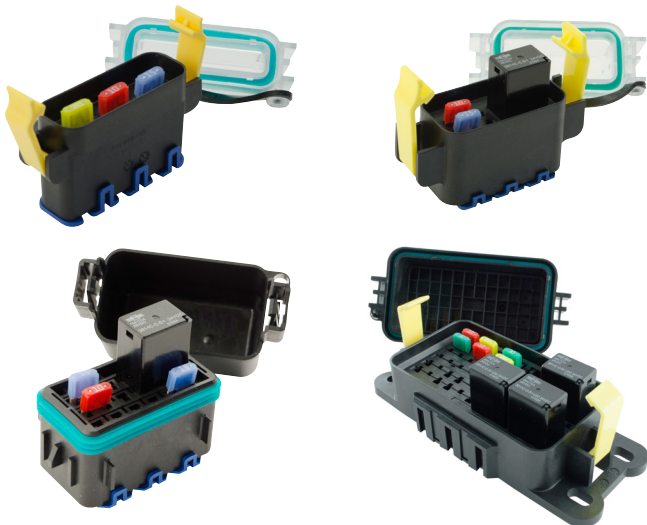
HARD-WIRED MODULES

**Simplify Circuit Protection and Power Distribution
When Designing Electrical Systems**

Over the last few decades, there has been a continuing trend toward replacing hydraulically powered equipment on work trucks and other commercial vehicles with electrically powered equipment. This technology shift is the result of a variety of factors, including the need for fuel efficiency and a desire for lighter, more compact vehicle systems. Hydraulic systems constantly absorb power with their belt-driven design and consume valuable space with components such as a power source, reservoir, directional control valve and actuators to control the fluid in order to accomplish work. Switching to electrically powered equipment offers one way for manufacturers to reduce weight, save fuel and minimize the amount of space a system takes up. Given that hydraulic systems must include a power source, reservoir, directional control valve, and actuators to move and control fluid in order to accomplish work, switching to electrically powered equipment offers one way for truck builders to reduce weight and minimize the amount of space a system takes up. The growing shift from hydraulics to electricity makes it more important than ever to control the distribution of electrical power effectively.

Once, designing power distribution and circuit protection systems for working trucks was complicated and time-consuming, sometimes requiring design engineers to manage dozens of accessory and overflow circuits for various vehicle components that could not be accommodated in the vehicle's primary power distribution module (PDM). Accessory and overflow circuits include lift buckets, specialized lighting, motors, pumps, switches, sirens, plows, larger alternators, additional batteries, GPSs, satcom systems, etc. This originally involved bundles of wires, each with its own inline fuse holder, along with isolated relays and circuit breakers. This solution complicates electrical system troubleshooting and maintenance and is time consuming and difficult to install correctly.

Figure 1. Littelfuse offers a growing family of Hard-Wired Boxes that can accommodate up to 60 mini plug-in circuit protection components. Shown here: HWB6 (upper left), HWB12 (upper right), HWB18 (lower left), and HWB60-AL).



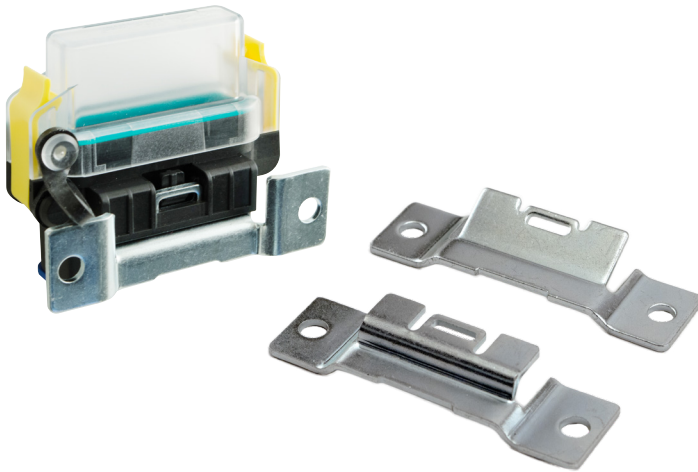
More recently, a number of manufacturers have developed smaller PDMs intended to bridge the gap between inline fuse holders and isolated relays/circuit breakers and the primary PDM. These secondary PDMs are intended to consolidate the components needed for these accessory and overflow circuits in one location. This plug-in design offered work truck and other commercial vehicle component design engineers a variety of advantages, particularly in terms of ease of installation and simpler troubleshooting/maintenance. However, many of these early accessory PDM designs still left significant room for improvement, often because they are made as snap-together modules that couldn't be sealed air- or water-tight against contaminants.

To address the shortcomings of these earlier accessory/overflow PDMs, Littelfuse Commercial Vehicle Products has developed a new class of sealed compact PDMs. These new hard-wired boxes (HWB) offer design engineers a variety of improvements in dealing with electrical system design challenges:

- **A range of sizes.** Hard-wired boxes are available to accommodate from 3 (HWB6) to 30 (HWB60-AL) mini (2.8mm) plug-in circuit protection components.
- **Compact design.** Unlike earlier PDM designs that must be enclosed in a sealed box to prevent dirt or water intrusion, HWBs are small enough to be installed virtually anywhere the flow of electrical power must be protected or controlled—whether in or on a vehicle or a piece of equipment. For example, the HWB6 measures just 70.9 mm x 64.3 mm x 36.4 mm.
- **Best-in-class sealing.** All four sizes are water-proof (not just weather-proof like some competing products) to protect the components inside from corrosion due to road splash, salt spray, and dust intrusion. The HWB6, HWB12, HWB18 and HWB60-AL have Ingress Protection ratings of IP67 (total protection from dust and protected from temporary liquid immersion) and IP69K (proven to resist ingress of high temperature and pressure wash).
- **Positive-sealing latches.** Each unit except HWB18 has two AssureLatch™ yellow positive-sealing latches that open easily to remove the cover for component replacement. The latches combine with the unit's gasket to keep the cover sealed securely against water and dirt intrusion. They are designed to snap in place audibly, so personnel servicing the unit can be confident the enclosure is sealed properly.
- **Accommodation for a varied mix of circuit protection components.** The HWB6 can accommodate up to three mini (280 style) fuses or circuit breakers. The HWB12 and HWB18 can handle mini fuses, mini format circuit breakers, 4-pin single throw relays, and 5-pin double throw relays. The HWB60-AL can accept any combination of mini fuses, relays, and circuit breakers. Designers can also customize their own circuitry using direct wire-to-component connections, which are crimped to the wire harness with grommets to seal the unit.

- **Universal bracket.** Brackets to hold HWB units can be stamped into the sheet metal of the vehicle body or are available as individual parts. Two different brackets can hold the unit straight or at a 30° angle to allow easier viewing and servicing. The same bracket(s) can accommodate the HWB6, HWB12, and HWB18, which gives greater electrical system optionality without the need to alter either the bracket or sheet metal.

Figure 2. Both straight and 30° angle brackets are available. The bracket can be pre-attached to the vehicle or stamped into the sheet metal, and the HWB unit snapped into the bracket as the harness is dressed into the vehicle.



- **Terminal position assurance (TPA) locks.** Wires plug into the back of hard-wired boxes using industry-standard tanged terminals. TPA locks, included with all HWB models, are retaining devices that keep these wire leads locked securely in position, a feature not found on competing modular power distribution boxes. Leads can't unplug themselves accidentally, even if the vehicle is subject to heavy vibration or rough terrain (HWB6 and HWB12 tested to ISO 16750-3).
- **Optional tethers.** In the crowded, cluttered environment of a repair facility, it can be all too easy to drop or misplace an enclosure cover during troubleshooting or repair procedures. Our optional tethers keep the box's cover tied to the box itself, so it's immediately at hand once maintenance is complete, saving time and the cost of future replacement.

Figure 3. TPA locks keep all terminals in position, even when vehicles are exposed to heavy vibration or travel over rough terrain.



- **Optional relay retention features.** Available with lid inserts that ensure relay retention in the harshest vibration environments.
- **Standard clear or black UL covers.** For those who use fuses with indication, the HWB6 and HWB12 come with a clear cover that makes it easy for maintenance personnel to check for any blown fuses. By eliminating the need to open the enclosure unnecessarily, the clear cover reduces the potential for accidental contamination during the troubleshooting process. A black UL listed cover is also available for applications dictating additional certifications.

Unlike inline fuse holders and many earlier types of accessory PDMs, Littelfuse hard-wired boxes are designed to allow for fast, uncomplicated assembly and installation.

- Step 1** Terminate electrical system wires.
- Step 2** Snap in the terminals on the back of the unit.
- Step 3** Place the TPA locks over the terminals.
- Step 4** Attach the optional tether.
- Step 5** Insert the required fuses, relays and/or circuit breakers as dictated by the vehicle equipment installed.
- Step 6** Place the cover on the unit and seal it with the AssureLatch Technology.
- Step 7** Snap the unit into the bracket as the harness is dressed into the vehicle.

Littelfuse hard-wired boxes offer significant advantages over earlier solutions for a variety of applications and operating environments:

- **Wide variety of work trucks/specialty equipment/emergency vehicles.** Body builders/upfitters who customize vehicles for specific applications appreciate the compact, adaptable designs that can fit virtually anywhere on a vehicle's body or chassis.
- **Small electrically powered vehicles.** Work trucks are far from the only type of vehicles that need compact power distribution solutions. With their water- and dirt-proof enclosures and UL approved versions, Littelfuse hard-wired boxes are also well-suited for small cleaning vehicles like floor washers,
- **Worksite support equipment.** Construction site equipment like gensets, compressors, light towers, etc. must be able to withstand significant abuse with little or no maintenance. Littelfuse hard-wired boxes can seal out the contaminants that can trigger premature failures.
- **Special add-ins for large fleet vehicles.** Littelfuse can supply vehicle OEMs with the appropriate mounting bracket for bolting into the chassis or body and the hard-wired box to the harness manufacturer, who can assemble it with the appropriate fuses/relays/circuit

breakers, cables, etc. When the harness is delivered to the vehicle OEM for dressing into the vehicle, OEM personnel can simply snap the box directly into the bracket, giving manufacturers an easy solution for fleet vehicle add-ins that doesn't require vehicle power distribution box modification.

- **Marine applications.** The sealed IP67/IP69k enclosure design helps prevent premature failures due to water penetration and salt spray corrosion.
- **Oil and gas drilling equipment.** Oil and gas industry wastes, which may contain petroleum hydrocarbons, metals, naturally occurring radioactive materials, salts

and toxic chemicals, can quickly corrode unprotected components. Littelfuse hard-wired boxes help seal out these contaminants for longer service life.

This new class of PDMs offers work truck component design engineers, OEMs, installers and maintenance personnel a variety of design, cost, and time-saving advantages. To learn more about how these HWBs can simplify your next design project, contact Littelfuse Commercial Vehicle Products for datasheets and 2-D prints for HWB6, 12, 18, and 60AL Sealed Distribution Modules.

Littelfuse HWB Selector Guide



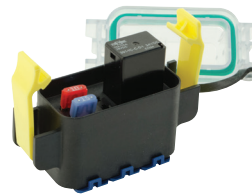
HWB60-AL



HWB60



HWB18



HWB12



HWB6

PRODUCT SERIES	CAVITIES	CAPACITY			MOUNTING METHOD			MOUNTING TORQUE	DIMENSIONS	TERMINAL TYPE	
		MINI FUSES	ISO MICRO 280 RELAY		BRACKET FORMED IN SHEET METAL	30° BRACKET	STRAIGHT BRACKET				BOLT-DOWN
			4-/5-PIN 35A	4-PIN 20A							
HWB6	6	3	-	-	•	•	•	5.5-6.5 Nm	71x64x36 mm	Tyco MCP 2.8	
HWB12	12	6	2	3	•	•	•	5.5-6.5 Nm	83x70x44 mm	Tyco MCP 2.8	
HWB18	18	9	3	3	•	•	•	5.5-6.5 Nm	80x70x45 mm	Delphi Metri-Pak 280	
HWB60	60	30	8	12				4-6 Nm	113x52x81 mm	Delphi Metri-Pak 280	
HWB60-AL	60	30	8	12				4-6 Nm	113x52x81 mm	Delphi Metri-Pak 280	

HWB Series - Compact Sealed Hard-Wired Boxes for 2.8mm Style Fuses & Relays

The series features durable construction, IP67 & IP69K ratings, compact sizes, gasket sealed covers and multiple mounting types. See chart below for specific details. The HWB series eliminates the use of internal bussing allowing the user or design engineer to customize the circuitry utilizing direct wire-to-component connections. TPAs (terminal position assurance locks) give secondary locking protection of the wire leads, which aid in prevention of leads from being pulled out and snap onto the back after wires are installed.

- Accepts a combination of 2.8mm components – MINI® fuses, relays, circuit breakers or diodes. (sold separately)
- Cover tethers available to prevent loss of component during service.
- HWB60 series are modular and can be dovetailed together to expand circuit protection capacity. They can also be interlocked to other PDMs and fuse holders (FLEC Flexible Electrical Control Center and MEGA/MIDI Flex fuse holder)
- HWB60 and HWB18 series uses Delphi Metri-Pack 280 terminals, cable seals and cavity plugs.
- HWB12 and HWB6 series are available with black or clear covers for easy component status identification and use TYCO MCP terminals, cable seals and cavity plugs.

Datasheet, 3D Models, 2D Prints and additional information: littelfuse.com/HWB

PART NUMBER	SERIES	MAX FUSE RATING (PER CIRCUIT)	MAX CONTINUOUS CURRENT	FUSE TYPE	ACCEPTS ISO 280 STYLE RELAYS	NUMBER OF CAVITIES	INGRESS PROTECTION RATING	MATING TERMINALS & SEALS	COVER		ASSURELATCH™		GASKET	GRID	MOUNTING BRACKET		TPAS
									BLACK	CLEAR	FINGER	TOOL			90°	30°	
PDM32001ZXM	HWB6	30A	68A	MINI		6	IP67/IP69K	Tyco MCP		•	•	•					•
PDM32002ZXM		30A	68A	MINI		6	IP67/IP69K	Tyco MCP	•		•	•					•
PDM32003ZXM		30A	68A	MINI		6	IP67/IP69K	Tyco MCP		•	•	•			•		•
PDM32004ZXM		30A	68A	MINI		6	IP67/IP69K	Tyco MCP	•		•	•			•		•
PDM33001ZXM	HWB12	30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP		•	•	•					•
PDM33002ZXM		30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP	•		•	•					•
PDM33003ZXM		30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP		•	•	•			•		•
PDM33004ZXM		30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP	•		•	•			•		•
PDM31001ZXM	HWB18	30A	100A	MINI	•	18	IP67/IP69K	Delphi Metri-Pack 280	•			•				•	•
PDM31002ZXM		30A	100A	MINI	•	18	IP67/IP69K	Delphi Metri-Pack 280	•			•					•
PDM31003ZXM		30A	100A	MINI	•	18	IP67/IP69K	Delphi Metri-Pack 280	•			•					•
PDM71001ZXM	HWB60-AL	30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•					•
PDM71003ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•		•	•					•
PDM71004ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•	•				•
PDM71006ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•	•				•
PDM71008ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•		•	•					•
PDM71009ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•	•				•
PDM21001LXM	HWB60	30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•					•

For more information, visit
Littelfuse.com/HWB

Additional technical information and application data for Littelfuse protection relays, generator and engine controls, fuses and other circuit protection and safety products can be found on www.littelfuse.com. For questions, contact our Technical Support Group (800-832-3873). Specifications, descriptions and illustrative material in this literature are as accurate as known at the time of publication, but are subject to changes without notice. All data was compiled from public information available from manufacturers' manuals and datasheets.