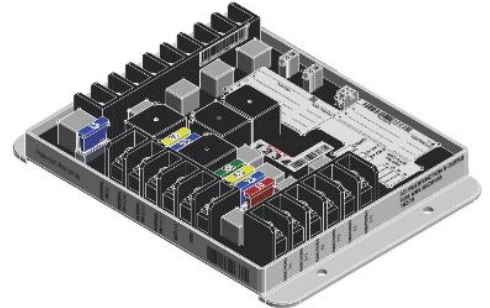
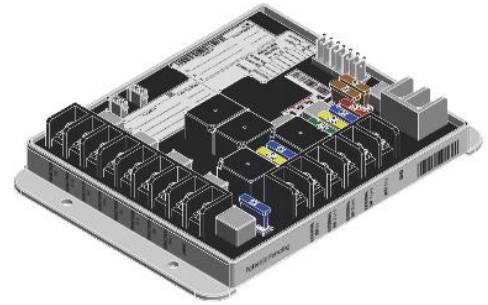


Multi-Function HD (Heavy Duty)

Description

Electronic control module that switches power between multiple high current H-Bridge relays and a latching relay for lights. Optional support for up to 5 hydraulic valves. Remote control operation via Linc Wireless Touch Remote to control, with added support for redundant manual switch bank. Selectable on board fusing lets you configure the right fuse value for each output. Software over current detection and enforced cool-down time increases mechanical and fuse life.



Applies to

Part #	Description
18438-D	LCI Multifunction 5 Output 3 Valve Fuse Mux Receiver
18439-E	LCI Multifunction 8-Output 5 Valve Fuse Mux Receiver
18448-E	LCI Multifunction 8 Output Receiver
18449-F	LCI Multifunction 5 Output Receiver
18570-D	LCI Multifunction 8 Output Fuse Mux Receiver
18571-D	LCI Multifunction 8 Output 5 Valve Fuse Mux Receiver
18698-F	LCI Multifunction 5 Output Fuse Mux Receiver
18699-E	LCI Multifunction 5 Output 3 Valve Fuse Mux Receiver

Absolute Maximum Ratings

Rating	Value	Unit	Conditions
Input Voltage	18	VDC	
Output Current (Functions, External Sw)	60	A	10 sec max
Output Current (Valve outputs)	3	A	Internally limited

Electrical Characteristics

Rating	Symbol	Min	Typ	Max	Unit	Conditions
Operating Supply Voltage	V_{batt}	9	13.8	16	VDC	
Function Output Current (Function 1-7)	I_F		< 30 35 45		A	*Internally Limited 2 min shutdown 20 sec shutdown 8 sec shutdown
Function Short Circuit Current (Function 1-7)	I_{SS}		65		A	* Internally Limited 25 ms
Inrush Time (Function 1-7)	T_{IR}		80		ms	Maximum length of motor inrush. Upon function start up all current measurements are ignored for this length of time.
External Switch Output Current (ExternalSw(+), ExternalSw(-))	I_{ES}			30**	A	Tested against Bussman 30 A resettable breaker, part number CB123-30HB.
Valve Output Current (V1-V7, Pump Ext, Pump Ret)	I_D		1.5		A	
Valve Voltage (voltage applied to any valve output)	V_D			$V_{batt} + 1.0$	V	
Light Output Current	I_L			15	A	

Notes:

* If rating is exceeded control will shut down the output for 30 seconds. See section "Active Over-Current Protection" for more information

** Design tested and validated to work with Bussman 30A resettable breaker, part number CB123-30HB. Exceeding this rating or failing to properly fuse this output may result in controller overheating and/or damage to the control and/or output relay.



Multi-Function HD (Heavy Duty)

Function Outputs

Every function (1-7) (+) and (-) output is normally open. That is, while not in operation the outputs rest in a non-conducting state.

Each function is capable of providing a polarity reversing output to control a bi-directional motor. When commanded, the output will supply positive or negative voltage across its terminals depending on the desired direction. When commanded to stop, both function outputs are connected to ground. After several seconds of no new commands the output terminals are returned to the open state.

Having normally open function terminals allows an external source (such as a switch) capable of driving the output devices to be connected to each output. Any external switch/device that drives one of the functions connected to the Multi-function Control must also be normally open and must be powered from the External Switch output to avoid shorting power to ground. Failure to do so may cause one of the on-board fuses to open or result in damage to the control module. A detailed description of External Switch Output operation and on-board fuses can be found below.

Every function output uses one of 4 on-board fuses. See the "On-Board Fusing" section for more information.

Light Output

The light output is normally open. That is, while not in operation the output rests in a non-conducting state.

The light is capable of sourcing battery voltage when active, and is open when inactive. The light output is fused on board the controller. See section "On-Board Fuses" for fuse information.

Similar to the Function Outputs, because it is normally open the Light Output allows an external drive source such as a switch to be connected in parallel. Because this output provides battery to the output terminal, any switch/device capable of connecting ground to the light output terminal must be powered from the External Sw output. Failure to do so may cause the fuse to open.

Valve Outputs (hydraulic versions only)

Part numbers 18438, 18439, 18571 and 18699 have additional Valve outputs available. V1-V3 have been added, and Function Output 6 and 7 have been replaced by V6, V7, Pump Ext, and Pump Ret. These are called "Valve Outputs".

Each Valve Output is capable of sourcing battery voltage to a hydraulic valve or solenoid. When a valve output is active, its terminal is driven high (to battery). When inactive it is open (high impedance to ground).

There are several valve outputs:

- 18438 has V1-V3
- 18439 has V1-V3, V6-V7, Pump Ext, Pump Ret.
- 18571 has V1-V3, V6-V7, Pump Ext, Pump Ret.
- 18699 has V1-V3

V1 – V3 are named so because they correspond to Function 1-3. When Function 1 is active (control driving +V_{batt} or -V_{batt} across the terminals) V1 is also active, otherwise V1 is inactive. The same applies to Function2-V2, and Function3-V3. V6 and V7 do not have a corresponding function output. Instead they share Pump Ext and Pump Ret. When commanded to extend, Pump Ext and either V6 or V7 are activated. When commanded to retract, Pump Ret and either V6 or V7 are activated

Multi-Function HD (Heavy Duty)

Similar to the Function Outputs, having normally open valve outputs allows an external drive source such as a switch to be connected to the valves/solenoid. Because these outputs provide battery to the terminals, any switch/device capable of connecting ground to the valve output terminals must be powered from the External Sw output. Additionally, any external voltage source connected to the Valve Outputs must not exceed V_b .

The valve outputs are fused on board the controller with two 5A ATC fuses. See section “On-Board Fuses” for fuse information.

External Switch Output

The external switch output provides a power source for mechanical switches used in parallel with the function outputs. The External Sw (+) and (-) terminals are normally closed directly to the battery (+) and battery (-) terminals. When any function becomes active the External Switch (+) and (-) outputs are both driven to an open (non-conducting) state. By design, this output does not share the active over-current protection utilized by the Function Outputs. This way power is still available to the manual switches in the event either the Linc transmitter or multi-function control becomes non-functional. Because the External Sw Output is not actively protected, it needs to be fused correctly (see “On-Board Fusing” section).

ANY EXTERNAL SWITCH/DEVICE THAT IS CONNECTED IN PARALLEL WITH ONE OR MORE OF THE FUNCTION OUTPUTS MUST BE NORMALLY OPEN AND POWERED FROM THE EXTERNAL SW OUTPUT. Failure to do so may result in the External Sw Fuses opening, the Function Output fuses 1-4 opening, or damage to the control on the ground side (if the shorted wire is not fused).

On-Board Fusing

There are several on-board fuses populated to prevent damage due to short circuit or over-current conditions.

Care must be taken in selecting the proper fuse values to prevent damage to the Function Output relays and External Switch Relay. No fuse should be used that exceeds the ratings of a 30A ATC blade fuse shown here:

http://www.cooperindustries.com/content/dam/public/bussmann/Electronics/Resources/product-datasheets/Bus_Elx_DS_2009_ATC_Series.pdf

Fuses should not be auto-resettable; if the fuse opens it is important that the condition be addressed. Replacing a blown fuse with a larger value may mask possible wiring problems and other faults in the system.

There are 4 fuses selectable through programming which protect the Function Outputs (*Figures 1 and 2, right side of Detail A*). Every Function Output used must be pre-programmed with a fuse position. Every function programmed with Fuse 1 will use the same fuse (“1” on the label). The same applies to fuses 2-4. If no fuse position is selected for a Function Output, then that output is non-operational.

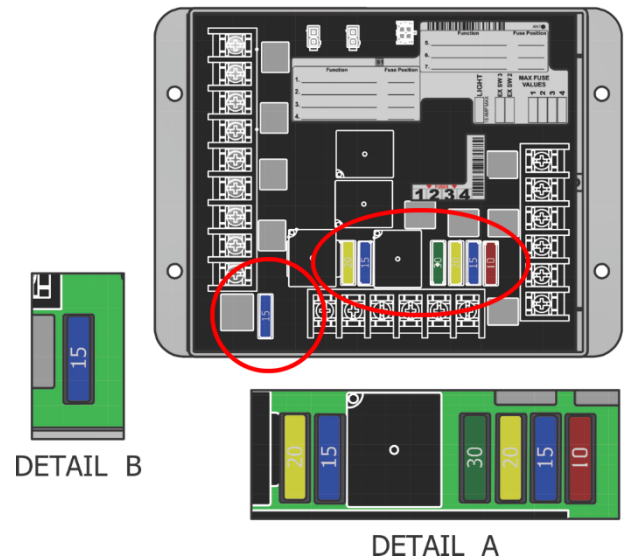


Figure 1: Typical multifunction without valves

Multi-Function HD (Heavy Duty)

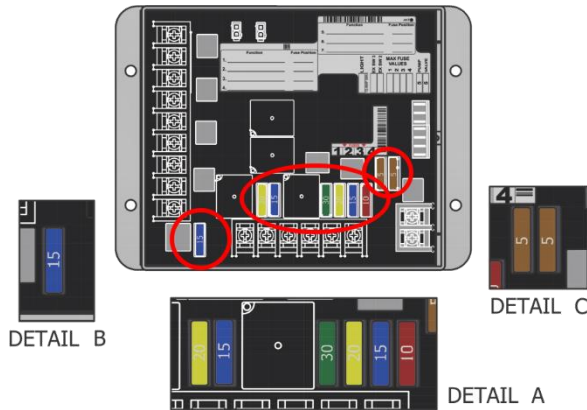


Figure 2: Typical multifunction with valves

The External Switch Output has 2 Fused (+) Outputs: External Sw 2 (+) and External Sw 3 (+). External Sw 2(+) and External Sw 3 (+) terminals have an associated on-board fuse (*Figures 1 and 2, left side of Detail A*). This provides different levels of protection for different wire sizes.

The External Switch Output 1(+) is NOT fused, therefore installations MUST provide external fusing of the main Battery + line. Without proper fusing board overheating may occur during motor stall and external short circuit conditions. The external fuse used cannot exceed the rating of a Bussman 30A breaker CB123-30HB or equivalent. See Electrical Characteristics section for ratings.

The Light Output fuse (*Figures 1 and 2, Detail B*) should not exceed the ratings of a 15A ATC blade fuse.

The Valve Outputs are fused with 2 x 5A on-board fuses (*Figure 2 Detail C*). No value other than a 5A ATC fuse should be used in either location.

Active Over-Current Protection

Each of the Function Outputs has its output current measured and restricted by the on-board circuitry. The maximum allowable output current (I_F) is described in the “Electrical Characteristics” section. If these limits are exceeded the control will shut down the output. When this occurs, a 30 second “cool down” period is initiated in which the output cannot be activated. When the cool down period expires, the user can reactivate the output by releasing and re-pressing the activation button.

The current limit for every function is based on an integrated power measurement. Based on a constant current, it can be found by the following equation:

Load Current \leq 29A:

$$On\ time\ (seconds) = 2\ minutes\ maximum$$

Load Current > 29 A:

$$On\ time\ (seconds) = \frac{121.58}{(LoadCurrent\ in\ amps - 29)}$$

Fuses are needed to prevent severe abuse of the outputs. See the section “External Fusing” for more information.

The Valve Outputs similarly have over current and short circuit protection to ground. The ICs that control the valve outputs have thermal over-current protection built directly into them; if the output driver IC becomes overheated it will deactivate the output. Consult the “Absolute Maximum Ratings” and “Electrical Characteristics” for amperage specifications.

The Light output is protected from short circuits to ground. Fusing is needed to protect from over-current conditions. See “Light Output” and “External Fusing Sections” for more information.