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Find the *Rockwell / Allen-Bradley 1398-SR3AF* at our website: *Click HERE*

300 W Active Shunt Regulator

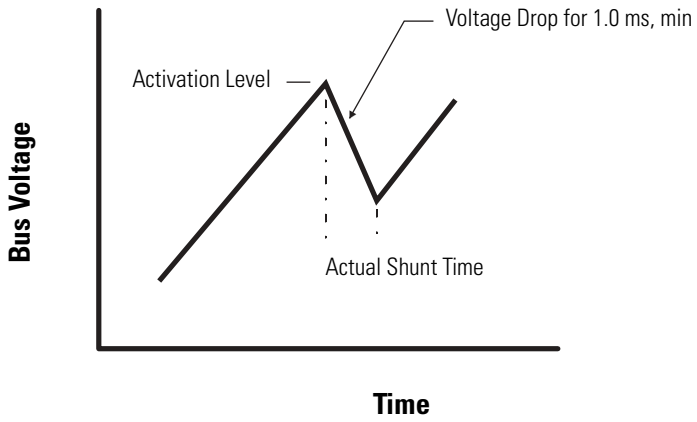
The 300 W Active Shunt Regulator is used in systems that see significant dc voltage regeneration from large inertial load applications. The Allen-Bradley Ultra3000, Ultra5000, and ULTRA 100 drives (see table below) do not have internal shunt circuitry to dissipate excess energy, resulting in overvoltage faults. For the smooth braking of large inertial loads, the use of a shunt regulator is recommended.

The active shunt (catalog number 2090-UCSR-A300 or 1398-SR3AF) can be used with the following drive products.

Drive Family	Cat. No.
Ultra3000 Drives	2098-DSD-005, -005-SE, -005-DN, -010, -010-SE, -010-DN, -020, -020-SE, -020-DN, -005X, -005X-DN, -010X, -010X-DN, -020X and -020X-DN
Ultra5000 Drives	2098-IPD-005, -005-DN, -010, -010-DN, -020, and -020-DN
ULTRA 100 Drives	1398-DDM-005, -005-DN, -009, -009-DN, -019, -019-DN, -005X, -005X-DN, -009X, -009X-DN, -019X, and -019X-DN

The active shunt monitors the dc bus voltage of the drive. If the voltage reaches activation level, the shunt drops the dc bus voltage and dissipates the energy as heat. Figure 1 illustrates the drop in dc bus voltage.

Figure 1
Shunt Activation on DC Bus Voltage



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Performance

The peak shunting capability is a direct result of using a 36 Ω shunt resistor. The peak shunt power can be calculated by dividing bus voltage squared, by 36. For example, if the bus voltage is 380V when the shunt is energized, the shunt power is 4,011 W.

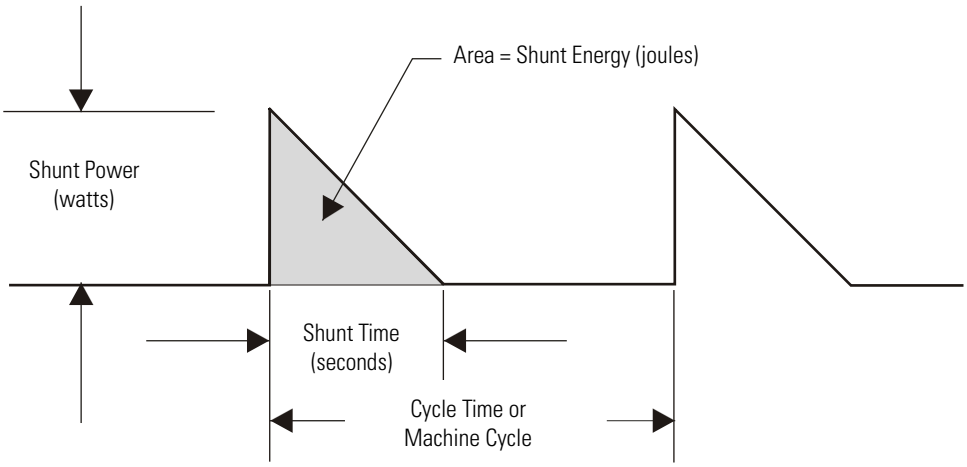
$$\frac{380V}{36\,\Omega}^{2} = 4011\ W$$

Continuous Shunt Capability

A shunt regeneration profile is defined by shunt time, cycle time, and peak power level. Figure 2 illustrates a profile of regeneration during a machine cycle.

- Shunt power is the peak shunt power during the shunt time.
- Shunt time is the time the power pulse is dissipated by the shunt.
- Cycle time is the time from the beginning of one shunt time to the beginning of the next shunt time.

Figure 2
Shunt Regeneration Profile

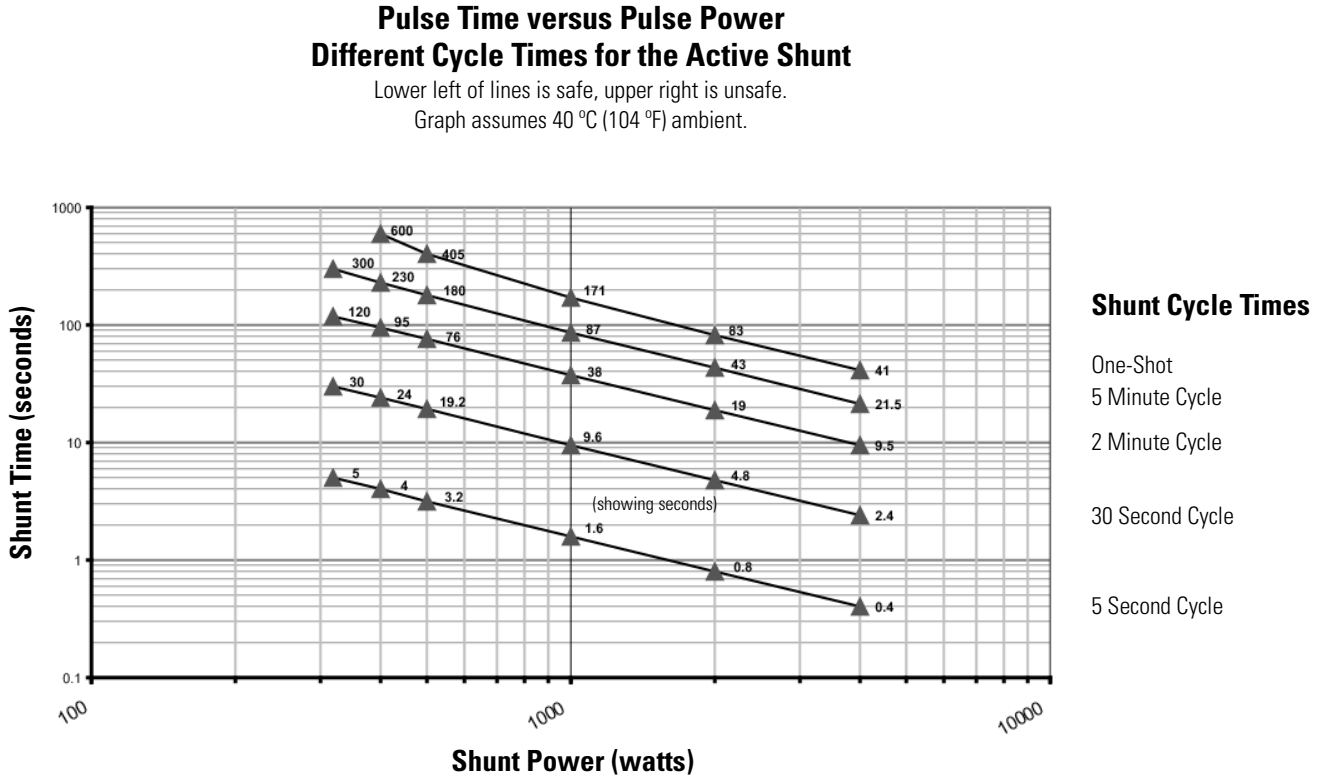


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If the required average shunt power over the machine cycle is ≤300 W and the cycle time is ≤300 seconds, the active shunt can handle the application. Figure 3 illustrates the capability of an active shunt at 40 °C (104 °F) ambient temperature. The different lines represent different cycle times (rates). The x-axis is the shunt power during the shunt time and the y-axis is the maximum shunt time for that power and cycle time. For example, the bottom line is a 5 second cycle time (meaning the shunt pulse comes every 5 seconds) and it intersects the 800 W pulse for 2 seconds every five seconds in a 40 °C (104 °F) or less environment. This means that the shunt can handle an 800 W pulse lasting for two seconds, every 5 seconds if the ambient temperature is not above 40 °C (104 °F).

IMPORTANT The limiting factor on how much average power can be dissipated is temperature. The shunt power capability increases approximately 5.5 W for every 1.0 °C drop in ambient temperature (3.1 W/ °F). Increasing the air flow across the heat sink can increase the continuous shunt capability significantly, although obstructing air flow can decrease it significantly.

Figure 3
Active Shunt Module Thermal Capacity

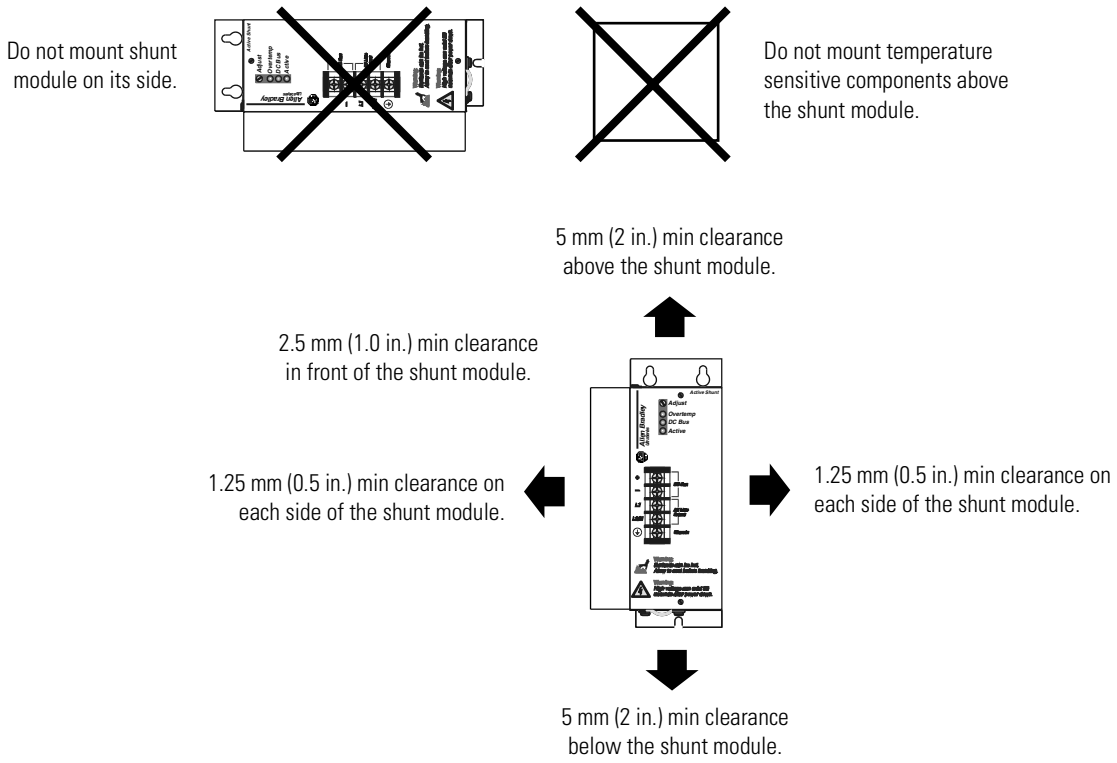


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Install the Shunt

Refer to Figure 4 for shunt module spacing requirements.

Figure 4
Shunt Module Spacing Requirements within an Enclosure



ATTENTION

The shunt module can release a large amount of heat over time.

Any materials above the shunt module or its enclosure may need the protection of a metal plate to keep from deteriorating.

Failure to observe this precaution could result in damage to surrounding materials, possibly leading to fire.

ATTENTION

The shunt module can release a large amount of heat inside an enclosure.

Be sure there is enough ventilation so as the maximum ambient temperature of 40 °C (104 °F) is not exceeded. Power performance must be decreased 5.5 W for every 1.0 °C (3.1 °F) of increasing ambient temperature.

Failure to observe this precaution could result in damage to the shunt module.

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If the work environment dictates, the shunt module should be in an enclosure providing protection against dust and splashing water (IP54), or dust free and protection against water jets (IP65).

ATTENTION



Avoid contaminating electronic components.

Provide a quality air source to cabinets: free of debris, oil, corrosives, or electrically conductive contaminates. All cabinets should have scheduled inspections and be cleaned as needed.

Failure to observe these safety procedures could result in breakdown and damage to equipment.

Many National Electrical Manufacturers Association (NEMA) Type 4 cabinets provide this level of protection.

ATTENTION



If you mount the shunt module inside a cabinet, you must make sure that the ambient temperature inside the cabinet does not exceed 40 °C (104 °F). Power performance must be decreased 5.5 W for every 1.0 °C (3.1 °F) of increasing ambient temperature.

Mount the Active Shunt Module

To mount the shunt module on a flat, solid, grounded surface:

1. Install the top mounting fasteners on the subpanel for the shunt module.

   Refer to Product Specifications on page 7 for fastener, wire, and terminal torque specifications.

2. Mount the shunt module on the two fasteners.

3. Install the lower fasteners.

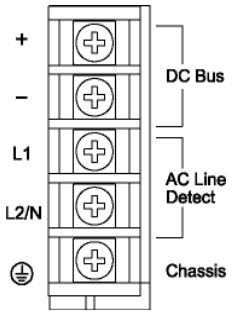
4. Tighten all mounting fasteners.

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Wire the Active Shunt Module to a Drive

It is recommended to use shielded, high temperature (75 °C, 600V), 4.0 to 2.5 mm^2 (12 to 14 AWG) copper wire, or run the wire through shielded conduit. The maximum length of each wire should be 3.05 m (10 ft) with the shield grounded at both ends. Unshielded wiring should be kept as short as possible.

1. Locate the terminal block on your active shunt.



2. Wire the +DC Bus connection to the positive (+) bus connection of the drive, and the -DC Bus connection to the negative (-) bus connection of the drive.

IMPORTANT The dc bus connections should only be used to connect a single drive to the active shunt module. Contact your Allen-Bradley representative for further assistance if your application requires additional dc power connections.

3. Wire the AC Line Detect to the respective terminals (L1, L2/N) of the drive or its ac power source.

   The shunt module will actively sense when ac power is lost to the drive and after 0.25/s, it will drop the dc bus.

4. Wire the Chassis ground to earth ground.

5. Tighten the terminal block screws to 1.2 Nm (11 lb-in).

6. Gently pull on each wire to make sure it does not release from its terminal.

7. Reinsert and tighten any loose wires.

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Product Specifications

Specifications for the active shunt module are provided in the following tables. Physical measurements are shown in 300 W Active Shunt Regulator Mounting Dimensions on page 8.

General Specifications	Value
Weight	1.51 kg (3.34 lb)
Vibration	2 g at 10...2000 Hz
Shock	15 g 11 ms half sine
Altitude	1500 m (5000 ft)
Humidity	5...95% noncondensing
Ambient operating temperature (1)	0...40 °C (32...104 °F)
Air flow clearances	50 mm (2.0 in.) above and below unit for air flow

(1) Power performance increases/decreases approximately 5.5 W for every 1.0 °C (3.1 W/ °F) drop/rise in ambient temperature.

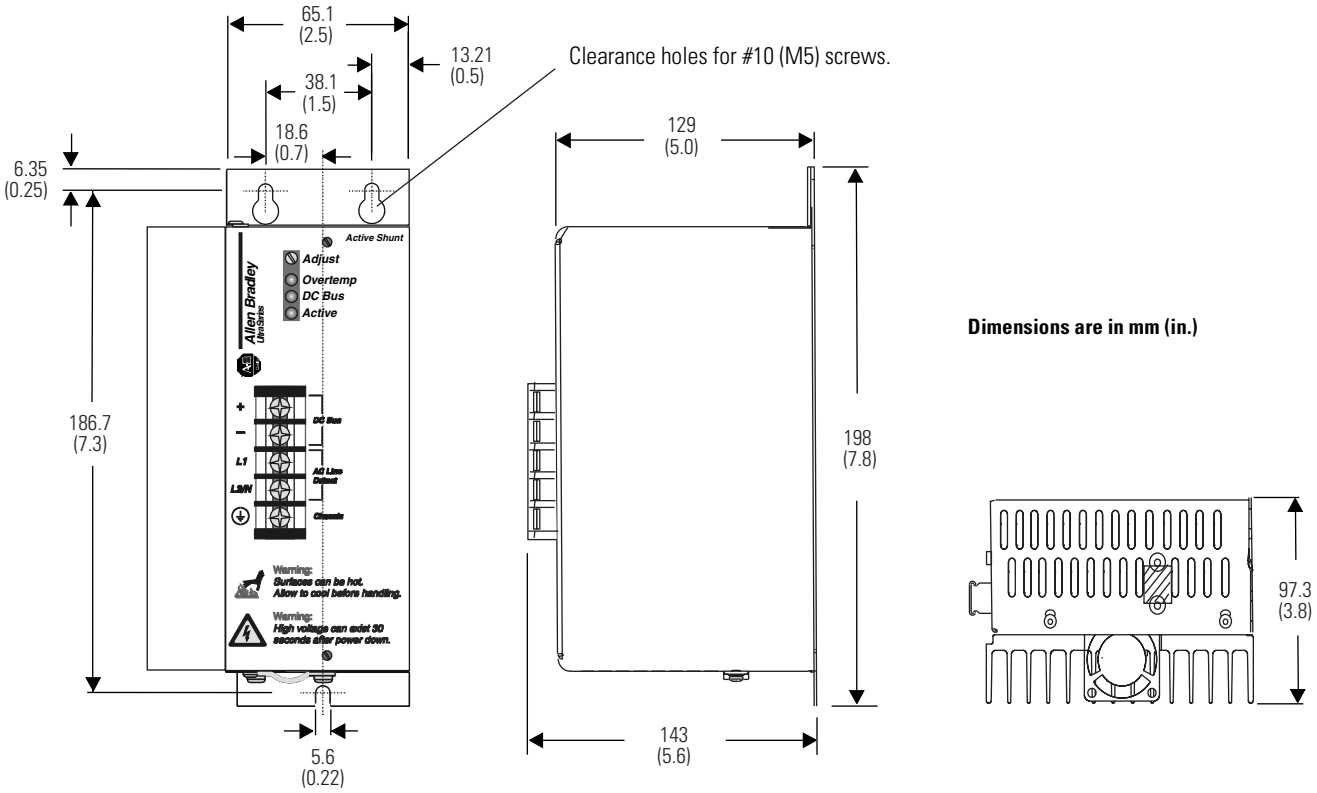
Mounting Hardware	Size
Metal screws	#10
Hex cap screws	1/4 in.-20
Hex cap screws (metric)	M5

Wiring	Size
75 °C copper wire	4.0 mm^2 (12 AWG) or 2.5 mm^2 (14 AWG)

Terminal Block Screws	Torque
Chrome plated brass	1.2 Nm (11 lb-in)

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Figure 5
300 W Active Shunt Regulator Mounting Dimensions



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ULTRA 100 Radiated Emissions CE Compliance

In order for the ULTRA 100 drive to comply with the CE radiated emissions standards, ferrites must be added to the ends of the twisted dc bus wires when using an active shunt. Route both wires through the ferrites. Ferrites with an impedance at 100 MHz between 100 to 200 Ω were found to be effective. The following table lists some readily available ferrites with effective impedance ratings.

Ferrites for CE Radiated Emissions Compliance

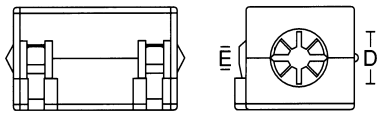
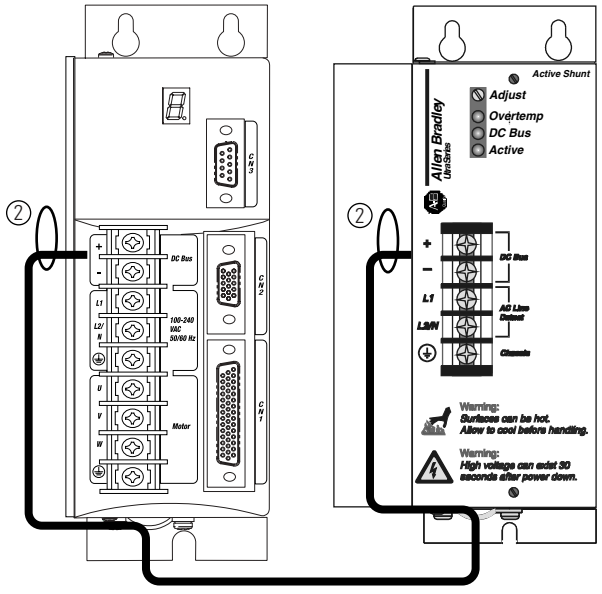
Mfg. Part/No.	D	E	Impedance
SS28B2034	0.250	0.120	125 Ω
SS28B2037	0.350	0.200	154 Ω
SS28B2032	0.500	0.200	230 Ω
Box-shaped ferrite assembly in fully enclosed nylon case. End ports are surrounded with flexible spring flutes to grip a range of cable diameters from 3.2...12.7 mm (0.125...0.500 in.). FerriShield, Inc. 350 Fifth Avenue, Suite 7310 New York, NY 10118-7591			

Figure 6
DC Bus Wiring Layout Using Ferrites with Shielded Cable



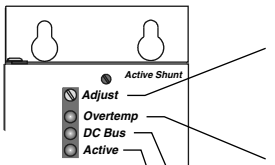
- Place shunt in metal enclosure providing EMI noise reduction.
- For ULTRA 100 drive only:
  Install a 100 to 200 W ferrite RFI suppressor at both ends of the dc bus wires to comply with CE radiated emissions standard.
- Some drive terminals are marked R, S, and T instead of U, V, and W.

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Maintain the Active Shunt

Figure 7 shows information relating to the adjust screw and the LEDs that show shunt activity. Refer to Troubleshoot on page 11 for more information.

Figure 7
Shunt Module Adjustment Screw and LEDs



Adjust (screw)
The Adjust screw sets the activation level of the shunt. It is set at the factory and ordinarily will not need adjustment.

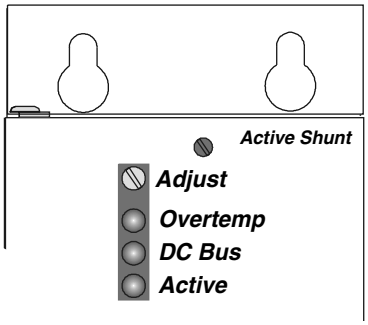
Overtemp (LED)
The Overtemp (yellow) LED illuminates when the unit's thermostat has tripped. While the thermostat is tripped, the unit will not shunt excess voltage (but the dc bus drop feature will still function) and this will usually cause the host drive to fault on overvoltage. Once this LED turns on, power must be removed before it will shut off, even if the active shunt unit has cooled and is functioning again.

DC Bus (LED)
The DC Bus (green) LED illuminates when there is sufficient bus voltage. The higher the bus voltage, the brighter the LED will glow.

Active (LED)
The Active (green) LED illuminates while the shunt is dissipating power. This LED indicates not only that the shunt is functioning, but shows how often the shunt is energized.

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Troubleshoot

	If this fault appears	Then
	Overtemp light is on	The internal thermostat in the shunt unit is getting too hot. To fix this problem: • reduce the average shunt power, • reduce the ambient temperature of the air around the shunt, or • increase the amount of air passing over the heat-sink fins. Once this LED turns on, only removing power will shut it off; even when the active shunt unit has cooled and is functioning again.

	Drive registers Bus Overvoltage faults, but the active shunt is functioning and the Overtemp light is off.	There are two situations where this can happen.
		• First, if the Bus Overvoltage trip level on the drive is too low. Since this is not adjustable on the drive, the solution is to reduce the turn-on threshold level of the active shunt. This is done by turning the Adjust pot counter-clockwise.
		• Second, if the regeneration power exceeds the shunt power for too long. It is possible for the drive to generate more power than the active shunt can handle. There are two possible solutions to this situation.
		  • Adjust the regeneration profile so that the drive generates less power for a longer time. The drive current limit parameters may be useful here.
		  • Reduce the turn-on threshold level of the active shunt, which turns on the shunt earlier in the regeneration profile.

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For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

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