DC Bus Condition Attributes

These are Motion Control Axis attributes associated with the DC Bus including functionality to address both under-voltage and over-voltage conditions.

DC Bus Voltage

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Required - BD	Get	T	REAL	-	-	-	Volts

Measured DC Bus Voltage. For inverters and DC Converter Types, the DC Bus measured is an input to the device. For all other Converter Types, the DC Bus measured is an output of the device.

DC Bus Voltage - Nominal

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Get	T	REAL	-	-	-	Volts

Normal DC Bus Voltage during operation as determined by averaging the DC Bus Voltage over a device specific time interval. This value is used as the basis for Bus Overvoltage and Undervoltage limits.

Tip: If the device does not support this bus voltage averaging concept, hard code this value.

For inverters and DC Converter Types, the DC Bus measured is an input to the device. For all other Converter Types, the DC Bus measured is an output of the device.

Bus Regulator Reference

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Get	T	REAL	-	-	-	% of Nominal Bus Voltage

The Bus Regulator Reference attribute returns the current turn on voltage threshold for the bus regulator.

Bus Configuration

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set	T	USINT	-	-	-	Enumeration: 0 = Standalone 1 = Shared AC/DC 2 = Shared DC

The Bus Configuration attribute is an enumerated selection that specifies how the DC Bus is used.

Standalone. Specifies that DC Bus power supplied by the converter section of the drive is applied only to the drive power structure.

Shared AC/DC. Specifies that the converter associated with this CIP Motion device is to supply and share DC Bus power with other drives. This would typically result in de-rating of the converter's continuous current rating when there are multiple converter devices paralleled in a bus sharing group. Shared DC specifies that this drive is sharing DC bus power generated by another Shared AC/DC or Shared DC/DC CIP Motion drive, or external CIP Motion converter.

Shared DC. Non CIP Converter specifies that this drive is receiving DC bus power generated by an external AC/DC converter that is not CIP Motion compliant and distributing its DC bus power to other CIP Motion drives. A drive configured for Shared DC - Non CIP Converter is responsible for communicating the status of the external converter to the control system as if the external converter were integrated with the drive. Specifically, this communication includes the DC Bus Up and DC Bus Unload status bits reflecting the current state of associated external converter.

Shared DC/DC specifies that the converter associated with this CIP Motion device supplies and shares DC bus power with other Shared DC devices. DC/DC converters may convert input DC bus power from a Shared AC/DC converter to a different DC Bus output voltage level to supply one or more Shared DC drives. It may also simply distribute DC bus power from a Shared AC/DC converter to multiple Shared DC drives without any conversion. A Shared DC/DC converter has a unique capability in that it can be both a bus master for a bus group and a bus slave in a different bus group.

Bus Voltage Select

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set	T	USINT	-	-	-	Enumeration: 0 = High (115V, 230V, 460V) 1 = Low (100V, 200V, 400V) 2-255 (reserved)

The Bus Voltage Select value indicates the expected bus voltage level of the drive application. High bus voltage selection is usually associated with drive running on the North American power grid, while operating in Europe a Low Bus Voltage selection would be appropriate. This parameter can be used to compensate for these different bus voltage levels in the current loop.

Bus Regulator Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values

Optional - BD	Set	T	USINT	-	-	-	Enumeration: 0 = Disabled (O) 1 = Shunt Regulator (O) 2-127 (reserved) 128-255 (vendor specific) 128 = Adj. Frequency (O/IM) 129 = Both - Shunt first (O/IM) 130 = Both - Freq first (O/IM) 131 = Bus Follower (O)

The Bus Regulator Action attribute controls the method of operation of the DC Bus Regulator that addresses the regenerative over-voltage conditions that occurs when decelerating a motor. If Disabled, no regulation is applied to the DC Bus level by this device to control regenerative energy sourced by the motor. When Shunt Regulator is selected the associated shunt regulation hardware is applied to the DC Bus to dissipate. regenerative energy via an internal or external resistor.

When controlling Induction Motors, additional bus regulation methods are available that don't require a shunt regulator. When Adjust Frequency is selected, the output frequency of the device is controlled relative to the speed of the motor to control the amount of regenerative energy pumped into the DC Bus. Different sequential application of shunt regulation and frequency control canbe applied to motor.

When Bus Follower is selected, the DC Bus is generated by an external converter rather than an integral converter. No bus regulation is applied to the DC Bus level and the drive does not generate an exception if the DC Bus is still active when the DC Bus contactor of the integrated converter is open. In this context, the integral converter is not connected to AC power.

Bus Regulator Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		USINT	-	-	-	Enumeration: 0 = Disabled (O) 1 = Shunt Regulator (O) 2-127 = (reserved) 128-255 = (vendor specific) 128 = Adj. Frequency (O/IM) 129 = Both - Shunt first (O/IM) 130 = Both - Freq first (O/IM) 131 = Bus Follower (O)

The Bus Regulator Action attribute controls the method of operation of the DC Bus Regulator that addresses the regenerative over-voltage conditions that can occur when decelerating a motor. If Disabled, no regulation is applied to the DC Bus level by this device to control regenerative energy sourced by the motor. When Shunt Regulator is selected the associated shunt regulation hardware is applied to the DC Bus to dissipate regenerative energy via an internal or external resistor. When controlling Induction Motors, additional bus regulation methods are available that do not require a shunt regulator. When Adjust Frequency is selected, the output frequency of the device is controlled relative to the speed of the motor to control the amount of regenerative energy pumped into the DC Bus. Different sequential application of shunt regulation and frequency control can be applied to motor. When Bus Follower is selected, the DC Bus is generated by an external converter rather than an integral converter. No bus regulation is applied to the DC Bus level and the drive does not generate an exception if the DC Bus is still active when the DC Bus contactor of the integrated converter is open. In this context, the integral converter is not connected to AC power.

Regenerative Power Limit

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - D	Set		REAL	-	-	-	% Motor Rated

The Regenerative Power Limit attribute limits the amount of power allowed to transfer between the motor and the DC Bus during regenerative braking of the motor load. Since this is regenerative power, the value of the limit is negative.

Converter Regenerative Power Limit

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - B	Set/SSV		REAL	-	-	-	% Converter Rated

The Converter Regenerative Power Limit attribute limits the amount of regenerative power allowed to transfer from the DC Bus to the converter. Since this is regenerative power, the value of the limit is negative. Converter Rated is defined as the Converter Rated Input Power attribute value.

Converter Motoring Power Limit

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - B	Set		REAL		-	-	% Converter Rated

The Converter Motoring Power Limit attribute limits the amount of motoring power allowed to transfer from the AC Line to the motor via the DC Bus. Converter Rated is defined as the Converter Rated Input Power attribute value.

Shunt Regulator Resistor Type

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		USINT	-	-	-	Enumeration: 0 = Internal 1 = External 2-255 = (reserved)

The Shunt Regulator Resistor Type defines using either the Internal or External Shunt resisto.

External Shunt Regulator ID

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		INT	-	-	-	-1 = None 0 = Custom 1-32767 = Shunt Regulator ID

The External Shunt Regulator ID is the Rockwell specific identifier for the External Shunt Regulator. A value of 0 indicates use of a custom shunt regulator that requires user configuration.

External Shunt Power

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		REAL	-	-	-	Kilowatts

Use the External Shunt Power attribute after configuring the external shunt resistor. The External Shunt Power attribute value specifies the power rating of the external shunt resistor, in Kilowatts.

External Shunt Pulse Power

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		REAL	-	-	-	Kilowatts

Use the External Shunt Pulse Power attribute after configuring the external shunt resistor. The attribute value specifies the power for delivering to the external shunt resistor for one second, without exceeding the rated element temperature. There are approximations to help determine this attribute if this information is not available from your vendor. *Shunt Pulse Power* (Kilowatts) = 75,000 * lbs, where lbs is the weight of the resistor wire element.

Tip: Shunt Pulse Power is not the weight of the resistor.

Another is that the thermal time constant = *Shunt Pulse Power* (Kilowatts) / 'Shunt Power' (Kilowatts) sometimes referred to as thermal mass.- the time for the resistor element to reach 63% of rated temperature with applied rated Kilowatts. A third method for determining this value: The pulse Kilowatts for 1 second is twice the watt rating of a 2 second pulse. In other words, the watt*sec rating is a constant if the pulse duration is short compared to the thermal time constant of the resistor and is a function of the element mass.

External Bus Capacitance

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		REAL	-	-	-	µF

▷ Select/Limit Instructions
▷ Sequential Function Chart (SFC) Instructions
▷ Statistical Instructions
▷ Safety Instructions
▷ Studio 5000 Logix Designer Glossary

The External Bus Capacitance attribute represents the external DC Bus capacitance when the associated converter or drive:

- Acts as a Bus Master
- Supplies DC Bus power to one or more Common Bus Followers.

The External Bus Capacitance attribute also is applicable with standalone drives that allow connection to an external capacitor. This attribute is not applicable when the Bus Regulator Action is set to Bus Follower.

External Shunt Resistance

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		REAL	200 DB	0	∞	Ohms

The External Shunt Resistance attribute represents the resistance of the External Shunt Regulator resistor.

Power Loss Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		USINT	0 (N) 1 (D) 3 (G)	-	-	Enumeration 0 = Continue (Ignore) (R) 1 = Coast Thru (R/D) 2 = Decel Regen (O/D) 3 = Ride Thru (R/G) 4-127 = Reserved 128-255 = Vendor Specific

The Power Loss Action attribute sets the reaction to a DC Bus under-voltage condition when the DC Bus voltage or AC Line RMS voltage drops below a hard-coded threshold in the device or the configured Power Loss Threshold. This provides a specific (configured) response to an incoming power loss while the drive/motor is running.

A **Continue** action selection configures the drive to ignore the power loss condition and continue to run for as long as possible. A Bus Undervoltage exception may occur if the DC Bus Voltage falls below the Factory or User Limits. Otherwise, operation will continue until the low voltage power supplies drop out. There may be concerns operating the power structure below the point where the gate drives start to lose power potentially resulting in damage to the device. The Bus Undervoltage Exception Actions will be set accordingly.

A **Coast Thru** action selection configures the drive to zero the PWM output of the drive while leaving the axis in the Running state. For a drive, this effectively disable power flow to the motor through the devices power structure. If the incoming power returns before the timeout period, given by the Power Loss Time, the drive automatically starts to control the motor again. If, however, the power doesn't return before Power Loss Timeout period expires, a Bus Power Loss exception is generated.

A **Decel Regen** action selection configures the drive to regeneratively charge the DC bus by decelerating the motor using the bus regulator to regulate the bus voltage at a predetermined level. When incoming power is restored the drive returns to normal

operation. If, however, the drive reaches zero speed or the Power Loss Time period expires before the incoming power has restored, the drive power structure is disabled and a Bus Power Loss exception is generated.

A **Ride Thru** action selection configures the device to zero the PWM output of the device while leaving the axis in the Running state. For a regenerative converter, this disables regenerative power flow through the devices power structure to the AC line. If the incoming power returns before the timeout period, given by the Power Loss Time, the device automatically restarts PWM modulation. If, however, the power does not return before Power Loss Timeout period expires, a Converter AC Power Loss exception is generated.

Power Loss Threshold

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		REAL	0	0	10^3	% of nominal

Sets the Level for Power Loss as percent of nominal DC Bus Voltage or nominal AC Line Voltage.

Shutdown Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		USINT	0 (D) 1 (B)	-	-	Enumeration 0 = Disable (R/D)(O/G) 1 = Drop DC Bus (R/B) (O/D) 2-127 = Reserved 128-255 = Vendor Specific

Shutdown Action selects the action for the device when a Shutdown Request initiates.

Disable, the default action for a drive, immediately disables the device's power structure according to the Category 0 Stop Sequence. For a regenerative converter, this action immediately disables the converter's power structure to stop regenerative power flow.

If Drop DC Bus is selected, action can be taken to drop the DC Bus voltage as well. This is generally done by opening an AC Contactor Enable output provided by the device that controls power to the converter.

The Shutdown Action executes the Category 0 Stop Sequence for a drive.

Power Loss Time

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Set		REAL	0	0	∞	Seconds

When the Power Loss Action is set to Coast Thru, Ride Thru, or Decel Regen, this attribute sets the timeout value before a Bus Power Loss exception is generated by the drive, or a Converter AC Power Loss exception is generated by the converter, in response to a Power Loss condition. For details, see the Power Loss Action attribute table earlier in this topic.

See also

See also

Motion Planner Configuration Attributes
State Behavior

How are we doing?