Advanced Energy®Advanced Power Controls™

User Manual

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Related Documentation

For complete information on the Advanced Energy inverters, see the user manual for each component in the system. In particular, reference the safety information in the AE inverter product manual.

OVERVIEW

Advanced Energy has made a number of updates to enhance inverter operation including the addition of Advanced Power Controls. The enhanced functions and Modbus® configuration interface are described in the following sections of this document.

Related Links

ADVANCED POWER CONTROLS FUNCTIONALITY

Select models of Advanced Energy inverters including the AE 75TX/AE 100TX, AE 250TX/ AE 260TX, and AE 500TX are equipped with Advanced Power Controls functions that enable the inverter to source/sink reactive power, reduce output power to specified levels, and control the rate and timing for increasing or decreasing power. Using a Modbus/TCP or Modbus/RTU interface, the inverter can be commanded to transition to power factor and curtailment set points by an external controller and will remain at the set point until commanded otherwise. This is referred to as fixed mode operation. Advanced Power Controls functions enable plant owners to control site dynamics,

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comply with interconnection requirements and assist with grid stability and support, improving power quality and system efficiency.

☞ **Important**

Reactive power control (power factor control) is prohibited in some jurisdictions due to utility interconnection requirements. Only enable reactive power control after obtaining authorization from your local utility.

The following table describes Advanced Power Controls functions.

Function	Description	Range
Power factor	Sets the ratio between real power “P” (kW) and apparent power “S” (kVA). Power factor = P/S. Varies the phase angle of current with respect to voltage and allows for sourcing or sinking of VARs. The power factor ratio is entered as a percentage and is adjustable in increments of 0.01(1%). For example, a power factor of 0.95 = 95% and would be entered as 95. The power factor can be set to leading or lagging: • Leading: The power factor is referred to as leading when the current phase angle is positive in relation to the voltage phase angle (current leads voltage). A source producing power with a leading power factor increases the grid voltage. • Lagging: The power factor is referred to as lagging when current phase angle is negative in relation to the voltage phase angle (current lags voltage). A source producing power with a lagging power factor reduces the utility grid voltage.	90 to 100 (leading) -90 to -99 (lagging) Power factor of 1 = 100

Function	Description	Range
Curtailment	Specifies an upper limit for inverter output power either by percent of maximum output or by an absolute kVA setting. Increments of 1% or 1 kVA can be specified. 100% means no curtailment. If the DC input power is less than the curtailment set point, the inverter will only produce up to the amount of power available. Two separate registers are available for setting the curtailment value – one for percent and one for kVA. Setting one register will result in the appropriate value be written to the other. • Percent: The percent of maximum rated output power produced by the inverter. Example: Curtailment of 75% on an AE 500TX inverter will result in inverter output of 400 kVA assuming there is sufficient DC power to generate 400 kVA output. • kVA: The total allowable combined real and reactive power. This value will be <= to maximum rated output power (apparent power) of the inverter. This value specifies the upper limit of the output power produced by the inverter. For example, curtailment of 75 kVA on an AE 500TX inverter will set the maximum AC power output to 75 kVA.	5% to 100% of maximum rated output power (% or kVA)
Ramp rate	Allows for controlling the rate at which instantaneous power increases or decreases. Defines the maximum rate the inverter will ramp to the designated set point. The inverter will ramp as quickly as possible without exceeding the specified ramp rate. Set in increments of 1 kVA/s. If not specified, the inverter will run at maximum ramp rate.	1 to 50 kVA/s. 100 kVA can be entered to ensure maximum ramp rate.
Action delay	Defines a time delay for set point changes to take effect. This is typically used for multi-inverter sites where individual inverters can be programmed with different action delay settings so their output power characteristics do not change simultaneously. Allows for staggered responses of inverter collective response.	0 to 255 seconds
Randomization	Randomizes the start time of set point changes based on predefined thresholds. This can be used in conjunction with action delay where the action delay setting will set the reference point around which the randomization will occur. For example, an action delay of 10 seconds with randomization of 5 seconds will result in the change taking effect anywhere between 5 to 15 seconds within the set point change (**Control Go**) command being issued.	0 to 255 seconds

Function	Description	Range
Remote enable/ disable	Allows for the control of inverter power production. In the disabled state the inverter will not produce power. The enabled state allows the inverter to produce power but can be overridden by any other means of disabling the inverter such as the inverter ON/OFF switch, disconnect switches, the physical remote disable inputs, or a faulted state. All options must be enabled for the inverter to produce power. The remote enable/disable control register is automatically enabled (register value = 0) after any power cycle; even if it had been disabled via Modbus command prior to the power cycle. A power cycle occurs when AC power is removed from the inverter. ☞ **Important** The disable function should not be relied on to disable the inverter for service or maintenance. Follow procedures in the inverter Installation and Operation Manual to shut down and de-energize the inverter.	Enabled Disabled

THE ADVANCED POWER CONTROLS MODBUS INTERFACE

The AE commercial inverter supports both Modbus/TCP and Modbus/RTU operation. The Modbus register mapping applies to both interface protocols.

Modbus/TCP can be used to access the inverters over the Intranet/Internet using the IP address of the unit and TCP port number 502.

If you are communicating with the inverter over a Modbus RS-485 network (Modbus/RTU), please follow the Modbus network installation process in the inverter Installation and Operation manual to configure your Modbus network and to determine or set the inverter's Modbus address.

VERIFYING ADVANCED POWER CONTROLS AVAILABILITY

Verification of Advanced Power Controls availability can be performed on any AE commercial inverter model after the inverter boots up. The Modbus command **Read Holding Register** queries the inverter's firmware to determine if the inverter is Advanced Power Controls compatible. The Modbus command **Write Single Register** can set or write to the firmware register to enable the Advanced Power Controls mode.

To Verify an Inverter is Compatible with Advanced Power Controls

- Use the Modbus **Read Holding Register** command to read register 29.

The inverter returns one of the following values in register 29:

- 1 = Advanced Power Controls is available on this inverter
- 0 = This inverter needs a firmware upgrade to make it compatible with the Advanced Power Controls functionality

To Enable Advanced Power Controls

The following steps query the inverter for its Advanced Power Controls status and enable the feature if needed. The inverter must be equipped with Advanced Power Controls prior to performing the following steps.

1. Use the **Read Holding Register** command for Modbus register 3035.

   The inverter returns one of the following values:

   - 5 = Advanced Power Controls is enabled and ready to use
   - 10 = Advanced Power Controls is disabled. Register 3035 must be set to enabled.

2. If the feature is not enabled, write the value `5` to register 3035 using the **Write Single Register** command to enable Advanced Power Controls.

To Disable Advanced Power Controls

The following steps disable the Advanced Power Controls feature on an inverter. The inverter must be equipped with Advanced Power Controls prior to performing the following steps.

1. Use the **Read Holding Register** command for Modbus register 3035.

   The inverter returns one of the following values:

   - 5 = Advanced Power Controls is enabled. Register 3035 must be set to disabled.
   - 10 = Advanced Power Controls is disabled.

2. Write the value `10` to register 3035 using the **Write Single Register** command.

ADVANCED POWER CONTROLS CONFIGURATION EXAMPLES

The following configuration examples use Modbus commands and registers to read and write Advanced Power Controls parameters to an inverter. Each example provides the required steps to set and verify the parameters. The first four examples write power control parameters to the inverter while the last example can be used to read back the results of the power control settings.

☞ **Important**

Register values from previous write commands are retained. All command registers should be reviewed and rewritten each time a change is made. Register values are persistent and will be retained after a power cycle.

All examples assume Advanced Power Controls have been enabled (register 3035) and use the following general process:

- Ensure Advanced Power Controls are enabled.
- Write the associated control registers (4101-4113) with the desired set points.
- Write the **Go Now** command (4100).
- Allow a 2 second delay.
- Read back the status registers (4000-4006).

Example 1: Setting the Power Factor

The following example shows an inverter being set with a power factor of 0.95 leading. Depending on your requirements, you will need to determine your own register values.

Example 1 parameter settings:

- Power factor = 0.95 leading
- No curtailment
- No delay or randomizing

Table 1. *Example of setting power factor parameters*

Step	Action	Register	Description	Decimal Value	Notes
Advanced Power Controls must be enabled (register 3035 = 5)					
1	Read	4006	Power factor operation error	0	If the value is not 0, determine the error and cause using the Advanced Power Controls operation errors table.
2	Write	4101	Power factor mode	1	Set the fixed power factor mode.
3	Write	4102	Curtailment mode	0	Set to 0 for no curtailment.
4	Write	4108	Action delay	0	0 = Start as soon as **Go Now** is sent, without any delay.
5	Write	4107	Ramp rate	100	Set ramp rate to maximum.
6	Write	4109	Randomize range	0	0 = No randomization of delay. Start immediately.
7	Write	4103	Power factor set point	95	Power factor = 0.95 leading
8	Read	4005	Power factor format error	0	Optional check to verify that the set point was written.
9	Write	4100	Go now	85	Initiate all changes in this example.
Delay for 2 seconds: Allows change to be made and status registers to be updated.					
10	Read	4006	Power factor operation error	0	Verify inverter is functioning properly. An error of 10 is acceptable.

Table 1. Example of setting power factor parameters (Continued)

Step	Action	Register	Description	Decimal Value	Notes
11	Read	4000	Power factor mode	1	Optional check to verify all prior programming.

Example 2: Setting Curtailment

The following example shows an inverter being set with curtailment of 75% of full power using a ramp rate of 5 kVA/second.Depending on your requirements, you will need to determine your own register values.

Example 2 parameter settings:

- Curtailment at 75% of full power
- Ramp rate at 5 kVA
- No delay or randomization

Table 2. Example of setting curtailment parameters

Step	Action	Register	Description	Decimal Value	Notes
Advanced Power Controls must be enabled (register 3035 = 5)					
1	Read	4006	Power factor operation error	0	If the value is not 0, determine the error and cause using the Advanced Power Controls operation errors table.
2	Write	4101	Power factor mode	0	No change to power factor. Power factor = 1.0.
3	Write	4102	Curtailment mode	1	Set fixed curtailment mode.
4	Write	4107	Ramp rate	5	Decrease power by 5 kVA per second ramp rate.
5	Write	4108	Action delay	0	0 = Start as soon as **Go Now** is sent, without any delay.
6	Write	4109	Randomize range	0	0 = No randomization of delay. Start immediately.
7	Write	4105	Curtailment set point %	75	Set curtailment at 75% of full power.
8	Write	4100	Go now	85	Initiate all changes in this example.
Delay for 2 seconds: Allows change to be made and status registers to be updated.					
9	Read	4006	Power factor operation error	0	Verify inverter is functioning properly. An error of 10 is acceptable.
10	Read	4000	Power factor mode read back	0	Optional check to verify all prior programming.

Table 2. Example of setting curtailment parameters (Continued)

Step	Action	Register	Description	Decimal Value	Notes
11	Read	4001	Curtailment mode read back	1	Optional check to verify all prior programming.

Example 3: Setting Power Factor and Curtailment

The following example shows an inverter being set with 0.98 lagging power factor and a curtailment of 85% of full power. Depending on your requirements, you will need to determine your own register values.

Example 3 parameter settings:

- Power factor = 0.98 lagging
- Curtailment = 85% of full power
- No delay or randomization

Table 3. Example of setting power factor and curtailment parameters

Step	Action	Register	Description	Decimal Value	Notes
Advanced Power Controls must be enabled (register 3035 = 5)					
1	Read	4006	Power factor operation error	0	If the value is not 0, determine the error and cause using the Advanced Power Controls operation errors table.
2	Write	4101	Power factor mode	1	Set the fixed power factor mode.
3	Write	4102	Curtailment mode	1	Set fixed curtailment mode.
4	Write	4107	Ramp rate	50	Decrease power by 50 kVA per second ramp rate.
5	Write	4108	Action delay	0	0 = Start as soon as **Go Now** is sent, without any delay.
6	Write	4109	Randomize range	0	0 = No randomization of delay. Start immediately.
7	Write	4103	Power factor set point	-98	Power factor = -0.98 lagging
8	Write	4105	Curtailment set point %	85	Set curtailment at 85% of full power.
9	Write	4100	Go now	85	Initiate all changes in this example.
Delay for 2 seconds: Allows change to be made and status registers to be updated.					
10	Read	4006	Power factor operation error	0	Verify inverter is functioning properly. An error of 10 is acceptable.
11	Read	4000	Power factor mode read back	1	Optional check to verify all prior programming.

Table 3. Example of setting power factor and curtailment parameters (Continued)

Step	Action	Register	Description	Decimal Value	Notes
12	Read	4001	Curtailment mode read back	1	Optional check to verify all prior programming.

Example 4: Setting Action Delay for Multiple Inverters

The following is an example intended for sites with multiple inverters where the effect of the power factor change is spread across time using action delay. Each inverter can be programmed for a different action delay which causes the actual shift in power factor or curtailment to occur incrementally. The random delay registers could also be used to randomize the inverter start times.

The following power factor, curtailment, and action delay parameters are set using the steps in this example. Depending on your requirements, you will need to determine your own register values.

Example 4 parameter settings:

- Power factor = -0.98 lagging
- Curtailment at 60% of full power
- Ramp rate at full speed
- Set action delay

Action delay parameters must be set for each inverter. Inverter one has a Modbus address of 80 and inverter two is address 81 if the network installation is using Modbus RTU over RS-485 serial. For a Modbus TCP network, the inverter address would be replaced with the IP address assigned to each inverter.

To view a change, the Modbus values will need to be read after the action delay and randomization delay time frame has expired. In this example, the power factor and curtailment parameters change will occur on the first inverter 10 seconds before the second inverter.

Table 4. Example of action delayed for multiple inverters

Step	Inverter Address	Action	Register	Description	Decimal Value	Notes
Advanced Power Controls must be enabled (register 3035 = 5)						
1	80 and 81	Read	4006	Power factor operation error	0	If the value is not 0, determine the error and cause using the Advanced Power Controls operation errors table.
2	80 and 81	Write	4101	Power factor mode	1	Set the fixed power factor mode.
3	80 and 81	Write	4102	Curtailment mode	1	Set fixed curtailment mode.
4	80 and 81	Write	4107	Ramp rate	50	Decrease power by 50 kVA per second ramp rate.

Table 4. Example of action delayed for multiple inverters (Continued)

Step	Inverter Address	Action	Register	Description	Decimal Value	Notes
5	80	Write	4108	Action delay	5	Wait 5 seconds after the **Go Now** command before initiating the change for inverter 80.
6	81	Write	4108	Action delay	15	Wait 15 seconds after the **Go Now** command before initiating the change for inverter 81.
7	80 and 81	Write	4109	Randomize range	0	0 = No randomization of delay. Start immediately.
8	80 and 81	Read	4103	Power factor set point	-98	Power factor = -0.98 lagging
9	80 and 81	Write	4105	Curtailment set point %	60	Set curtailment at 60% of full power
10	80 and 81	Read	4005	Power factor format error	0	Optional check to verify the set point was written.
11	80 and 81	Write	4100	Go now	85	Initiate all changes in this example.
Delay for 2 seconds: Allows change to be made and status registers to be updated.						
12	80 and 81	Read	4006	Power factor operation error	0	Verify all changes were accepted. An error value of 10 is acceptable.
13	80 and 81	Read	4000	Power factor mode read back	1	Optional check to verify all prior programming.
14	80 and 81	Read	4001	Curtailment mode	1	Optional check to verify all prior programming.

Example 5: Reading the Inverter Values

The following steps provide an example of how to read back the inverter's parameter values after completing any of the previous Advanced Power Controls parameter settings steps in this section.

☞ **Important**

Reading the percent VA output from register 1038 may not match the curtailment set point in register 4105. This reading is the actual value of VA as a percentage of maximum power and is dependent on available solar power as well as the curtailment setting. If curtailment is set at 75%, but there is only enough sun for 50%, then this value will read 50. If there is enough power for 75% or more, then curtailment will be active and this register will read 75%.

Table 5. Example of reading inverter values

Step	Action	Register	Description	Data Type	Notes
Advanced Power Controls must be enabled (register 3035 = 5)					

Table 5. Example of reading inverter values (Continued)

Step	Action	Register	Description	Data Type	Notes
1	Read	1000 - 1025	Standard values	See Modbus map	Reads the voltage, current, power factor, etc. to verify the inverter is running as expected. Refer to inverter Installation and Operation manual for details on the Modbus register map.
2	Read	1030, 1031	Reactive power	REAL	Reactive power should be close to the expected values for power factor and power.
3	Read	1034, 1035	Apparent power	REAL	Apparent power should be close to the expected values for power factor and power.
4	Read	1038	Percent VA output	UINT	Provides the actual percent of the maximum power currently output. Dependent on available sunlight and curtailment set point.
5	Read	1020, 1021	Total kWh	UDINT	Total real energy produced
6	Read	1032, 1033	Total VARh (positive)	UDINT	Total positive reactive VARh
7	Read	1036, 1037	Total VAh (apparent energy)	UDINT	Total apparent energy
8	Read	1040, 1041	Total VARh (negative)	UDINT	Total negative reactive VARh

MODBUS REGISTER MAPPING

The following tables list the Modbus registers with their location and a description of the data stored in the register.

☞ **Important**

The Modbus master must write all Advanced Power Controls configuration parameters first, followed by a write of 0x0055 to address 44101 to initiate the change.

Table 6. Modbus Advanced Power Controls compatiblity and enabling registers

Description	Start Register	End Register	No. of Registers	Modbus Address	Data Type	Notes
Inverter compatibility check for Advanced Power Controls	29	29	1	40030	UINT	1 = compatible, indicating the Advanced Power Controls is available on this inverter. 0 = not compatible. This inverter needs a firmware upgrade.
Advanced Power Controls status	3035	3035	1	43036	UINT	5 = enabled, indicating Advanced Power Controls is enabled and ready to use on this inverter 10 = disabled, indicating Advanced Power Controls is disabled. This is the default.

Table 7. Modbus Advanced Power Controls status registers

Description	Start Register	End Register	No. of Registers	Modbus Address	Data Type	Notes
Modbus base address = 4000						
Reactive power operating mode	4000	4000	1	44001	UINT	Range = 0 to 1. Refer to the power factor modes table.
Curtailment operating mode	4001	4001	1	44002	UINT	Range = 0 to 1. Refer to the curtailment modes table.
Operations error	4006	4006	1	44007	UINT	See status information and error list.

Table 8. Modbus Advanced Power Controls command registers

Description	Start Register	End Register	No. of Registers	Modbus Address	Data Type	Notes
Modbus base address = 4100						
Control go	4100	4100	1	44101	UINT	Initiates programmed change. Write 0x55 to initiate 44101.

Table 8. Modbus Advanced Power Controls command registers (Continued)

Description	Start Register	End Register	No. of Registers	Modbus Address	Data Type	Notes
Power factor operating mode	4101	4101	1	44102	UINT	Range = 0 to 1. Refer to the power control modes table.
Curtailment operating mode	4102	4102	1	44103	UINT	Range = 0 to 1. Refer to the curtailment modes table.
Power factor set point	4103	4103	1	44104	INT	Range = -90 to -99 and 90 to 100 PF x 100
Curtailment set point (%)	4105	4105	1	44106	UINT	Range = 5 to 100% (tied to register 4113).
Ramp rate	4107	4107	1	44108	UINT	Range = 1 through 50 kVA per second. Default value = 100 for fastest possible rate for inverter model.
Action delay	4108	4108	1	44109	UINT	Range = 0 through 255 seconds
Randomize range	4109	4109	1	44110	UINT	Range = 0 through 255 seconds
Curtailment set point (kVA)	4113	4113	1	44114	UINT	Range = 5 to maximum kVA (tied to register 4105)
Remote enable/ disable	3001	3001	1	43002	UINT	221 = inverter disabled 238 = inverter enablede 0 = inverter enabled by power cycle
Inverter operating status	2100	2100	1	42101	UINT	11 = disabled See inverter Operation and Maintenance manual for a complete list of status codes.

Modbus Register Return Values

The tables in this section list the Advanced Power Controls Modbus command format errors and return values.

The following table lists the command format errors that can occur when the user is setting Advanced Power Controls modes and values. Check this register after changing settings.

Table 9. Advanced Power Controls command format errors

Description	Decimal Value	Notes
Modbus register = 4005		
No error	0	
Updating in process	1	Indicates the **Go Now** command was accepted but is in the middle of making the change. Wait until this goes to zero before reading the status.
Set point out of range	2	The user tried to set a value that is out of range, such as a power factor of 80 or a curtailment of 2000. Refer to the command registers table for valid ranges.
Reserved	3	
Invalid mode	4	User tried to set a mode value that is out of range. OEM mode and fixed power factor modes are supported.
Not supported	5	Firmware version does not support Advanced Power Controls or unsupported mode was attempted.
Reserved	6	
Reserved	7	
Reserved	8	

This table describes the Advanced Power Controls operation errors that can occur independent of the user making changes to set points or modes. Check register 4006 on a regular basis to verify changed parameters or settings.

Table 10. Advanced Power Controls operation errors

Description	Decimal Value	Notes
Modbus register = 4006		
No error	0	

Table 10. Advanced Power Controls operation errors (Continued)

Description	Decimal Value	Notes
Communications error	9	This error occurs if there is a hardware communications failure or if a service technician is using the software Command Center. The power factor command values cannot be read or written when this error is active. Any value that is programmed while this error is active will be sent to the inverter as soon as communications resume. All voltage, power, and other Modbus registers will read "0" when this error is active.
Internal or network clock error	10	Could not get a valid time from either NTP (Network Time) or the battery-backed real time clock. Fixed power factor and curtailment parameters will continue to be in effect. This error can be ignored for normal operation.

This table lists the possible Advanced Power Controls modes.

Table 11. Power factor modes

Description	Decimal Value	Notes
Modbus register = 4101 (write), 4000 (read)		
OEM	0	OEM mode means the inverter is operating using the factory default setting.
Fixed power factor	1	Enables power factor to be set based on the value of address 44104. Refer to the command registers table for valid ranges.

This table describes the mode settings for power output curtailment control.

Table 12. Curtailment modes

Description	Decimal Value	Notes
Modbus register = 4102 (write), 4001 (read)		
OEM	0	OEM mode means the inverter is operating using the factory default setting.
Fixed curtailment	1	Enables curtailment to be set based on value of address 44106. Refer to command registers table for valid ranges.

TROUBLESHOOTING

The following Modbus registers can contain the values listed in the following table.

- 4005: Format or schedule error
- 4006: Operations error

If the returned value of either register is 2 through 10, use the action listed in the following table to resolve the error.

Table 13. Advanced Power Controls status information and errors

Error Description	Decimal Value	Action
No error	0	No action required.
Updating	1	Wait for inverter to complete update.
Set point out of range	2	Reset the set point value within the range values provided in the command registers table.
Reserved	3	No action required.
Invalid mode	4	Select a valid power factor mode from the values provided in the power factor modes table.
Not supported	5	Firmware version does not support Advanced Power Controls or unsupported mode was attempted.
Reserved	6	No action required.
Reserved	7	No action required.
Reserved	8	No action required.
DSP communication error	9	Communication link error
Internal or network clock error	10	No action required.

MODBUS COMMANDS

Basic Modbus commands are supported on applicable AE commercial units. The commands in the following table are used to read and write (set) operating parameters or obtain the unit's identifying information.

Table 14. Modbus commands

Command Name	Command Number	Description
Read Holding Register	03	Read value from the register
Write (preset) Single Register	06	Write value to the register

Table 14. Modbus commands (Continued)

Command Name	Command Number	Description
Return Slave ID	17	Returns a text string containing the ID number of the unit. The format of the ID returned is dependent on the version of the unit.

Modbus Command Format

The **Read Holding Register** command is used to read values from Modbus registers.

Table 15. Format for Read Holding Register command

Command Information	Command Layout
Modbus address	nn
Command number	03
First register MSB	xx
First register LSB	xx
Data MSB	xx
Data LSB	xx
CRC LSB	xx
CRC MSB	xx

Table 16. Response format for Read Holding Register command

Response Information	Response Layout
Modbus address	nn
Command number	03
Number of bytes of data	n
First register MSB	xx
First register LSB	xx
Second register MSB	xx
Second register LSB	xx
Nth register MSB	xx
Nth register LSB	xx
CRC LSB	xx
CRC MSB	xx

The **Write Single Register** command is used to write data to a register.

Table 17. Format for Write Single Register command

Command Information	Command Layout
Modbus address	nn
Command number	06
First register MSB	xx
First register LSB	xx
Nth register MSB	xx
Nth register LSB	xx
CRC LSB	xx
CRC MSB	xx

Table 18. Response format for Write Single Register command

Response Information	Response Layout
Modbus address	nn
Command number	06
Number of bytes of data	n
First register MSB	xx
First register LSB	xx
Data MSB	xx
Data LSB	xx
CRC LSB	xx
CRC MSB	xx

Return Slave ID

The **Return Slave ID** command is used to read a text string containing the ID number of the unit.

Table 19. Format for Return Slave ID

Command Information	Command Layout
Modbus slave address	nn (1-126)
Command number	11h

Table 20. Format for Return Slave ID command

Response Information	Response Layout
Modbus slave address	11h
Command number	n

Table 20. *Format for Return Slave ID command (Continued)*

Response Information	Response Layout
Number of bytes of data	xx
Data 1	xx
Data 2	xx
Data n	xx
CRC LSB	xx
CRC MSB	xx

AE SOLAR ENERGY TECHNICAL SUPPORT

Please contact AE Solar Energy Technical Support if you have questions or problems that cannot be resolved by working through the provided troubleshooting. When you call Solar Energy Technical Support, make sure to have the unit serial number and part number. These numbers are available on unit labels.

Table 21. *AE Solar Energy Technical Support 24 X 7 contact information*

Office	Contact
AE Solar Energy Technical Support 20720 Brinson Blvd Bend, OR 97701 USA ☞ **Important** For returns and repairs, please call Solar Energy Technical Support to request an RMA and obtain the correct shipping address.	Phone (24 hrs/day, 7 days/week): Inside the U.S., call 877.312.3832 or Outside the U.S., call +1.541.323.4143 Email: (We will respond to email by the next business day.) invertersupport@aei.com
If you would prefer to contact a local or regional sales or service office, visit the Advanced Energy web site for current contact information: • http://www.advanced-energy.com	

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