

435NBX-S2E
Serial ASCII to/from
Allen-Bradley PLC Gateway
Product Quick Start

Firmware Version: 1.0.0

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Overview

The 435NBX gateway seamlessly connects a serial ASCII device to a ControlLogix, CompactLogix, FlexLogix, Micro820, Micro850, Micro870, MicroLogix, PLC-5E, SLC5/05 or other legacy PLC featuring a NetENI module.



Tools and documents available online: <http://www.rtautomation.com/product/435-nbx-support/>

If you need further assistance at any time do not hesitate to call Real Time Automation support. Support

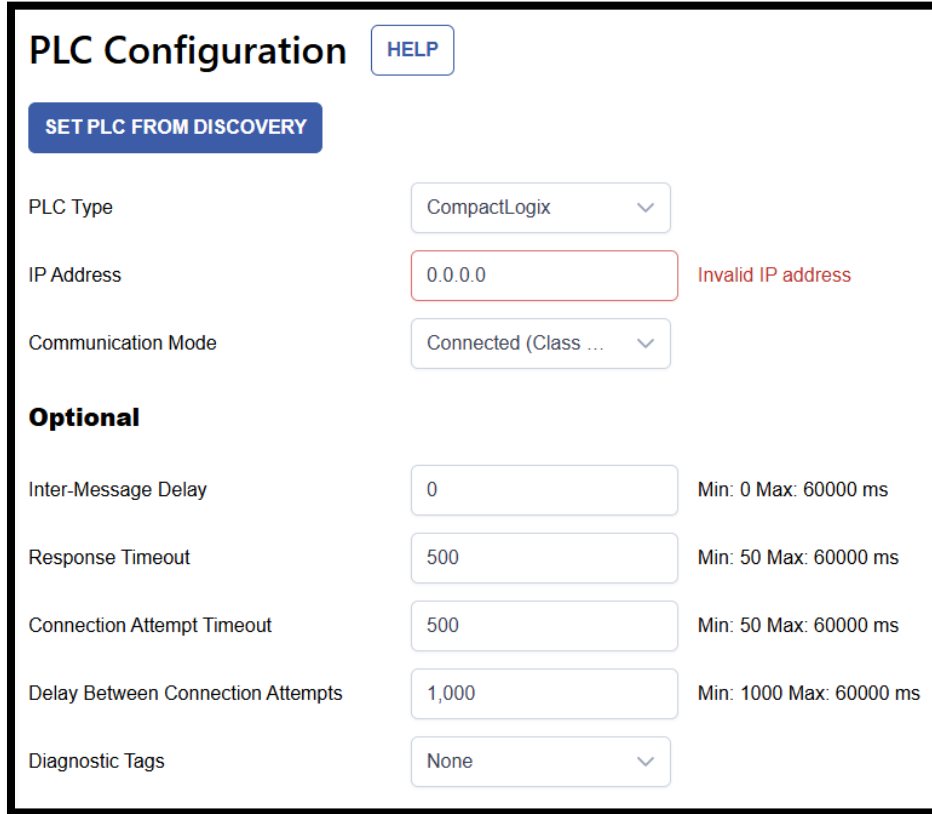
Hours are Monday-Friday 8am-5pm CST

Phone: 800-249-1612

Email: support@rtaautomation.com

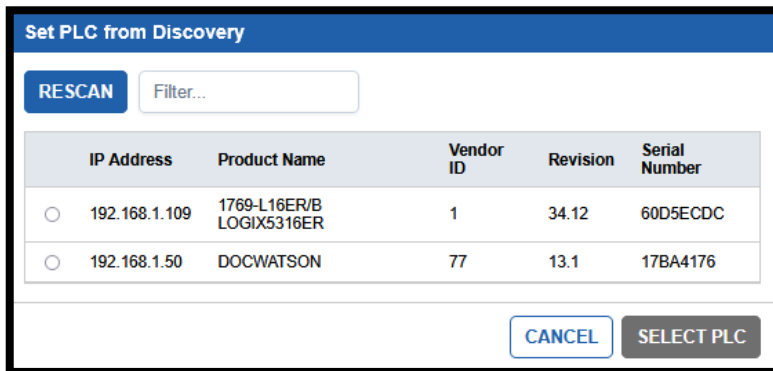
PLC Configuration

Click the PLC Configuration page.



The screenshot shows the 'PLC Configuration' window. At the top left is a 'SET PLC FROM DISCOVERY' button, and at the top right is a 'HELP' button. Below these are three input fields: 'PLC Type' (a dropdown menu showing 'CompactLogix'), 'IP Address' (a text box with '0.0.0.0' and a red border, with the text 'Invalid IP address' to its right), and 'Communication Mode' (a dropdown menu showing 'Connected (Class ...)'). Below these is a section titled 'Optional' with four more input fields: 'Inter-Message Delay' (0, Min: 0 Max: 60000 ms), 'Response Timeout' (500, Min: 50 Max: 60000 ms), 'Connection Attempt Timeout' (500, Min: 50 Max: 60000 ms), and 'Delay Between Connection Attempts' (1,000, Min: 1000 Max: 60000 ms). At the bottom is a 'Diagnostic Tags' dropdown menu showing 'None'.

1. To Automatically discover the Allen-Bradley PLC, click the Set PLC from Discovery button.
 - a. Select your PLC you wish to add to the 435NBX.
 - b. Click the Select PLC button.
 - c. Configuring the PLC through Discovery, will automatically fill in the PLC Type, IP Address and Controller Slot (ControlLogix PLC Only).
 - d. If you do not see your PLC in the list, then the 435NBX and the PLC are on two separate networks.



The screenshot shows the 'Set PLC from Discovery' dialog box. It has a blue header bar with the title 'Set PLC from Discovery'. Below the header is a 'RESCAN' button and a 'Filter...' text box. Below these is a table with the following columns: IP Address, Product Name, Vendor ID, Revision, and Serial Number. The table contains two rows of data. At the bottom of the dialog are 'CANCEL' and 'SELECT PLC' buttons.

	IP Address	Product Name	Vendor ID	Revision	Serial Number
☐	192.168.1.109	1769-L16ER/B LOGIX5316ER	1	34.12	60D5ECDC
☐	192.168.1.50	DOCWATSON	77	13.1	17BA4176

2. PLC Type: Select which PLC you are using.
 - a. If using Logix PLC, all processors are compatible.
 - b. If using a PLC5E, then it must be Series C, Revision N.1 or later; Series D, Revision E.1 or later; or Series E, Revision D.1 or later.
 - c. If using a SLC5/05, then it must be: Series A, Version OS501; or FRN5 Series B and Series C or later.
 - d. If using a NetENI module, select based on the Processor it is connected to.
3. IP Address: Enter the IP Address of the PLC.
4. Controller Slot: Enter the slot that the Controller is located in.
 - a. If you are using an Integrated Ethernet Card, enter slot 0.
 - b. For Logix processors, this is not the slot of the Ethernet Adapter.
5. Communication Mode:
 - a. Connected (Class 3 Explicit) messaging relies on reserved resources to transfer data to/from the PLC. Connected (Class 3 Explicit) messaging is recommended if you are reading and writing and always want to keep that connection open to the PLC.
 - b. Unconnected (UCMM) messaging relies on shared resources to transfer data to the PLC. This could result in message timeouts if there are a lot of devices fighting for these shared buffers. If you don't want the RTA gateway to constantly keep the connection open to the PLC but only maintain a connection when there is data needed to be transferred, then Unconnected (UCMM) will work best if you are only writing to the PLC.
6. Inter-Message Delay: The amount of time, in milliseconds, to delay between read and write requests the gateway sends to the PLC.
 - a. This setting will affect the speed at which a message is delivered and the amount of traffic the gateway adds to the network.
 - b. If set to 0, the gateway will communicate as fast as possible to the PLC and generate the most traffic.
 - c. In applications with a heavy network, it is recommended that you increase this delay to limit network traffic.
7. Response Timeout: The amount of time, in milliseconds, the gateway should wait before a timeout is issued for a read and write request.
8. Connection Attempt Timeout: The amount of time, in milliseconds, to wait for an accepted connection to the PLC before issuing a connection timeout.
9. Delay Between Connection Attempts: The amount of time, in milliseconds, to wait between a failed connection and the next attempt.
10. Diagnostic Tags: This Tag or File will act as an incremental counter for messages passed through the gateway.
 - a. For RSLogix5000 Family: This should be an INT Data Type Tag.
 - b. For RSLogix500 Family: This should be an N Register.
 - c. This can be used to monitor if the gateway has stopped communicating with the PLC.
11. Diagnostic UDT Tag/File:
 - a. Enter a Tag/File that is defined in the PLC, based on the selection.
 - b. Heartbeat: Free running counter to let the PLC know that the 435NBX is active.

c. Diagnostic UDT or INT Array:

- i. If using RSlogix 5000, this Tag must use the UDT link provided (right click as save as).
- ii. If using RSlogix 500, create an N file with 6 elements.
 - Bit_Map_Status: bit map of the ASCII devices communicating.
 - Value 1 = Serial Port is TX/RX data
 - ASCII_Event_Delimiter: number of messages called complete due to delimiters.
 - ASCII_Event_Length: number of messages called complete due to max number of characters received.
 - ASCII_Event_Timeout: number of messages called complete due to the timer being reached.
 - ASCII_Event_Discard: number of messages called complete, but the RTA unit had to discard them due to the queue being full.

For step-by-step instruction on how to set up the UDT, please see [Appendix D](#).

Serial Configuration

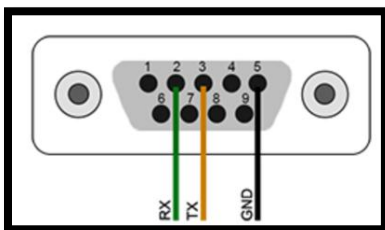
Click the Serial Configuration page.

Serial Configuration

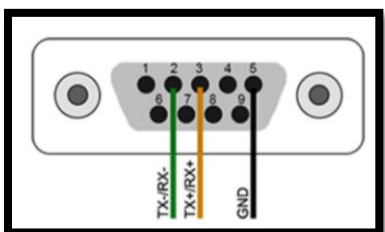
Mode	RS-232
Baud Rate	19200
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

- By default, Serial Port is configured for RS232. The Serial Port can be configured for RS232 or RS485 communication.
 - If RS485 is selected, change the hardware switch in the product.
- All serial settings must match the serial device being connected. If any of these fields are incorrect, proper communication will not be possible.

RS232 pinout

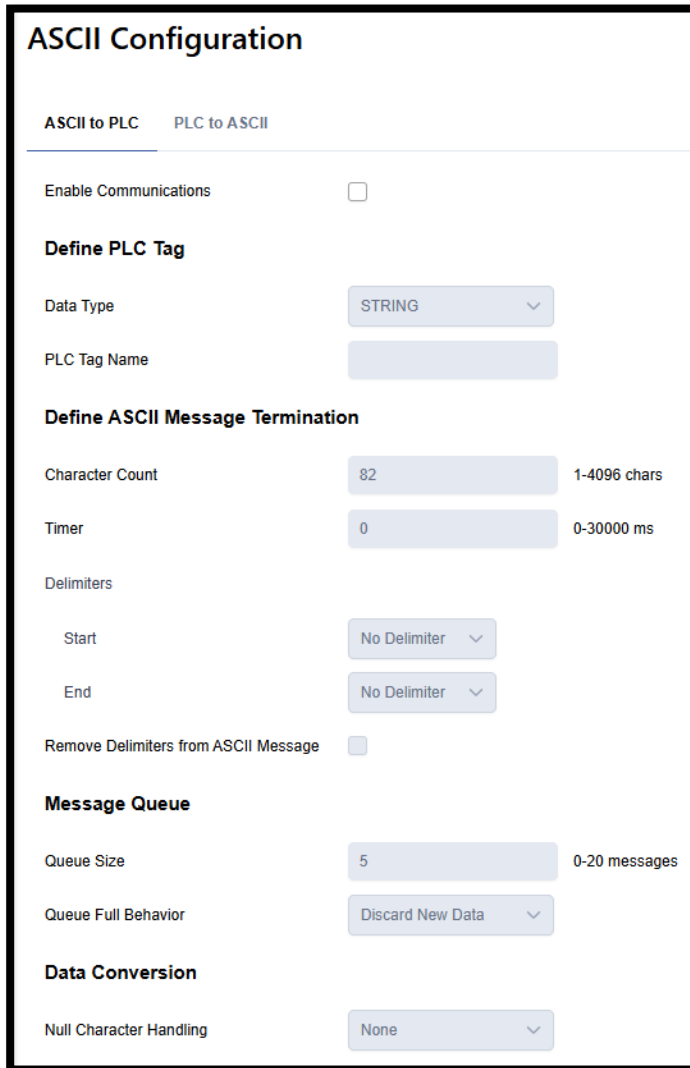


RS485 pinout



ASCII Configuration - ASCII to PLC

Click the ASCII Configuration page and navigate to the ASCII to PLC direction.



The screenshot shows the 'ASCII Configuration' web interface. At the top, there are two tabs: 'ASCII to PLC' (selected) and 'PLC to ASCII'. Below the tabs, there is a section 'Enable Communications' with an unchecked checkbox. The next section is 'Define PLC Tag', which includes a 'Data Type' dropdown menu set to 'STRING' and a text input field for 'PLC Tag Name'. Below this is the 'Define ASCII Message Termination' section, which includes a 'Character Count' input field set to '82' (with a range of '1-4096 chars' to its right), a 'Timer' input field set to '0' (with a range of '0-30000 ms' to its right), and two 'Delimiters' dropdown menus for 'Start' and 'End', both set to 'No Delimiter'. There is also a checkbox for 'Remove Delimiters from ASCII Message' which is unchecked. The next section is 'Message Queue', which includes a 'Queue Size' input field set to '5' (with a range of '0-20 messages' to its right) and a 'Queue Full Behavior' dropdown menu set to 'Discard New Data'. The final section is 'Data Conversion', which includes a 'Null Character Handling' dropdown menu set to 'None'.

Define PLC Tag / File

1. Data Type: Select the Data Type for the Tag / File Name that you defined in the PLC.
2. Enter the Tag / File name you want the gateway to move the ASCII message to.
 - a. The Tag / File must be defined in the PLC and must match exactly.
 - b. Most of the time, the Tag Name is defined within the Controller Scope of the PLC for Read/Write Access.
 - i. To configure our gateway for a Program Scope Tag, see [Appendix C](#) for instructions.

Define ASCII Message Termination

1. To define an ASCII message, you must select one or more of the following end cases: Character Count, Timer or Delimiters.
 - a. Character Count: Enter the max number of characters that the device could output.

Example: If your device sends a four-digit temperature, set the length to 4.

 - a. If using an INT Data Type, this is also the dimension size/2 + 1 of the Tag / File.
 - b. If using a SINT Data Type, this is also the dimension size + 2 of the Tag / File.
 - c. For Controllers using RSLogix 5000 or Studio5000 or Logix Designer, the range for each data type is:
 - i. STRING/INT/SINT: 1-4096 characters
 - STRING: If using more than 82 characters, a User Defined Data Type must be created within the PLC and used. Refer to [Appendix B](#) for instructions.
 - ii. For Controllers using RSLogix 500, the range for each data type is:
 - STRING: 1-82 characters
 - INT: 1-200 characters
 - SINT: Not Used
 - iii. For Controllers using Connected Components Workbench (CCW), the range for each data type is:
 - STRING: 1-255 characters
 - INT: 1-200 characters
 - SINT: 1-400 characters
 - b. Timer: Use this option if your device sends data of varying lengths and does not have end delimiters. This is the amount of time we will wait after the last character of a message before considering the message complete.
 - c. Delimiters:
 - i. Start: Select how many Start Delimiters to look for in the ASCII message. Use this feature if the ASCII message has common starting delimiter(s), (characters at the beginning of every message).
 - ii. End: Select how many End Delimiters to look for in the ASCII message. Use this feature if the ASCII message has common end delimiter(s). <CR><LF> is a common example.
 - iii. Remove Delimiters: If using any Start or End Delimiters and you do not want them to be sent to the PLC, then enable this checkbox.

Message Queue

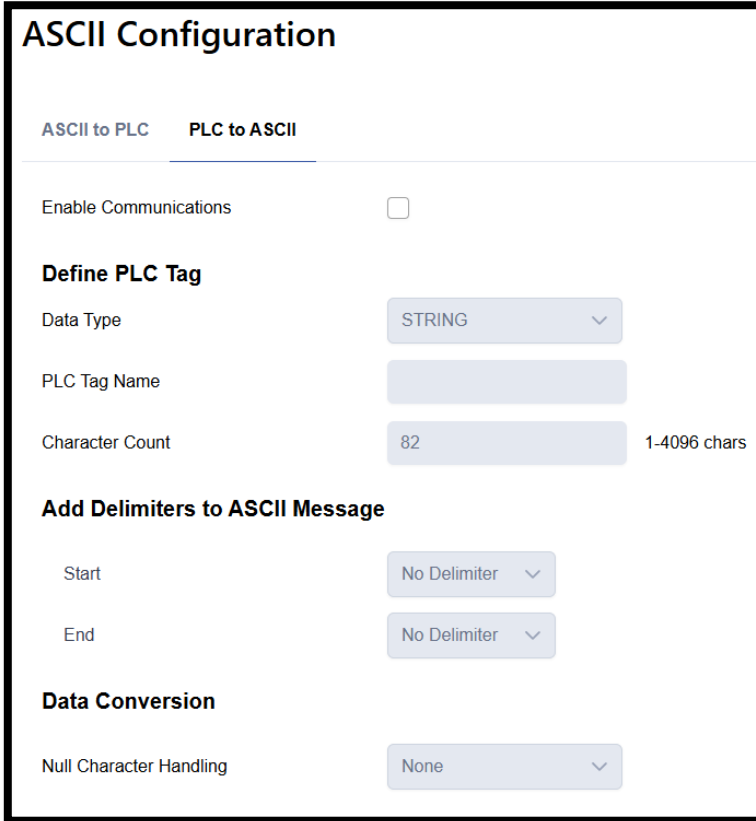
1. Queue Size: Enter the number of complete messages you want the gateway to hold before discarding.
2. Queue Full Behavior: If the Queue is full, the gateway will discard messages in one of the following ways:
 - a. Discard New Data: Gateway will discard any new messages.
 - b. Overwrite Oldest Data: Gateway will overwrite oldest message with new data.

Data Conversion

1. NULL Character Handling: Select how the gateway will handle the NULL Character.
 - a. None (Default): Does no additional conversion on the data before sending it to the PLC.
 - b. Remove All NULLs: Removes all NULL characters from the ASCII Message before sending it to the PLC.

ASCII Configuration - PLC to ASCII

Click the ASCII Configuration page and navigate to the PLC to ASCII direction.



The screenshot shows the 'ASCII Configuration' window with the 'PLC to ASCII' tab selected. It includes sections for 'Enable Communications' (unchecked), 'Define PLC Tag' (with fields for Data Type: STRING, PLC Tag Name, and Character Count: 82), 'Add Delimiters to ASCII Message' (with Start and End dropdowns set to 'No Delimiter'), and 'Data Conversion' (with Null Character Handling set to 'None').

Define PLC Tag / File

1. Data Type: Select the Data Type for the Tag / File Name that you defined in the PLC.
2. Enter the Tag / File name that you want the gateway to monitor for messages.
 - a. The Tag / File must be defined in the PLC and must match exactly.
 - b. Most of the time, the Tag Name is defined within the Controller Scope of the PLC for Read/Write Access.
 - To configure our gateway for a Program Scope Tag, see [Appendix C](#) for instructions.
3. Character Count: Enter the maximum number of characters that the gateway can send to the ASCII device.
 - a. If using an INT Data Type, this is also the dimension size/2 + 1 of the Tag / File.
 - b. If using a SINT Data Type, this is also the dimension size + 2 of the Tag / File.
 - c. For Controllers using RSLogix 5000 or Studio5000 or Logix Designer, the range for each data type is:
 - i. STRING/INT/SINT: 1-4096 characters
 - ii. STRING: If using more than 82 characters, a User Defined Data Type must be created within the PLC and used. Refer to [Appendix B](#) for instructions.
 - d. For Controllers using RSLogix 500, the range for each data type is:
 - i. STRING: 1-82 characters

- ii. INT: 1-200 characters
 - iii. SINT: Not Used
- e. For Controllers using Connected Components Workbench (CCW), the range for each data type is:
 - i. STRING: 1-255 characters
 - ii. INT: 1-200 characters
 - iii. SINT: 1-400 characters

Add Delimiters to ASCII Message

1. Delimiters: Configure the characters to add to the message.
 - a. Start: Use this feature to add a common starting delimiter(s) to messages being sent to the ASCII device.
 - i. Use this feature only if your ASCII device requires such delimiters.
 - ii. All ASCII messages will receive the starting delimiters selected.
 - b. End: Use this feature to add a common end delimiter(s) to messages being sent to the ASCII device.
 - i. Use this feature only if your ASCII device requires such delimiters.
 - ii. All ASCII messages will receive the end delimiters selected.

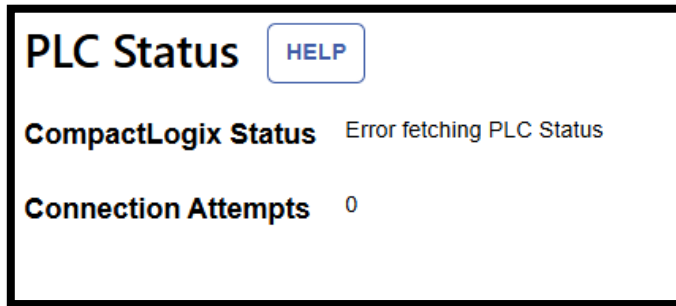
Data Conversion

1. Data Conversion:
 - a. None (Default): Does no additional conversion on the data before sending it from the gateway to the ASCII device.
 - b. Prepend NULL: Adds a NULL character to the beginning of each message that is to be sent from the gateway to the ASCII device.
 - c. Postpend NULL: Adds a NULL character to the end of each message that is to be sent from the gateway to the ASCII device.

Diagnostics

PLC Status

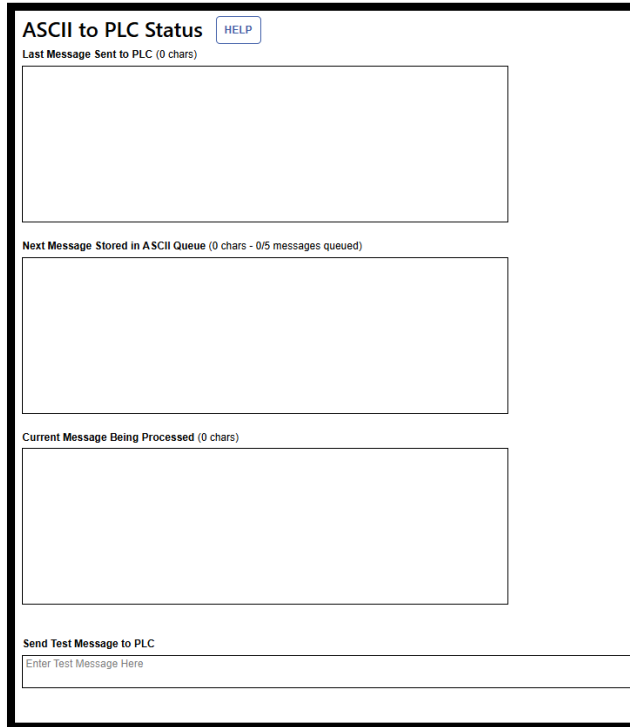
From the Diagnostics menu, click the PLC Status page.



1. PLC Status: Shows the same information that is on the Home page diagnostics. See the [Home Page Device Status](#) section for further explanations.
2. Connection Attempts: This value increases every time the 435NBX loses connection to the PLC and attempts to reconnect.
3. Write Heartbeat to PLC: if the Heartbeat is configured in the PLC Configuration > Diagnostic Tags
 - a. OK: Number of successful write message to the heartbeat Tag/File name.
 - b. Error: Number of failed write messages to heartbeat Tag/File name.
 - c. Last Error: Specific error information pertaining to the last failed heartbeat Tag/File name.
4. Write Diagnostic UDT to PLC: if the Diagnostic UDT is configured in the PLC Configuration > Diagnostic Tags
 - a. OK: Number of successful write message to the diagnostic UDT Tag or INT Array name.
 - b. Error: Number of failed write messages to the diagnostic UDT Tag or INT Array name.
 - c. Last Error: Specific error information pertaining to the last failed diagnostic UDT Tag or INT Array name.

ASCII to PLC Status (Messages)

From the Diagnostics menu, click the Status page and select the ASCII to PLC Status tab.



The screenshot shows the 'ASCII to PLC Status' window. At the top left is the title 'ASCII to PLC Status' and a 'HELP' button. Below the title are three large text input fields. The first field is labeled 'Last Message Sent to PLC (0 chars)'. The second field is labeled 'Next Message Stored in ASCII Queue (0 chars - 0/5 messages queued)'. The third field is labeled 'Current Message Being Processed (0 chars)'. At the bottom, there is a section titled 'Send Test Message to PLC' with a sub-label 'Enter Test Message Here' and a corresponding text input field.

1. Last Message Sent to PLC (chars):
 - a. This buffer shows the last message that was successfully sent to the PLC.
2. Next Message Stored in ASCII Queue (chars – messages queued):
 - a. This buffer shows the next ASCII message waiting to be sent.
 - b. This ASCII message will only be sent to the PLC if the Length field within the Tag/File is set to zero, indicating the last message has been processed.
 - i. When using String Data Type, the .LEN needs to be set to 0.
 - ii. When using INT Data Type, the 1st array index [0] needs to be set to 0.
 - iii. When using SINT Data Type, the 1st and 2nd array index [0] & [1] needs to be set to 0.
3. Current Message Being Processed (chars):
 - a. This buffer shows the real time data that the ASCII device is sending out to the 435NBX gateway.
 - b. All data in this buffer is pending due to one of the three end cases not being met. Those end cases are Character Count, Timer and Delimiters.
4. Send Test Message to PLC:
 - a. Use this field to send a test message to the PLC.
 - b. PLC and ASCII to PLC direction must be configured to use this feature.
 - c. This message will not work if buffer is already full. Message will be discarded.

ASCII to PLC Status (Counters)

Diagnostic Counters

ASCII Event

Delimiter	0
Length	0
Timeout	0
Discards	0

Read Handshake Message from PLC

OK	0
Error	0
Last Error	

Write ASCII Message to PLC

OK	0
Error	0
Last Error	

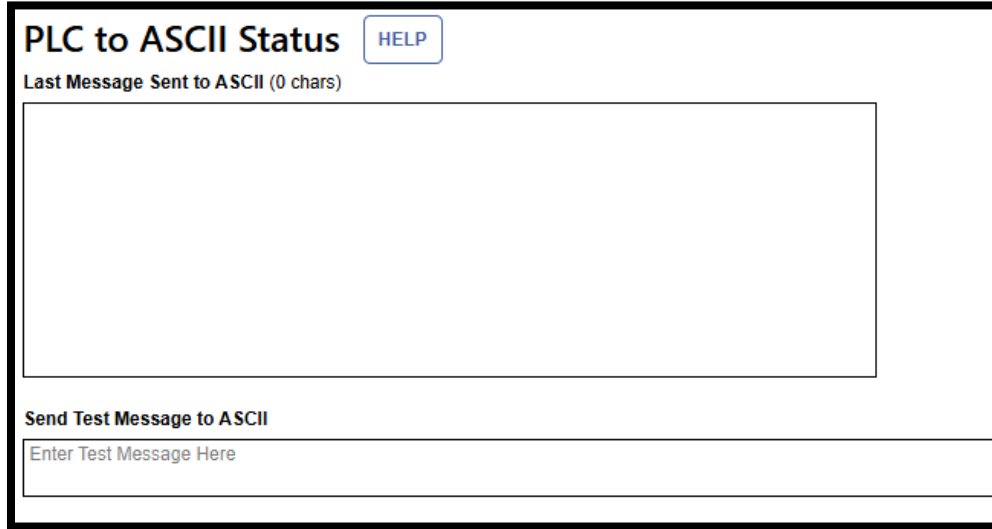
1. ASCII Event:
 - a. Delimiter: Increases if a successful ASCII message was received with delimiters being read.
 - b. Length: Increases if a successful ASCII message was received containing the max character count.
 - c. Timeout: Increases if a successful ASCII message was received with the timer value being reached.
 - d. Discards: Increases if a message was thrown away due to the ASCII queue buffer being full.
2. Read Handshake Message from PLC:
 - a. OK: Increases when the length field is non-zero in the PLC.
 - b. Error: Increases when there is an error with the Tag/File in the PLC.
 - c. Last Error: This will report the most recent error.

Note: Errors that show up here are reported from either the 435NBX or the PLC. For detailed errors and explanations, please see [Appendix A](#).
3. Write ASCII Message to PLC:
 - a. OK: Increases with every successful message sent from ASCII to the PLC.
 - b. Error: Increases when there is an error writing the Tag / File.
 - c. Last Error: This will report the most recent error found.

Note: Errors that show up here are reported from either the 435NBX or the PLC. For detailed errors and explanations, please see [Appendix A](#).

PLC to ASCII Status (Messages)

This page will automatically refresh to show the latest data.



The screenshot shows a web interface titled "PLC to ASCII Status" with a "HELP" button. Below the title, it says "Last Message Sent to ASCII (0 chars)". There is a large empty rectangular box for the message. At the bottom, there is a section titled "Send Test Message to ASCII" with a text input field labeled "Enter Test Message Here".

1. Last Message Sent to ASCII (chars):
 - a. This buffer shows the last message that was sent to the ASCII device.
 - b. Data portion should be filled first and then the Length field. When the Length is non-zero, the gateway will process it and then set to 0, indicating another message can be sent.
 - i. When using String Data Type, length is set using the .LEN field.
 - ii. When using INT Data Type, the length is the 1st array index [0].
 - iii. When using SINT Data Type, the length is the 1st and 2nd array index [0] & [1].
2. Send Test Message to ASCII:
 - a. Use this field to bypass the PLC and send a test message out to the ASCII device from the gateway. All delimiter information configured in the ASCII Configuration section will be applied when a message is sent.
 - b. Use this field to send a test message to the PLC.
 - c. PLC and PLC to ASCII direction must be configured to use this feature.

PLC to ASCII Status (Counters)

Diagnostic Counters
Read ASCII Message from PLC
OK 0
Error 0
Last Error

Write Handshake Message to PLC
OK 0
Error 0
Last Error

[CLEAR COUNTERS](#)

1. Read ASCII Message from PLC:
 - a. OK: Increases with every read request for the length field from the gateway.
 - b. Error: Increases when there is an error with the Tag/File Name in the PLC.
 - c. Last Error: This will report the most recent error found.
[Note: Errors that show up here are reported from either the 435NBX or the PLC. For detailed errors and explanations, please see Appendix A.](#)
2. Write Handshake Message to PLC:
 - a. OK: Increments with every successful message sent from PLC to the ASCII device.
 - b. Error: Increments when there is an error with the Tag/File Name in the PLC.
 - c. Last Error: This will report the most recent error found.
[Note: Errors that show up here are reported from either the 435NBX or the PLC. For detailed errors and explanations, please see Appendix A.](#)