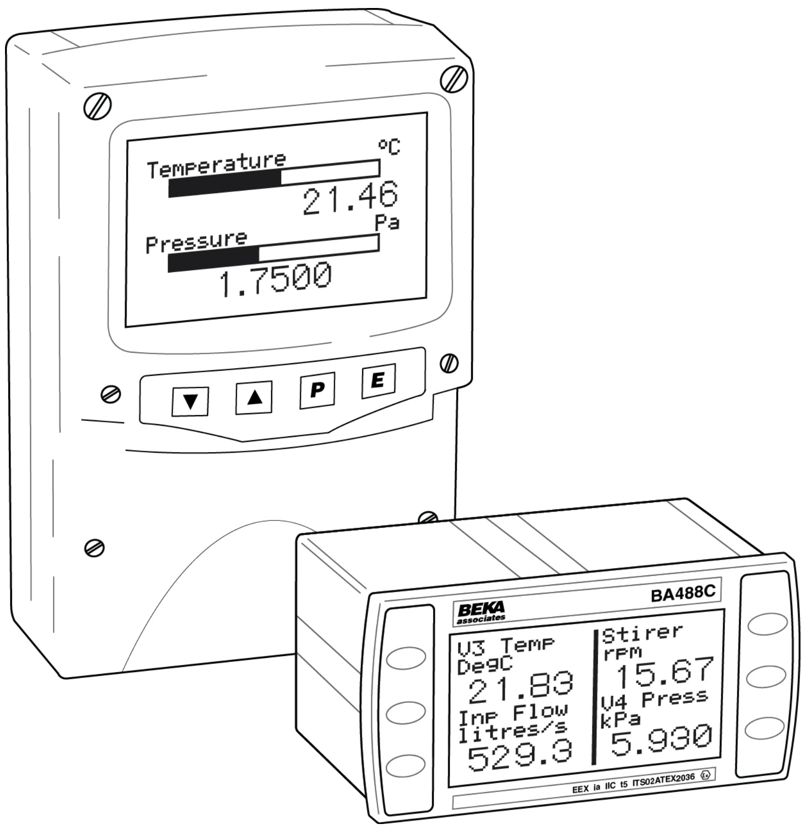
Serial Text Display

Modbus Interface Guide

[Version 3.4 Firmware]



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This guide applies to the following models:

BA488C - *Panel mounted, Intrinsically Safe*
BA484D - *Field mounted, Intrinsically Safe*
BA688C - *Panel mounted, Safe Area*
BA684D - *Field mounted, Safe Area*

Contents

Introduction

This guide gives all the necessary information to use our Serial Text Displays in a Modbus installation.

Several other protocols are commonly used in industry which we may choose to support as market demand rises. This guide and others will periodically be updated, so please come back to our website regularly for the latest information.

For hardware installation information, please refer to the separate instruction manuals available for each model.

For information on customising the screen displays of the Serial Text Display, please refer to the "Serial Text Display Programming Guide".

What's in this Modbus Interface Guide

- An overview of each instrument
- A description of the parameters that are applicable to each instrument.
- Instructions on how to use the instrument in its standard non-programmed modes

What's in the Programming Guide

- A description of the Serial Text Display
- An overview of the protocol
- Specific information on more advanced features
- A command summary, where the commands are grouped together by function and presented in a series of tables
- A command reference, where each command is listed in alphabetical order and covered in detail. The information is presented in a consistent layout and examples given to demonstrate the use of the command in context.

What's in the Instruction Manuals

- An overview of the instrument
- Intrinsic Safety Certification information
- System Design and Installation
- Configuration
- Maintenance

What's new in this version

- Numeric data can now be entered into 16 and 32 bit integer registers in addition to floating point registers
- Two additional standard screens have been added to show all 8 variables at once
- Unused variables can now be hidden from standard screens
- String variables have been added to scripting commands

Other sources of information

Our website at ***www.beka.co.uk*** is kept up to date with the latest literature and information

After reading through this guide, if you still have a problem getting the results you need then email us at ***support@beka.co.uk*** and we will do our best to help you

Product Overview

A detailed overview of the instrument is given in the instruction manual for each product. This should be read before implementing any system using these instruments. However it is useful to summarise the main features of the product before attempting to design any controlling software application.

Display

The instrument display is organised as 120 pixels horizontally by 64 pixels vertically. Each pixel is approximately 0.7mm square which makes it ideal for displaying text and simple graphics. The size of the pixels improves the contrast and hence the readability at greater distances.

The display is also backlit by an ultra-efficient green LED module which enables the screen to be viewed in all conditions, from bright sunlight to total darkness.

Analogue Input Display

The primary purpose of this instrument is to display process variables that exist in a system. Eleven pre-programmed screen layouts are available to display one, two, three, four or eight variables simultaneously. A total of eight (8) variables can be accessed by using the front panel push buttons.

For applications that require a customised display, the unit can be programmed by following the instructions in the "Serial Text Display - Programming Guide" (available from www.beka.co.uk). It is possible to map a number of Modbus registers to a corresponding set of formatted text strings such that they are automatically updated without any further intervention. As this guide concentrates on the non-programmed modes of operation, such advanced use is outside the scope of this document.

Switch Inputs

There are six switches on the front of the panel mounted instrument, and four on the field mounted instrument. Both models have the option of overriding these with up to six external switches which can be sized and labelled to suit the application. The status of these switches can be read via Modbus registers.

Switch Outputs

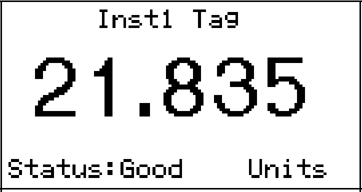
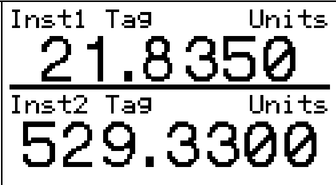
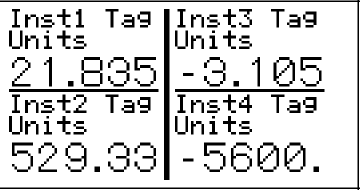
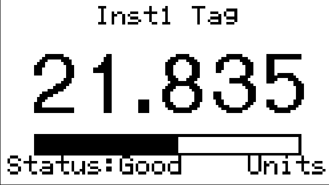
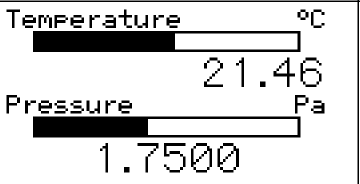
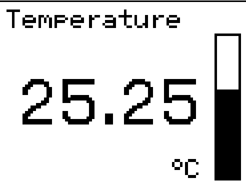
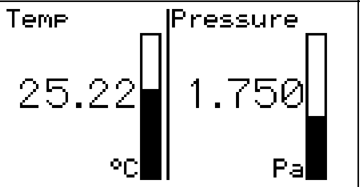
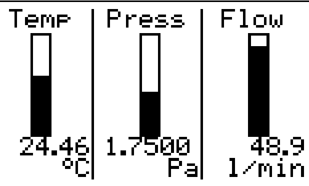
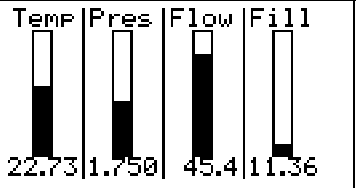
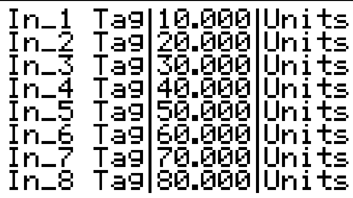
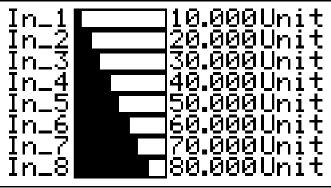
There are two switch outputs available. These are totally isolated and can be energised or de-energised independently of each other. They are controlled by Modbus registers and are intended to be used for indication only.

Standard Screens

There are eleven standard screens available which require no application programming. They are capable of displaying a selection of up to eight process variables, together with their units of measure and tag description. Once a screen format has been chosen, each input variable can be brought into view by pressing the up and down arrow keys.

These standard screens are ideal for many simple applications and can be implemented very quickly. However, where a unique display format is required these can be built up using the commands that can be found in the "Serial Text Display – Programming Guide"

The screen format is selected by either using the local menu (as described in the Instruction Manual) or by using the ***"Screen Option"*** Modbus register. One of eleven standard display formats can be selected as shown in the following table:

Screen Option 1	 Inst1 Tag 21.835 Status:Good Units	Screen Option 2	 Inst1 Tag Units 21.8350 Inst2 Tag Units 529.3300
Screen Option 3	 Inst1 Tag Units 21.835 | Inst3 Tag Units -3.105 Inst2 Tag Units 529.33 | Inst4 Tag Units -5600.	Screen Option 4	 Inst1 Tag 21.835 Status:Good Units
Screen Option 5	 Temperature °C 21.46 Pressure Pa 1.7500	Screen Option 6	 Temperature 25.25 °C
Screen Option 7	 Temp 25.22 °C | Pressure 1.750 Pa	Screen Option 8	 Temp 24.46 °C | Press 1.7500 Pa | Flow 48.9 l/min
Screen Option 9	 Temp 22.73 | Pres 1.750 | Flow 45.4 | Fill 11.36	Screen Option 10	 In_1 Tag 10.000 Units In_2 Tag 20.000 Units In_3 Tag 30.000 Units In_4 Tag 40.000 Units In_5 Tag 50.000 Units In_6 Tag 60.000 Units In_7 Tag 70.000 Units In_8 Tag 80.000 Units
Screen Option 11	 In_1 10.000Unit In_2 20.000Unit In_3 30.000Unit In_4 40.000Unit In_5 50.000Unit In_6 60.000Unit In_7 70.000Unit In_8 80.000Unit	Screen Option 0	Custom screens

Setting the ***"Screen Option"*** Modbus register to a value of 0 will allow custom screens to be displayed by using BEKA protocol commands.

General Operation

The primary purpose of a BEKA Serial Text Display when using the Modbus protocol is to enable local indication of up to 8 process variables. This is normally achieved by writing to the Modbus cyclic data registers which are mapped out in tables starting on page 13.

It is important to note that some input registers are capable of accepting numbers that the Display cannot handle. To indicate when this has happened, the ***"Write Error"*** register is set to a value of "1". The host can therefore check to see if the display has been able to process the data satisfactorily.

The Text Display will return an Exception Response "Slave Busy" to any modbus command if it is in the local configuration menus.

Setting the Address

Each Serial Text Display should be given a unique Modbus address via the user menu. Any address between 1 and 247 is acceptable. Note that the broadcast address "0" is supported, allowing multiple displays to show identical data in different locations, but should only be used if no other instrument types are connected at the same time; doing so will yield unpredictable results.

Setting the Screen Option

A Serial Text Display is normally configured to respond to ASCII commands. In order to use the standard screens the unit has to be configured by setting the ***"Screen Option"*** register to a value between 1 and 11, as shown in the preceding table. Setting it to a value above 11 will result in the ***"Write Error"*** register being set to "1".

Setting the ***"Screen Option"*** register to a value of 0 will allow custom screens to be created and displayed by using BEKA protocol commands.

Configuring the values to be displayed

Up to eight process variables can be displayed. These are written to the ***"IN_x Value"*** in the Modbus Register Address Map, where 'x' is a value between 1 and 8. The data format can now be either 16 bit integer, 32 bit integer or big endian IEEE floating point. 32 bit integers and floats must be written as a pair of registers, with the lowest register address first. Multiple values can be written with one command.

When an integer value is written to the display it is internally converted to a float prior to being displayed or saved.

The ***"Divisor"*** register defines the number of times an integer value is divided by ten before being processed by the display. For example, if the ***"Divisor"*** register is set to 2 and a cyclic value of 12345 is written using a 32-bit integer, the value 123.45 will be displayed.

If the display over-ranges all the digits display the question mark character: '**?**'.

The operator can select which input variable is displayed on the screen by pressing the up and down arrow keys, or the host can take control by setting the ***"Screen Variable"*** register to a value between 1 and 8. This forces the unit to display that input variable using the current screen format i.e. if 2 variables per screen are being shown, then setting the ***"Screen Variable"*** register to a value of 4 will show input variables 3 and 4. Note that the ***"Screen Variable"*** register will be updated to the first variable being shown i.e. 3 in this example.

A menu option ***"Last Input"*** and a new register ***"Variable Last"*** have been added to limit the number of variables displayed in standard screens. This allows scrolling via the up/down buttons of only the used variables rather than cycle through the complete set of 8. In multivariable screens, variable entries above the 'last variable shown' are just blank

Data Timeout

The ***"Cyclic Data Timeout"*** register is used to set the longest allowable time between cyclic data updates. The number in this register is multiplied by 10 Seconds to give the actual time period. The default value is 1, giving a timeout period of 10 Seconds.

As each input variable can be updated independently, there are eight ***"IN_x Timeout"*** registers to indicate which ***"IN_x Value"*** has not been updated recently. In addition, if the input value is being displayed on the screen, its status is shown as ***BAD***.

Data Status

The ***"IN_x Status"*** is used to mark the data ***GOOD*** or ***BAD***. When marked ***BAD*** the appearance of the value will be in inverse video i.e. clear pixels on a dark background.

The value in the status register must be set to a "1" to mark it as ***GOOD***. Setting the value to "0" will mark it as ***BAD***, and the values will be displayed in inverse video. Note that data will always be marked as ***BAD*** if the timeout period has been exceeded.

Configuring the decimal places to be displayed

The number of decimal places that are displayed is selected by writing to the ***"IN_x Number Format"*** register.

This function enables the position of the decimal point on each of the eight displayed variables to be individually defined. Six options are available:

0 - No decimal point
1 - 1 digit on right of decimal point
2 - 2 digits on right of decimal point
3 - 3 digits on right of decimal point
4 - 4 digits on right of decimal point
5 - Maximum resolution with the selected display format.

The total number of display digits available depends upon the display screen selected:

Screen Option 1	1 Variable	5,7,11 or 17 digits available (Font automatically resizes)
Screen Option 2	2 Variables	7 digits available
Screen Option 3	4 Variables	5 digits available
Screen Option 4	1 Variable + Bar	5,7,11 or 17 digits available (Font automatically resizes)
Screen Option 5	2 Variable + Bars	7 digits available
Screen Option 6	1 Variable + Bar	6 digits available
Screen Option 7	2 Variable + Bars	4 digits available
Screen Option 8	3 Variable + Bars	6 digits available
Screen Option 9	4 Variable + Bars	4 digits available
Screen Option 10	8 Variables	5 digits available
Screen Option 11	8 Variable + Bars	5 digits available

If a negative number is likely to be displayed, a digit must be allocated for the negative sign. If the display over-ranges all the digits display the question mark character: '**?**'.

For all options, leading zeros are automatically suppressed.

The default value of ***"IN_x Number Format"*** is "**5**", but once set is stored in non-volatile memory.

Configuring Units display and Tag description

Each of the eight process variables may be displayed with a 'Tag description' that can consist of up to sixteen characters. This is simply achieved by writing to the ***"IN_x Description"*** register. Each variable can also have an associated eight character 'Units' value displayed alongside by writing to the ***"IN_x Units"*** register. Note that for some Screen Options the display space available for the Tag and Units is smaller than the register size, so it is important to check that the resultant display is acceptable.

In each case, the character strings can include upper and lower case, numbers and punctuation. To simplify temperature display, the ` character (alt+096) is mapped to the degrees symbol.

For example, the string **`Temp `C`** is displayed as **`Temp °C`**

Information written to these two registers is saved to non-volatile memory and is retained if power to the display is lost.

Configuring Bargraph Displays

Some standard screens incorporate horizontal and vertical bargraphs. These can be scaled by writing to the ***"IN_x Minimum Bargraph Limit"*** and ***"IN_x Maximum Bargraph Limit"*** registers in either IEEE floating point format or 16/32 bit integers with a divisor. Floats must be written as a pair of registers, with the lowest register address first.

If these registers are not configured, the defaults of 0 and 100 will be used, which may (or may not) be suitable for the intended application. If the input variable is higher or lower than both bargraph limits then the bargraph is drawn as an unfilled dotted outline only, indicating that a bargraph should be present but cannot be meaningfully drawn.

Reading the keypress status

The ***"KEY x"*** registers returns information on the keys pressed since the parameter was last read. A "**1**" in the register indicates that the key has been pressed. Each time the parameter is read it will be reset to "**0**". Care must be taken in the configuration of the host application such that keypresses are not missed by polling at inappropriate times.

The unit has the facility to connect external switches in addition to the front panel buttons. By selecting the appropriate "Keys" configuration in the local menu these external switches can be simple normally open or closed contacts that can be used for a variety of basic signalling tasks.

Controlling the alarm outputs

The ***"OUTPUT x"*** registers are used to directly control the local alarm output circuits. Writing a "**1**" in the register will turn the output On (short circuit), and writing a "**0**" will turn the output Off (open circuit).

Advanced Operation

Some applications may require a custom screen to be displayed, in which case the full range of BEKA protocol commands can be used. The possibilities are endless, but typical examples may be:

- Display of text and simple graphics. This permits the use of the display as a basic operator terminal. Keypad button presses are latched and can be read over Modbus.

- Design of custom screens that contain text, graphics and embedded process variables that are automatically updated from received cyclic data.

Full details of how to use these more advanced text and graphics capabilities of the display are contained in the "Serial Text Display - Programming Guide".

The "Command String" and "Graphic Data" registers are used to send the required commands and graphics to the display.

Transmitting Text Display Commands

Please refer to the "Serial Text Display - Programming Guide" which describes the commands in detail and gives practical examples of their use. A summary of the basic procedures are shown below:

The command format is: <AB[param1],[param2]…,[paramN]>

where:

AB is the command.
[ ] indicates optional parameters separated by comas

example:

<CS><CM4,90><CI>

where:	*CS*	-	*Clear Screen*
	CM4,90	-	*Cursor Move to Row 4 Column 90*
	CI	-	*Command Implement*

The commands are written to the ***"COMMAND STRING"*** register starting at address 300. They may be written either one at a time, or several may be grouped together into one long string. **NOTE:** Every command (or group of combined commands) must be terminated with the <CI> Command Implement command. The reception of this command causes the unit to process the contents of its input buffer. **No action will be taken if the <CI> is omitted.**

The maximum length of a command string is 32 bytes.

The result is obtained by reading the ***"RESULT"*** register, which is an unsigned16 word with the following valid responses:

0x00 - indicates that the previous command/command set has been accepted.
0x01 - indicates a parameter or communications error has been detected in the previous command string.
0x02 - indicates the command is unrecognised.
0x04 - indicates that a message has been received but NOT actioned because the unit is in programming mode.
0x08 - indicates that no BEKA command has yet been actioned.
0x10 - indicates that a script is running.
0x20 - indicates that the script is busy. (See the *BB command)

As many commands may be passed and actioned during a screen update, a mechanism has been provided to ensure the host knows which command the result refers to. Two registers have been added to provide a method of matching commands to their results. The sequence of events should be as follows

1. Write a numeric value 'n' into the ***"COMMAND_ID"*** register

2. Write the command string (including the terminating <CI> command) to the ***"COMMAND_STRING"*** register

3. Continually read the ***"RESULT_ID"*** parameter until it equals the value 'n' set in the ***"COMMAND_ID"*** register

4. Read the ***"RESULT"*** parameter: This is the result given by the command string.

Transmitting and Receiving Bulk Data needed by some commands

Some commands require a large amount of data to be supplied. Examples of this are the <DF>Download Font, <DG>Download Graphic and <DS>Download Screen commands.

When communicating via ACSII the command is issued first, and then data is transmitted. With Modbus, it is done slightly differently: The data is first transferred via the ***"GRAPHIC_DATA"*** register, and then the command is issued. The main reason for this is that the data download can take place at any time, so there is no long delay between the command being issued and the screen changing appearance.

The graphics data to be download must first be loaded into the ***"GRAPHIC_DATA"*** register. The size of this block is only 64 bytes, therefore, files must be split and loaded in segments.

The <GB*n*> command is used to specify the segment that a subsequent write to the ***"GRAPHIC_DATA"*** register goes into. The value *n* can be in the range of 0 to 9. The file to be downloaded must start at the beginning of segment 0 and fill as many segments as necessary to download all of the data. Once the desired number of segments are filled with data, the <DF>, <DG> or <DS> command is then issued; The downloaded object is then processed and displayed.

Note that any data at the end of the file and in higher numbered segments is ignored.

The <US> command works in an identical way, but graphics data is made available by the display in 64 byte segments.

Transmitting Scripts

The process described above is slightly changed when uploading a script to the display. The <GB*n*> command is not required, but the <DP*n*>Download Program command is instead used in a similar way.

The script to be download is loaded into the ***"GRAPHIC_DATA"*** register, but as the size of this block is only 64 bytes the script must be split and loaded in segments.

The <DP*n*> command is used to transfer the 64 bytes from the ***"GRAPHIC_DATA"*** register into memory. The transfer process MUST start with <DP0> and be done in ascending order. The value of n can be from 0 to 31, meaning that a 2048 byte script can be loaded. The end of the script is marked by a zero following the command zero terminator, i.e. two consecutive 0x00s.

For further information please refer to the following "Scripting" section, and the appropriate chapter in the "Serial Text Display – Programming Guide"

Scripting

The Serial Text Display has a powerful scripting language built into the firmware. Full details on writing and controlling scripts are documented in the appropriate chapter in the "Serial Text Display – Programming Guide". It is essential that a full understanding of the scripting facilities is gained before attempting to customise the display.

Scripts are conveniently developed and uploaded using ASCII commands directly from a workstation. However, the facilities have been duplicated over Modbus to give application developers the ability to control the display while connected to a live system. In such cases, the additional registers that appear shaded in the Modbus map (Page 13) should be used. The functions of these registers are briefly described below, but these should be read in conjunction with the information contained in the Programming Guide.

Uploading Scripts

Once a script has been developed, it can be uploaded using the procedures covered in the "Transmitting Scripts" section of this manual (Page 11).

Controlling Scripts

If a script is loaded into the display it will automatically run when power is applied to the instrument.

The "***Execute Script***" coil register can be set to "0" to stop the script , or to "1" to start the script.

The "***Script Running***" status register can be interrogated to determine whether a script is running or not.

The "***Jump Control***" register provides a mechanism for the host to influence the running script. A value of 1 to 255 can be written by the host, and the script can use the *GR*n* command to perform an action based on this value. As this is a polled command, it is typically used as a simple method of displaying a specific message in response to an alarm condition. The register is cleared as soon as the script engine has completed the jump.

The "***Event Control***" register is similar to "Jump Control" except that it does not require a register to be polled; the action is taken immediately. A value of 1 to 20 can be written to the register, and it is cleared as soon as the script engine has responded to the event.

A ***"Slave Busy"*** exception will be returned to a write to the jump register or event control register if a script is busy.

Debugging Scripts

Errors that are encountered when running a script are displayed on the screen, giving the line number that the error occurred. The error also stops the script engine from executing any further commands and puts a value of "1" in the the "***Script Error***" status register.

The host can read the error message by interrogating the "***Error String***" register and find out the offending line number by reading the "***Error Line***" register.

Don't Panic !

As it is very easy to stop the display from functioning correctly by uploading a defective script, we have provided the ability to control scripts from the user menu. Simply press the "P" and "E" buttons on the front panel and select the "Script Control" menu item. From here scripts can be stopped or erased, restoring the unit back to its unprogrammed state.

Modbus Register Address Map

Note: Shaded rows denote advanced registers that can be disregarded when using Standard Screens.

Coils	**Read / Write**		
Address	**Bits**	**Description**	**Functions Supported**
1	1	IN_1 Status	1, 5, 15
2	1	IN_2 Status	1, 5, 15
3	1	IN_3 Status	1, 5, 15
4	1	IN_4 Status	1, 5, 15
5	1	IN_5 Status	1, 5, 15
6	1	IN_6 Status	1, 5, 15
7	1	IN_7 Status	1, 5, 15
8	1	IN_8 Status	1, 5, 15
9	1	Output 1	1, 5, 15
10	1	Output 2	1, 5, 15
11	1	Execute Script	1, 5, 15
12	1	Update Strings	1, 5, 15
13	1	Show Status	1, 5, 15

Notes:

Status:	0 = Bad	1= Good
Outputs:	0 = Off	1= On
Script:	0 = Stopped	1= Running
Update Strings	0 = No Action	1 = Update strings
Status Indication	0 = Off	1 = On

Input Status	**Read Only**		
Address	**Bits**	**Description**	**Functions Supported**
1	1	Key 1	2
2	1	Key 2	2
3	1	Key 3	2
4	1	Key 4	2
5	1	Key 5	2
6	1	Key 6	2
7	1	IN_1 Timeout	2
8	1	IN_2 Timeout	2
9	1	IN_3 Timeout	2
10	1	IN_4 Timeout	2
11	1	IN_5 Timeout	2
12	1	IN_6 Timeout	2
13	1	IN_7 Timeout	2
14	1	IN_8 Timeout	2
15	1	Write Error	2
16	1	Script Error	2

Notes:

Keys:	0 = Not Pressed	1= Pressed
Timeout:	0 = No Timeout	1 = Timeout
Errors:	0 = No Error	1 = Error

Input Registers	**Read Only**		
Address	**Registers**	**Description**	**Functions Supported**
1	9	Unit Type (18 ASCII bytes)	4
10	9	Software Version (18 ASCII bytes)	4
19	9	Error String (18 ASCII bytes)	4
28	1	Error Line (Unsigned Int)	4
29	1	Result_ID (Unsigned 16)	4
30	1	Result (MSB = 0, LSB = Result)	4

Notes:

Result Enumeration:	0 = No Error
	1 = Parameter Error
	2 = Command Error
	4 = In Menus
	8 = No Command Yet Executed
	16 = Script Running
	32 = Script Busy

Holding Registers	Read / Write				
Address	**Registers**	**Description**	**Functions Supported**	**Default Value**	**Saved in E^2**
Cyclic Data Registers					
1	2	IN_1 Value (4 bytes IEEE format)	3, 16		-
3	2	IN_2 Value (4 bytes IEEE format)	3, 16		-
5	2	IN_3 Value (4 bytes IEEE format)	3, 16		-
7	2	IN_4 Value (4 bytes IEEE format)	3, 16		-
9	2	IN_5 Value (4 bytes IEEE format)	3, 16		-
11	2	IN_6 Value (4 bytes IEEE format)	3, 16		-
13	2	IN_7 Value (4 bytes IEEE format)	3, 16		-
15	2	IN_8 Value (4 bytes IEEE format)	3, 16		-
Control Registers					
25	1	Screen Option (MSB = 0, Screen Option = LSB)	3, 6, 16	0 (Text Display)	Saved
26	1	Cyclic Data Timeout (MSB = 0, Timeout Value = LSB)	3, 6, 16	1 (10S)	Saved
27	1	Screen Variable (MSB = 0, Screen Variable = LSB)	3, 6, 16		-
28	1	Jump Control (MSB = 0, Jump Control = LSB)	3, 6, 16		-
29	1	Event Control (MSB = 0, Event Control = LSB)	3, 6, 16		-
30	1	Variable Last	3, 6, 16		Saved
31	1	Divisor (n/10)	3, 6, 16	0	Saved
Configuration Registers					
100	8	IN_1 Description (16 ASCII bytes)	3, 6, 16	"Inst1 Tag"	Saved
108	8	IN_2 Description (16 ASCII bytes)	3, 6, 16	"Inst2 Tag"	Saved
116	8	IN_3 Description (16 ASCII bytes)	3, 6, 16	"Inst3 Tag"	Saved
124	8	IN_4 Description (16 ASCII bytes)	3, 6, 16	"Inst4 Tag"	Saved
132	8	IN_5 Description (16 ASCII bytes)	3, 6, 16	"Inst5 Tag"	Saved
140	8	IN_6 Description (16 ASCII bytes)	3, 6, 16	"Inst6 Tag"	Saved
148	8	IN_7 Description (16 ASCII bytes)	3, 6, 16	"Inst7 Tag"	Saved
156	8	IN_8 Description (16 ASCII bytes)	3, 6, 16	"Inst8 Tag"	Saved
164	4	IN_1 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
168	4	IN_2 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
172	4	IN_3 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
176	4	IN_4 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
180	4	IN_5 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
184	4	IN_6 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
188	4	IN_7 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
192	4	IN_8 Units (8 ASCII bytes)	3, 6, 16	"Units"	Saved
196	1	IN_1 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
197	1	IN_2 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
198	1	IN_3 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
199	1	IN_4 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
200	1	IN_5 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
201	1	IN_6 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
202	1	IN_7 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
203	1	IN_8 Number format (MSB = 0, LSB = Number Format)	3, 6, 16	5 (Auto)	Saved
250	2	IN_1 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
252	2	IN_1 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
254	2	IN_2 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
256	2	IN_2 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
258	2	IN_3 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
260	2	IN_3 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
262	2	IN_4 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
264	2	IN_4 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
266	2	IN_5 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
268	2	IN_5 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
270	2	IN_6 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
272	2	IN_6 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
274	2	IN_7 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
276	2	IN_7 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
278	2	IN_8 Minimum Bargraph Limit (4 bytes IEEE format)	3, 16	0	Saved
280	2	IN_8 Maximum Bargraph Limit (4 bytes IEEE format)	3, 16	100	Saved
300	16	Command String (32 ASCII bytes)	3, 16		-
316	32	Graphic Data (64 ASCII bytes)	3, 6, 16		-
348	1	Command_ID (Unsigned 16)	3, 6, 16		-
Cyclic Data Registers					
401	1	IN_1 Value (16 Bit Integer format)	3, 6, 16		
402	1	IN_2 Value (16 Bit Integer format)	3, 6, 16		
403	1	IN_3 Value (16 Bit Integer format)	3, 6, 16		
404	1	IN_4 Value (16 Bit Integer format)	3, 6, 16		
405	1	IN_5 Value (16 Bit Integer format)	3, 6, 16		
406	1	IN_6 Value (16 Bit Integer format)	3, 6, 16		
407	1	IN_7 Value (16 Bit Integer format)	3, 6, 16		
408	1	IN_8 Value (16 Bit Integer format)	3, 6, 16		

Holding Registers	**Read / Write**				
Address	**Registers**	**Description**	**Functions Supported**	**Default Value**	**Saved in E^2**
Configuration Registers					
450	1	IN_1 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
451	1	IN_1 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
452	1	IN_2 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
453	1	IN_2 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
454	1	IN_3 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
455	1	IN_3 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
456	1	IN_4 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
457	1	IN_4 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
458	1	IN_5 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
459	1	IN_5 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
460	1	IN_6 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
461	1	IN_6 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
462	1	IN_7 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
463	1	IN_7 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
464	1	IN_8 Minimum Bargraph Limit (16 Bit Integer format)	3, 6, 16	0	Saved
465	1	IN_8 Maximum Bargraph Limit (16 Bit Integer format)	3, 6, 16	100	Saved
Cyclic Data Registers					
501	2	IN_1 Value (32 Bit Integer format)	3, 16		
503	2	IN_2 Value (32 Bit Integer format)	3, 16		
505	2	IN_3 Value (32 Bit Integer format)	3, 16		
507	2	IN_4 Value (32 Bit Integer format)	3, 16		
509	2	IN_5 Value (32 Bit Integer format)	3, 16		
511	2	IN_6 Value (32 Bit Integer format)	3, 16		
513	2	IN_7 Value (32 Bit Integer format)	3, 16		
515	2	IN_8 Value (32 Bit Integer format)	3, 16		
Configuration Registers					
550	2	IN_1 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
552	2	IN_1 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
554	2	IN_2 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
556	2	IN_2 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
558	2	IN_3 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
560	2	IN_3 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
562	2	IN_4 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
564	2	IN_4 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
566	2	IN_5 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
568	2	IN_5 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
570	2	IN_6 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
572	2	IN_6 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
574	2	IN_7 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
576	2	IN_7 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
578	2	IN_8 Minimum Bargraph Limit (32 Bit Integer format)	3, 16	0	Saved
580	2	IN_8 Maximum Bargraph Limit (32 Bit Integer format)	3, 16	100	Saved
600	8	Script String Variable 1	3, 16		
608	8	Script String Variable 2	3, 16		
616	8	Script String Variable 3	3, 16		
624	8	Script String Variable 4	3, 16		
632	8	Script String Variable 5	3, 16		
640	8	Script String Variable 6	3, 16		
640	8	Script String Variable 7	3, 16		
648	8	Script String Variable 8	3, 16		
656	8	Script String Variable 9	3, 16		
664	8	Script String Variable 10	3, 16		
672	8	Script String Variable 11	3, 16		
680	8	Script String Variable 12	3, 16		
688	8	Script String Variable 13	3, 16		
696	8	Script String Variable 14	3, 16		
704	8	Script String Variable 15	3, 16		
712	8	Script String Variable 16	3, 16		

Supported Modbus Functions

The Modbus functions that are supported by the Serial Text Display are as follows:

01 - Read Coils
02 - Read Discrete Inputs
03 - Read Holding registers
04 - Read Input Registers
05 - Write Single Coil
06 - Write Single Register
15 - Write Multiple Coils
16 - Write Multiple Registers
43 - Read Device Identification.

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