Stuttgart Field Controller

User Manual

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Introduction

Welcome to the Stuttgart field controller.

This guide will guide you through the configuration and setup of the product.

There are different options and versions of the product. Please identify the features that you have purchased.

Stuttgart Controller Options								
Part number	Description	Ethernet	LCD	RS485	Analog Inputs	Digital Inputs	Battery Protector	Digital Outputs
R104-003	Stuttgart Field Controller Full	√	√	√	√	√	√	√
R105-003	Stuttgart Field Controller Digital	√	√	√		√	√	√
R106-003	Stuttgart Field Communicator	√		√		√		√
R107-003	Stuttgart Field Controller Ethernet IO Basic	√				√		√
Additional Options								
R108-008	LCD Option - if not included							
R109-008	Zigbee Option							
R110-008	WiFi Option							
R113-008	Bluetooth Option							
R111-008	1-Wire iButton Option							
R114-008	Second RS485/RS232 Port							
R115-008	SD Card / Logger Software							
R112-009	NTCIP 1209 software							

Connecting Your Controller

The front view of your controller has the following markings indicating connections.
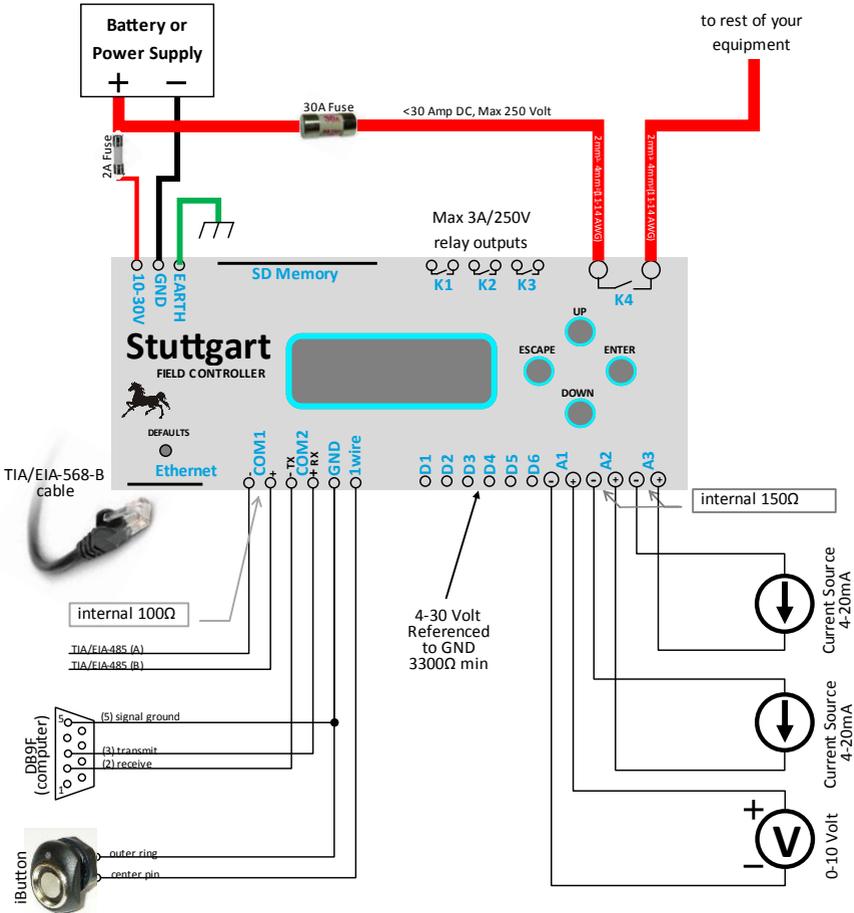
Connector	Pins	Part number	Photo
Power	3	MC 1,5/ 3-ST-3,81	
Relays	6	MC 1,5/ 6-ST-3,81	
Digital/Analog Inputs	12	MC 1,5/ 12-ST-3,81	
	6	MC 1,5/ 6-ST-3,81	
Communications	6	MC 1,5/ 6-ST-3,81	

Setting 4-20mA inputs

To configure A2 or A3 to receive 4-20mA input signals, the enclosure has to be opened and DIP switches set. These are by default set to 4-20mA. Therefore if you want to change to 0-10V measurement, you can change the DIP switches.

Please note that BOTH DIP switches 1 & 2 or 3 & 4 must be switched together.

Switch	ON position	OFF position
1	A2 = 4-20mA	A2= 0-10V
2		
3	A3 = 4-20mA	A3= 0-10V
4		

Factory Defaults

You can reset the factory defaults by using a sharp object to push the DEFAULTS button just behind the Ethernet connector. The button has to be held in on power-up. "HOLD BUTTON TO RESTORE DEFAULTS" will be displayed. Continue to hold the button until "RELEASE BUTTON NOW, DEFAULTS RESTORED!" is displayed.

The defaults are shown below:

Setting	Value
MAC Address	00 04 A3 00 00 00
IP Address	10.10.0.1
Subnet	255.0.0.0
Gateway	10.0.0.1
DNS	10.0.0.1
Relay 1 Formula	
Relay 2 Formula	
Relay 3 Formula	
Relay 4 Formula	V1>120;V1<105
Serial Baudrate	19200
Serial Port	9761

HTTP

Browsing to the Stuttgart IP address (default is 10.10.0.1) on port 80, will return a web interface as below:

On the status screen you can click on the Relays to turn them on or off. This overrides any existing rules momentarily, but the next moment the rules are evaluated, the relays will return to the resultant state. Relays that do not have rules associated with them can be toggled at will. A red circle means the relay is engaged or causing a short on its outputs. The left most circle represent K1 and the right most circle represent K4.

The Digital Inputs will show the current state of the input. A voltage between 3V and 40V applied to the digital input relative to GND will cause the circle to turn red.

The left most circle represent D1 and the right most circle represent D6.

A summary of the current IP configuration is shown on the main screen. UART transmit show the number of packets sent out on the RS232/485 port towards the device. UART receive show the number of packets received from the device over the RS232/485 port. TCP/IP receive show the number of packets received on the Serial Bridge IP port to be transmitted over RS232/485. TCP/IP transmit show the number of packets transmitted on the Serial Bridge IP port that were received over RS232/485. Take note that the Ethernet and RS232/485 packets are not the same size and therefore the number of incoming packets over IP will not equal the number of outgoing packets on RS232/485. The purpose of this screen is to see if data are flowing though the Serial/IP bridge in both directions.

If you are directed to a page like this:

MPFS Image Upload

Choose File | No file chosen   Upload

It means that there is no current web page stored in internal FLASH memory. You can upload the most current web page using this interface. If you want to manually update the web interface, you can go to 10.10.0.1/mpfsupload. Substitute the ip address to the current device IP address if you have changed it.

The IO Configuration page allows the Digital and Analog ports to be configured depending on the specific hardware configuration. Some Analog inputs, ibutton, relays, temperature or other functions may not be available on the model that you purchased. The battery cal box allows the battery input to be calibrated. The battery is sensed from the supply pins and does not take into account voltage drop over power supply cables or other losses. The value entered in this box is a floating point number that is multiplied to get the battery voltage.

Stuttgart *M18*
Industrial Field Controller V2.5

MENU OPTIONS
Status
.
IO Configuration
UART Configuration
Network Configuration
Error Log

IO Configuration

Battery cal:	1.00
Temperature offset:	10.00
K1 Formula:	D1&&(T1>600)
K2 Formula:	A1>300||(A2+(D2*12))
K3 Formula:	D3|D4&D5
K4 Formula:	V1>140;V1<110

Save Config

The temperature offset is a value that is subtracted from the measurement. The device itself heats up inside due to its electronics. Temperature is additive, so if the electronics increase the ambient temperature by 10 degrees, an offset of 10 should be configured in this box.

The formula box allows one or two formulas to be entered, separated by a semicolon. If one formula is present, the relay will be in the 'on' position if the formula evaluate > 0, otherwise the relay will be in the 'off' position. Care must be taken that this will not cause the relays to jitter, because of the input condition to oscillate around a specific point. In this case a second formula can be provided. If the first formula is true, the relay will turn on, if the second formula is true, the relay will

be turned off. This provides the opportunity to build hysteresis into the control algorithm. The following OPERANDS can be used:

Operand	Description
A1-A3	Analog Inputs. The value is the raw 0-1023 value produced by the 10-bit A-D converter
V1	Battery Voltage in Volts*10. Thus 12.5 volt will equal to a value of 125
D1-D6	Digital Inputs. If it is low, the value is 0, otherwise the value is 1
T1	Temperature Sensor Value*10. Thus a temperature of 22.3C, will equal to a value of 223
M1-M4	Modbus tags if the device is configured to communicate with other devices over Modbus.
I1	iButton value. While an ibutton is present, this value shall be equal to the memory that the ibutton is stored in. There are 8 programmable allowed ibutton memory spaces. A value of 0 means that no ibutton is present, or the ibutton is not in the list.

Supported OPERATORS are as follows:

Operator	Description
&&,||,!	Logical Operators
&,^,|,~	Boolean Operators
>>,<<	Shift Operators
()	Brackets
+,-,*,/	Mathematical operators. Precedence must be defined by using brackets. Any expression or sub-expression where the denominator = 0, will evaluate to 32768.
<, <=, =, ==, >=, >, <>, !=	Relational Operators
%	Modulus, return the remainder
=	Not allowed in formula, the result of the formula will define the action

The maximum formula length is 20 characters. When save is selected the resultant formula will be shown. Numberic values only range from -32767 to 32768

The UART configuration page can be used to change the port number or baudrate of the RS485 port.
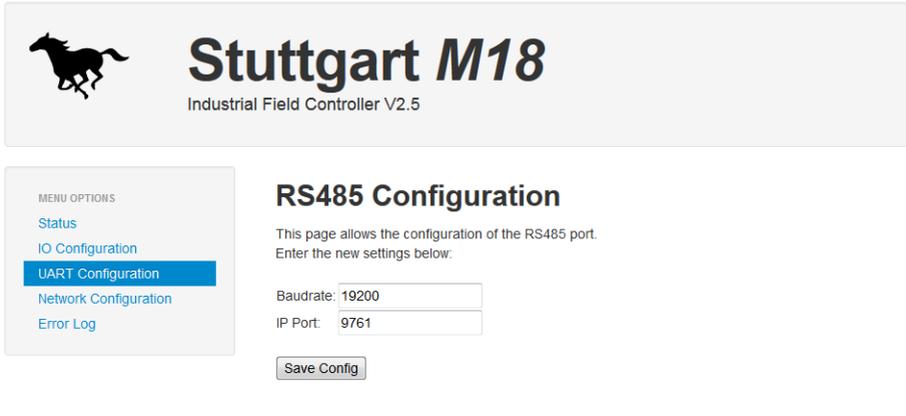
Supported baudrates are:

Bits per second
9600
19200
57600
115200

Other default communication settings are No Parity, 1 Stop bit, No flow control. Software flow control can be implemented by the user application.

The IO port is the TCP port number where the bridge server will wait for a connection. The transmission is RAW.

The Network Configuration settings allow network configuration to be changed.

To change the network configuration, you have to login using 'admin' as username and 'stuttgart' as password.
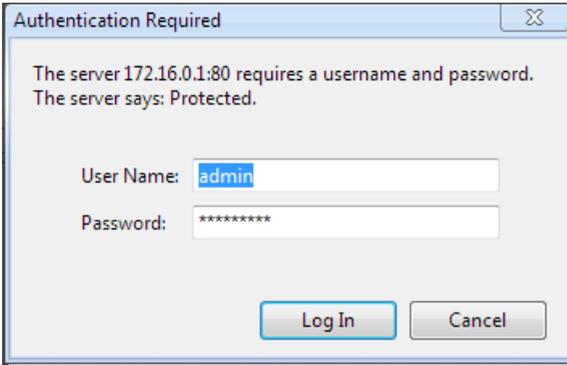
Be careful in changing the MAC address, because the MAC address has to be unique in order for Layer 2 routing to be possible, in other words 2 devices cannot exist on the same network with the same MAC address. The default MAC Address will be loaded when the EEPROM is blank if there are corrupt data in the EEPROM. In this case you should reconfigure the MAC address. Note that the MAC address can be programmed only once. If the last two numbers in the MAC address are other than 00:00, the MAC address will not be configurable.

SNMP

The M18 controller support SNMP v1 remote monitoring. A MIB is downloadable from the Radar Vision ftp site. Basic MIB tree is indicated below. The write and read community is "public". The port number is 161.
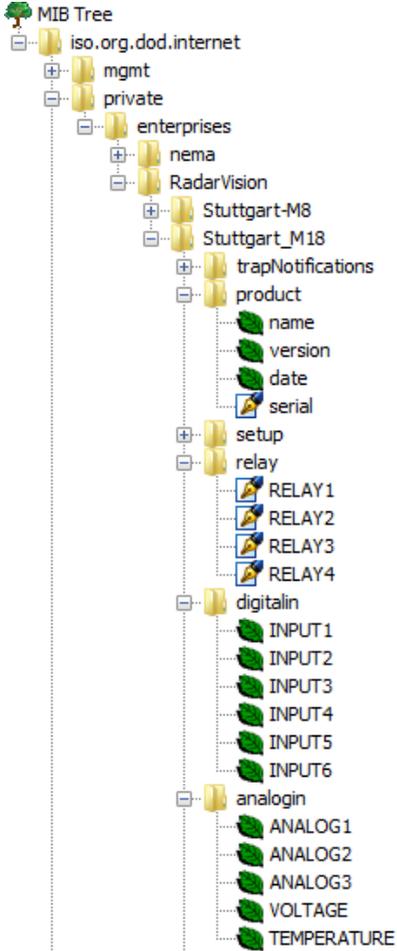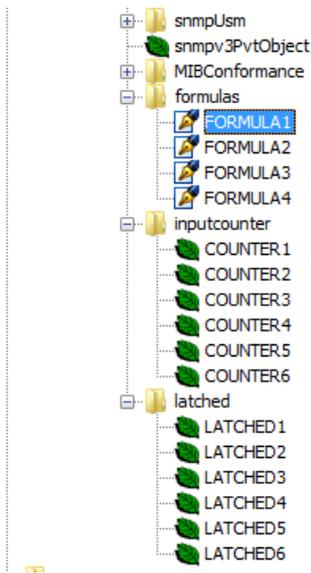
The Digital inputs are value 0 or 1. A value 1 indicate that a voltage of 3-40VDC is present on the digital input. INPUT1=D1 and INPUT6=D6. COUNTER1-6 indicate the number of level changes for the corresponding input. An upgoing edge on D1 will increment COUNTER by 1 and a downgoing edge on D1 will increment the COUNTER by 1. The maximum value for count is 65535 and at the next transition the value will roll over to 0.

FORMULA1-4 correspond to the formulas for RELAY1-4. Note that a maximum of 20 characters can be used per formula.

The value of LATCHED1-6 correspond to a level change on input D1-D6. Therefore if the input on D1 change from high to low or from low to high, LATCHED1 will become 1. The moment that LATCHED1 is read, it is reset back to '0'. If it is then read again, it will be 0 until a level changed on D1 again. Take note that SNMP is used over UDP and if the packet does not get received by the SNMP client, it will reset in the device and on the next read, it will return 0. In a critical application it would be better to use COUNTER to see if the value has changed since the last read.

You can download a MIB browser from http://www.ireasoning.com/

RS485/RS232 - Ethernet Bridge

By default the RS485/RS232 Ethernet Bridge is configured on port 9761 and 9762. All data transmitted to the IP address of the controller, on port 9761 will be transmitted out of COM1 and all data received on port 9761 will be transmitted to the computer with a current open TCP/IP connection on port 9761. RS485 is a half duplex communication connection. Therefore if data is transmitted, it will override the received data and may cause a short circuit on the bus damaging other devices on the bus. Care should therefore be taken to implement the correct handshaking with devices on the RS485 bus.

All data transmitted to the IP address of the controller, on port 9762 will be transmitted out of COM1 and all data received on port 9762 will be transmitted to the computer with a current open TCP/IP connection on port 9762. If this is fitted with an RS232 transceiver, operation will be full duplex.

LCD Menus

The device has a 32 x 128 dot matrix LCD display. On startup it will show Stuttgart M18. The main screen show the currently configured IP address, comm settings, battery voltage and IO status. A '-' indicate an off condition and a bar indicate an on position for the 4 OUTPUTS and 6 INPUTS.
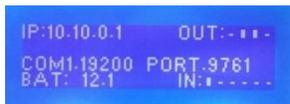
Using the UP and DOWN buttons, the user can scroll through the menu. The menu structure is as follows:
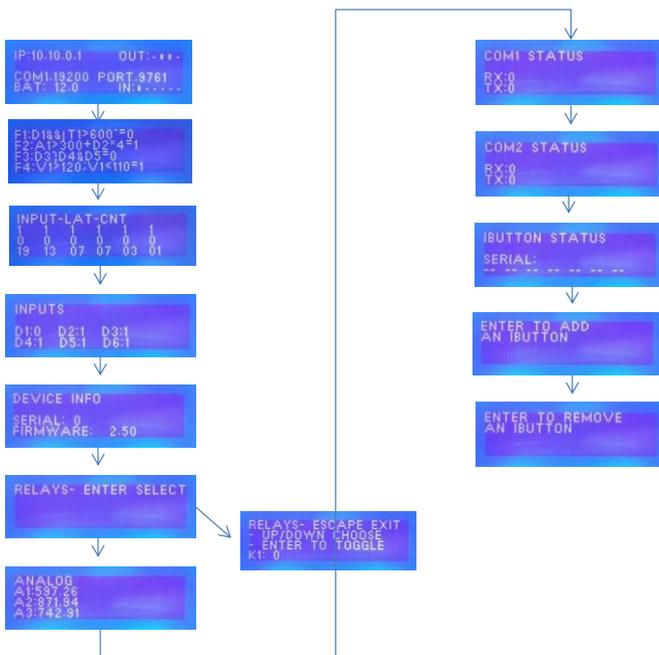
Pressing the Up button progress to the next menu, and pressing the Enter button select the sub-menu. The menus in order are:

Formula display. For each F1-4 correspond to Relay 1-4. For each relay the formula is displayed together with the result.

Input latch and counter display. The top line show the input values for D1-D6, D1 being on the left side. The middle line shows the LATCHED status. LATCHED status is set when the value change and is reset when LATCHED is read via SNMP. The bottom line shows the COUNTER value, also available via SNMP.

The inputs show the current Digital Inputs D1-D6

Device input show the serial number and firmware version number

Relays allow relays to be manually controlled. Note that only relays that do not have a formula associated with it can be controlled.

Analog inputs show the analog inputs if available on the device. A value of 0-1023 is valid values and provide an integer return of the Analog-Digital converter. This needs to be translated towards the real world values.

COM1 status show the number of bytes transmitted and received via the RS232/485 bridge interface.

COM2 status show the number of bytes transmitted and received via the RS232/485 bridge interface.

iButton status show the currently connected iButton ID number. After the iButton is removed the number will display "-- -- -- -- -- -- --"

Enter to add iButton allow up to 8 iButtons to be enrolled. Refer to section on iButton Setup for more detail.

Delete iButton allow removal of iButtons. Refer to section on iButton Setup for more detail.

iButton Setup

For instructions regarding the iButton Probe connection see the Connecting Your Controller section.

The Stuttgart field controller can store up to 8 iButton serial numbers to trigger Relay output K1. A positive iButton will trigger K1 for 5 seconds.

Add iButton

To add an iButton serial to a controller scroll to the ADD IBUTTON SERIAL menu on the controller and press the ENTER button. The first of the eight available slots will be displayed with the serial currently in the slot. Choose the preferred iButton slot to store the serial in, using the UP and DOWN buttons. Once the preferred slot is reached, put the iButton to be added on the iButton probe, when the serial is received by the controller the serial will be displayed. Press the ENTER button to store the serial number. The controller will briefly display STORED when an iButton serial are successfully stored. A new serial can be stored in an empty slot, displaying only 0's, or override the iButton serial currently in the slot. Press the EXIT button to exit to the main menu.

Remove iButton

To remove an iButton serial from a controller scroll to the REMOVE IBUTTON SERIAL menu on the controller and press the ENTER button. The first serial stored on the device will be displayed. Choose the iButton serial to remove using the UP and DOWN buttons on the controller. Once the serial to remove is reached press the ENTER button to remove the iButton serial from the device. The controller will briefly display DELETED when serial are successfully removed. Press the EXIT button to exit to the main menu.

Firmware Update

The firmware can be updated using Tiny FTP. TFTP will be enabled in Windows XP. In Windows Vista and above press the Windows button and type "turn windows features on or off" to get to the features options. Scroll down the list to TFTP client en check the checkbox.

With TFTP enabled, use the command prompt to go to the folder where the firmware is located.

Then type "**tftp   -i 10.10.0.1   put   Stuttgart_Field_Controller_V1.00.hex**"

Substitute the IP address with the correct one, and the filename with the correct one.

Uploading may commence while the device is ready, but due to network traffic or processing inside the device , the bootloader may not be ready. If the uploading does not finish in 10 seconds, then the bootloader was not ready. The device also allows 4 seconds after powerup for firmware update to start. You can start the download right after power up to ensure readiness of the device.

Technical Specifications

Characteristic	Min	Max	Units	Conditions
Storage Temperature	-25	105	°C	
Operating Temperature	-10	+70	°C	*Extended temperature available*
Digital Outputs				
Relay 1-3 outputs contact rating	0.1	3	A	*Designed contact ratings*
Relay 4 output contact rating	1	30	A	*Designed contact ratings*
Digital Inputs				
Input voltage	4	30	VDC	
Analog Inputs				
Input impedance	480		kohm	
Input voltage limits	-40	+40	VDC	
Input voltage measurement (AN1,2,3)	0.1	10	VDC	
Current measurement (AN2 & AN3)	4	20	mA	
RS485				
Input voltage limits	-7	12	V	
Output current		60	mA	
RS232				
Input voltage limits	-25	25	V	
Battery Protection				
Relay 4 Connector wire size	0.2	4	mm^2	*Multi stranded cable*
Relay 4 Connector wire size	0.2	6	mm^2	*Single core cable*
Power Supply				
Input Voltage	10	30	V	*Reverse input protected*
Power Consumption		4.1	W	*Without wireless*
Wireless				
WiFi Output Power		10	dBm	
Zigbee Output Power		19	dBm	*At antenna connector*