

# MainProbeX-V RS485 Communicator Manual Version 1.0 – March 2025

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MainProbeX-V RS485 Communicator Manual - Mar 25 - V1.0.docx

WORLD CLASS FLOWMETERS

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#### Warranty

Mainstream Measurements Ltd warrants that the Mainstream MainProbeX is free from defects in material and workmanship and operate substantially as escribed in this manual.

If, during the warranty period specified below, the Mainstream MainProbeX is shown to the reasonable satisfaction of Mainstream Measurements Ltd to be faulty and not to operate substantially as described in this manual, Mainstream Measurements Ltd will repair or replace the MainProbeX.

Mainstream Measurements Ltd will not be responsible for any failure of the Mainstream MainProbeX caused by incorrect installation or extreme operating conditions and will not in any event be liable for any loss consequential or otherwise, caused by any error, defect, or failure of the Mainstream MainProbeX, howsoever arising, including but not limited to loss of use, loss of data, loss of profit or loss of contract. The warranty period is 24 months from the date of shipment.

#### **Communicator Overview**

MainProbeX Communicator is Windows software which allows the MainProbeX to be configured and managed. MainProbeX Communicator acts as a Modbus client device.

MainProbeX Communicator is either provided by USB drive, or from the web site.

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#### **1. INSTALLING COMMUNICATOR**

Minimum system requirements: Windows 10, .NET 5.0.1(\*) desktop runtime SDK.

(\*) Or better. Some Windows PCs will have the .NET 5 desktop runtime SDK installed already. Some may require manual installation.

Any USB drive provided by Mainstream or "MainProbeX Communicator.zip" file, will a include a setup file for Communicator. This setup file will install Communicator in a folder of the user's choice.

#### 2. .Net 5.X

If you install Communicator and try to run the software without the .NET 5.x installed, you will be shown an error message, prompting you to install the .NET runtime.

Clicking yes on this message will direct you to a Microsoft webpage where .NET can be downloaded. At time of writing this is

<u>https://dotnet.microsoft.com/download/dotnet/5.0</u> . Ensure you download the **x64** SDK.

You can now run Communicator.

## 3. CONNECT DEVICE TO RS485 CABLE AND POWER

Listed below are the functions for each wire contained in the MainProbeX-V RS485 cable.

Insulation colour	Purpose
Yellow	RS485 Half Duplex B-
Brown	RS485 Half Duplex A+
Red	Power (+ve)
Black	Power (-ve)
Clear	Screen

Input voltage (1 device on bus): 6V - 28V

#### Input voltage (>1 device on bus): 7V - 28V

RS485 Drive capability: 25 unit loads RS485 Input impedance of device: 0.32unit load

Screen connection: Should be connected to OV or terminated.

Line termination: See official Modbus documentation.

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Below, is an example of how the MainProbeX should be connected to an RS485 to USB adapter cable.



As always when dealing with electrical connections, care must be taken to avoid short circuiting when wiring up the MainProbeX to the power supply.

#### 4. CONNECTING TO MAINPROBEX

After you have started Communicator, you will need to connect to the MainProbeX device. The definitions below assume you have the correct physical connections to the MainProbeX using an RS485 to USB converter to allow a connection to the product to be made via a PC.

#### 4.1. Home

#### 4.1.1.Connections settings

On the left-hand side there are menu items to setup the communications between the device and your computer.

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🖾 Communicator 4.0.25					- 🗆 X
	Home	Configuration	Measurements	Diagnostic	
Connection Port COM2 ~ 2 Options 19200-8-E-1 v Modbus Address	<b>Device</b> S Firm App	Product Type: Ma Serial Number: Ma nware Version: 3.3 Device Name: De lication Name: De	ainProbe RS485 PX00536 35 rfault rfault	Acces	s Level Access Level: Read Only Access Code: Login
Disconnect %	Intrir	isic Safety	Status	s: Device is NO	OT Intrinsically Safe
Serial Number MPX00536					
Firmware Version 3.35					
Access Level Read Only					
25/02/2025 09:21:38					

## 4.1.2. Choose Comm Port

The **PORT** box is used to specify which COM port the connection is on. The button to the right will scan the ports on your PC for appropriate connections.

The **OPTIONS** box is used to specify the usual COM port settings (Hint, press the button next to the Options box to reveal all the settings).

#### 4.1.3.Select Baud Rate

The Baud Rate, refers to the speed at which data is transmitted over the communication network.

Select the required Baud Rate.

The **default** setting of Baud Rate is 19200.

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RLD CLASS FLOWMETERS       Device Info         Port       Product Type: MainProbe RS485         Unit Serial: MPX00536         Firmware Version: 3.35         Device Name: Default         19200 *         Parity	D CLASS FLOWMETERS	
Pont       Product Type: MainProbe RS485       Access Level: Read Only         Port       Unit Serial: MPX00536       Access Code:         COM2       Email       Device Name: Default       Access Code:         Baud Rate       19200       Intrinsic Safety       Intrinsic Safety	Lange and the second bird	Device Info Access Level
19200 ~ Parity Intrinsic Safety	Deptions 9200-8-E-1	Product Type: MainProbe RS485 Unit Serial: MPX00536 Firmware Version: 3.35 Device Name: Default Application Name: Default
Even 👻 🗸 Status: Device is NOT Intrinsically Safe	Parity Even v	Intrinsic Safety Status: Device is NOT Intrinsically Safe
Device Product Type MainProbe R5485	<b>Jevice</b> Product Type MainProbe RS485	
Serial Number MPX00536	Serial Number MPX00536	
Firmware Version 3.35	Firmware Version 3.35	
	Accoss Loval	

## 4.1.4. Select Parity

Parity in Modbus refers to a binary digit added to a data transmission to validate that the received data matches the original data. It's a configuration option for Modbus data packs, and can be set to even, odd, or none. The parity setting should match on all devices on the network.

The **default** setting of parity is even.

#### 4.1.5. Select Modbus Address

The **MODBUS ADDRESS** box is used to specify which Modbus Address the software should interrogate. The button next to it will trigger a sequence of Modbus messages which will interrogate the attached Modbus bus, to determine if one or more MainProbeXs are attached to the bus. Default address is 1

The address can be entered as a single number (between 1-247), for example, "1" or "123". Or the address can be entered as a range, for example, "1-3" or "100-120".

Scanning each address can take up to 3 seconds.

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#### **4.1.6. CONNECT**

Click the **Connect** button to detect the MainProbeX.

If a MainProbeX is found during the scan, its details will be displayed in a panel on the left of the dashboard (pictured above).

## 4.2. Change Access Level

The Login button is used to change the access mode of the connected MainProbeX, you must be connected to a MainProbeX before clicking this button. Initially the software will log you in as **READ ONLY**.

Once connected to a MainProbeX, Communicator will issue regular messages to the MainProbeX to prevent the firmware from reaching its communications' timeout. If the communications' timeout (2 minutes 30 seconds) elapses without a message being sent to the MainProbeX, the probe will automatically return itself to Read-Only mode.

Enter a 4-digit, numerical Access Code into the **ACCESS CODE** text box before clicking the Login button.

Upon clicking the Login button, the MainProbeX will evaluate the access code you have submitted.

If the MainProbeX determines the access code submitted is valid, it will automatically update to the Access Mode, this change will be reflected on the Communicator interface, in the **ACCESS MODE** text box.

Access Mode	Access Code	Description
Read-Only	0000	Used to force measurements, edit measurement units, and view the device configuration.
Basic	1234	BASIC used to modify Modbus (Baud Rate, Parity, Modbus Address) and Velocity (Measurement Interval) settings.
Advanced	5678	ADVANCED used to modify all other configurable settings.

Valid Access Codes are listed below:

An incorrect password or closing the software, will cause the MainProbeX to reset and revert to Read-Only mode.

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#### 4.2.1.Basic

The Basic Access Mode is primarily intended for use by an installer and allows the measurement interval and communication parameters to be set.

Enter a **1234**, numerical Access Code into the **ACCESS CODE** text box before clicking the Login button.

Shown below is a successful login to a unit in BASIC Mode.

MEASUREMENTS LTD	Home Configuration Measurements	Diagnostic
Device Product Type MeASOREPENTS CID Port COM2 Options 19200-8-E-1 Disconnect Solution Product Type MainProbe R5485	Device Product Type: MainProbe RS485 Serial Number: MPX00536 Firmware Version: 3.35 Device Name: Default Application Name: Default	Access Level Access Level: Basic Access Code: 1234 Login
	Intrinsic Safety Status:	Device is NOT Intrinsically Safe
Serial Number MPX00536 Firmware Version		
Access Level Basic		

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#### 4.2.2.Advanced

In the Advanced Access Mode changes to all user configurable settings are permitted.

Enter a **5678**, numerical Access Code into the **ACCESS CODE** text box before clicking the Login button.

Shown below is a successful login to a unit in ADVANCED Mode.

MEASUREMENTS LTD	Home	Configuration	Measurements	Diagnostic	
RLD CLASS FLOWMETERS	Device S Firm Appl	Product Type: Ma erial Number: Mi ware Version: 3.3 Device Name: De ication Name: De	ainProbe RS485 2X00536 5 fault fault	Access	s Level Access Level: Advanced Access Code: 5678 Login
Disconnect %	Intrin	sic Safety	Status	s: Device is NC	DT Intrinsically Safe
Serial Number MPX00536 Firmware Version 3.35					
Access Level Advanced					

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# **5. CONFIGURATION**

## 5.1. General

🖾 Communicator 4.0.25									×
	Home	Configuration	Measu	urements	Diagnost	ic			
WORLD CLASS FLOWMETERS	General	Modbus	Velocity						
Connection Port				Device Na	me Defaul	t			
Options 19200-8-E-1			Арр	lication Na	me Defaul	t			
Modbus Address									
Device									
Product Type MainProbe RS485									
Serial Number MPX00536									
Firmware Version 3.35									
Access Level Advanced		Refr	esh				Apply		
25/02/2025 11:07:57									

#### 5.1.1. Device Name

Device Name is a unique identifier for a device that helps distinguish it from other devices.

#### 5.1.2. Application Name

It is a unique name that helps the user identify and locate a MainProbeX installation.

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# 5.2. Modbus

Communicator 4.0.25		- 🗆 X
	Home Configuration Measurements Diagnostic	
WORLD CLASS FLOWMETERS	General Modbus Velocity	
Connection Port COM2 💝 😂 Options 19200-8-E-1 👽 Modbus Address 1 Disconnect 🗞	Baud Rate 19200 × Parity Even × Modbus Address 1 ×	
Device Product Type MainProbe RS485 Serial Number MPX00536 Firmware Version 3.35 Access Level		
Advanced	Refresh App	ly
25/02/2025 11:08:59		

#### 5.2.1.Baud Rate

The common baud rates for Modbus vary depending on the type of network and the application. For serial networks, the typical baud rates range from 1200 to 115200 baud.

The **default** is 19200 baud rate.

# 5.2.2.Parity

The parity is a configuration setting for data packs that relates to error checking. The **default** is **Even** parity.

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#### 5.2.3. Modbus Address

Set required Modbus Address for MainProbeX, device is assigned a unique slave ID in the range of 1-247.

#### The **default** address is 1.

# 5.3. Velocity

Communicator 4.0.25		- 🗆 X
	Home Configuration Measurements Diagnostic	
WORLD CLASS FLOWMETERS	General Modbus Velocity	
Connection Port	Measurement Interval 30 Seconds *	
СОМ2 ~ 😂	Measurement Time 1 Second *	
Options 19200-8-E-1	Noise Suppression Medium *	
Modbus Address	MAMS Velocity Disabled *	
1	Histogram Averaging	
Disconnect 🗞	Signal Quality To Fail 10% ×	
	Fail Hold-Off Count 2 *	
Product Type MainProbe RS485	Bidirectional Velocity	
Serial Number MPX00536	Direction Reversal	
Firmware Version 3.35	Reset to Default	
Access Level Advanced	Refresh Apply	(
25/02/2025 11:09:44		

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#### 5.4. Measurement Interval

The measurement interval is the time elapsed between successive measurements of the liquid flow rate. This can be Continuous, 15 secs, 30 secs, 1 min, 2 min, 5 mins, 10 mins, 15 mins, 20 mins, 30 mins, 1 hour.

#### 5.5. Measurement Time

The measurement time is the time that the MainProbeX requires to make a velocity measurement. Rapidly varying flows require a short response time. For slower flows a longer response time may be appropriate.

#### 5.6. Noise Suppression

This allows for unwanted background noise from the signals to be reduced. Noise suppression can reduce the effects of acoustic noise.

## 5.7. MAMS Velocity

Mainstream Adaptive Measurement System (MAMS) automatically adjusts the ultrasonic signal acquisition time based on flow conditions, so that each velocity measurement is based on the same quantity of information regardless of the signal quality.

For example, if the signal quality is low, it increases the measurement time and thereby increases the quantity of signal processed.

Conversely if the signal quality is high, it decreases the measurement time. This means that if the flow conditions are favorable, there will be a reduction in measurement time and therefore less power consumed.

## 5.8. Histogram Averaging

The histogram shows the distribution of tracer velocities in the Zone of Inspection of the MainProbeX. It shows the relative amounts of the ultrasound signal corresponding to each flow velocity. Histogram averaging may be set to either DISABLED or ENABLED.

The normal setting is DISABLED. When histogram averaging is DISABLED, each velocity measurement is based only on information accumulated during the latest measurement interval.

When histogram averaging is ENABLED, part of the information from the previous measurement interval is retained and combined with new information accumulated during the measurement period. This has the effect of smoothing changes in the measurement and can be used to improve measurement repeatability whilst conserving power consumption.

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#### 5.9. Signal Quality to Fail

The signal quality to fail is the value of the measured ultrasound signal quality below which is considered unsafe to determine the flow velocity from the velocity histogram data. When the signal quality falls below the signal quality to fail, the MainProbeX gives the velocity measurement as zero.

#### 5.10. Fail Hold Off Count

Where the signal quality drops below a configured parameter selected by the user, between 0 and 5 readings, the probe will take a number of sequential velocity measurements before the measured velocity is set to zero.

#### 5.11. **Bi-directional Velocity**

When enabled (the default is enabled), forward flows (towards the probe nose) are represented as positive velocities and reverse flows are represented as negative velocities. When disabled, both forward and reverse flows are represented as positive velocities.

#### 5.12. Directional Reversal

When enabled, forward flows (towards the probe nose) are represented as negative velocities and reverse flows are represented as positive velocities.

## 5.13. Reset to Default

Resetting to default, also known as a factory reset, restores a device to its original settings.

This button is only visible in advanced mode.

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## 6. MEASUREMENTS



## 6.1. Measurement Options

These are graphs representing the readings. The legend above the graphs displays the last reading.

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	ELOWMETEDS							<u> </u>		
CLASS	PLOWMETERS		Measur	ement (	Options				Force Mea	surement
Port	∞ Measurement C	Options		-		× 9	6	Tempera	ture: 23.4 C	Voltage: 10.2 V
COM2	Signal	١	/isible	Unit of I	Measurer	ment				
Options 19200-8-E-1	Velocity		✓	mm/s		~				
Modbus Ac	Quality		$\checkmark$							
Disconnect	Temperature		✓	Celsius		<u>.</u>				
	Voltage		$\checkmark$				-			
Device Product Ty		ł	Apply							
MainProb Serial Num MPX0	e RS485 ber 0536	0- 15-								
Firmware V 3.3	ersion 5	Voltag (V)								
Access Level Advanced		0	09:30:00			10:00:00		Time	10:30:00	11:00:00

# 6.2. Select Measurands

If you activate the Measurement Options you can select the Unit of Measurement that will be used in the chart. Make your selections and click **Apply** button.

# 6.3. Force Measurements

The FORCE MEASUREMENTS tab allows you to manually invoke a measurement.

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# 7. DIAGNOSTICS

# 7.1. Modbus

	Modbus Signals Histogram	
Annection Port COM2 Carlow Comparison Specification of the second sec	Read Registers         Modbus File         Device         Register         Hardware_Serial_Number         Hardware_Serial_Number         Hardware_Manufacture_Date         Product_Type         Hardware_Version         Intrinsic_Safety_Status         Serial_Number         Firmware_Version         Device_Name         Application_Name         Access_Mode	Log Tx: 01-03-A1-AC-00-02-27-D6 Rx: 01-03-04-0A-C8-42-BE-C8-C5 Read the register for Velocity_mms Tx: 01-03-A1-A0-00-02-E7-D5 Rx: 01-03-04-2F-3E-43-3B-E3-C8 Read the register for Voltage Tx: 01-03-A1-B2-00-02-47-D0 Rx: 01-03-04-40-14-41-41-5F-97 Read the register for Temperature_C Tx: 01-03-A1-AE-00-02-86-16 Rx: 01-03-04-E7-C3-41-CA-8C-BC Read the register for Signal_Quality Tx: 01-03-A1-AC-00-02-27-D6 Rx: 01-03-04-B1-80-42-B9-2D-F5 Read the register for Velocity_mms Tx: 01-03-A1-A0-00-02-E7-D5 Rx: 01-03-04-65-C5-43-39-05-E0

#### 7.1.1.Read Registers

In this window we can read the values of the MainProbeX registers.

To read the register value, select the required register and then press the **Get Value** button.

# 7.1.2. Log

The Log window displays information packets sent (Tx transmit) and (Rx receive) from MainProbeX in binary form.

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# 7.2. Signals



The Signals function gives access to data captured from the MainProbeX velocity sensor. This shows the transmit and receive signals in synchronisation.

This function also allows the user to establish if the installation is correct.

You can refresh the signal using the **Get Signal Data** button.

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# 7.3. Histogram

# 7.3.1. Diagnostic Options

© Communicator 4.0.25				- 🗆 X			
	Home Configuration	Measurements Diagr	nostic				
WORLD CLASS FLOWMETERS	Modbus Signals H	istogram					
Connection	Diagnostic	Options	Get Histogram				
COM4 ~	100						
Options 🛛 🐼 Dia 19200-8-E-1 🗸	gnostic Options		– 🗆 X				
Modbus Address	Signal	Unit o	f Measurement				
Communicating %	velocity	Apply					
Device Product Type MainProbe RS485	40 -						
Serial Number MPX00536	20 -						
Firmware Version 3.35							
Access Level Basic	0+	0 Velocity (	1000 mm/s)				
13/02/2025 15:00:15	[[						

In the Diagnostic Options you can select the Unit of Measurement that will be used in the chart. Click **Apply** button.

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# 7.3.2.Get Histogram

To display or refresh the Histogram chart use the **Get Histogram** button.

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#### 8. FIRMWARE UPDATE

🖾 Communicator 4.0.21						(200)	×
	Home	Configuration	Measurements	Diagnostic	Firmware Update		
Connection Port OMAZ	Version Select I MPX33	n Firmware Version 1	Lo	9			
Options 19200-8-E-1 V Modbus Address		Program					
Disconnect % Device Device Name Default							
Product Type MainProbe RS485							
Access Level Read Only							
Serial Number MP00535							
					Clear		]
09/10/2024 14:25:10							

MainProbeX firmware upgrades are supplied in the form of .bin files.

Copy the .bin file to Binaries folder in the location where the communicator is installed.

For example:

C:\Program Files\Mainstream Measurements\MainProbe Manager v4.0.21\Resources\Binaries.

(The .bin file will not be displayed on drop list if Communicator is running when copying new firmware. In this case, restart Messenger.)

Start the MainProbe Communicator, connect to the MainProbeX

Go to Firmware Update window.

Select required Firmware Version from drop list.

Press **Program** button to start update process.

The update progress will may take several minutes and will be displayed on the left side of the screen in the **Log** window.

At the end of the upgrade MainProbeX restart.

WARNING: Do not disconnect the power supply from the MainProbeX during the upgrade process. This can damage the MainProbeX system.

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