

iBeam Sensors

User Manual

Automated Design Corp
140 S. Pinnacle Drive
Romeoville, IL 60446 U.S.A
Phone: + 1-630-783-1150
Fax: + 1-630-783-1159

I. Introduction.

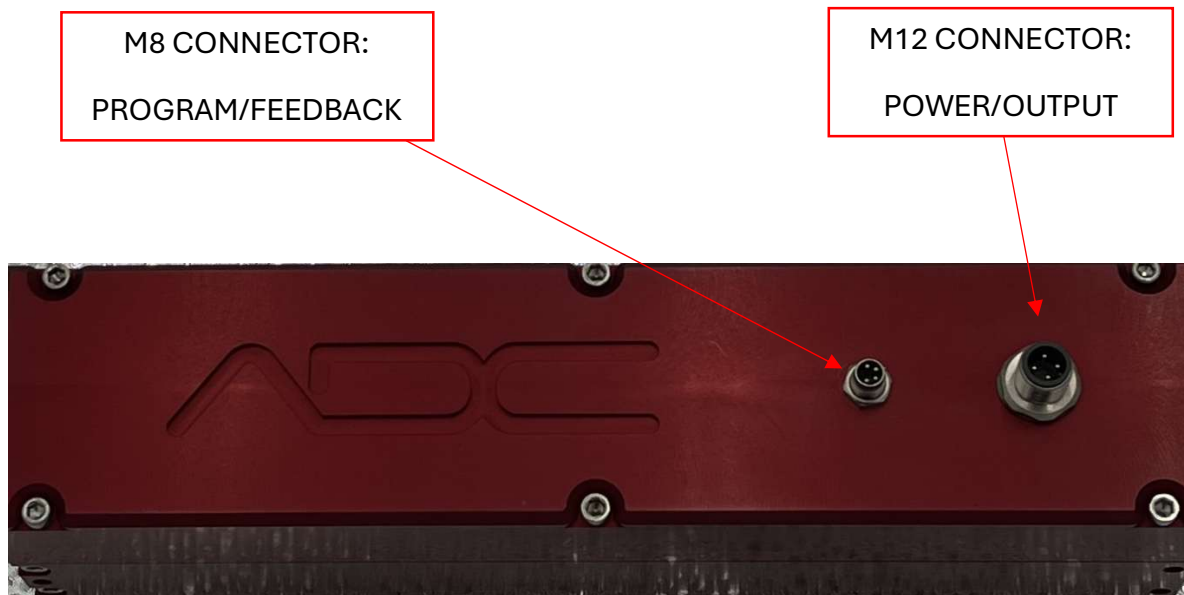
This manual will introduce you to the ADC iBeam sensors. They have been designed and built to offer the highest accuracy in speed sensing. The design offers many advances that will be explained in the following pages. Features include software selectable sensitivity, feedback from the sensors, and a modular circuit board design that allows for easier maintenance.

II. Overview

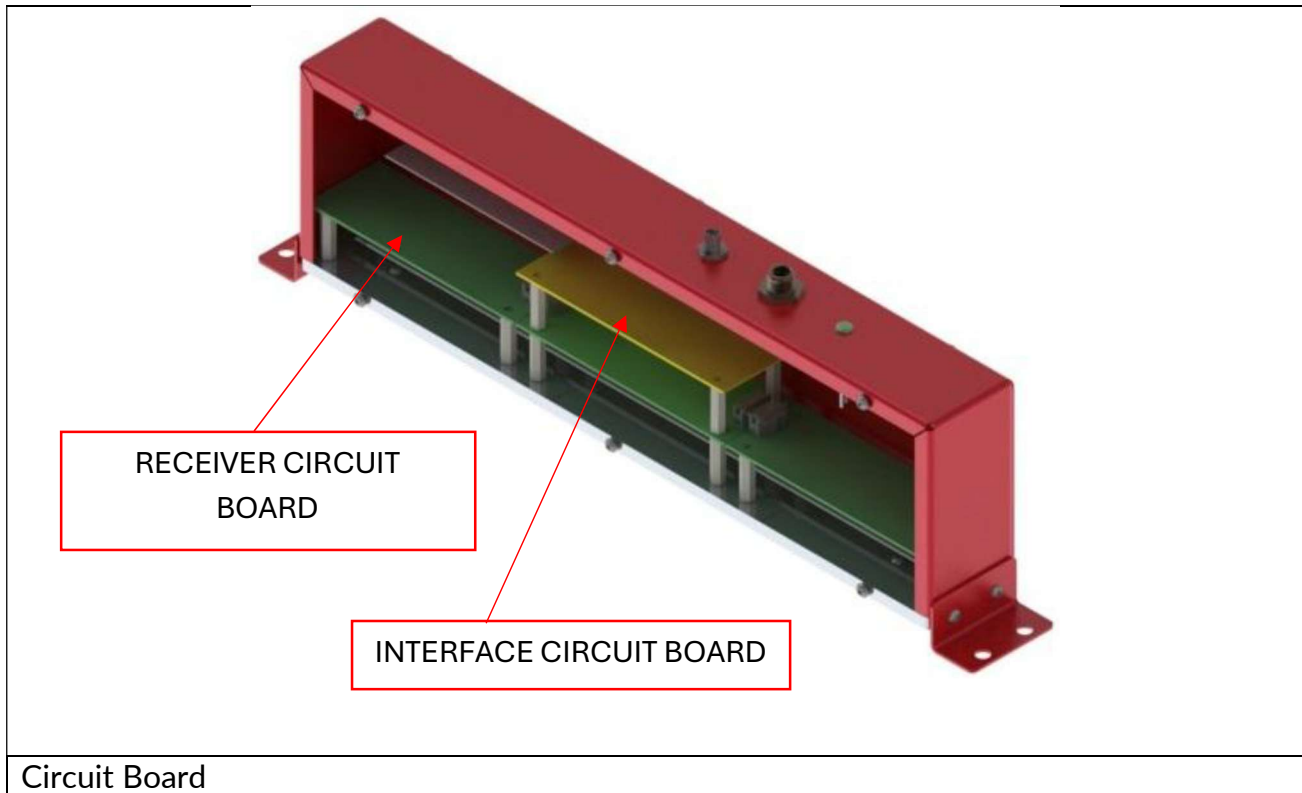
Each set of iBeams sensors includes (1) receiver, and (1) emitter. The receiver uses a M8 4-Pin connector for programming and feedback, and both use an M12 4-Pin connector for power.

The Receiver:

Each receiver has 2 cable connections on the top of the housing. The larger M12 connection is for the Power and Output. This cable must be connected for operation. The second, smaller M8 connector is the programming and feedback connection.

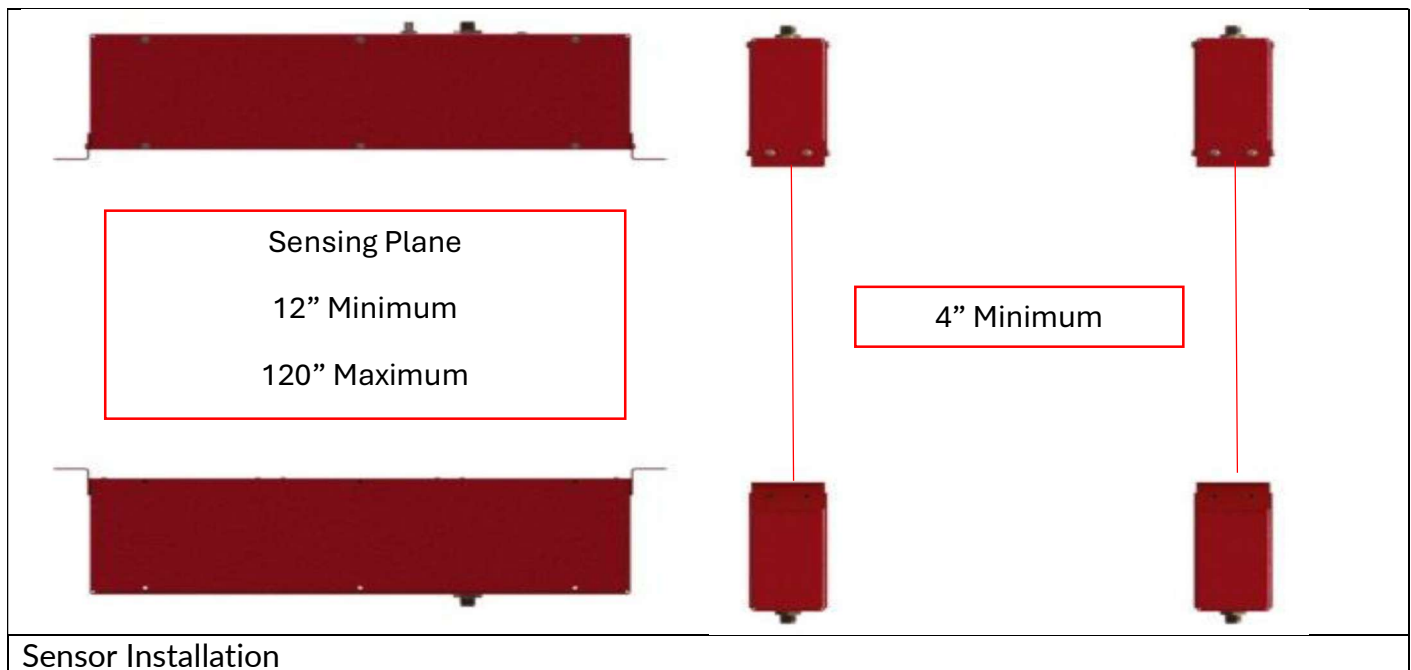


The Receivers



SENSOR INSTALLATION

In order to get velocity feedback, it is required to have at least two sets of iBeam sensors. One set consists of (1) receiver, and (1) emitter. The following is a basic setup for sensing ball speed.

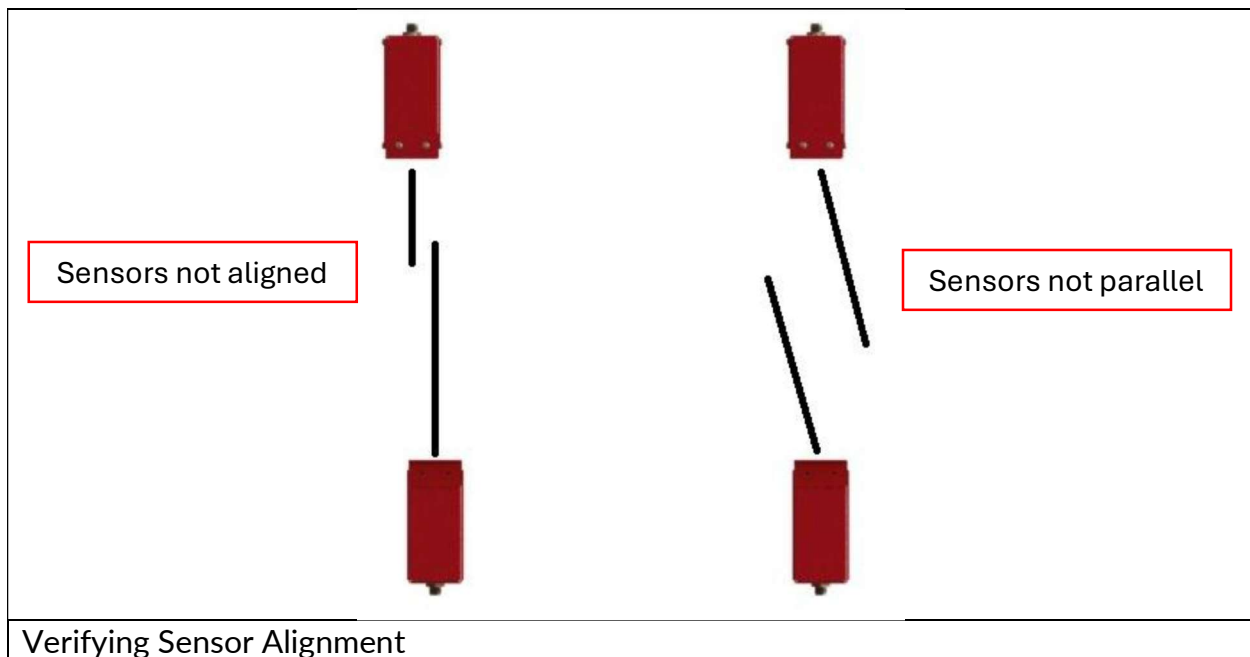


MOUNTING THE SENSORS

There are (2) clearance holes (for a 5/16 - 18 screw) on each side of the sensor. These are the mounting holes. Make sure that there are no obstructions in front of the sensing slot when mounting the units.

VERIFYING SENSOR ALIGNMENT

ALL iBeam sensors must be installed such that the receiver “sees” the light curtain from the emitter. You must verify that the Receiver Slot is in line with the emitter slot. Also, the face plates need to be parallel to each other. The sensors require an accurate mounting frame to provide accurate velocities.



CHOOSING YOUR OUTPUT VOLTAGE:

Each sensor is capable of outputting 5, 15, or 24VDC. **It is always best to specify your desired output voltage when ordering your iBeams sensors.** However, if you need to select a different voltage (or are not sure what the current voltage is), this is done by accessing the Interface Circuit Board. Remove one of the side panels to do so. On Each Interface CB, there is a row of 7 terminals on the left hand side.



The terminals are as follows:

- **V+** Sensor Power (24vdc)
- **GND** Sensor 0VDC
- **S24** 24VDC Output
- **S15** 15VDC Output
- **S05** 5VDC Output
- **A** LED Anode
- **K** LED Cathode

SENSOR OUTPUTS

Moving the black OUTPUT Wire between S24, S15, and S05 is how you select 5, 12, or 24VDC. To do so, you need to remove one of the side panels on the sensor to access the terminals, or if you have our new style remove the top plate housing. Using a small flat head screw driver, loosen the terminal, remove the wire, and insert to the desired Output terminal. Once in position, tighten all screw terminals in the strip.

USING THE PROGRAM/FEEDBACK CONNECTION:

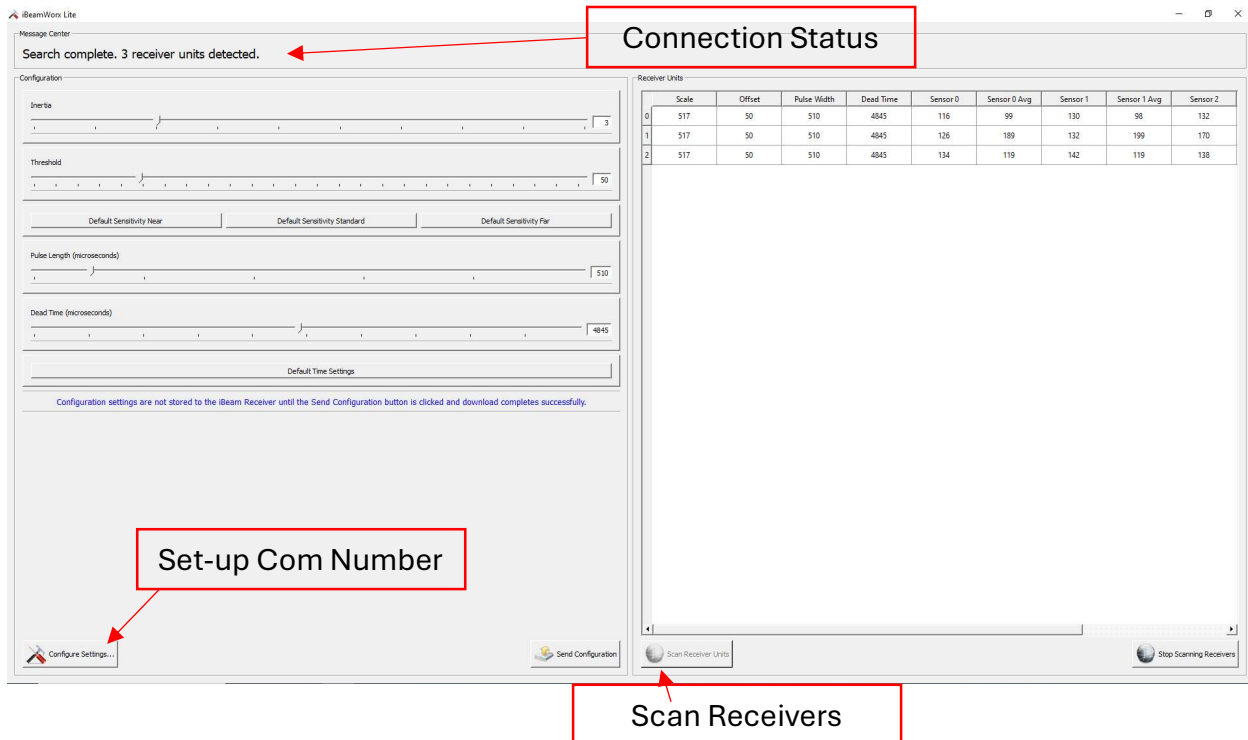
The (M8-4Pin) connection is only used when you wish to change the sensitivity, change the pulse width, deadtime, or monitor the intensity of the sensors. The 2325-CAB (Programming cable) and 2325-422 (USB Converter) must be purchased to make any sensitivity, pulse, or intensity changes. Insert the USB Plug into the computer's USB port. Insert the M8 Plug into the program port on the sensor. You are now ready to launch the **iBeamWorx** Configuration Software.



Part# 2325-422

iBeamWorx CONFIGURATION SOFTWARE

Using the iBeamWorx configuration software, you can set the sensitivity(threshold), pulse width, deadtime, and record intensity of the unit. In the past, a series of Dip Switches were used. This is no longer necessary due to improvements in the design. The sensors are “Self Adjusting” for a wide range of conditions.



The pulse width is the length of time the output will remain “active” after being triggered. The pulse width can be set through iBeamWorx. The rising pulse (active high) output will transition from low to high upon being triggered, and then remain high for the selected period of time. The falling pulse (active low) output will transition from high to low upon being triggered, and then remain low for the selected period of time.

The proper pulse width setting is only a function of the speed-measuring equipment (chronograph) that is being used. ‘Slower’ chronographs may require longer pulses in order to function properly. In cases where the chronograph is the ADC VelociGraph, the pulse width should be set to the default value.

The dead time is the length of time the output remains disabled after turning off to eliminate false triggers caused by the projectile still being in the curtain.

Requirements

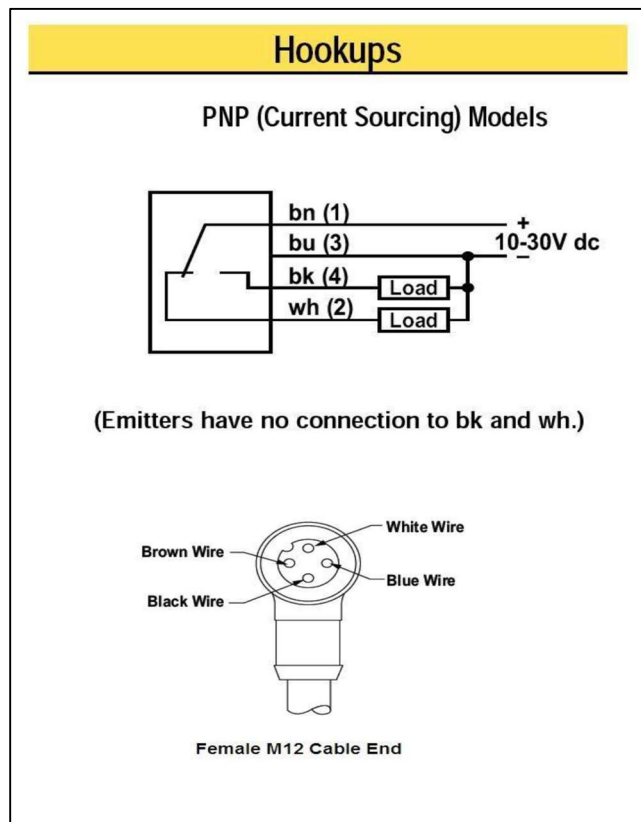
- Microsoft Windows 7/8/10/11
- Microsoft MSVC Runtime 2010 (included with installer)
- VG03 Programming Cable.
- RS422 Serial Port

Cable Connections.

2325-422 Programming Cable/ USB Converter.

The programming cable consists of an M8 Socket on one end, and a RS422/USB converter on the other. Explanation of the cable is as follows:

Screw Terminal	RS 485	RS422	Sensor Connection
1	D+	TX+	M8 Pins/ color 3 Blue 4 Black 1 Brown 2 White
2	D-	TX-	
3		RX+	
4		RX-	
5	GND	GND	



Downloading

The latest iBeamWorx Lite configuration software can be downloaded from our website at <https://automateddesign.com/download/iBeamWorxSetup.msi>

Follow all on-screen prompts, accepting all defaults.

The iBeamWorx Lite software requires Microsoft Visual C++ 2010 Redistributable Packages which is included in the installation of the iBeamWorx Lite software. Select YES if you do not have this installed on your computer, or if you are unsure. Follow the on-screen prompts to complete installation.

iBeamWorx Lite Software.

The advantage of recording the intensity allows the units to be calibrated, inspected, and assists in trouble shooting. You will now also be able to see and record the effects of LED life cycles.

1. Before configuring, the proper COM# needs to be set according to the COM# the computer is using to communicate.

To check the COM# on the computer. (Windows 7)

- a. Click the **Start** button on your computer.
 - b. Go to **Control Panel**.
 - c. Click **Hardware and Sound**.
 - d. Under “Devices and Printers”, click on **Device Manager**.
 - e. Under “Ports (COM & LPT)”, there should be the COM# the computer is using to communicate. i.e. **USB Serial Port (COM#)**
2. Click **Configure Settings...**
 - a. Set the COM# to the proper value.
 - b. Click **Ok**

3. Scanning Receivers

Ensure the iBeam Sensors are properly set up. Click **Scan Receiver Units**

Notes: Once the iBeamWorx Lite software successfully detects the receivers on the iBeam sensors, it will display its properties under Receiver Units. The software will keep scanning the receivers until the **Stop Scanning Receivers** is clicked or until it times out.

Notes: A message will appear at the top left-hand corner to indicate a scan has begun. If there was an unsuccessful scan the following message will appear, "Timeout. No response from network. Check Connection." Make sure iBeam Sensors are on. The latest iBeam Sensor models need to be connected to a VelociGraph unit to turn on.

Configuration

In order to properly change the receiver's properties, the software must be scanning the receivers. It will automatically display the changes under Receiver Units. Under Configuration set the values accordingly, click "Send Configuration" and the new settings will download.

Notes: The program will display a successful download message as follows,



Test Protocol

The following items will be necessary for this test protocol.

- ADC VelociGraph VG03-400 unit (1)
- ADC 1815CAB2 cables (4-8)
- RS485 serial port programming cable (1)
- Additional computer (recommended)
- M12 Splitters if necessary (1-4)
- AC Adaptor provided with VG03 (1)

Step 1 – Software Downloads

VG03Config

The VelociGraph VG03 captures high-speed pulses from external sensors (typically an ADC iBeam Sensor, or other light-screen sensor), calculates the time between those pulses and, if configured to do so, calculate the speed and the angle of the projectile that passes through the sensors. The VG03 has 4 inputs for sensor installation. Data is available via the RS485 serial port built into the device using a custom protocol. Refer to *VG03_OperationManual.pdf* for more details. You will need the programming cable part# ADC-2325-422

Download the latest version of the VG03Config software. This software can be found at our website <https://automateddesign.com/download/Vg03Config-Setup.exe>. Also, download the VG03 Operation Manual for instructions on how to use this program.

Recorder 7.00

Download the latest version of Recorder 7.00. This software can be found at our website <https://automateddesign.com/download/Recorder-Setup.exe>

Foxterm (Optional Non-ADC software)

Download the latest version of Foxterm. This software can be found at: https://automateddesign.com/download/foxterm_1_5_3_0.zip

- a. Extract all files.
- b. The software used for trouble shooting is *FoxTerm.exe*

Step 2 – Connections

You will need to proper cable to go from the sensors to the VG03. If you do not currently use the VG03 in your everyday setup, you will need to get 1 cable per each emitter and receiver part# 1815-CAB2.

Do you have more than 2 set of sensors? If so, you will need an M12 splitter as the one shown here for connecting all the sensors to the VG03.



FIGURE 1.1 - M12 splitter
Notice the channel numbering on the splitter.

Please refer to the instructions ahead and Figure 1.2 for proper connections.

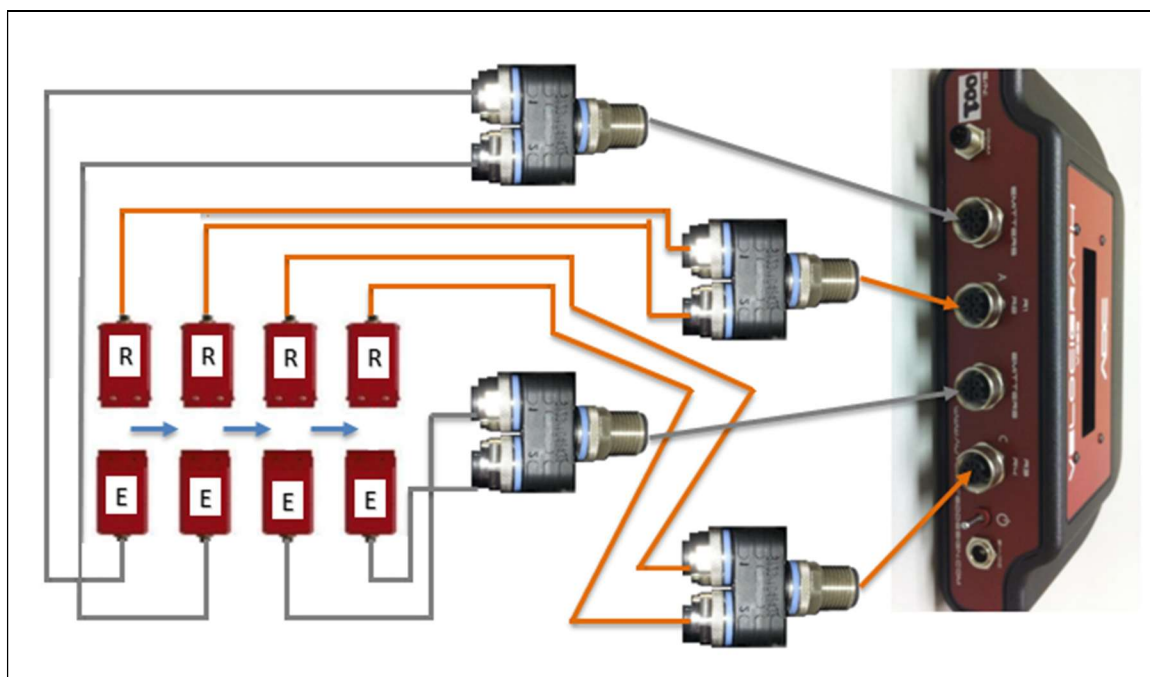


FIGURE 1.2 - Illustration for connecting 4 set of sensors. The blue arrows indicate the path of the object as it enters from left to right triggering all sensors.
NOTE: The sole purpose of this diagram is to illustrate proper connections and does not depict any real setup.

Begin by connecting the light source, or EMITTER, for your sensors to the EMITTER connections on the VG03. Emitters can be connected in any order.

For iBeam sensors, simply use the cables provided and connect to the EMITTER port on your VG03. For sensors from other manufacturers, see the documentation that came with your sensor.

Source connections provide supply power for any sensor light source (24VDC output). Be sure to connect the emitters to the proper pins of the source connector, and that the emitter can accept 24 VDC as the input power, or damage can result.

Next, connect the sensor RECEIVER to the VelociGraph. The RECEIVER connections *must be connected in the order of the ball path*, the RECEIVER A is the receiver closest to the entry path of the projectile, and the RECEIVER C is the final receiver in the path of flight.

Connect the AC Adaptor to the +24 VDC Female plug on the back of the enclosure. Please be sure to use the AC Adaptor provided with the VelociGraph.

Step 3 - Reporting the Results

Before trouble shooting the device, you must configure the VG03 unit. Keep in mind that all configurations and trouble shooting should be done on a separate computer to avoid communication interruptions.

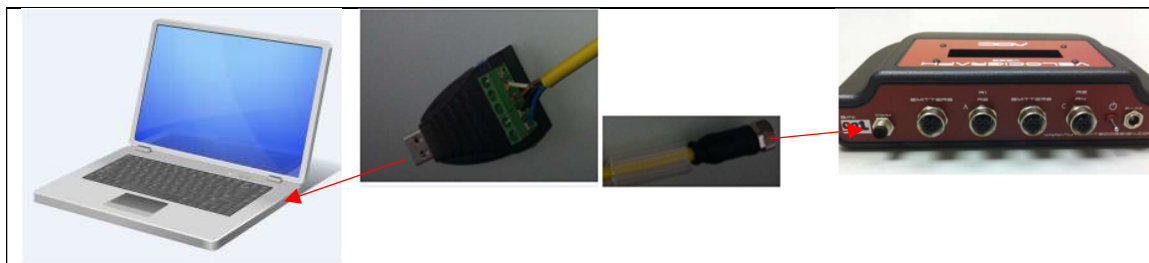


FIGURE 1.3 – Computer connection with RS485 programming cable.

First, connect the programming cable to the computer. When you plug in the programming cable (cable with a USB) to your computer, it will establish a communication port or COM#. There is no default COM# the computer will use however, you can check which COM# your computer uses by doing the following:

Go to Control Panel,

- Click on **Hardware & Sound**. Under **Devices and Printers**, click on *Device Manager* (the Device Manager window will pop-up).
- On the *Device Manager* window, Scroll-down to **Ports (COM & LPT)**. There should be a **USB Serial Port(COM#)** item. This is the COM number you will use on your computer for the VG03Config and Foxterm software.

Next, open the VG03Config software. Select the proper COM# (from the instructions above) and click **SEEK**. The Velocigraph will need the following settings:

Mode: *Net Only Mode*

Deadtime: 300 microseconds

Trip Level: 5 volts

When done, click **WRITE**. Power off the VG03 unit and then power back on. You will see the LCD display MODE 04.

NOTE: YOU MUST CLOSE OUT THE VG03CONFIG SOFTWARE BEFORE MOVING ON TO THE NEXT STEP.

Next, open Recorder5.00, click *Connect*, then click *Start Capture*. The program will start recording every pulse it detects and display it on the screen. The last pulse detected will be displayed at the very top. When done, click *Stop Capture*.

(Optional – Do not use this program if Recorder5.00 is being used!)

Next, open Foxterm and click RUN

Go to File, select *New COM port Connection...*

- Under *COM Port Configuration*
 - Port: *Select the same COM#*

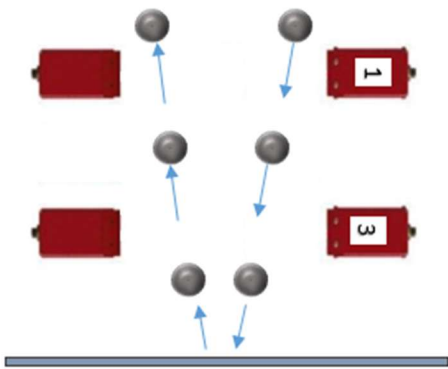
- Under *Additional Features*
 - Echo Characters: *true*
- Click Ok.

Foxterm will display all the pulses the VG03 unit will receive. This will help us pin-point where the problem is.

Performing the test.

1. Execute 10 shots through the sensors.

Example output using Recorder7.00

	Data <table><tr><th></th><th>Address</th><th>Channel</th><th>Time</th><th>Time Stamp</th></tr><tr><td>8</td><td>1</td><td>1</td><td>112.721</td><td>1/24/2014 2:49:...</td></tr><tr><td>7</td><td>1</td><td>3</td><td>73.0488</td><td>1/24/2014 2:49:...</td></tr><tr><td>6</td><td>1</td><td>3</td><td>35.6483</td><td>1/24/2014 2:49:...</td></tr><tr><td>5</td><td>1</td><td>1</td><td>0</td><td>1/24/2014 2:49:...</td></tr><tr><td>4</td><td>1</td><td>1</td><td>108.033</td><td>1/24/2014 2:49:...</td></tr><tr><td>3</td><td>1</td><td>3</td><td>69.6012</td><td>1/24/2014 2:49:...</td></tr><tr><td>2</td><td>1</td><td>3</td><td>33.502</td><td>1/24/2014 2:49:...</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1/24/2014 2:49:...</td></tr></table>		Address	Channel	Time	Time Stamp	8	1	1	112.721	1/24/2014 2:49:...	7	1	3	73.0488	1/24/2014 2:49:...	6	1	3	35.6483	1/24/2014 2:49:...	5	1	1	0	1/24/2014 2:49:...	4	1	1	108.033	1/24/2014 2:49:...	3	1	3	69.6012	1/24/2014 2:49:...	2	1	3	33.502	1/24/2014 2:49:...	1	1	1	0	1/24/2014 2:49:...
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2	1	3	33.502	1/24/2014 2:49:...																																										
1	1	1	0	1/24/2014 2:49:...																																										
Drop Test – 2x with channel 1 being the top receiver and channel 3 being the bottom receiver	Sample output data – Latest pulse detected on row 8.																																													

Trouble shooting

1. Make sure the iBeam Sensors are properly setup.
2. iBeam Sensors must be connected to a VelociGraph unit to power on. The M12 connector on the **iBeam Receiver** is the power/output connection. This cable must be connected to the M12 connector on the VelociGraph unit labeled as R1/R2A or R3/R4C. The corresponding **iBeam Emitter** can be connected just *left* of where its **iBeam Receiver** cable is connected. The VelociGraph unit must be turned on.
3. The programming cable must be connected to the M8 connector on the **iBeam Receiver** and NOT the VelociGraph unit.
4. The correct COM# must be chosen from the Configure Settings pop-up window on the interface.

5. If “Failed to open serial port.” message keeps appearing, close the program and start it up again.

For further assistance, you may contact our technical support department in the following ways:

1. Call 1 (630)783-1150 Mon – Fri 8:00am to 4:30pm Central Standard Time (CST)
Email: tbj@automateddesign.com