VBW-108 Vibrating Wire Interface

Connection to an RS-485 Network

The information below shows how to connect the VBW-108 to a general purpose RS-485 multi-drop network
Only a simple command structure is required to activate and receive results from the instrument. All of the sensor inputs can be uniquely defined for individual instruments.

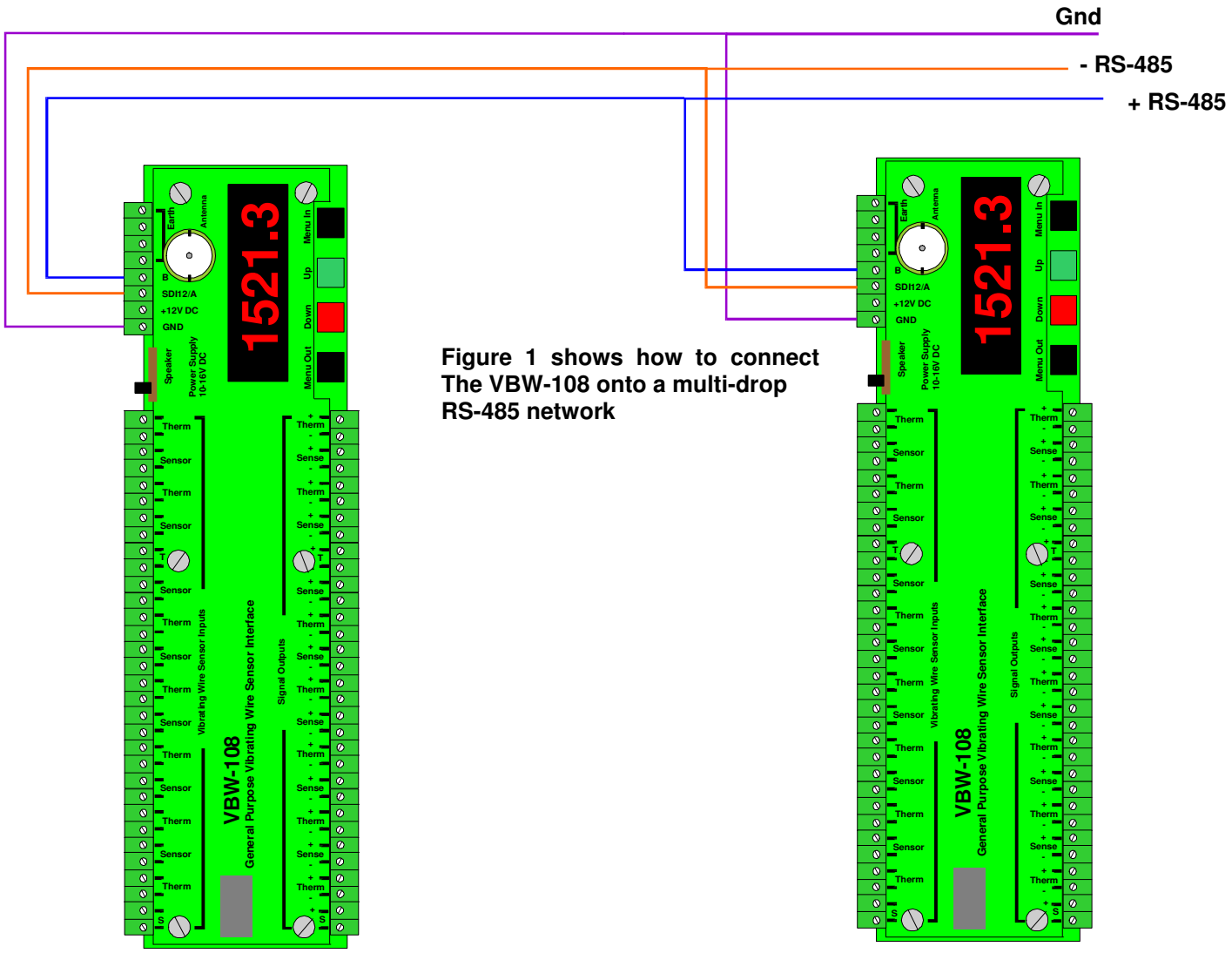


Figure 1 shows how to connect The VBW-108 onto a multi-drop RS-485 network

Selecting RS-485 Operational Mode

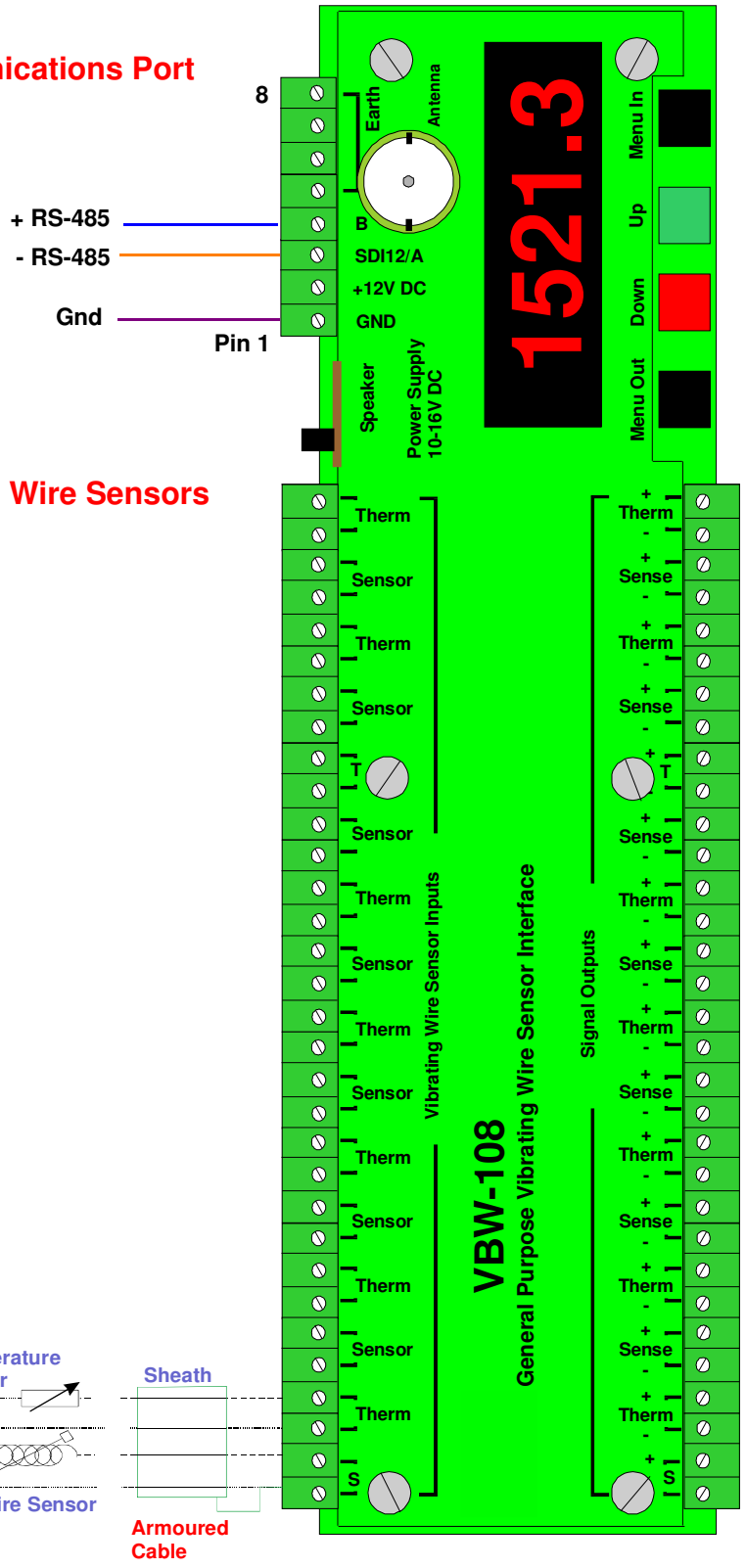
The VBW-108 has several different modes for operation
and to activate the unit for RS-485 operations select:

→ Select "Menu In" key → Use Up & Down buttons
To select the "**Serial**" option

Once the "Serial" option is selected press "**Menu Out**" key to activate the option
And return the User display back to "**basic**" display

VBW-108 RS-485 network connections

Communications Port



Comms Port Pin-out

1	GND
2	+12V
3	-RS-485
4	+RS-485
5	Earth
6	Earth
7	Earth
8	Earth

Not Used with RS-485 network

Maximum Network Length	1200 m
Maxiumun number of VW108	32 per network string
Baud Rate	1200

VBW-108 RS-485 Operating Instructions

The instructions below detail the operations to follow to operate the VBW108 across an RS-485 serial LAN.

Unlike Other operating modes for the VBW108 no channel configuration details need be defined. Simply connect the sensors to th interface as shown in Fig 2 and initiate the commands listed below.

Recommended Test

Use a single instrument only when undertaking measurements with a VBW-108 on a RS-485 network. This simplifies the software and will speed up the understanding of the command used to obtain data. It will be very easy to test the results measured across the RS-485 network with the on-board frequency display of the unit.

The results obtained across the RS-485 network will be same as those shown on the display for a specified channel.

Command Structure and Operations Across An RS-485 Network

The VBW-108 uses a command structure across the RS-485 network very similar to that used by SDI-12 network in order to simplify the overall system operations. Understanding the control of the instrument on one network be that RS-485 or SDI-12 will make using the the unit on the other a very simple operation.

The RS-485 and SDI-12 network both operate at the same speed of 1200 baud.

Even though this is a relatively slow rate as networks go it is more than adequate for the small amounts of data transmitted by the instrument.

No break characters are transmitted in an RS-485 command and any sent will be ignored by the instrument.

A short **delay** of approximately **10ms** aprox delay is added between a command received by VBW108 and it's transmission of data sir this delay is used to allow time for the host PC to turn off its transmitter when using soft-negotiation for data flow control operations. Under normal RS-485 data transmission operations the RTS line on the serial port is used for flow control operations.

Keynes Controls recommends an RS-485 interface with Hardware negotiation be used to control the VBW108 across a network.

Timing Constraints RS-485 / SDI-12 Network

There are no timing constraints for the transmission of instructions and receipt of data across an RS-485 network compared to the operations on and SDI-12 network.

Data Access Time

Typically the VBW-108 takes approximately 60 seconds to complete its readings from receiving the command to activate the gauge to making the results available for transmission across the network.

Allow 60 seconds for the unit to respond no matter how many sensors have been fitted. Under RS-485 operation

RS-485 Commands

In the following commands 'a' and 'b' are the address of the instrument can be 0 to 9 or the characters a - z.

where

'**ttt**' represents a time in seconds (0 to 999 seconds)
'**n**' or 'nn' represends a number of channels (00 to 99 channels)
\r and **\n** are the Carrigde Return and Line Feed characters - ASCII 13 and 10.

Start Measurement Commands

There are 2 separate commands supported by the VBW-108 for initiating measurements across and RS-485 network and are named '**aM!**' and '**aC!**'. Table 1 includes a complete description of the commands used by the VBW-108

The '**aM!**' starts a measurement and responds as soon as the data is ready to be transmitted from the instrument. This command returns all instrument sensor inputs as a string

The '**aC!**' command starts concurrent operations that are used to initiate measurements upon multiple instruments deployed across the network. The 'aC!' command frees the RS-485 bus so that other devices can operate freely.

Initial Configuration

To setup a multi-instrument RS-485 network the ID number used to select an instrument on the network has to be adjusted from the default factory settings. It is recommended that each instrument is individually configured before being deployed in order that no confusion settings is made.

Care is to be taken that each instrument to be deployed has a unique ID number to ensure that data is correctly identified.

The initial factory set ID number for each instrument is 0.

Table Of Commands

The following commands are all those supported by the VBW-108 for use on an

Description	Master	VBW108 Response
Acknowledge active	a!	a\r\n
Send ID:	I!	a13KEYNESCOVW1080001\r\n
provided to complement SDI-12 protocol		Part Description assigned by Keynes
Address query	?!	a\r\n
identifies instrument address and commonly used on single instrument operations only.	Used to make command set SDI-12 compatible	Where a = number 0 - 9 or a - z
change Address:	aAb!	b\r\n
used to change instrument address from default to new one for network operations	**a** = initial address **b** = new address	**a : b** = number 0 - 9 or a - z
Start Measurement	aM!	a0608\r\n
instruct an instrument to make measurement	**a** = address of instrument	instrument with address a returns 8 x vibwire & 8 x temp after 60 seconds
Concurrent measurement:	aC!	a06016\r\n
Used for polling multiple instruments on a network to start to make readings. This command frees RS-485 bus for other devices	start measurement instrument address **a**	initial response only after receipt of instruct and no response when data ready to be sent.
Send data	aD0! aD1! aD2! or aD3!	+xxxx.x+xxxx.x+xxxx.x+xxxx.x\r\n
data returned aND! = Vib + Vib + Therm + Therm and has same format for each command	aD0! = channel 0 and 1 aD1! = channel 2 and 3 aD2! = channel 4 and 5 aD3! = channel 6 and 7	

Additional Information

1 Strain gauge data is given as frequency in units (Hz)
2 Temperature data is given in millivolts (0000.0 to 2500.0)

The RS-485 commands are almost identical in their format and use to those used on an SDI-12 network.

Examples Of Using RS-485 Code

The following examples show how to undertake the various tasks needed to setup and make reading witht he VBW-108 across an RS-485 bus.

Changing the ID Number

The following example demonstrates how to change the instrument ID number from the default factory setting 0 to 5.

Use the command '**a**A**b**' where a = Start ID b = Final ID

master sends: '**0A5**' Instrument responds **5\r\n** Return New Line (5 representing new ID number)

ID Number Query

This command has been included to remain compatible with the SDI-12 and should be used for used with single instrument operations only. Useful command when identifying ID numbers for instruments to be deployed on a multi-instrument network.

The example below is to show the ID number of a single instrument

Use the command '**?!**' .

master sends:: '**?!**' Instrument responds 3**\r\n** Return New Line (3 is the ID number)

Start Measurements On Distributed Instruments Upon A Network

The following example shows how to start measurements on instruments deployed on a RS-485 network with ID numbers 2, 7, and 9 respectively.

For this example the instruments are instructed to start readings one at a time and the network is not freed up until each instrument responds that the readings are being undertaken.

The instruments will start their measurement operations but will not send data across the network until instructed to do so.

Use the command '**aM!**' where a = Instrument ID Number

master sends: '2M!' Instrument responds '**20608\r\n**' indicated readings available after 60 secs
followed by '**2\r\n**' when the measurement is completed

7M! '**70608\r\n**'
'**7\r\n**'

9M! '**90608\r\n**'
'9\r\n'

Note. For this command the RS-485 network will not become available until each instrument completes its measurement cycle.

Start Concurrent Measurements on a Number of Distributed Instruments

The following example shows how to start measurements on multiple instruments deployed on a RS-485 network. Concurrent measurements '**aC!**' differ from the '**aM!**' command in that they free the RS-485 network after the initial command response to allow other devices to operate. Concurrent measurements enable multiple instruments to respond faster to measurement commands.

The '**aC!**' command initiates the measurement cycle within the instrument to start reading from the sensors however the data still has to be requested from the VibWire-108 before being sent across the network.

Example of concurrent measurements for instruments with ID numbers 1, 6, and 7 respectively.

For this example the instruments are instructed to start readings one at a time and the network is not freed up until each instrument responds that the readings are being undertaken.

The instruments will start their measurement operations as soon as command is received but will not send data across the network until instructed to do so.

Use the command '**aM!**' where a = Instrument ID Number

master sends: '**1C!**' Instrument responds '1**0608\r\n**' indicated readings available after 60 secs
RS-485 network is free for other devices as soon as this response is returned.

'**6C!**' '6**0608\r\n**'

'**7C!**' '7**0608\r\n**'

Read Values From The VBW-108

No matter which instruction 'aM!' or 'aC!' is used to initiate measurement operations for the VBW-108 has to be instructed to send data when it becomes available. It takes the instrument 60 seconds to make sensor vales available after being instructed to make a measurement. The **vibrating wire readings** are in **Units Hz**. The **Temp/Current loop** input are in **Units mV**..

Use the command: '**aD0!**' -- Vibrating Wire inputs 0 - 3
'**aD1!**' -- Vibrating Wire inputs 4 - 7
'**aD2!**' -- Temp/current loop inputs 0 - 3 (values in mV)
'**aD3!**' -- Temp/current loop inputs 4 - 7 (values in mV

Instrument responds: '**a**+xxxx.x+xxxx.x+xxxx.x+xxxx.x\r\n' xxxx.x is the format of the number returned - 1 decimal place

for example to read all the sensor data back from an instrument with ID = 4

master sends: **'4D0!'** Instrument responds: '**4+1011.3+1204.4+1101.3+1190.7**' Vibrating wire data
'4D1!' Instrument responds: '**4+1021.5+0000.0+1141.2+0000.0**' 0000.0 is returned when no sensor installed

Temperature/Current loop Data

'4D2!' Instrument responds: '**4+0050.6+0056.1+0101.2+0000.0**' shows results with only 3 temp/loop values
'4D3!' Instrument responds: '**4+0051.4+0058.3+0110.2+0015.3**'

No Data is available Instrument responds 'a\r\n' or this example '**4\r\n**'

Note. the temperature values are in mV only. Thermistor linearisation is needed is convert the results into engineering values.

Measurement Systems Ltd
16 Kingfisher Court
Newbury
Berkshire
RG14 5SJ
Tel: +44 1635 576800
Fax: +44 1635 31023
Web: www.measurementsystems.co.uk
E-mail : sales@msl-datascan.com