FlexWedge for Quadrature to USB Interface/Multiplexer

FW-QUAD1 with single input to connect scales/indicators
FW-QUAD3 with three inputs to connect scales/indicators

Accepts: Sinewave and Squarewave Quadrature signals – Auto detects format
Configurable: Range and Resolution configured for each input
High precision input analysis: 16, 24, 32 bit and 32 bit Differential Inputs

Configuration Guide
Version 1.0

MIDWESTFLEX.COM
A Midwest FlexSystems, Inc. Company

Table of Contents

General Description

Congratulations on your new FlexWedge for Quadrature devices. Each unit is shipped with USB cable and USB drive preloaded with driver for Windows and manual/instructions. Also included is a free terminal communication software for ease of use and setup or testing.

The FlexWedge Quadrature interface can output data via VCP ***USB Serial or HID USB Keyboard.***
Contact manufacturer for other options available with RS232 via DB9 and Bluetooth serial.

VCP USB Serial: The driver loads a Virtual Com Port that is a standard driver for converting your USB port into a serial port for software to recognize. Default is 9600 baud rate.

HID USB Keyboard: The driver loads for keyboard emulation. This is the HID (Human Interface Device) driver for standard keyboards that comes with all Windows Operating Systems. When connected, the FlexWedge will send readings like they were typed on a numeric keypad; this will allow readings to immediately appear in spreadsheets and databases.

Congratulations on selecting the FlexWedge for Quadrature signals.

This interface/multiplexer will allow you to connect to quadrature output devices and capture positive and negative movement and correlate that into a measurement of distance travelled.

Front Panel:

Input Ports: Industry standard DB15 connector compatible with most Mitutoyo Linear scales with Quadrature output.

Custom splitters and adapters available to adjust pinout and connector types to be compatible with other devices.

Back Panel:

USB Output: This port is **BOTH USB Serial and USB Keyboard**. You can select the data sent from this port to emulate a Virtual Com Port or to act as if readings were typed on a keyboard. (When using the keyboard mode, readings can be captured into spreadsheets and databases without any additional software.)

Data Send Jacks: 2.5 or 3.5mm "headphone" style jack on the rear of the model. Operators can use a footswitch, handswitch or PLC input to trigger readings; closing contact will trigger a reading.

NOTE: If input is held for 3 secs it will ZERO the readings at that location.

Blue LED: "Flashes" to signal data sending. The LED will light when power is present. When data is requested, the LED will toggle off/on signaling data is sent.

Reset Button: Pressing this button will reset the internal CPU of the FlexWedge to a known state.
Note: When using in USB output mode, it is **not recommended** to reset the unit. Operating software (Microsoft Windows) will consider a reset a disconnection and shut down the USB connection. Collection programs would then have to be closed and reopened to re-establish a connection. (The reset button is rarely used and is unlikely to be needed.)

Input choices/options

Compatible device details:

Input signals accepted	- Two 90° phase-shifted sinusoidal (sinewave) signals - Two 90° phase-shifted squarewave signals - 90° phase difference, differential squarewave (RS-422A equivalent)	
Input counter accuracy This is the number of individual segment changes that can be captured and stored.	- 16 bit: - 32,768 to 32,768 segments	-
	- 24 bit: - 8,388,608 to 8,388,608 segments	-
	- 32 bit: -2,147,483,648 to 2,147,483,648 segments	-
Signal pitch	This is the distance traveled represented by a completed progression of the sine or square wave signal. Users can enter number from .1 to 99.9 um	
Quadrature Signal	Quadrature signals are made up of 4 segments. To calculate segments used = pitch/4 x counter bit segments 16 bit counter: 20um /4 = 5um per segment, 16 bit allows 32,768 segments = +/- 163 mm 24 bit: 20um/4 = 5um x 8,388,608 segments = +/-41,943 mm or +/-1,651 inches or +/-137 feet 32 bit: 20um/4 = 5um x 2,147483,648 segments = +/- 35,227 feet!! Adjust your signal pitch and the counter bits used for best option for your application.	
Interpolation of curve	Sinewave signals are also analyzed with interpolation to get even more precise positioning. This is the process of examining the position of the sinewave in-between the 4 quadrants for more sample points. This gives even more precise measurements of the movement travelled.	
Zero readings with hardware input	The readings can be set to zero by holding the datasend switch continuously for 3 secs.	

Installation

Connecting FlexWedge to computer – Quick and Easy

1. Connect the USB cable from the FlexWedge to the PC to an available USB port on PC. Power supplied from the USB port will be all the power needed. (laptops or desktops)

2. The default input type and pinout for the FlexWedge Quadrature is the AT100 series of linear scales from Mitutoyo.

3. The FlexWedge has default settings and can begin sending readings immediately.

However, with quadrature devices, the output can vary, and users should setup the range and resolution of device connected.

*Note: See **Firmware Configuration** to customize the FlexWedge output and interactions to match any data collection project.*

USB Connection:
Install the USB driver from the memory stick and run the installation program. This will load the driver for the FlexWedge for both the VCP and HID devices. You can also select the option to install terminal programs. Once the driver is installed, connect the interface and you will have a new VCP (Virtual Com port) listed under Ports in the control panel. The computer will automatically assign the next available COM port number. Data collection software will be able to see this new port as well as collect data.

The FlexWedge is configured and programmed in USB Serial VCP mode. In the FlexWedge options, the output can be configured to be sent like keystrokes on a keyboard and add extra keyboard strokes and commands.

Collecting Data into ANY software:
The FlexWedge will send data to your computer's COM port. SPC software packages and software wedge programs have a driver that allows the software to read the port and transfer that data into your software. Data can even be programmed to go to specific part files or characteristics based on the input port to which the device/scale is connected.

For programs like Excel or a custom database, the FlexWedge can use USB Keyboard mode and readings will then appear like they were typed on the keyboard. Now your data can be easily placed into ANY software you need to collect measurements.

Because they are designed for use straight from the box, operators can connect scales, indicators and other quadrature signal devices to the interface and begin collecting data immediately. The FlexWedge does not use internal or external dipswitches; it is controlled by firmware built into each FlexWedge interface.

Firmware Configuration

The FlexWedge for Quadrature multiplexers come with built-in features giving you control over the type of data being captured. The firmware inside the FlexWedge allows standard data collection or customization that is unsurpassed by even dedicated hardware.

To setup advanced features of the FlexWedge line of interfaces, simply use *any* terminal program to access the built-in configuration menu. (Tera Term shareware software is included on the USB drive.)

Start a Terminal Software
Select the COM port the interface is attached to on the PC and set serial settings to match output settings of the FlexWedge (printed on bottom of unit). The default settings are 9600 baud, no parity, 8 data bits, 1 stop bit. The Flow control needs to be set to NONE. (Speed can be increased if required.)

Access FlexWedge firmware
Type: SPC
The main menu of the FlexWedge will be displayed in the window.

Follow on-screen instructions to setup
This setup routine allows advanced or custom features to be accessed.

Configure features of the FlexWedge for number of devices connected, resolution and signal pitch of devices. Offset reading, mm/in, TIR modes, and output type and format also are configurable.

FlexWedge Main Menu Screen

```
FlexWedge Configuration Menu Version 1.0
Quadrature Sinewave/Squarewave

Port Settings:
                    Port 1      Port 2      Port 3
Device ID :         11          12          13
Accuracy:           24 bits     24 bits     24 bits
Resolution:         .001        .001        .001
Signal pitch:       20.0 um     20.0 um     20.0 um
Offset value:       .0000000    .0000000    .0000000

Global Settings:

Output Data:        Tab, Round, mm, VCP, Numeric
Output String Format: Reading

Select Options:
    1:  Configure the input port
    2:  Set device resolution
    3:  Enter the signal pitch (um) for device
    4:  Set reading offset for device
    5:  Configure the output data
    6:  Output string format

CFG:  Restore default   EX:  Quit with Save   QU:  Quit without Save

Enter Choice:
```

Custom applications:
The FlexWedge includes many features that are exclusive to the Midwest FlexSystems line as well as the ability to be customized in the field for special applications. Features can be combined to create a custom interface or if you want to create a special application; advanced functions can be programmed and added to the interface.

Updates and continuous improvements add features and functions to the FlexWedge line. There may be new features or functions that are not listed in this manual. Contact your Midwest FlexSystems representative to inquire about special or custom applications.

Stepping thru the Configuration Menu

Main Menu options:

1: Configure the input port
2: Set device resolution
3: Enter the signal pitch (um) for device
4: Set reading offset for device
5: Configure the output data
6: Output string format

1: Configure the input port:

Configure the Input Port :
1: Port 1: (1 Device, 24 bits)
2: Port 2: (1 Device, 24 bits)
3: Port 3: (1 Device, 24 bits)
Enter Choice:

(enter 1)

Port 1: Select analog accuracy of the Input Port:
1: 1 24 bit device
2: 2 24 bits devices (Requires 2 way splitter and can be used as 1 or 2 inputs)
3: 1 16 bit device
4: 2 16 bits devices (Requires 2 way splitter and can be used as 1 or 2 inputs)
5: 3 16 bits devices (Requires 3 way splitter that only works as 3 input not valid as 1 or 2)
6: 1 32 bit device
7: 1 32 Differential device
Enter Choice:

Special NOTE: If you program for more than one device to be connected you will need to use a splitter cable to give you access to the additional input connector.

Also NOTE: If you program for more than 1 device on a port, the additional devices will appear in the Main menu.

Examples:
Port 1 with 1 device will have Device ID 11
Port 1 with 2 devices will have Device ID 11 and 12
Port 1 with 3 devices will have Device ID 11, 12, and 13

Port 2 will be 21, 22, 23 and Port 3 will be 31,32,33 following the above pattern.

2: Set device resolution:

Port 11 Resolution {5um = 0.000005} [.001]:
1: 0.1
2: 0.12
3: 0.123
4: 0.1234
5: 0.12345
6: 0.123456
7: 0.1234567
Selection:

Each device configured into the system will display and allow users to adjust the number of digits of resolution. Please note that the device connected will have a factory level of accuracy and the output will vary if not stable from device.

3: Enter the signal pitch (um) for device:

Port 11 Pitch [20.00 um]:

This requires a numeric entry. Enter the signal pitch of the device connected.
(This normally can be found in device manufacturers information or flyers.)

4: Set reading offset for device:

Port 11 offset [.000000]:

This is default set to zero. You can enter a positive or negative number.

5: Configure the output data:

Format the output settings:

1. Set field delimiters:	Semicolon/Comma/Space/Tab
2. Reduce number of digits:	Round/Truncate
3. Set global units of measurements:	in/mm
4. Output mode for sending data:	VCP/HID/RS232
5. Device ID as alpha or numeric:	Alpha/Numeric

Enter output setting:

1: Set field delimiter used between devices
2: Reduce the number of digits will set if number is ROUNDED or TRUNCATED at set resolution
3: Set whether in or mm are sent
4: Output mode for FlexWedge: VCP, HID or optional RS232/Bluetooth
5: Device ID as Alpha or Numeric. (See note)

Note: Device ID is 11,12,13, etc. or X,Y, Z. If more than one device is connected, the lowest 3 device IDs will be converted to X,Y,Z and the remaining will still use numeric assigned.

6: Output string format:

Select the data output format:

1. Reading only	(12.45271)
2. Port: Reading	(X:12.45271)
3. TIR (Max-MIN)	(TIRX:6.8642)
4. MIN	(MINX:1.29870)
5. MAX	(MAXX:8.1629)
6. TouchDRO	(x######;y######;z#####;w#####;)

Enter Data output format: [1]

(TouchDRO output is a special use output used with Bluetooth output)

TIR (Max-Min - Total Indicator Runout):
This popular feature will continually read input over a specified period and return the value for the TIR (difference between the MIN and MAX readings) for the device requested.

MIN: The minimum reading taken between data triggers.

MAX: The maximum reading taken between data triggers.

The TIR feature is turned on/off via the footswitch or host command. When a data send is issued, the FlexWedge will monitor the input until the next data send is issued. When the FlexWedge receives the second data send request, the MIN/MAX/TIR is calculated and sent to the PC.

Cable Splitters and Custom Cables

To allow more devices to be connected, the FlexQuad will accept special splitter cables giving more device input options.

Custom cables can be created to convert a device connector and pinout to match the FlexQuad. By default the Mitutoyo line of linear glass scales using the DB15 is the standard input.

2 -Way splitter:

This 'Y' cable will allow 2 devices to be connected. When 2 devices are selected in the configuration menu, each input is assigned a Device ID.

Port Number	Device IDs
Port 1	11, 12
Port 2	21, 22
Port 3	31, 32

3 -Way splitter:

NOTE: 3-way splitter is ONLY used in 16 bit configurations

This 3-way splitter will allow 3 devices to be connected. When 3 devices are selected in the configuration menu, each input is assigned a Device ID.

NOTE: This splitter is not compatible to be used with only 2 input programmed into the FlexQuad. The configuration of the cable is not the same as the 2-way splitter.

You can connect only 1 or 2 devices but the port has to be programmed for 3 @ 16 bit

Port Number	Device IDs
Port 1	11, 12, 13
Port 2	21, 22, 23
Port 3	31, 32, 33

Appendix

Host Commands

The FlexWedge offers various Host Commands to make using the interface as easy as possible.
The use of **Host Commands** enables users to control the data sent to the PC from the interface.

Action	Command	Response
Send reading from selected device by ID	SR##	Will return device reading of selected ID (Replace ## with 11,12,13, 21,22,23, 31,32,33)
Send readings from all device IDs	SRA	Will read all gages connected
Stream all readings	DRO	Continuously stream the device readings Type DRO to start and again to stop
Zero reading on selected device by ID	ZR##	Will zero device reading of selected ID (Replace ## with 11,12,13, 21,22,23, 31,32,33)
Zero reading on all device IDs	ZRA	Will return gage reading on port ## (Replace ## with 2 digit port ID for desired port)
Note: Zero readings with hardware input		The readings can be set to zero by holding the datasend switch continuously for 3 secs.
Reverse Travel (Reverse the sign)	RT##	Will reverse the travel stroke of selected ID (Replace ## with 11,12,13, 21,22,23, 31,32,33)

FlexWedge, FlexPort and FlexDisplay family of products

FlexWedge Quadrature for Sinewave and Squarewave

FlexWedge FW-Quad1 – 1 input
FlexWedge FW-Quad3 – 3 inputs

FlexPort Models:

*FlexPort FP-2USB - 2 inputs plus Pass-Thru Port**
*FlexPort FP-4USB - 4 inputs plus Pass-Thru Port**
*FlexPort FP-8USBl - 8 inputs plus Pass-Thru Port**

Other Gage Interface Models:

FlexPort FP-4A Analog – 4 analog inputs plus Pass-Thru Port
FlexPort FP-8A Analog – 8 analog inputs plus Pass-Thru Port

FlexPort FP-1M – 1 Midwest FlexSystems input with data send
FlexPort FP-M29 – 1 Midwest FlexSystems input direct to DB9

FlexWedge FW-1M – 1 Midwest FlexSystems input to PS/2 keyboard input
FlexWedge FW2-1M-USB – 1 Midwest FlexSystems input to USB

Gage Interfaces with built-in Remote Displays

FlexDisplay FD-1 – 4 Midwest FlexSystems inputs to a single readout display
FlexDisplay FD-1PLUS – 4 Midwest FlexSystems inputs and 4 virtual ports to a single readout display (basic math functions)
FlexDisplay FD-1ADV – 8 Midwest FlexSystems inputs and 8 virtual ports to a single readout display (advanced math functions)
FlexDisplay FD-2 – 2 Midwest FlexSystems inputs and 2 readouts with Go/No Go status

Additional products, solutions, and support are available upon request. Contact Midwest FlexSystems, Inc. or your local MidwestFlex Value Added Reseller (VAR) for details.

Version 1.0