Appendices

APPENDIX A

The following Code program that is downloaded on to the microcontroller is presented below with comments to explain the function is marked with // .

```
Char uart_rd;

void main() {

 ADCON1 |= 0x0F; // Configure AN pins as digital

 CMCON |= 7; // Disable comparators

UART1_Init(15200); // Initialize UART module at 5000 bps

Delay_ms(100); // Wait for UART module to stabilize

UART1_Write_Text("Start"); UART1_Write(10); // Line feed

 UART1_Write(13); // Carriage return

while (1) { // Endless loop

if (UART1_Data_Ready()) { // If data is received,

uart_rd = UART1_Read(); // read the received data,

 UART1_Write(uart_rd); // and send data via UART

 }

 }
```

Appendix B:

Pins descriptions and layout of Microcontroller PIC16F877

Pin #	Pin Name	Description
1	~MCLR	
2	RA0/AN0	PORTA.0 /Analog Channel 0
3	RA1/AN1	PORTA.1 /Analog Channel 1
4	RA2/AN2	PORTA.2 /Analog Channel 2
5	RA3/AN3	PORTA.3 /Analog Channel 3
6	RA4/T0CK1	PORTA.4 / External Clock for Timer 0
7	RA5/AN4	PORTA.5 /Analog Channel 4
8	RE0/AN5	PORTE.0 /Analog Channel 5
9	RE1/AN6	PORTE.1 /Analog Channel 6
10	RE2/AN7	PORTE.2 /Analog Channel 7
11	Vdd	+3 ~ +5V
12	Vss	GND
13	OSC1/CLKIN	Oscillator Connection /Clock In
14	OSC2/CLKOUT	Oscillator Connection / Clock Out
15	RC0/T1CK1	PORTC.0 /External Clock for Timer 1
16	RC1/CCP2	PORTC.1 /CCP2
17	RC2/CCP1	PORTC.2 /CCP1
18	RC3/SCK/SCL	PORTC.3 /SCK(for SPI)/SCL(for I^2C)
19	RD0	PORTD.0
20	RD1	PORTD.1

http://ww1.microchip.com/downloads/en/DeviceDoc/30292c.pdf

Pin #	Pin Name	Description
21	RD2	PORTD.2
22	RD3	PORTD.3
23	RC4/SDI/SDA	PORTC.4/SDI(for SPI)/SDA(for I^2C)
24	RC5/SDO	PORTC.5 /SDO (for SPI)
25	RC6/TX	PORTC.6 /TX (for Serial Com.)
26	RC7/RX	PORTC.7 /RX (for Serial Com.)
27	RD4	PORTD.4
28	RD5	PORTD.5
29	RD6	PORTD.6
30	RD7	PORTD.7
31	Vss	GND
32	Vdd	+3 V ~ +5 V
33	RB0/INT	PORTB.0/External Interrupt
34	RB1	PORTB.1
35	RB2/PGM	PORTB.2 /Programming Input
36	RB3	PORTB.3
37	RB4	PORTB.4
38	RB5	PORTB.5
39	RB6/PGC	PORTB.6 /Debugger/ICSP
40	RB7/PGD	PORTB.7 /Debugger/ICSP

Appendix C

Device: Instrumentation Amplifier.
Type: AD524
Features:
- Low noise: 0.3 μV p-p at 0.1 Hz to 10 Hz.
- Low nonlinearity: 0.003% (G = 1).
- High CMRR: 120 dB (G = 1000).
- Low offset voltage: 50 μV.
- Low offset voltage drift: 0.5 μV/°C.
- Gain bandwidth product: 25 MHz.
- Pin programmable gains of 1, 10, 100, 1000.
- Input protection, power-on/power-off.
- No external components required.
- Internally compensated.
- MIL-STD-883B and chips available.
- 16-lead ceramic DIP and SOIC packages and 20-terminal leadless chip carrier available.
- Available in tape and reel in accordance with EIA-481A standard
- Standard military drawing also available

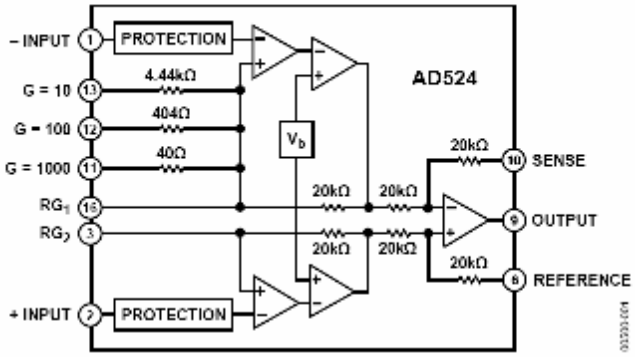
General description:

The AD524 is a precision monolithic instrumentation amplifier designed for data acquisition applications requiring high accuracy under worst-case operating conditions. An outstanding combination of high linearity, high common-mode rejection, low offset voltage drift, and low noise makes the AD524 suitable for use in many data acquisition systems. The AD524 has an output offset voltage drift of less than 25 μV/°C, input offset voltage drift of less than 0.5 μV/°C, CMR above 90 dB at unity gain (120 dB at G = 1000), and maximum nonlinearity of 0.003% at G = 1. In addition to the outstanding dc specifications, the AD524 also has a 25 kHz bandwidth (G = 1000). To make it suitable for high speed data acquisition systems, the AD524 has an output slew rate of 5 V/ μ s and settles in 15 μ s to 0.01% for gains of 1 to 100.

As a complete amplifier, the AD524 does not require any external components for fixed gains of 1, 10, 100 and 1000. For other gain settings between 1 and 1000, only a single resistor is required. The AD524 input is fully protected for both power-on and power-off fault conditions. The AD524 IC instrumentation amplifier is available in four different versions of accuracy and operating temperature range. The economical A grade, the low drift B grade, and lower drift, higher linearity C grade are specified

from −25°C to +85°C. The S grade guarantees performance to specification over the extended temperature range −55°C to +125°C. The AD524 is available in a 16-lead ceramic DIP, 16-lead SBDIP, 16-lead SOIC wide packages, and 20-terminal leadless chip carrier.

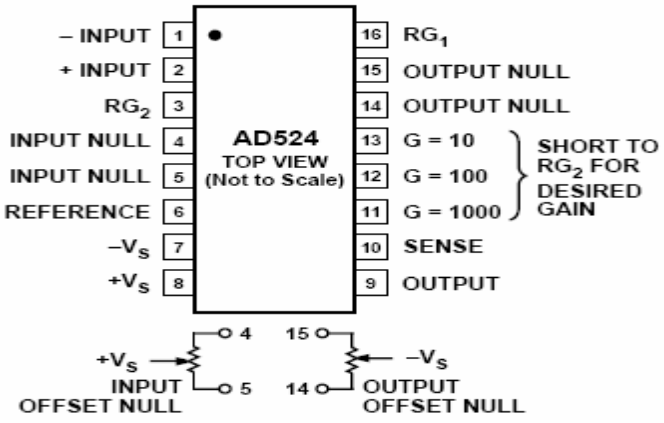
FUNCTIONAL BLOCK DIAGRAM



Production highlights:

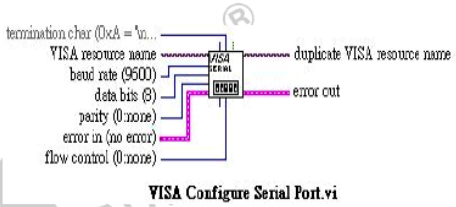
1. The AD524 has guaranteed low offset voltage, offset voltage drift, and low noise for precision high gain applications.
2. The AD524 is functionally complete with pin program- mable gains of 1, 10, 100, and 1000, and single resistor programmable for any gain.
3. Input and output offset nulling terminals are provided for very high precision applications and to minimize offset voltage changes in gain ranging applications.
4. The AD524 is input protected for both power-on and power-off fault conditions.
5. The AD524 offers superior dynamic performance with a gain bandwidth product of 25 MHz, full power response of 75 kHz and a settling time of 15 μ s to 0.01% of a 20 V step (G = 100).

CONNECTION DIAGRAMS

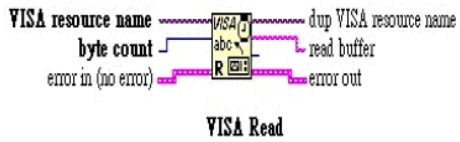


Appendix C
Labview commands

	Path	Controls➤Graph Inds➤Waveform Graph
	Explanation	Waveform Graph, can display the curve of chart from the numeric data of variable, and have the capability of memory function, almost the same as the paper tape for recording signals.

	Path	All Functions➤Instrument I/O➤I/O Serial➤VISA Configure Serial Port
	Explanation	Initializes the serial port specified by **VISA resource name** to the specified settings
	Input	**VISA resource name** specifies the resource to be opened. The parameters need initialization such as: the baud rate、flow control etc
	Output	If there is a bug, output the error code

	Path	All Functions➤Instrument I/O➤ Serial ➤ VISA Write
	Explanation	Writes the data from **write buffer** to the device or interface specified by **VISA resource name**.
	Input	**VISA resource name** specifies the resource to be opened.**write buffer** contains the data to be written to the device. **error in** describes error conditions that occur before this VI or function runs.
	Output	**dup VISA resource name** is a copy of the **VISA resource name** that VISA functions return. **return count** contains the actual number of bytes written. **error out** contains error information.

 VISA Read	Path	All Functions➤Instrument I/O➤ Serial (VISA Read
	Explanation	Reads the specified number of bytes from the device or interface specified by VISA resource name and returns the data in read buffer.
	Input	VISA resource name specifies the resource to be opened. byte count is the number of bytes to be read. error in describes error conditions that occur before this VI or function runs. The default is no error.
	Output	Read in string and output of error code
 String To Byte Array	Path	All Functions➤Numeric➤Conversion
	Explanation	Converts a string into an array of unsigned bytes.
	Input	**string** is the input string the function converts.
	Output	**unsigned byte array** is the output array.