YOUNG

INSTRUCTIONS

MODEL 61402V-1

BAROMETRIC PRESSURE SENSOR

CE

1.0 SPECIFICATIONS

Pressure	500 to 1100 hPa standard range
Digital Accuracy*	0.2 hPa (25°C) 0.3 hPa (-40°C to +60°C)
Analog Accuracy**	0.05% of analog pressure range
Analog Temperature Dependence**	0.0017% of analog pressure range per °C (25°C reference)
Long Term Stability:	0.08% FS per year

*Defined as ±1 standard deviation from NIST-traceable pressure reference in clean, dry air. Includes non-linearity, hysteresis, repeatability, and calibration uncertainty.

**Defined as ±1 standard deviation from ideal analog output. Total analog output accuracy is the root sum square of digital accuracy, analog accuracy, and analog temperature dependence.

Output Rate	2.0 Hz (max) to 1 per minute
Voltage Output	0 to 5000 mV (standard) 0 to 2500 mV 12-bit resolution (1 in 4000) Selectable pressure range: 500 to 1100 hPa (standard)
Serial Output	Full duplex RS-232 1200 to 38400 baud Continuous ASCII text Polled ASCII text NMEA 0.01 hPa resolution
Supply Voltage	7 to 30 VDC 3.6 mA with Vout (standard) 2.7 uA shutdown (Trig=0V) 7.6 mA with serial I/O
Case	Fiber-reinforced thermoplastic
Weight	44 g (1.5 oz)

R.M. YOUNG COMPANY
2801 AERO PARK DRIVE, TRAVERSE CITY, MICHIGAN 49686, USA
TEL: (231) 946-3980 FAX: (231) 946-4772

PN: 61402V-1-90
REV: A040819

2.0 INTRODUCTION

MODEL 61402V-1 Barometric Pressure Sensor is a versatile electronic barometer featuring high accuracy, low power, wide operating temperature range, and calibrated voltage output or RS-232 serial data I/O.

Low power consumption and wide temperature range make the 61402V ideal for remote applications using battery or solar power.

Full scale voltage output may be set to span any portion of the 500 to 1100 hPa operating range. RS-232 serial I/O options include continuous or polled ASCII text output or NMEA marine output. The sensor is supplied with the following standard configuration:

Voltage output
0 to 5000 mV = 500 to 1100 hPa
10 samples averaged
2.0 Hz update rate

3.0 INSTALLATION

The sensor operates over a temperature range of -40°C to +60°C and must remain dry.

Electrical connections are made with the 5-position terminal plug included with the sensor. Jumper settings may be used to select operating options. Access jumpers by loosening two screws in the sensor enclosure and removing the cover. See Appendix A for wiring details and jumper settings.

If changed from the standard configuration, please note that the software Vout Scale parameter must be set to agree with the hardware Voltage Output Scale jumper (**P3**) in order to achieve calibrated output.

4.0 OPERATION

Operation begins approximately 1 second after power is applied. Output will appear after a delay determined by the number of samples averaged and the output rate. With default values (2.0 Hz output and 10 samples averaged), outputs will begin after an initial 3 second delay then remain continuous at the 2.0 Hz rate. Parameters for output rate and number of samples averaged may be changed using software commands and removal of P1 jumpers.

4.1 VOLTAGE OUTPUT

Hardware jumpers and software parameters determine voltage output operation. Appendix A shows jumper configurations.

Both **P4** jumpers must be in position **A** for voltage output.

Jumper **P3** sets the Voltage Output Scale to either 0-5000 mV or 0-2500 mV. Please note that jumper P3 ***must*** agree with the software Vout Scale parameter in order to achieve calibrated output.

The voltage output scale may be mapped to any part of the 500 to 1100 hPa pressure range using the VOUT HI and VOUT LO software parameters. The standard setting maps 0 to 5000 mV with 500 to 1100 hPa. With this setting:

hPa = 0.12 * mV + 500
Effective resolution is about 0.15 hPa

Better effective resolution may be achieved by mapping the voltage output to a narrower range of pressure with the VOUT HI and VOUT LO parameters. For example, with VOUT LO set to 950 hPa and VOUT HI set to 1050 hPa and the VOUT Scale set to 0-5000 mV:

hPa = 0.02 * mV + 950
Effective resolution is about 0.025 hPa

Please see section 4.3 below for details on changing the VOUT HI and LO parameters.

With jumper **P4** configured for voltage output, a special TRIG input may be used to control barometer power. When TRIG=0V, all processes cease and power consumption is reduced to 2.7 uA. When the voltage on TRIG > 1.8V (or left floating), normal operation resumes with a powerup reset. The TRIG input connection is optional. It may be connected to +PWR or left floating.

4.2 SERIAL OUTPUT

Jumper settings and software parameters determine RS-232 serial communication format. The Appendix A Wiring Diagram shows jumper locations and function.

P1 A/B/C sets output format, baud rate, output rate, and averaging.The table below summarizes P1 configurations.

P3 A/B sets RS-232 hardware function. AUTO (A) enables RS-232 hardware when valid standard RS-232 signals are present at RX and TX. When not present, the RS-232 hardware is disabled to save power. FIXED (B) enables RS-232 hardware at all times so it can be used with some non-standard RS-232 signals.

P4 A/B configures the terminal connections for RS-232. Both jumpers must be in position **B** for RS-232 serial communication.

Format	Description
Continuous ASCII Text (standard)	9600 baud 10 sample average 2.0 Hz output
Polled ASCII Text	9600 baud 10 sample average Output when polled
Marine NMEA	4800 baud 10 sample average 1Hz output
Software	Output parameters determined by software settings

Note that NMEA output is normally specified to work on RS-422 and RS-485 networks. The NMEA output here conforms to the standard data format but the electrical connection uses RS-232 signal levels.

In POLLED ASCII mode, the unit sends data only after receiving a poll command. The poll command is Ma! where ‘a’ is the address value. The standard address is ‘0’ (ASCII 48) for a poll command of M0! Please see section 4.3 for details on changing the poll address.

Standard baud rate is 9600 but any of several available baud rates between 1200 and 38400 may be used.

4.3 SOFTWARE COMMANDS

Software commands sent via serial communication may be used to set operational parameters. The sensor must be configured for serial communication and connected to a PC or other compatible device using a program like HyperTerminal.

New settings are stored in temporary memory and must be permanently saved to flash with command CMD420 or CMD300 2 to be retained.

Note: The **P1** jumper must be configured for SOFTWARE format to alter baud rate, sample average count, and output rate parameters. Jumper settings will override command settings on a power cycle.

Although the sensor may receive commands at any time, measurement output may be paused by sending three ESC (ASCII 27) characters or CMD300 1. While paused, COMMAND mode is indicated by a ">" prompt. All commands must be terminated with a carriage return CR (ASCII 13).

Use "?" to list available commands as shown below.

```
>?

CMD100 n   OUTPUT PERIOD (0-60 sec)
CMD105 n   AVG SAMPLE COUNT (0-32)
CMD110 n   OUTPUT FORMAT
           (1=ASCII 2=POLLED 3=NMEA 4=RAW 5=DIAG)
CMD120 n   MULTIPLIER (10000 = 1.0000)
CMD125 n   OFFSET (hPA x 100)
CMD130 n   SEA LEVEL CORRECTION (hPA x 100)
CMD140 n   VOUT RANGE HI (500-1100)
CMD142 n   VOUT RANGE LO (500-1100)
CMD144 n   VOUT SCALE (2=2.5V 5=5V)
CMD150 c   POLL ADDR CHAR
CMD160 n   BAUD RATE (38400,9600,4800,2400,1200)
CMD300 n   1=STOP, 2=RUN
CMD310 n   FORCE VOUT (0-5000 FULL SCALE)
CMD400 n   1=RPT TEXT, 2=RPT CODE ONLY
CMD410     GET CAL TABLE
CMD420     STORE SETUP PARAMETERS

>
```

CMD100 n sets output period in seconds. When set to zero, the output rate is about 2 per second.

CMD105 n sets the average sample count. Higher sample count yields more stable readings but will lengthen the startup delay.

CMD110 n sets output format. RAW and DIAG settings are for factory use only.

CMD120 n sets the output multiplier. 10000 represents 1.0000

CMD125 n sets the output offset in hPa x 100

CMD130 n sets the sea level correction in hPa x 100

$$= \left[P_{unadjust} * \left(Mult / 10000\right)\right] + \left[\left(Offset / 100\right) + \left(Correction_{Sea\ Lvl} / 100\right)\right]$$

CMD140 n sets the Vout Pressure Range HI

CMD142 n sets the Vout Pressure Range LO
Vout Pressure Range HI must be greater than Vout Pressure Range LO

CMD144 n sets the Vout Scale. 2 = 0 to 2500 mV. 5 = 0 to 5000 mV. This parameter setting must agree with the physical P3 jumper position to achieve calibrated voltage output.

CMD150 c sets the poll address character. Any ASCII character from '0' (ASCII 48) to 'z' (ASCII 122) may be used.

CMD160 n sets the baud rate. Acceptable values are 38400, 9600, 4800, 2400, and 1200. Note that the baud rate change occurs immediately after the command is received. Therefore, in order to continue communicating, the serial communication program that issued the command must also change to match.

CMD300 n causes the sensor to pause or resume measurement. 1 = Stop, 2 = Run.

CMD400 n causes the sensor to issue a report summarizing parameter settings.
1 = RPT text
2 = RPT code only

CMD410 retrieves the internal calibration table. This is for factory use only.

CMD420 or run mode (CMD300 2) stores new parameter settings to flash memory. This step ***must*** take place to retain changes otherwise parameters will revert to the previous values at the next powerup.

5.0 MAINTENANCE

The MODEL 61402V-1 Barometer requires no regular maintenance. Periodic calibration certification, if required, is available from the factory.

6.0 WARRANTY

This product is warranted to be free of defects in materials and construction for a period of 12 months from date of initial purchase. Liability is limited to repair or replacement of defective item. A copy of the warranty policy may be obtained from R. M. Young Company.

7.0 EMC COMPLIANCE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This ISM device complies with Canadian /CES-001.

Cet apparei/ISM est conforme a la norme NMB-001 du Canada.

EN55011/CISPR 11, Group 1, Class B device

Class B equipment is suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

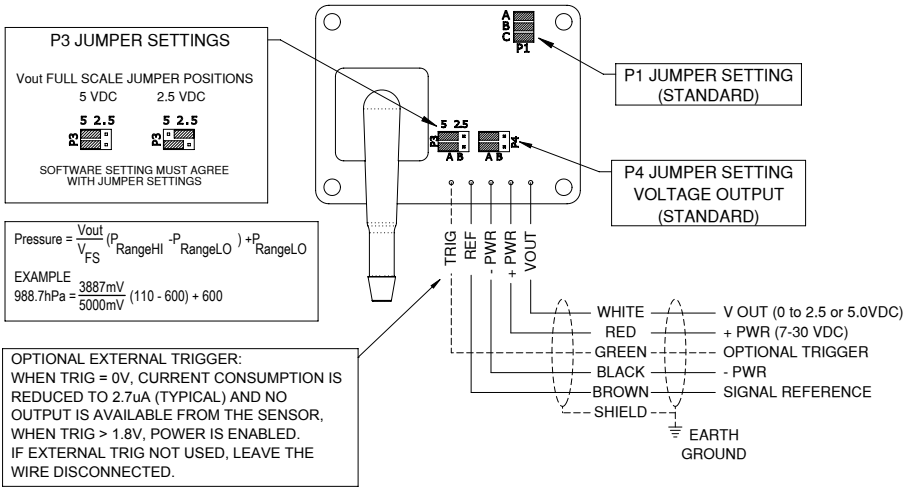
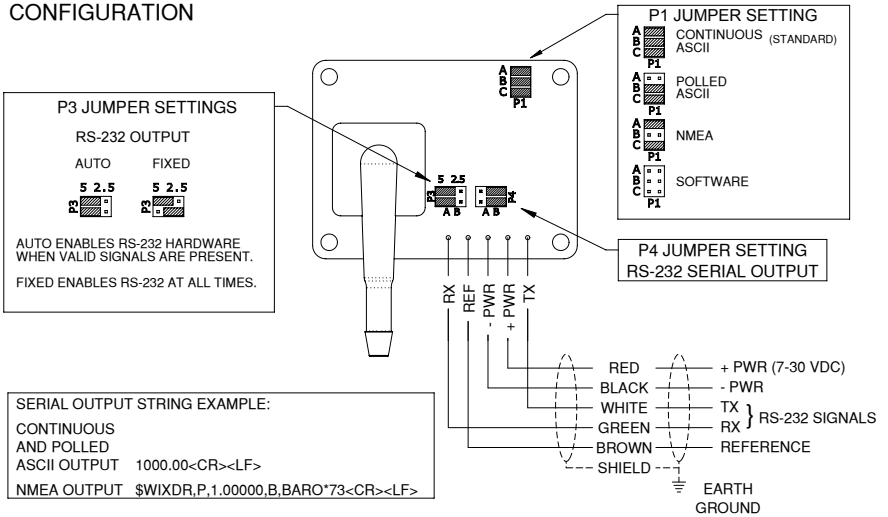
8.0 CE COMPLIANCE

This product has been tested and complies with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

APPENDIX A

61402V-1 BAROMETER
TYPICAL WIRING CONNECTIONS

VOLTAGE OUTPUT CONFIGURATION



RS-232 SERIAL OUTPUT CONFIGURATION