

# BAROMETRIC PRESSURE TRANSDUCERS FOR AUTOMATED WEATHER OBSERVING SYSTEMS (AWOS)

AN-105

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Honeywell's high performance pressure sensors have been used on aircraft for primary air data measurements for decades. These extremely reliable and stable sensors are digitally compensated to provide high accuracy over wide temperature ranges. The same technology that is being used for making these critical pressure measurements in the air is now available for making AWOS measurements on the ground. Honeywell's barometric pressure transducers have been tested against the requirements of FAA Advisory Circular 150/5220-16C. This application note describes the testing and compliance of Honeywell's barometric pressure transducers to the requirements of the FAA AWOS specification.



## HONEYWELL'S BAROMETRIC PRESSURE TRANSDUCERS

Honeywell's HPB/A and PPT barometric pressure transducers combine proven silicon sensor technology with microprocessor-based signal conditioning to eliminate the need to insulate or temperature-regulate the barometer. Available in a compact, rugged design, the barometric pressure transducers have many software features that support a wide range of applications. The table below provides a cross-reference of compliant barometric pressure transducer types versus application.

Product Type	AWOS Application		
	Indoor	Class 1 Outdoor	Class 2 Outdoor
HPB/A, RS232	X	X	
HPB/A, RS485	X	X	
HPB/A, TTL	X	X	
PPT, RS232	X	X	X
PPT, RS485	X	X	X



## AWOS REQUIREMENTS

The AWOS requirements for barometric pressure transducers are as follows:

Quantity:	Two barometers per AWOS system
Pressure Range:	17.58 – 31.53 inHg
Error (RMSE):	0.01 inHg
Error (max):	0.02 inHg
Resolution:	0.001 inHg increments
Average Differential Accuracy:	0.01 inHg
Maximum Drift with Time (RMSE):	0.01 inHg in 6 months
Maximum Drift with Time (max):	0.02 inHg
Temperature Range (Indoors):	+5 to +40°C
Temperature Range (Class 1, Outdoors):	-35 to +55°C
Temperature Range (Class 2, Outdoors):	-55 to +55°C

## AWOS TESTING AND RESULTS

Accuracy, Differential Accuracy, Resolution, and Drift tests were performed per section 22C of the AWOS Advisory Circular 150/5220-16C.

<p style="text-align: center;"><u>Accuracy Test</u></p> <p><b>Setup:</b> At +25°C, +55°C, -35°C (Class 1), and -55°C (Class 2), readings were taken at 1 inHg intervals between 17 and 32 inHg. Test was repeated.</p> <p><b>Requirements:</b> To pass, each test must exhibit a Root Mean Square Error (RMSE) accuracy of <math>\leq 0.01</math> inHg with all data points exhibiting an error <math>\leq 0.02</math> inHg.</p> <p><b>Results: (average of all units tested)</b></p> <table border="1"> <thead> <tr> <th></th> <th>Requirements</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td><b>RMSE</b></td> <td><math>\leq 0.01</math> inHg</td> <td><b>0.005 inHg</b></td> </tr> <tr> <td><b>Max Error</b></td> <td><math>\leq 0.02</math> inHg</td> <td><b>0.01 inHg</b></td> </tr> </tbody> </table>		Requirements	Results	<b>RMSE</b>	$\leq 0.01$ inHg	<b>0.005 inHg</b>	<b>Max Error</b>	$\leq 0.02$ inHg	<b>0.01 inHg</b>	<p style="text-align: center;"><u>Differential Accuracy Test</u></p> <p><b>Setup:</b> At 75°F and ambient pressure, 14 readings were taken at five second intervals. Test was repeated three hours later.</p> <p><b>Requirements:</b> To pass, the average difference between the two sets of 14 readings must be <math>\leq 0.01</math> inHg and the standard deviation should be <math>&lt; 0.003</math> inHg.</p> <p><b>Results: (average of all units tested)</b></p> <table border="1"> <thead> <tr> <th></th> <th>Requirements</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td><b>Avg Diff Acc</b></td> <td><math>\leq 0.01</math> inHg</td> <td><b>0.0005 inHg</b></td> </tr> <tr> <td><b>Std Deviation</b></td> <td><math>&lt; 0.003</math> inHg</td> <td><b>0.0003 inHg</b></td> </tr> </tbody> </table>		Requirements	Results	<b>Avg Diff Acc</b>	$\leq 0.01$ inHg	<b>0.0005 inHg</b>	<b>Std Deviation</b>	$< 0.003$ inHg	<b>0.0003 inHg</b>
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<p style="text-align: center;"><u>Resolution</u></p> <p><b>Setup:</b> All data taken in the Accuracy and Differential Accuracy tests used PFS (Percent Full Scale) pressure units.</p> <p><b>Requirements:</b> The AWOS Advisory Circular states “The manufacturer should demonstrate that the barometer resolution is displayed in 0.001 inHg increments.” 0.001 inHg represents a resolution of <math>\pm 0.003\%</math> FS (FS = 32 inHg)</p> <p><b>Results:</b> The units will exhibit a resolution between 0.002% and 0.001% FS at the 1 sec integration time and Percent Full Scale pressure units. Note: Please contact factory for actual report data to demonstrate the ability to meet 0.001 inHg resolution or better.</p>	<p style="text-align: center;"><u>Drift Over Time</u></p> <p><b>Setup:</b> All four units were under continuous power and monitored at ambient temperature and pressure for a period of six months.</p> <p><b>Requirements:</b> The AWOS Advisory Circular states “Each sensor should be stable and continuously accurate within 0.01 inHg RMSE for a period of not less than six months. The maximum error should be 0.02 inHg.”</p> <p><b>Results: (average of all units tested)</b></p> <table border="1"> <thead> <tr> <th></th> <th>Requirements</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td><b>RMSE</b></td> <td><math>\leq 0.01</math> inHg</td> <td><b>0.006 inHg</b></td> </tr> <tr> <td><b>Max Error</b></td> <td><math>\leq 0.02</math> inHg</td> <td><b>0.01 inHg</b></td> </tr> </tbody> </table>		Requirements	Results	<b>RMSE</b>	$\leq 0.01$ inHg	<b>0.006 inHg</b>	<b>Max Error</b>	$\leq 0.02$ inHg	<b>0.01 inHg</b>									
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## SUMMARY

Honeywell’s HPB/A and PPT barometric pressure transducers are now available for making AWOS measurements. Tested against FAA Advisory Circular 150/5220-16C to show compliance, Honeywell’s barometers passed all tests well within the AWOS requirements. When specifying barometers for your next AWOS application, please contact the factory for application assistance and a copy of our test report. Product datasheets with complete specifications are available on the following website.

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