



**D-90035**

**OPERATION and MAINTENANCE MANUAL  
TC-10 TEST CHAMBER**

Rev 9

January 3, 2008



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## Scope

This manual is intended for use by personnel who are familiar with the basic functions and operation of Altimaster altimeters intended for Freefall Parachuting operations.

## General Description

The TC-10 test chamber is a portable test chamber designed to test up to 10 Altimaster altimeters. It is a Vacuum only test chamber and therefore cannot test altimeters at altitudes below ambient.



## Specifications




TC-10	
Overall dimensions	8 ½" x 19 ½" x 24 ½"
Weight:	46 lbs.
Maximum Altitude	35,000 feet MSL
Temperature	-40 +80 °C
Operating Voltage	110V ac or 220V ac
Housing	Storm iM2700




## PRE-TESTING PREPARATION



1.		<p>TC-10 TEST CHAMBER</p> <p>The procedure for operating the test chamber is shown below.</p>
2.		<p>Insert the 110 or 220 volt plug.</p> <p>The receptacle is located on the main panel, at the center rear.</p> <p>Insert power cord into 110 or 220 volt wall outlet depending on voltage marked.</p>

**PROCEDURE FOR CHECKING ALTIMETERS ABOVE  
AMBIENT ALTITUDE**



3.	 A close-up photograph showing a hand turning a black selector switch on a black control panel. The switch is currently pointing to a white label that reads "STANDBY". There are several other circular ports or buttons on the panel.	<p>Turn selector switch to "STANDBY".</p> <p>The "Standby" setting causes the pump to create a vacuum in the reservoir which is located below the test area.</p>
4.	 A close-up photograph showing a hand turning a toggle switch on a black control panel. The switch is currently pointing to a white label that reads "ON". To the right of the switch is a circular altimeter gauge with a needle and the word "ALT" on its face. Below the switch is another white label that reads "OFF".	<p>Turn toggle switch to "ON".</p> <p>The pump should be running at this stage, if not, check that the test chamber has power.</p>



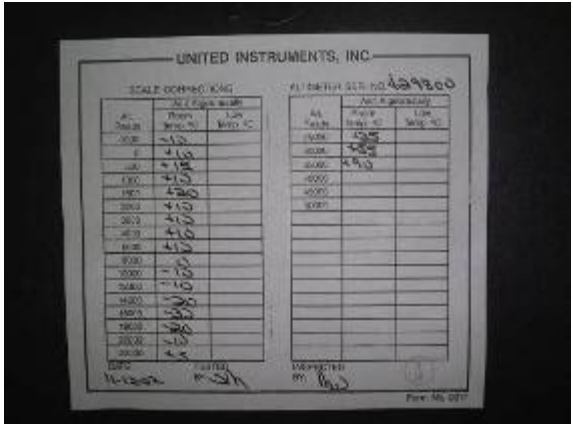
5.		<p>Set Master Altimeter to 0 ft.</p>
6.		<p>Zero all altimeters to be tested.</p> <p>Load altimeters into vacuum chamber as shown, taking care not to hit the painted edge of the test chamber.</p> <p>Hitting the edge could cause the paint to chip and this in turn would not allow for a good seal.</p>
7.		<p>When loading MA altimeters, ensure that the battery compartment is not wedged under the altimeter housing next to it.</p> <p>See the picture below for proper location.</p>

8.	 A close-up photograph of two circular MA altimeters mounted inside a dark, possibly black, test chamber. The altimeters have white faces with black markings and red needles. The top altimeter shows a reading around 10, and the bottom one shows a reading around 11. The brand name 'ALTI-2' is visible on the bottom altimeter's face.	<p>This picture shows proper location of MA altimeters in test chamber.</p> <p>This will allow the O-ring on the Lexan lid to properly make contact with vacuum chamber edge.</p>
9.	 A close-up photograph showing a person's hand installing a black O-ring into a groove on the back side of a Lexan lid. The lid is dark and the O-ring is being pushed into a recessed channel.	<p>Before installing Lexan lid, ensure O-ring is in place on back side of lid in groove.</p>
10.	 A photograph showing a person's hand placing a clear Lexan lid onto a vacuum chamber. The lid is being held over the chamber's flange, and the O-ring groove on the lid is being aligned with the top of the chamber's flange.	<p>Install Lexan lid with the O-ring facing down.</p> <p>The O-ring groove with O-ring should fit precisely on top of the flange of the vacuum chamber.</p>

11.		<p>Apply pressure across entire top of lid by placing hand, or hand and length of arm.</p> <p>Once pressure has been placed on lid, SLOWLY turn selector switch from "Standby" to "CLIMB".</p> <p>NOTE: Moving the selector switch too rapidly will produce a rapid pressure change which can damage the master altimeter.</p>
12.		<p>Run up vacuum chamber to desired altitude, in case of picture shown 31,000 ft.</p> <p>Allow about 1 minute maximum for the vacuum system to stabilize before using the "DESCEND" valve to slowly reduce altitude.</p> <p>Note for higher altitudes: At higher altitudes rotate the "DESCEND" valve slowly, the altitude will drop rapidly at higher altitudes due to the large pressure difference.</p> <p>The "DESCEND" valve will decrease in sensitivity as you descend to lower altitudes.</p>



13.	 A close-up photograph showing a person's hand turning a black selector switch with a yellow base. The switch is currently pointing towards a white label that reads "STANDBY". To the right of the switch are three circular indicator lights.	<p>Once the desired altitude has been reached, turn selector switch from "CLIMB" to "STANDBY".</p> <p><b><i>Leave toggle switch to "ON"</i></b></p> <p>Once the selector switch has been returned to the "STANDBY" position, the pump will start again to evacuate the air in the booster vacuum chamber while the test is being run on the altimeters in the test chamber.</p>
14.	 A close-up photograph showing a person's hand turning a black selector switch with a yellow base. The switch is currently pointing towards a white label that reads "DESCEND". To the right of the switch are three circular indicator lights. Other labels "CLIMB" and "STANDBY" are visible on the panel.	<p>The altitude in the test chamber may be slowly reduced using the "DESCEND" valve.</p> <p>Stop the descent at the required test altitude.</p> <p>Note: It is advisable to stop slightly above the required test altitude and allow the pressure to settle, before descending to the test altitude.</p>

<p>15.</p>		<p>Continue to check the altimeters under test for accuracy by slowly turning the "DESCEND" knob and comparing readings with the "Master Aircraft Altimeter".</p>																																																																																																																																																																																																																																																					
<p>16.</p>		<p>Due to the possibility of the large Lexan Lid having a slight bow it may become necessary, in order to retain a vacuum, to place a hand at either end of the lid as shown when lower altitudes are reached.</p> <p>This may only be necessary near 1000 ft. or lower.</p>																																																																																																																																																																																																																																																					
<p>17.</p>	 <table border="1" data-bbox="337 1234 764 1604"> <thead> <tr> <th colspan="4">UNITED INSTRUMENTS, INC.</th> <th colspan="3">ALTI-2 (SER. NO. 499200)</th> </tr> <tr> <th colspan="4">SCALE CORRECTING</th> <th colspan="3">Alt. in accuracy</th> </tr> <tr> <th>Alt.</th> <th>Pressure</th> <th>Temp.</th> <th>Wind</th> <th>Alt.</th> <th>Temp.</th> <th>Wind</th> </tr> <tr> <th>(ft.)</th> <th>(in. Hg.)</th> <th>(°C)</th> <th>(Kts.)</th> <th>(ft.)</th> <th>(in. Hg.)</th> <th>(Kts.)</th> </tr> </thead> <tbody> <tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>100</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>200</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>300</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>400</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>500</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>600</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>700</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>800</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>900</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1000</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1100</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1200</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1300</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1400</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1500</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1600</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1700</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1800</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1900</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2000</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2100</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2200</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2300</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2400</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2500</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2600</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2700</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2800</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2900</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>3000</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	UNITED INSTRUMENTS, INC.				ALTI-2 (SER. NO. 499200)			SCALE CORRECTING				Alt. in accuracy			Alt.	Pressure	Temp.	Wind	Alt.	Temp.	Wind	(ft.)	(in. Hg.)	(°C)	(Kts.)	(ft.)	(in. Hg.)	(Kts.)	0							100							200							300							400							500							600							700							800							900							1000							1100							1200							1300							1400							1500							1600							1700							1800							1900							2000							2100							2200							2300							2400							2500							2600							2700							2800							2900							3000							<p>A copy with the altitude corrections for the "Master Aircraft Altimeter" is located on the inside of the Storm IM 2700 Case Lid.</p> <p>The original is attached to the "Master Aircraft Altimeter" below the panel surface.</p>
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18.



Once the test is completed and the readings have been recorded, the altimeters can be removed.



The procedure can then be repeated again starting at step 3.

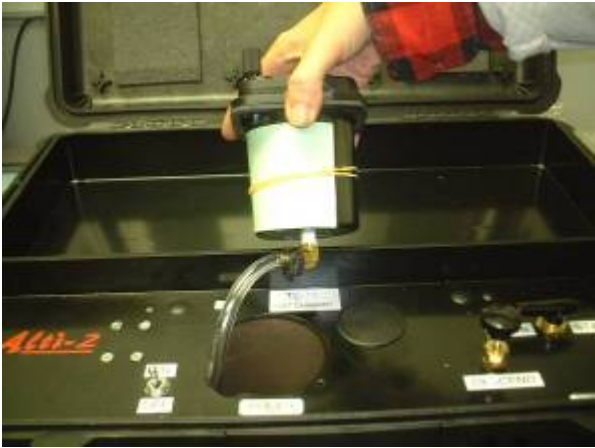


**WHEN TESTING IS COMPLETED**



19.	 A close-up photograph showing a person's hand turning a small rotary switch. The switch has two positions labeled 'ON' and 'OFF'. The switch is currently being moved from the 'ON' position towards the 'OFF' position. In the background, an altimeter gauge is visible, showing a needle pointing to approximately 10,000 feet.	<p>Turn pump OFF.</p>
20.	 A close-up photograph showing a person's hand turning a black knob labeled 'DESCEND'. The knob is being turned counter-clockwise. The background shows a black panel with some screws and a small white label with the word 'ALTI-2' on it.	<p>With the test chamber cover lid removed and the "DESCEND" valve opened fully (counterclockwise) slowly turn selector to standby.</p> <p>This allows the vacuum in the boost chamber to be released.</p> <p>NOTE: it may not be possible to restart the pump if the boost chamber still has a vacuum.</p>

	 A close-up photograph showing a person's hand adjusting a black knob on a control panel. The knob has a gold-colored base. A white label with the word "STANDBY" is positioned to the right of the knob. The panel is black with several circular holes below the knob.	
21.	 A close-up photograph showing a person's hand turning a black, spherical knob. The knob has "10/0000 S" engraved on it. A white label with the word "DESCEND" is positioned below the knob. The knob is being turned clockwise.	<p>When chamber has equilibrated: Fully close the "DESCEND" knob (clockwise) then open 1/2 turn.</p>


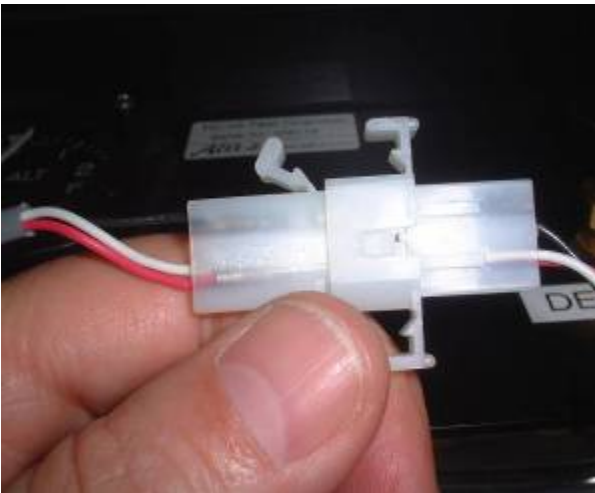
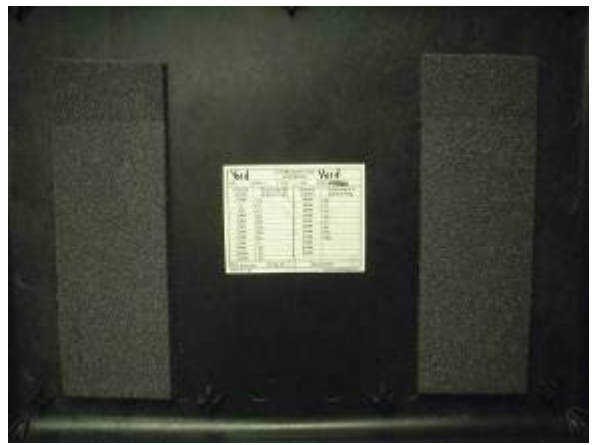
## REPLACING THE MASTER ALTIMETER

22.		<p>Tools and materials needed:</p> <p>Philips screw driver Pliers</p>
23.		<p>Altimeter removal (ANALOG):</p> <p>Remove the three (3) Philip head screws that hold the altimeter in place.</p>



24.		<p>Carefully lift the altimeter and bezel assembly out of the TC-10 enclosure.</p> <p>Place the altimeter on a padded surface to prevent damage.</p>
25.		<p>Remove hose clamp using a small screw driver.</p>
26.		<p>Detach hose from barbed fitting.</p> <p>To reinstall the altimeter follow this procedure in reverse.</p>



27.		<p>Altimeter removal (DIGITAL):</p> <p>Remove (4) 6-32 x 7/8" long screws thru hole in panel and altimeter.</p>
28.		<p>Carefully remove the digital altimeter from the TC-10 enclosure.</p> <p>The pneumatic line and the power plug will uncoil to about 10".</p>



29.		<p>Disconnect the pneumatic hose at the coupler.</p> <p>Retain the hose clips for re-use.</p>
30.		<p>Disconnect the power plug by pulling Molex connector apart.</p>
31.		<p>To reinstall the digital altimeter follow this procedure in reverse.</p> <p>When reinstalling a new altimeter be sure to remove the old master altimeter reference chart and install the new one.</p>

## OPERATING THE DIGITAL ALTIMETER

32.	 A circular digital altimeter with a black face and silver bezel. The display shows the word "cold" in large, white, digital characters. Above the display, the word "ALTITUDE" is printed in white. Below "ALTITUDE", the words "BARO", "CLIMB RATE", and "OAT" are printed. To the right of the display, the units "inHg", "mBar", "FEET", and "ft/min" are listed. Below the display, there are two buttons labeled "UP" and "DN", an "OXYGEN" indicator light, and a "MODE" button. The altimeter is mounted on a dark surface.	<p><b>For test chambers that have the optional digital altimeter:</b></p>
	 A circular digital altimeter with a black face and silver bezel. The display shows the number "29.95" in large, white, digital characters. Below the number, the word "PRESSURE" is printed. Above the display, the word "ALTITUDE" is printed in white. Below "ALTITUDE", the words "BARO", "CLIMB RATE", and "OAT" are printed. To the right of the display, the units "inHg", "mBar", "FEET", and "ft/min" are listed. Below the display, there are two buttons labeled "UP" and "DN", an "OXYGEN" indicator light, and a "MODE" button. The altimeter is mounted on a dark surface.	<p>When power is first applied to the test chamber the altimeter will go through a start up sequence.</p> <p>After a few seconds, the display should read <b>"cold"</b> as shown.</p> <p>After approximately 1 minute, the altimeter will be ready for operation and will be in <b>PRESSURE REFERENCE</b> mode.</p>

	<p>Press and release the MODE button to switch to ALTITUDE mode.</p>
	<p>Zero the altitude reading by positioning the "UP / DOWN" switch as needed.</p>



## **Servicing**

If the Test Chamber behaves abnormally or unusually, discontinue use IMMEDIATELY and return to Alti-2, Inc.

Alti-2, Inc.  
1400 Flightline Blvd.  
Suite E  
DeLand, FL 32724

Tel: (386) 943 9333  
Fax: (386) 943 9303

e-mail: [info@alti-2.com](mailto:info@alti-2.com)

Please be sure to include contact information such as Phone Number, Fax Number, and/or email address, and a description of the problem.

Status on your Alti-2 product can be checked by contacting the Alti-2, Inc. Service Department, or by initiating a Request for Repair Status through the Alti-2, Inc. web-page.

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