



**D-90040**

**OPERATION and MAINTENANCE MANUAL  
TC-21 TEST CHAMBER**

Rev 5

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-21 test chamber is a portable test chamber designed to test up to 10 Altimaster altimeters. It is a Vacuum/Pressure test chamber which can test altimeters from minus 1000 feet MSL to plus 35,000 feet MSL altitudes.

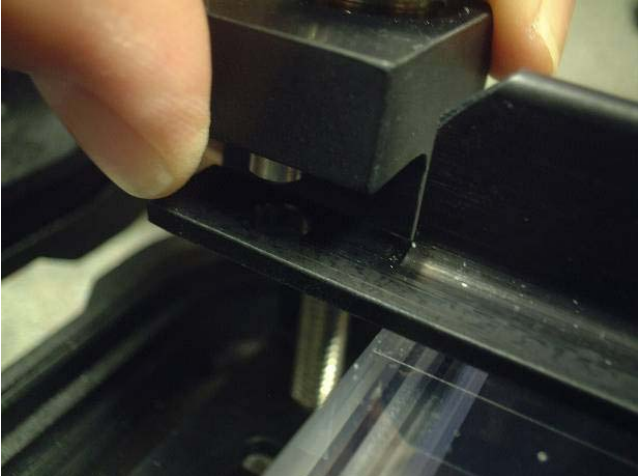


## Specifications

<b>TC-21</b>	
Overall dimensions	8 ½" x 19 ½" x 24 ½"
Weight	56.5 lbs.
Maximum Altitude	-1000 feet MSL to +35,000 feet MSL
Temperature	-40 +80 °C
Operating Voltage	110V ac or 220V ac
Housing	Storm iM2700


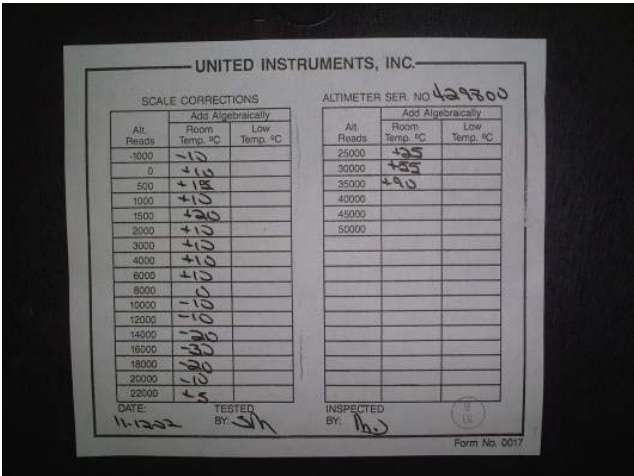
## PRE-TESTING PREPARATION




1.		<p>TC-21 TEST CHAMBER: The procedure for operating this test chamber is shown below.</p>
2.		<p>Insert the 110 or 220 volt plug as shown.</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>




3.		<p>Turn selector switch to "LOAD/UNLOAD".</p> <p>The "LOAD/UNLOAD" setting causes the pump (when turned on) to create a vacuum in the reservoir which is located below the altimeter test chamber.</p>
4.		<p>Turn toggle switch to "ON".</p> <p>The pump should be running at this stage, if not, ensure that the test chamber has power.</p> <p>To fully evacuate the vacuum reservoir of ambient air pressure takes approximately 2-3 minutes.</p>
5.		<p>Removing the lid: Turn the lid retaining knobs (8) counter- clockwise.</p>



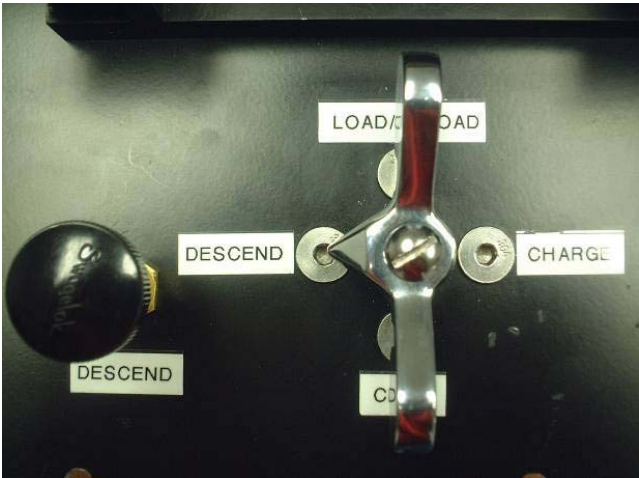
6.		About 1/2" of vertical rise is required to free the bracket from the dowel pin.
7.		Remove the brackets (4) from the retaining blocks.
8.		Remove the lid.




**PROCEDURE FOR CHECKING ALTIMETERS ABOVE AND BELOW AMBIENT ALTITUDE (USING POSITIVE PRESSURE CAPABILITY)**




<p>9.</p>		<p><b>Note:</b> It is advisable to use this procedure if your ambient altitude is greater than 2000 feet.</p> <p>After completion of <b>“Pre-Testing Preparation”</b>: Set Master Altimeter to 29.92” Hg. to obtain local altitude.</p> <p>For convenience and ease of testing adjust master altimeter to nearest 1000 foot mark.</p>
<p>10.</p>		<p>A copy of the altitude correction sheet for the “Master Aircraft Altimeter” is mounted on the inside of the Storm Case Lid.</p> <p>The original is attached to the “Master Aircraft Altimeter” below the panel surface.</p>




11.		<p>Set all altimeters to be tested to the same value as the master altimeter.</p> <p>Load altimeters into test 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>
12.		<p>When loading MA2-30 and/or MA3-30 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>
13.		<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>

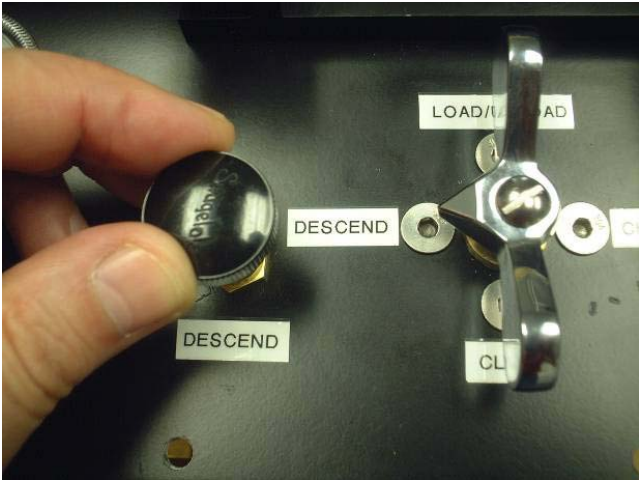


14.		<p>Reinstalling the lid: Before installing the Lexan lid, ensure O-ring is in place and is free from dust or dirt.</p> <p>Ensure that the top edge of test chamber is clean.</p>
15.		<p>Install Lexan lid with the O-ring facing down.</p>
16.		<p>Install brackets as shown.</p> <p><b>Note:</b> Do not use this procedure without retainer brackets securely in place.</p> <p>Do not attempt to unscrew knobs or remove Lexan lid until selector is in "LOAD/UNLOAD" position.</p>

17.		Verify that the "DESCEND" knob is fully closed (clockwise)
18.		Move selector to "CHARGE" position.  Pressure gauge will reach a maximum of 23-25 PSI.
19.		When pressure gauge reaches maximum pressure: Turn selector from "CHARGE" to "DESCEND".

20.		<p>Turn "DESCEND" knob to descend to zero MSL.</p> <p>Descend until master altimeter reads zero feet MSL.</p>
21.		<p><b>Important:</b> Observe each unit under test and make note of its displayed altitude.</p> <p>This error will be manually adjusted out when test chamber is returned to ambient.</p>
22.		<p>Fully close "DESCEND" valve (clockwise).</p>

23.		<p>To return to ambient pressure turn selector from "DESCEND" to "LOAD/UNLOAD" position.</p>
24.		<p>Remove Lexan lid.</p> <p>Adjust for the error in each unit under test from the notes made in step 21.</p> <p>Example: If unit "A" reads plus 150 feet at zero MSL then adjust unit "A" minus 150</p>
25.		<p>When all units under test have been adjusted for error:</p> <p>Replace lid and retaining brackets.</p> <p>Move selector from "LOAD/UNLOAD" to "CHARGE" position.</p> <p>Pressure gauge will reach a maximum of 23-25 PSI.</p>

26.		<p>SLOWLY turn selector switch from "CHARGE" to "CLIMB".</p> <p>Moving the selector switch too rapidly will produce a rapid pressure change which can damage the master altimeter.</p>
27.		<p>Run up test chamber to maximum test altitude, typically 30,000 feet for military altimeters.</p> <p><b>Important:</b> Lightly finger tighten the lid retaining knobs at this time.</p>
28.		<p>Once desired altitude has been reached, turn selector switch from "CLIMB" to "DESCEND".</p> <p><b>Leave toggle switch in "ON"</b></p>

<p>29.</p>		<p>The altitude in the test chamber may be slowly reduced using the "DESCEND" valve (turn counterclockwise).</p> <p>Stop the descent at the required test altitudes (clockwise).</p> <p>Note: It is advisable to stop slightly above the required altitude and allow the pressure to settle, before reducing to the test altitude.</p>
<p>30.</p>		<p>Continue to visually check the altimeters under test for accuracy by slowly turning the "DESCEND" knob and comparing readings with the "Master Altimeter".</p> <p>(TC-10 shown)</p>
<p>31.</p>		<p>When the first test cycle is completed:</p> <p>Equalize the air in the test chamber area by turning the selector to "LOAD/UNLOAD" and open the descend valve (counter clockwise).</p> <p>This will allow removal of the Lexan lid for the next test group.</p>


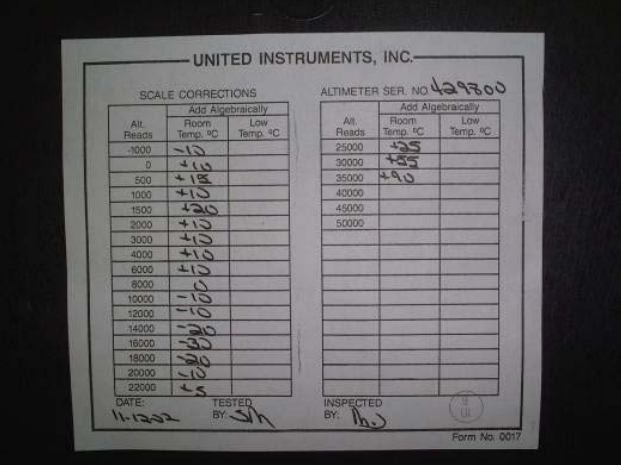
32.


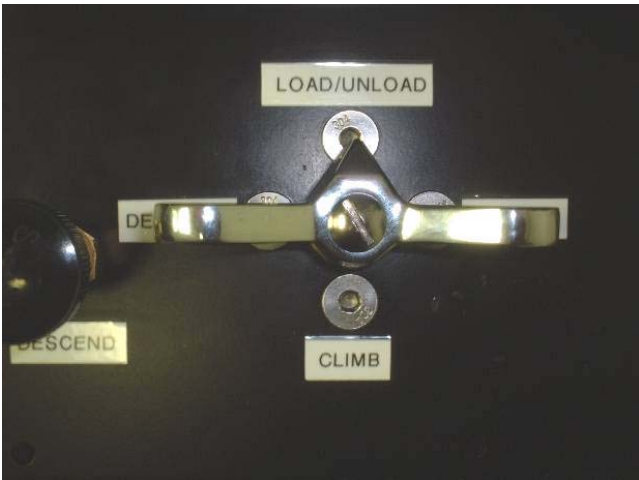






Once the first test cycle is completed and the test chamber equalized, the retainer brackets and altimeters can be removed. The procedure can then be repeated again starting at step 3.




(TC-10 shown)




**PROCEDURE FOR CHECKING ALTIMETERS ABOVE AMBIENT ALTITUDE (USING VACUUM ONLY)**

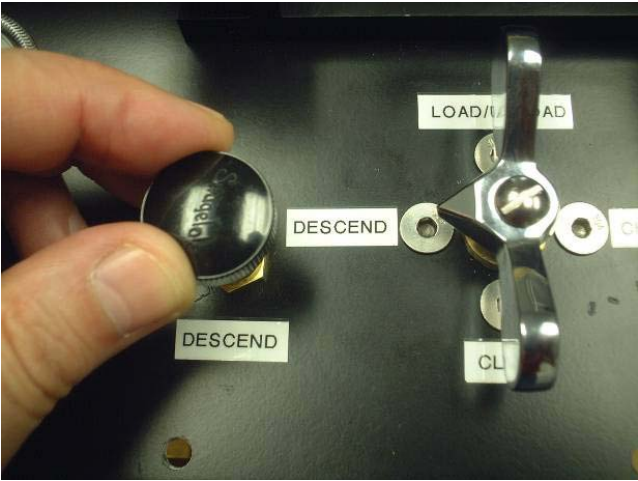

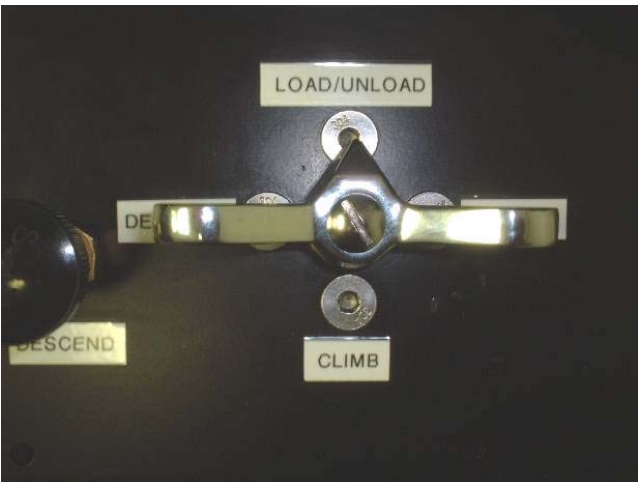
<p>33.</p>		<p>After completion of "Pre-Testing Preparation":</p> <p>Set Master Altimeter to 0 feet.</p>
<p>34.</p>		<p>A copy of the altitude correction sheet for the "Master Aircraft Altimeter" is mounted on the inside of the Storm Case Lid.</p> <p>The original is attached to the "Master Aircraft Altimeter" below the panel surface.</p>

35.		<p>Turn toggle switch to "ON". The pump should be running at this stage, if not, check that the test chamber has power.</p>
36.		<p>Turn selector to "LOAD/UNLOAD" position.</p> <p>Allow 1½ to 2 minutes for the ambient air in the vacuum reservoir (located below the front panel) to evacuate.</p> <p>During this time altimeters can be loaded into the test chamber.</p>
37.		<p>Set all altimeters to be tested to the same value as the master altimeter (0 feet).</p> <p>Load altimeters into test 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>

38.		<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>
39.		<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>
40.		<p>Reinstalling the lid:</p> <p>Ensure that the top edge of test chamber is clean.</p> <p>Before installing the Lexan lid, ensure O-ring is in place and has no dust or dirt attached to it.</p>

41.		Install Lexan lid with the O-ring facing down.
42.		Installing brackets for this procedure is not required.
43.		Verify that the "DESCEND" knob is fully closed (clockwise)

44.		<p>SLOWLY turn selector switch from "LOAD/UNLOAD" to "CLIMB".</p> <p>Moving the selector switch too rapidly will produce a rapid pressure change which can damage the master altimeter.</p>
45.		<p>Run up test chamber to a maximum test altitude, typically 31,000 feet for military altimeters.</p>
46.		<p>Once desired altitude has been reached, turn selector switch from "CLIMB" to "DESCEND".</p> <p><b><i>Leave toggle switch in "ON" position.</i></b></p>

47.		<p>The altitude in the test chamber may be slowly reduced using the "DESCEND" valve (turn counterclockwise).</p> <p>Stop the descent at the required test altitudes (clockwise).</p> <p>Note: It is advisable to stop slightly above the required altitude and allow the pressure to settle, before reducing to the test altitude.</p>
48.		<p>Continue to check the altimeters under test for accuracy by slowly turning the "DESCEND" knob and comparing readings with the "Master Altimeter".</p> <p>(TC-10 shown)</p>
49.		<p>When the first test cycle is completed:</p> <p>Equalize the test chamber area by turning the selector to "LOAD/UNLOAD".</p> <p>This will allow removal of the Lexan lid for the next test group.</p>

50.



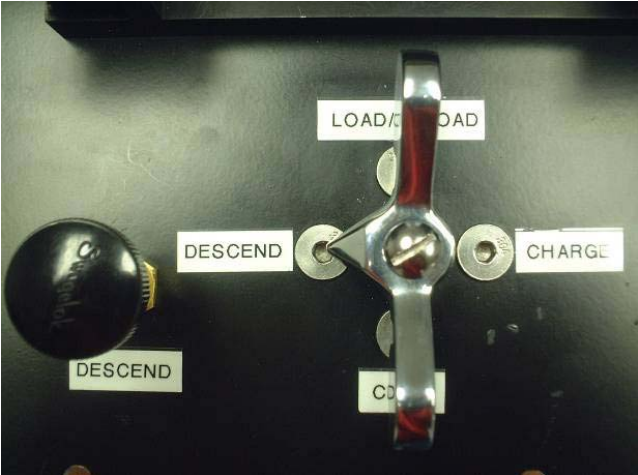


Once the first test cycle is completed and the test chamber equalized, the Lexan lid and altimeters can be removed.

The procedure can then be repeated again starting at step 33.

(TC-10 shown)

**WHEN TESTING IS COMPLETED**



51.		Turn pump OFF.
52.		<p>To purge the vacuum and pressure chambers:</p> <p>With the test chamber Lexan lid removed and the "DESCEND" knob fully opened (counterclockwise) SLOWLY turn selector to "CLIMB" position.</p> <p>This will purge the vacuum chamber.</p>
53.		<p>Turn selector from "CLIMB" to "DESCEND".</p> <p>Slowly turn descend knob counter-clockwise to open.</p> <p>This will purge the pressure chamber.</p>



54.




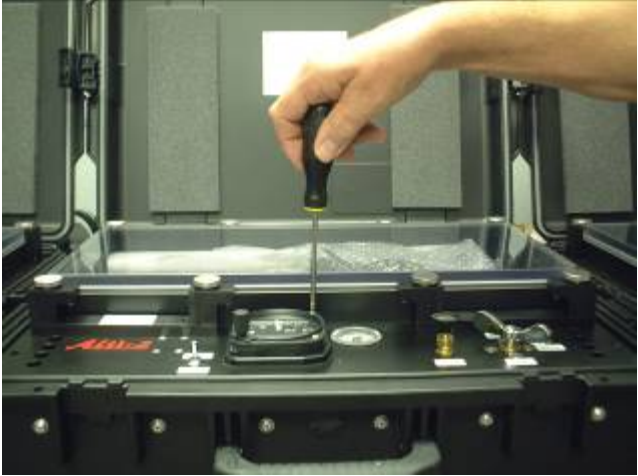
When not in use or for shipping purposes, turn selector to 'LOAD/UNLOAD" position and open the "DESCEND" knob 1/2 turn..

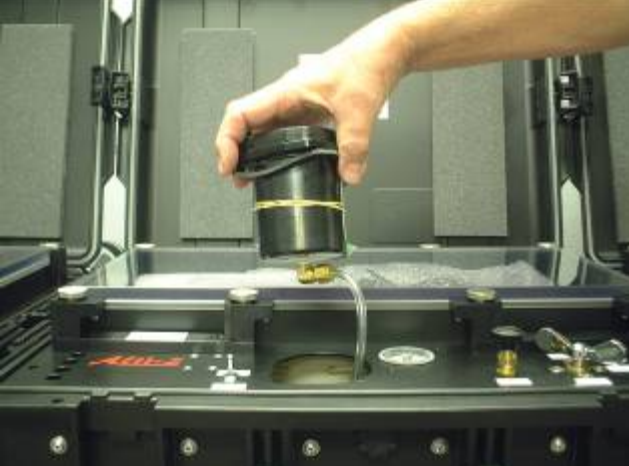

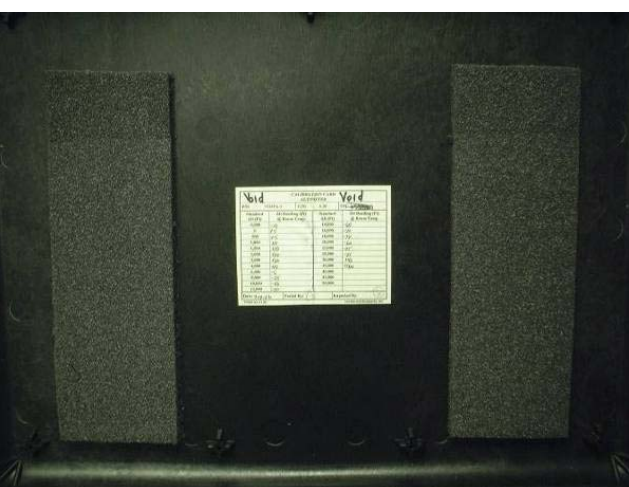
### FREEING THE VALVE LEVER




55.	Newly purchased TC-21s or TC-21s that have not been in use may experience the control valve lever stuck in the "LOAD/UNLOAD" position or whatever position it was left in.
56.	 <p>Tools and materials needed: One adjustable wrench 10-12" One paper towel or soft cloth</p>
57.	 <p>Place a cloth around one "ear" of the control lever, this will prevent damage to the lever.</p>

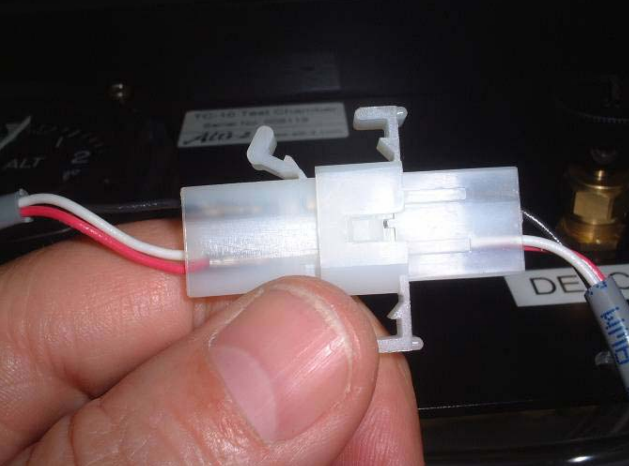
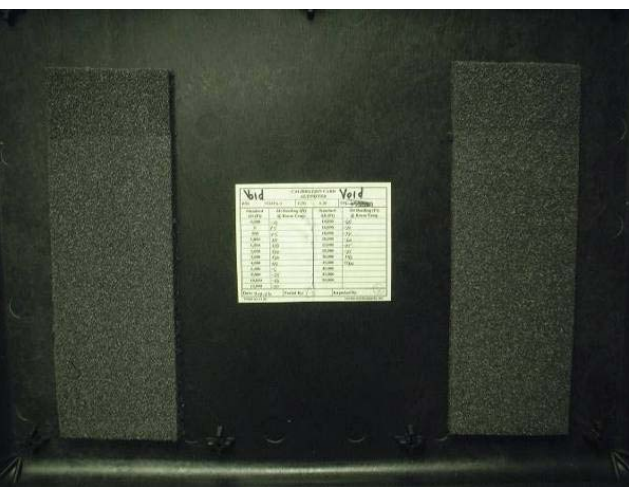
58.		<p>Using an adjustable wrench, position the wrench onto the "ear" of the lever and tighten by hand.</p>
59.		<p>With one hand on the wrench and the other hand on the other "ear" of the lever, rotate the lever 90 degrees in either direction.</p> <p>When the lever freely rotates, continue to rotate the lever for several revolutions. At this point the lever can be moved by hand.</p>

## REPLACING THE MASTER ALTIMETER

60.		<p>Tools and materials needed:</p> <p>Philips screw driver 10" adjustable wrench</p>
61.		<p>Altimeter removal procedure (ANALOG):</p> <p>Remove the three (3) Philip head screws that hold the altimeter in place.</p>

62.		<p>Carefully lift the altimeter and bezel assembly out of the TC-21 enclosure.</p> <p>Place the altimeter on a padded surface to prevent damage.</p>
63.		<p>Detach hose from fitting using a wrench.</p> <p>To reinstall the altimeter follow this procedure in reverse.</p>
64.		<p>When reinstalling a new altimeter be sure to remove the old master altimeter reference Peel off tape backing from <b>new</b> certification.</p> <p>Apply <b>new</b> altimeter certification between foam strips of back cover centered as shown.</p> <p>To reinstall the digital altimeter follow the <b>"REPLACING THE MASTER ALTIMETER PROCEDURE"</b> in reverse.</p>

65.		<p>Altimeter removal (DIGITAL):</p> <p>Remove (3) 6-32 x 7/8" long screws thru hole in panel and altimeter.</p>
66.		<p>Carefully remove the digital altimeter from the TC-21 enclosure.</p> <p>The pneumatic line and the power plug will uncoil to about 10".</p>
67.		<p>Remove hose clamp using a small screw driver.</p> <p>Retain the hose clips.</p> <p>Disconnect the pneumatic hose at the coupler.</p>

68.		<p>Disconnect the power plug by pulling Molex connector apart. To reinstall the altimeter follow this procedure in reverse.</p>
69.		<p>When reinstalling a <u>new</u> altimeter be sure to remove the old master altimeter reference Peel off tape backing from <b>new</b> certification.</p> <p>Apply <b>new</b> altimeter certification between foam strips of back cover centered as shown.</p> <p>To reinstall the digital altimeter follow the <b>“REPLACING PROCEDURE”</b> in reverse.</p>

## OPERATING THE DIGITAL ALTIMETER

70.		<p><b>For test chambers that have the optional digital altimeter:</b></p> <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>
71.		<p>After approximately 1 minute, the altimeter will be ready for operation and will be in <b>PRESSURE REFERENCE</b> mode.</p>
72.		<p>Press and release the <b>MODE</b> button to switch to <b>ALTITUDE</b> mode.</p>

73.



Zero the altitude reading by positioning the "UP / DOWN" switch as needed.



## Servicing

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

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

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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 e-mail 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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