

# ***BASEWEST***

***Calibration Manual***

***Model TS-421 Test Set***

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**25-60-46**

## 1.0 SCOPE

This manual covers the calibration of the Model TS-421 test set. Calibration is recommended annually, but user requirements may indicate a different calibration schedule. This manual and the companion TS-421 Operating Manual No. 25-60-45 are available at the BaseWest website ([www.basewest.com](http://www.basewest.com)).

## 2.0 DESCRIPTION

The BaseWest Model TS-421 test set is a rechargeable, handheld instrument with a touch-screen interface and readout designed specifically for testing airline escape slide lighting systems, harnesses and batteries. The Model TS-421 provides the following functions:

- Voltmeter with Built-in Resistor Load Bank – The Voltmeter Mode is used to measure and display the voltage of the internal cell stack of a connected slide light battery, under open or closed-circuit conditions under user-selectable resistive loads.
- Ammeter with Integral 5VDC Regulated Power Supply – The Ammeter Mode is used to measure and display the electrical current draw of a connected slide light harness, with input from internal regulated 5VDC power supply.

## 3.0 GENERAL ARRANGEMENT

The general arrangement of the Model TS-421 test set is shown in the figures below.



Figure 1. TS-421 General Arrangement

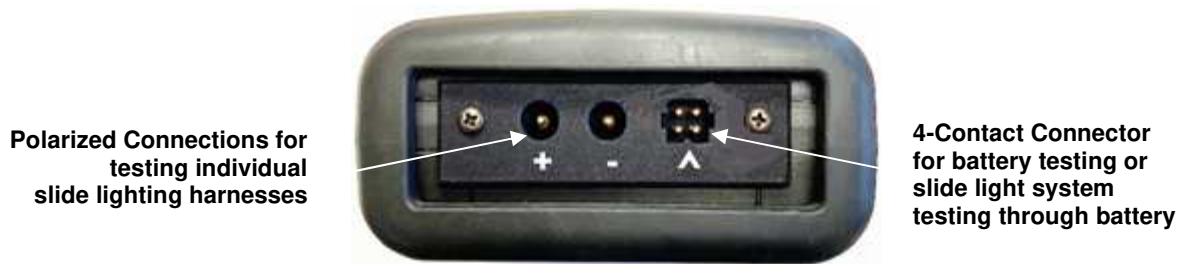


Figure 2. Connector Block

#### 4.0 EQUIPMENT REQUIRED

The following equipment is recommended for TS-421 calibration:

- Regulated DC Power Supplies No 1 and No. 2 (+/- 0.5%, 0 ~ 9 VDC, 0 ~ 3A)
- Digital Voltmeter, 4½ digits, ± 0.05% or better
- Digital Ammeter, 4½ digits, ± 0.05% or better, capable of handling 3 amps
- Power Cable, BaseWest P/N 7-6930
- Test Cable, BaseWest P/N 7-6931 (with 2Ω, 5%, 25W and 50Ω, 5%, 5W load resistors)
- Banana plug to Banana plug jumper cable, Red
- Banana plug to Banana plug jumper cable, Black

#### 5.0 CALIBRATION MODE SET UP

- 5.1 Remove all external connections to the test set.
- 5.2 Adjust an external DC Power Supply to 7.00 VDC, 3 A.
- 5.3 Connect the P/N 7-6930 Power Cable to Power Supply No. 1
- 5.4 Press the RED Button to turn the test set ON to the HOME screen and immediately connect the other end of the P/N 7-6930 Power Cable to the Recharge Receptacle on the test set (Figure 3). (Note: Pressing the RED while the Home Screen is ON turns the test set OFF.)

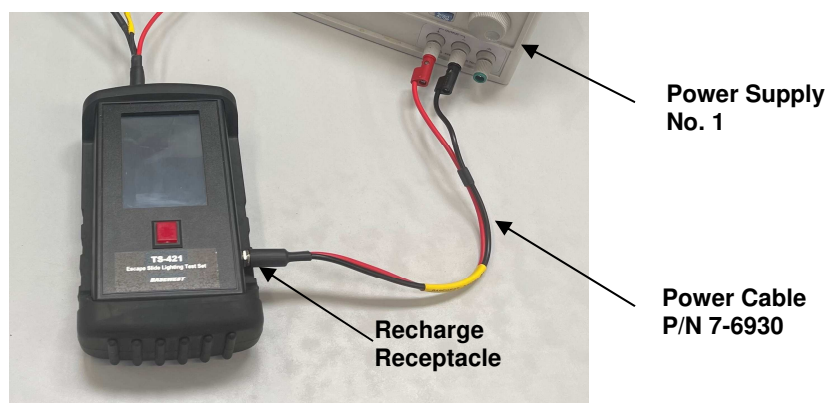
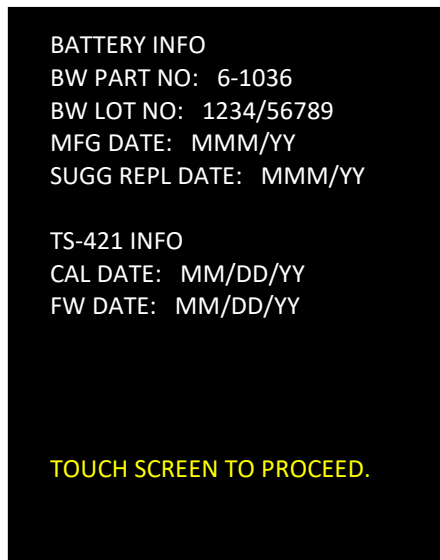


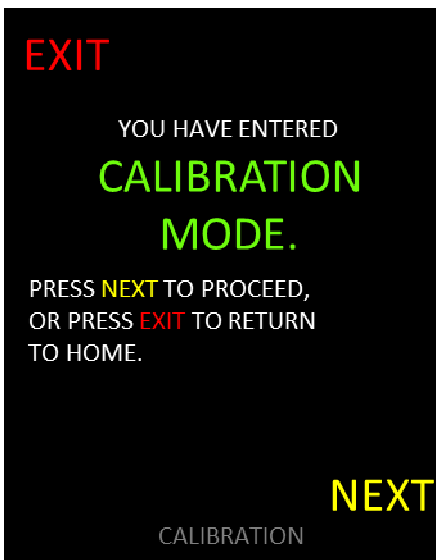
Figure 3. P/N 7-6930 Power Cable Connection

- 5.5 After approximately 2 seconds, the test set should enter Calibration Mode.
- If entering Calibration Mode takes more than 4 seconds, unplug the Power Cable from the Recharge Receptacle, turn the test set OFF and ON, and then quickly plug the Power Cable back in.
  - If the test set does not enter Calibration Mode, and a battery charging symbol (⚡) shows next to battery status icon in the top right hand of the Touchscreen, lower the voltage on the Power Supply to 6.50VDC and try again.
- 5.6 When entering Calibration Mode, the Touchscreen shows battery pack information (Figure 4). Record battery pack information on the Calibration Sheet (Appendix A). Press the Touchscreen anywhere to continue. (Note: The rechargeable battery pack is On Condition with a nominal life of 5 to 7 years from manufacture date. The battery's ability to retain charge will diminish over time and it should be replaced when charge retention becomes unacceptable. Changing the battery does not affect calibration and can be accomplished at any time.
- 5.7 To exit Calibration Mode prior to completion of calibration, select EXIT at any time (Figure 5). Any values up to that time will not be saved (Figure 6). Reenter Calibration Mode and select NEXT to continue with calibration.

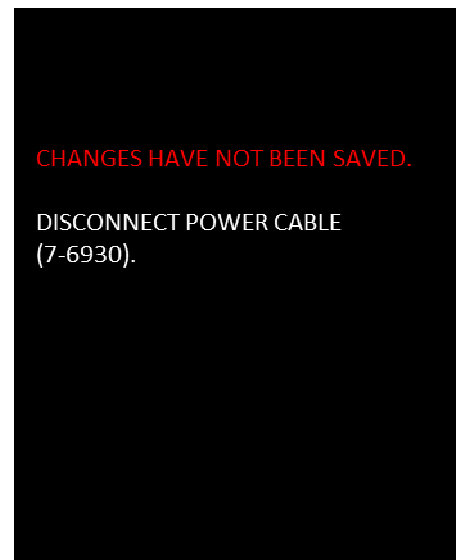
Note: Fonts on the Touchscreen may appear slightly different in figures throughout.



**Figure 4.**  
**Battery Info**



**Figure 5.**  
**Calibration Mode Intro**



**Figure 6.**  
**Calibration Exit**

- 5.8 Per Figure 7, below, adjust the Power Supply to  $7.00 \pm 0.01$  VDC, using a voltmeter if necessary. Select NEXT to continue. The white bar at the lower left of the screen is a calibration status indicator which becomes longer as the calibration proceeds.

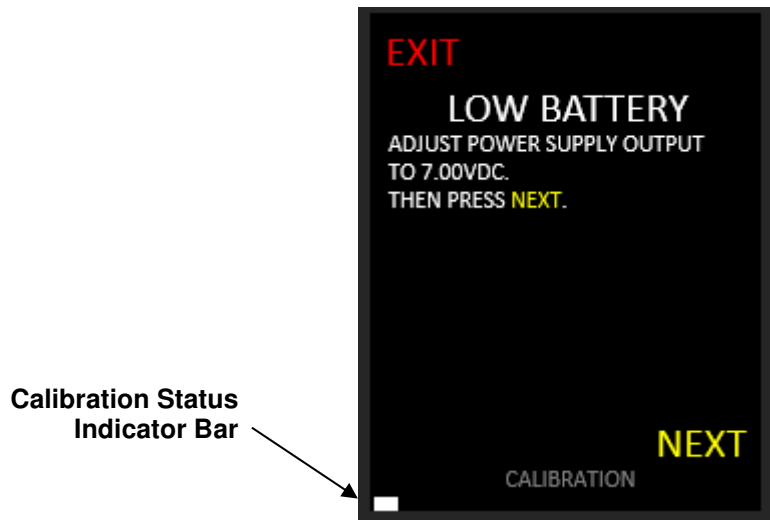


Figure 7. Set Low Battery Level

5.9 The internal battery is now disconnected, and the test set is powered by Power Supply No.1 for the remainder of the calibration sequence. DO NOT adjust voltage until calibration is complete.

## 6.0 5VDC OUTPUT SET UP

6.1 Connect the Test Cable P/N 7-6931 as follows: (a) 4-contact plug to the Connector Block (See Figure 2), (b) the AMMETER test lead to the Voltmeter, (c) the RED test lead to the Ammeter, and (d) a Black Jumper Lead from the 50Ω receptacle on the Load Module to the Ammeter (Figures 8A and 8B).

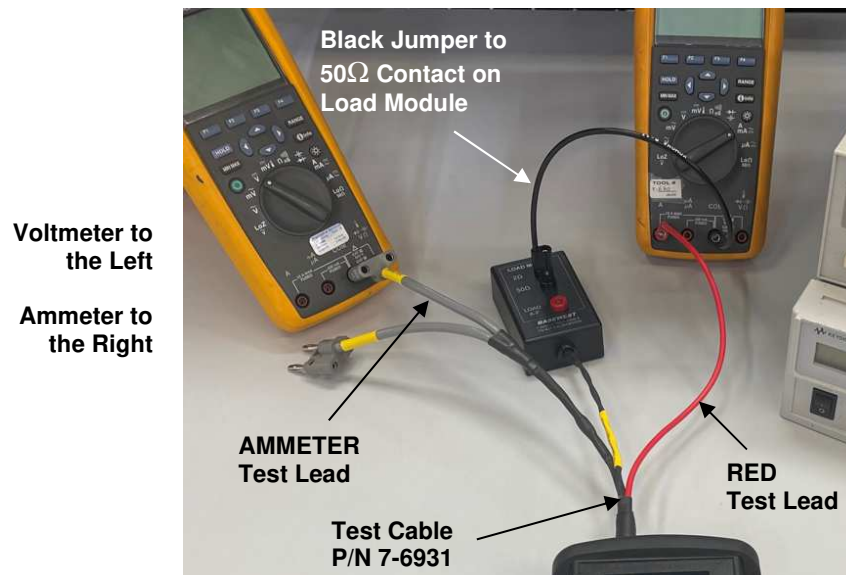


Figure 8A. 5 VDC Output Set Up



Figure 8B. Load Module Contact Points

6.2 Select NEXT to continue (Figure 9).

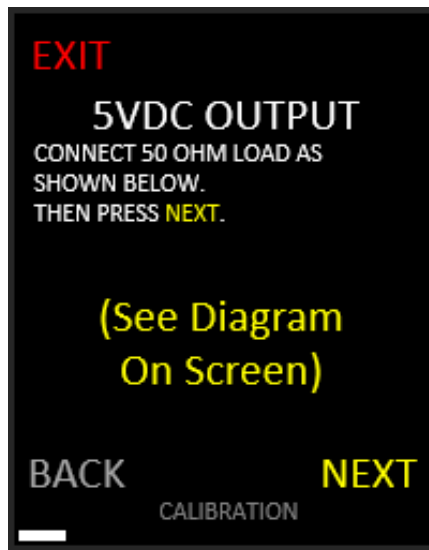


Figure 9. 5VDC Output Setup

6.3 Use arrows on the Touchscreen to change the 5 VDC output so the digital voltmeter reads in a tight range between 5.003 and 5.007 VDC (Figure 10). Select NEXT to continue.

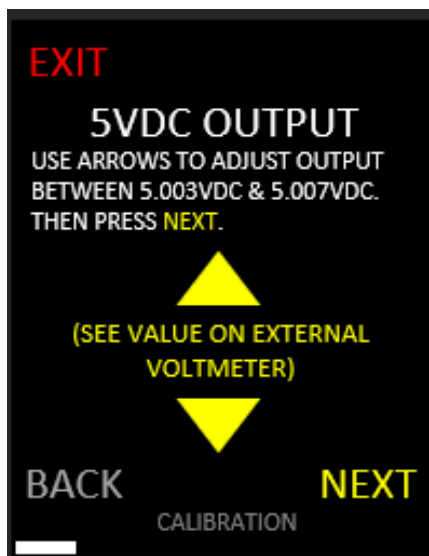


Figure 10. 5VDC Output Adjustment

- 6.4 Use arrows on the Touchscreen to match the value shown on the Touchscreen with the reading on the digital voltmeter (Figure 11). Due to possible losses in the cable, the reading can be loosened up to be between 5.002 and 5.008 VDC. Select NEXT to continue.



Figure 11. 5VDC Output

## 7.0 AMMETER CALIBRATION

- 7.1 Use arrows on the Touchscreen to match the value shown on the Touchscreen with the reading on the digital ammeter (Figure 12). Select NEXT to continue.

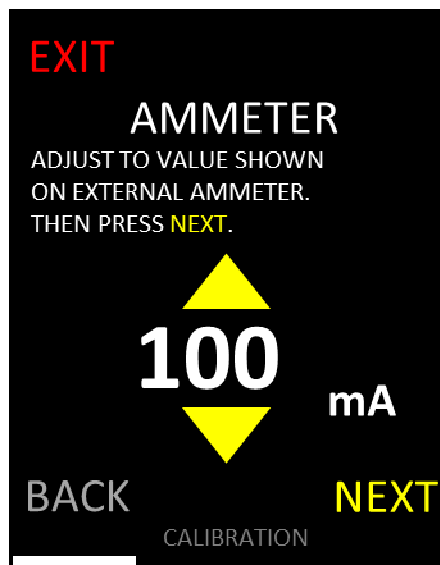


Figure 12. 50Ω Current

- 7.2 Move the Black Jumper Lead on the Load Module from the 2Ω contact (Figure 13). Select NEXT to continue (Figure 14).

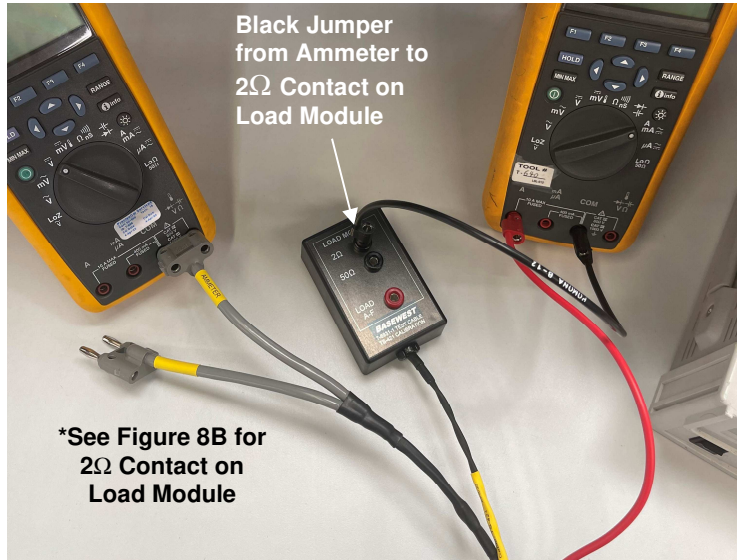


Figure 13. Ammeter (2Ω) Load Module

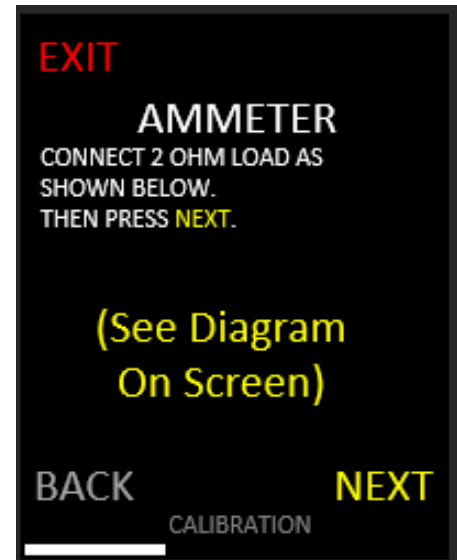


Figure 14. Ammeter (2Ω) Setup

- 7.3 Use arrows on the Touchscreen to match the value shown on the Touchscreen with the reading on the digital ammeter (Figure 15). Select NEXT to continue. It is recommended to wait for the ammeter value to drop down to the value on the Touchscreen and hit NEXT at the moment they are the same.



Figure 15. Current at 2Ω Load



**8.0 VOLTMETER CALIBRATION**

8.1 Adjust Power Supply No. 2 to 9.00VDC, 1A.

8.2 Reconnect the Test Cable P/N 7-6931 leads as follows: (a) Swap out the AMMETER Test Lead plugged into the digital voltmeter with the VOLTMETER Test Lead, (b) connect the RED lead of Test Cable P/N 7-6931 to Power Supply No. 2 (+) and (c) a Red Jumper Lead from the RED contact on the Load Module labeled "Load A-F" to the Ammeter. Reconnect the Black Jumper Lead between Power Supply No. 2 (-) and the Ammeter. (Figure 16)

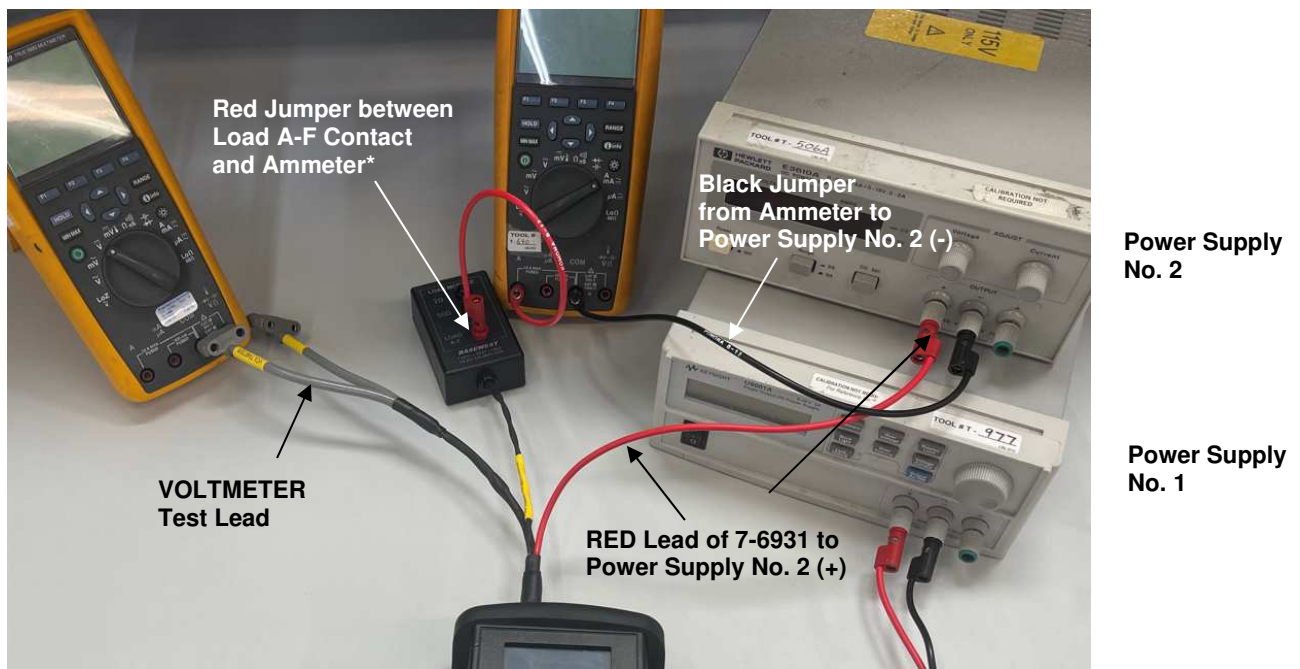


Figure 16A. Voltmeter Calibration Set Up



Figure 16B. Load Module Contact - Load A-F

- 8.3 Adjust Power Supply No. 2 until the digital voltmeter reads  $9.000 \pm 0.005$  VDC. Select NEXT to continue (Figure 17).



Figure 17. Voltmeter (9V) Setup

- 8.4 Adjust the second Power Supply until the digital voltmeter reads  $5.000 \pm 0.005$  VDC. Select NEXT (Figure 18) to continue to the Voltage Load Check.

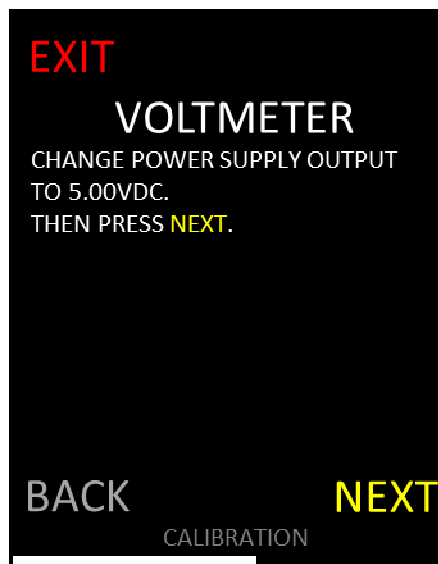


Figure 18. Voltmeter (5V) Setup

**9.0 VOLTMETER LOAD CHECK**

- 9.1 The “Load A” screen, below, appears. Use arrows on the Touchscreen to match the value shown on the Touchscreen with the reading on the digital ammeter (Figure 19). Select NEXT to continue to the “Load B” screen.

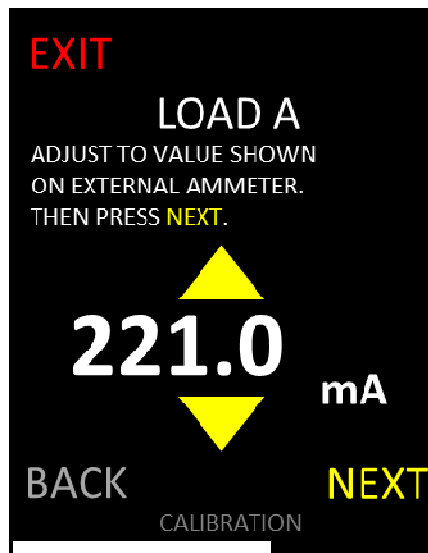


Figure 19. Voltmeter Load A

- 9.2 Repeat this step for all remaining loads B through F.

**10.0 CALIBRATION COMPLETION**

- 10.1 The Touchscreen will show the old and new calibration settings (Figure 20). Any readings that are RED were out of calibration but have been corrected. If any of the loads are RED instead of GREEN, it is recommended that the test set be returned to BaseWest for rework.

DESC	WAS	NOW
LOW BATTERY		
7.00V	-0.01	0.00
SV OUTPUT		
5.000V	+0.001	0.000
5.010V	0.000	0.000
AMMETER		
0.100A	+0.001	0.000
2.500A	-0.003	0.000
VOLTMETER		
9V	+0.01	0.00
3V	0.00	0.00
LOADS		
A 22.60ohms	22.60	
B 69.80ohms	69.80	
C 80.60ohms	80.60	
D 90.90ohms	90.90	
E 34.80ohms	34.80	
F 49.90ohms	49.90	

Figure 20. Calibration Summary

- 10.2 Record test information on the attached Calibration Sheet (Appendix A) or in-house form.
- 10.3 Select ACCEPT to accept changes. If EXIT is selected the test set returns to pre-calibration status and no changes are made.
- 10.4 Enter the date that the calibration took place on (Figure 21). If an invalid date is input, the screen on Figure 22 will appear and you will not be allowed to continue until a valid date is entered. When a valid date has been entered, select ENTER to continue.

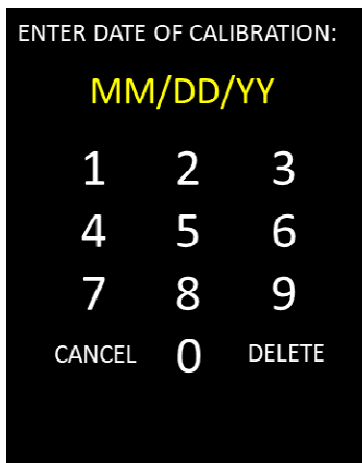


Figure 21. Date Prompt

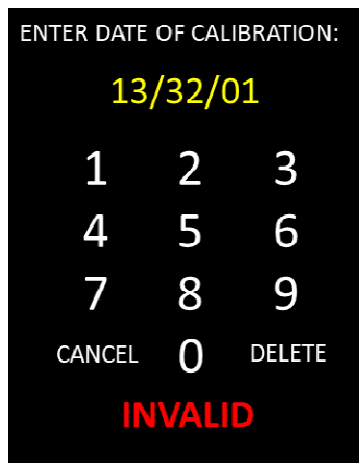


Figure 22. Invalid Date

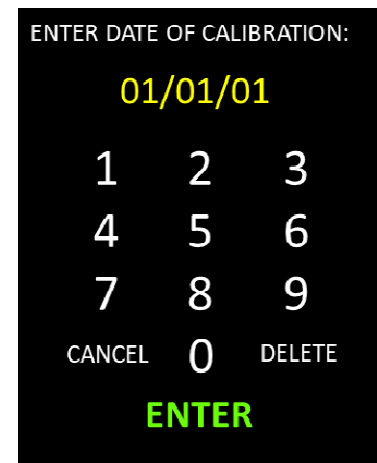


Figure 23. Valid Date

- 10.5 Changes are now saved, and calibration is complete (Figure 24). Disconnect the test cables and jumpers. Return to the HOME screen for testing or turn the test set OFF.

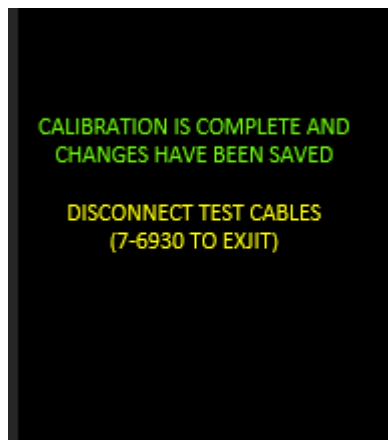


Figure 24. Calibration Complete

## TS-421 Calibration Record

<b>Appendix A</b> Perform Calibration per latest revision of TS-421 Calibration Manual No. 25-60-46	<b>Cal.</b>	New
	<b>Type</b>	Service

<b>Battery Info</b>		<b>P/N: 6-1036</b>
BaseWest Lot Number		
Manufacture Date		
Suggested Replacement Date		
<b>TS-421 Info</b>		<b>P/N 4-1021</b>
Serial Number	<b>T-00</b>	
Customer / Order	/	
Dates of Last Calibration	NIST:	(N/A if New)
	BW:	
Firmware Revision		



Calibration Step	Standard (Nominal)	Calibration Tolerance	As Found	Out of Tol?	After Calibration
<b>Section 5.0 - Calibration Mode Set Up</b>					
Low Battery Check	7.00 VDC	+/- 20mV			
<b>Section 6.0 - 5VDC Output Set Up</b>					
Internal 5V Cal - Minimum	5.000 VDC	+/- 1 mV			
Internal 5V Cal - Maximum	5.010 VDC	+/- 1 mV			
<b>Section 7.0 - Ammeter Calibration (*Note: Readings change with time on test; see Calibration Manual Section 7.0)</b>					
Ammeter Cal @ 50Ω Load (~100 mA)	*See Note Above	+/- 2 mA			
Ammeter Cal @ 2Ω Load (~2500 mA)	*See Note Above	+/- 10 mA			
<b>Section 8.0 - Voltmeter Calibration</b>					
Voltmeter Cal @ 9.00VDC	9.00 VDC	+/- 10mV			
Voltmeter Cal @ 5.00VDC	5.00 VDC	+/- 10mV			
<b>Section 9.0 - Voltmeter Load Check</b>					
Load Selector Test @ Load A	22.60 Ω	22.37 to 22.83 Ω			-
Load Selector Test @ Load B	69.80 Ω	69.10 to 70.50 Ω			-
Load Selector Test @ Load C	80.60 Ω	79.79 to 81.41 Ω			-
Load Selector Test @ Load D	90.90 Ω	89.99 to 91.81 Ω			-
Load Selector Test @ Load E	34.80 Ω	34.45 to 35.15 Ω			-
Load Selector Test @ Load F	49.90 Ω	49.40 to 50.40 Ω			-

Tools used for Calibration / EXP date	Temperature:	Relative Humidity:
	Tool # / EXP date	Tool # / EXP date

<b>Comments/Repairs/Notes:</b>	Calibration Date	Next Calibration Due
	Technician / Date	