

FT51010-32

Signal Source & Calibrator

User Manual

PN FT51010-3205

August 2015

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Navatek Eng. Corp.

www.navatek.com

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This Navatek product will be free from defects in material and workmanship for three years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. To obtain service during the warranty period, contact Navatek Eng. Corp. service center to obtain return authorization information, then send the tool to that Service Center with a description of the problem. THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. NAVATEK IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

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08/2015

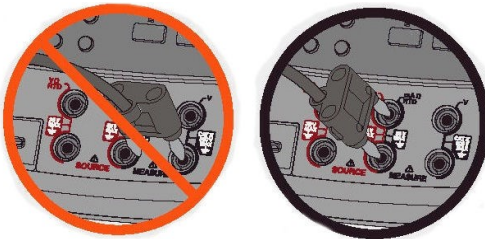
Safety Information



To prevent personal injury, use the tool only as specified.

To prevent possible electrical shock, fire, or personal injury:

- ◆ Read all safety Information before you use the tool.
- ◆ Carefully read all instructions.
- ◆ The battery must be locked in place before you operate the tool.
- ◆ Recharge the battery when the low battery indicator shows to prevent incorrect operation.
- ◆ Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.
- ◆ Do not use the tool around explosive gas, vapor, or in damp or wet environments.
- ◆ Do not use or disable the tool if it is damaged.
- ◆ Do not use the tool if it operates incorrectly.
- ◆ Keep fingers behind the finger guards on the probes.
- ◆ Connect the common test lead before the live test lead & remove the live test lead before the common test lead.
- ◆ Use only current probes, test leads, and adapters supplied with the tool.
- ◆ To prevent possible damage to the tool, do not force a dual banana plug between any two jacks in the horizontal orientation. Doing so will damage the jacks. A dual banana plug may be used in the vertical orientation only.



Introduction

The FT51010-32 Signal Source & Calibrator are battery-powered, hand-held instruments that source electrical and physical parameters. The Tool helps troubleshoot, calibrate, verify and document work performed on process instruments.

How to Contact Navatek

To contact Navatek call one of the following numbers

Technical support in the US: 1-888-NAVATEK

Calibration or repair: 949-888-2222

You can Fax: 949-635-3141

Or email to - support@navatek.com

Our web site: www.navatek.com

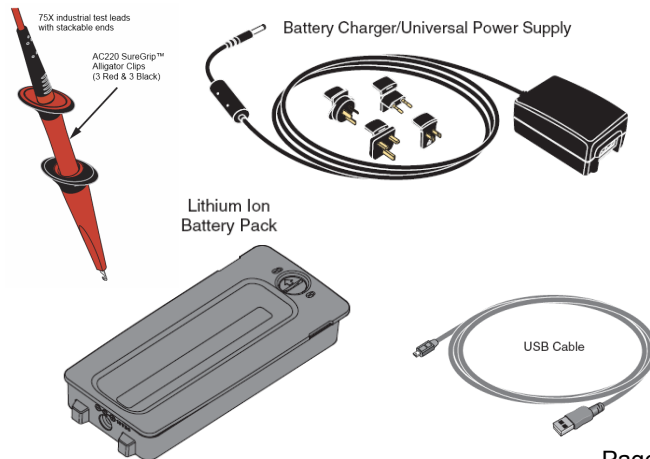
Before You Begin

After you unpack the tool from the kit, charge the battery for 8 hours (if the battery is outside of the Tool, charge for 5 hours). For more information, see "The Battery" in the *Users Manual*. When the Battery is inside the tool, it will only charge if the Tool is off.

Standard Equipment

Items included with the FT51010-32 are listed below. If the Tool is damaged or something is missing, contact Solar Turbines or Navatek immediately.

- ◆ BP7240 7.2V,4.4AH Battery Pack
- ◆ BC7240 Power Supply/Battery Charger
- ◆ AC220 SureGrip™ Alligator Clips
- ◆ 75X industrial test leads with stackable ends
- ◆ USB Cable: 6 ft. type A to type mini-B
- ◆ NIST-traceable Certificate of Calibration
- ◆ Printed Getting Started Manual
- ◆ USB Key containing Users Manuals and Software



Functions

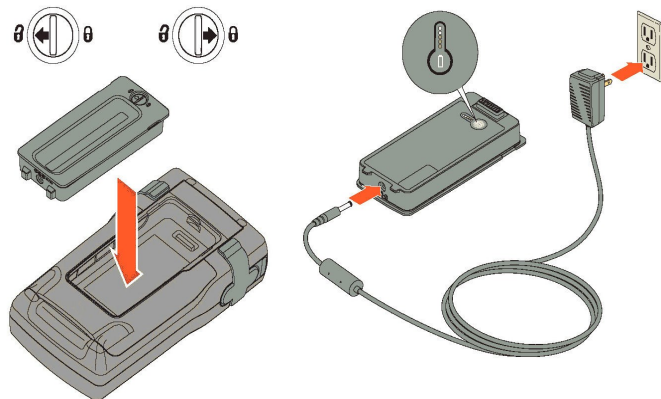
A summary of functions supplied by the tool is shown in the following table.

<i>Frequency#1</i>	10Hz to 20Khz, 0 to 7VRMS, Sine or square wave and 0 to -15Voffset
<i>Frequency#2</i>	10Hz to 20Khz, 0 to 7VRMS, Sine wave
<i>Volt DC 0 to -20V</i>	0 to -20V DC volt
<i>Volt DC 0 to 80mV</i>	0 to 80mV DC Volt
<i>DC Current 4 to 20mA</i>	4 to 20mA DC current
<i>DC Current 0 to 50mA</i>	0 to 25mA DC current
<i>Thermocouple</i>	Types E, N, J, K,
<i>Ramp Function</i>	Each one of the above functions can be ramp
<i>Help</i>	Help is available anytime during the tool use.
<i>Memory Function</i>	Memory function will store or recall tool setup and the above function values
<i>Setup</i>	Setup options allows the user to customized the tool

FT51010-32 Battery Charger

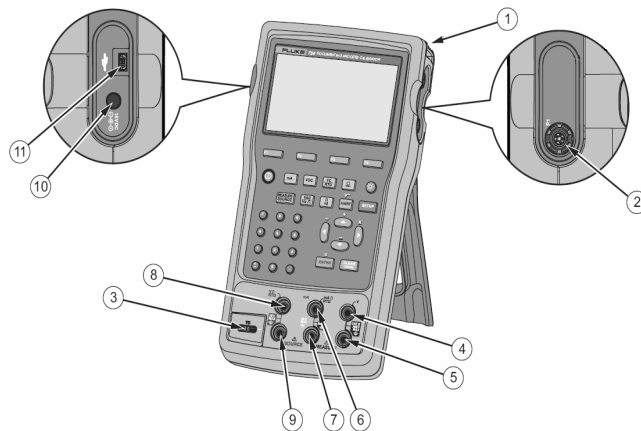
To charge the battery while it is inside the tool:

1. Turn the tool OFF.
2. Connect the battery charger to the tool and keep it OFF. The battery will not charge if the tool is on. The battery fully charges in 8 hours while inside the tool.



FT51010-32 Tool Connections:

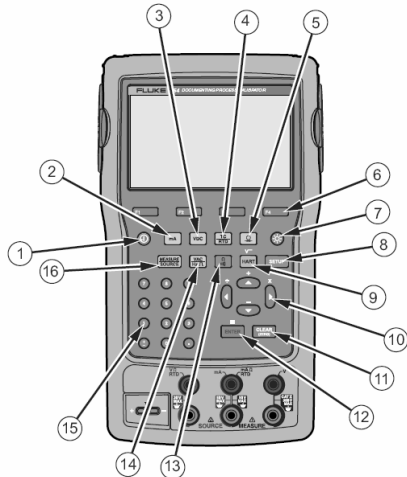
- | | |
|---------------------|-----------------|
| 1 - FT51010-32 | 7 - Ground |
| 2 - Navatek Service | 8 - Frequency#1 |
| 3 - Thermocouple | 9 - Ground |
| 4 - V/I Out/In | 10 - 15V DC In |
| 5 - Ground | 11 - USB |
| 6 - Frequency#2 | |



FT51010-32 Keypad

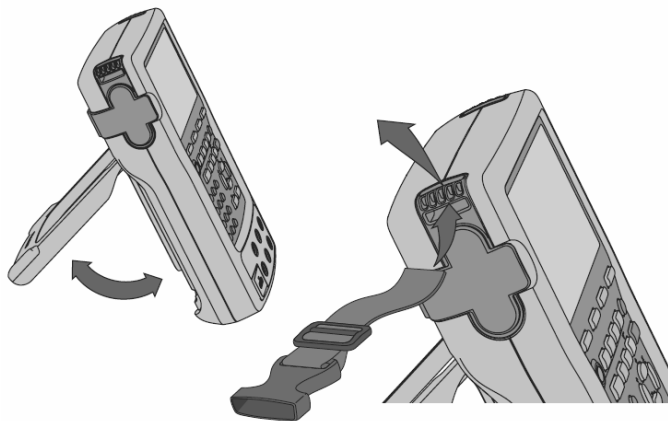
- | | |
|----------------|----------------------|
| 1-Power On/Off | 9-Help Key |
| 2-Frequency#1 | 10-Arrow keys |
| 3-Frequency#2 | 11-Clear key |
| 4-Vdc | 12-Enter Key |
| 5-mA | 13-Thermocouple |
| 6-F keys | 14-Ramp/Sweep |
| 7-Brightness | 15-Numeric Keypad |
| 8-Setup Key | 16-Memory Load/Store |

* Up & Down arrow keys are used for rapid stepping.



FT51010-32 Strap and Stand

After you unpack the Tool, attach its carrying strap as shown in following figure. The straps can be adjusted as necessary to hang the Tool on any sturdy support. The following figure also shows how to open the Stand to put the Tool at an optimal sight angle for bench top use.



FT51010-32 Main Screen

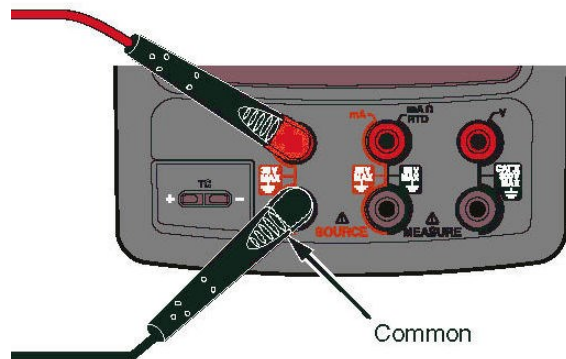


The main screen displays the key functions, battery charge level, and charge mode. The F keys are labeled F1, F2, F3 & F4. After power-on, choose one of the functions: Frequency#1, Frequency#2, Vdc, mA, Tc, or the Ramp function. Click on the HELP key at any time to get more info on the current function. Using the Arrow-up or down will change the back-light brightness

Frequency #1



Click F1 to set the frequency in Hz. Click F2 to set the Vrms, Vpp or Vpk. Click F3 to set the Voffset (Vbias) upto - 15V. Click F4 to switch modes between Sine or Square Waves. Frequency#1 source is referenced to system ground. Use the Up/Down arrow keys to increase or decrease the frequency, use the Left/Right arrow keys to increase or decrease the Amplitude or the Voffset (the last function key pressed will be in effect).

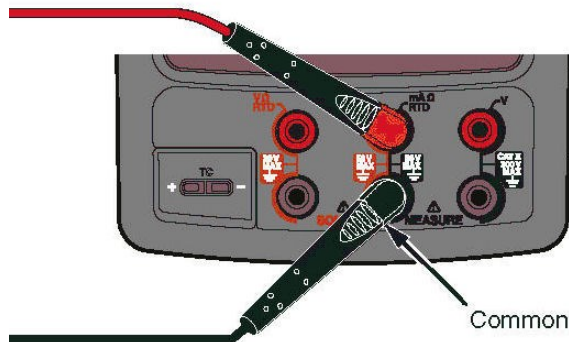


Frequency #2



Click F1 to set the frequency in Hz.
Click F2 to set the Vrms, Vpp or Vpk.
Frequency#2 source is NOT referenced to system ground. Frequency#2 is isolated from the tool ground.

Use the Up/Down arrow keys to increase or decrease the frequency, use the Left/Right arrow keys to increase or decrease the Amplitude.



Programmable Power Source

Choose the source - Vdc, mA or Tc All sources use the same output jack (V/I)

Programmable Power Source - Vdc



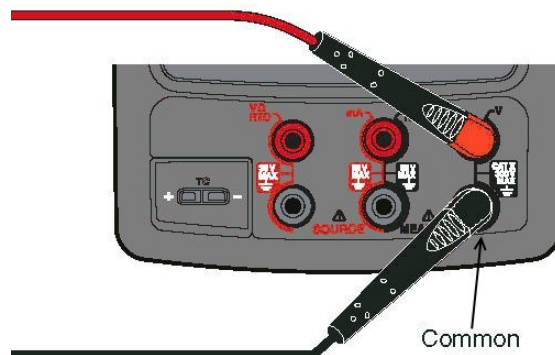
Two options are available:

0-80mV or 0 to -20V

Click F1 or F2 to enter the desired value

Click F4 to switch between modes.

Use the Up/Down arrow keys to increase or decrease the voltage.



Programmable Power Source - mA



Two options are available:

4-20mA or 0-50mA

Click F1 or F2 to enter the desired value

Click F4 to switch between modes.

Use the Up/Down arrow keys to increase or decrease the current.

Current Measurement

Click F4 to select mA In. You can measure mA input between 0-25mA.



Programmable Source - Tc (Thermocouple)

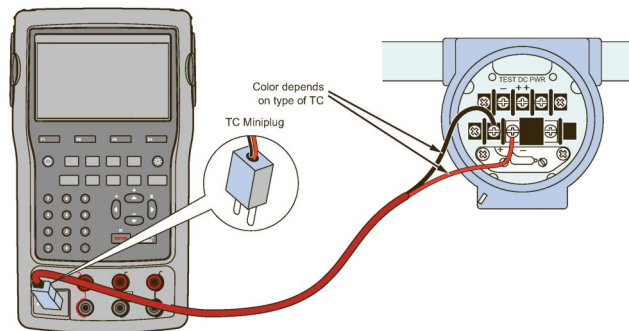


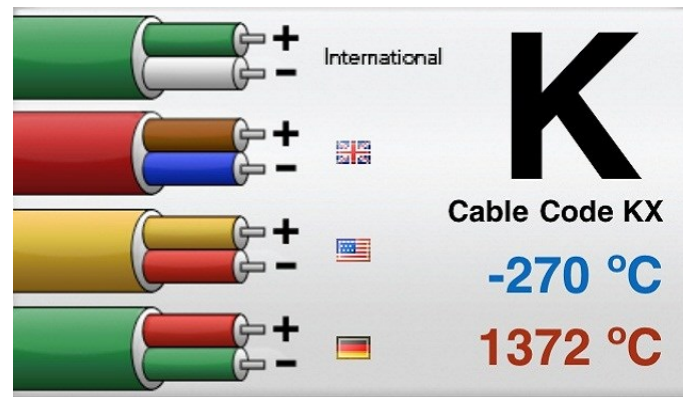
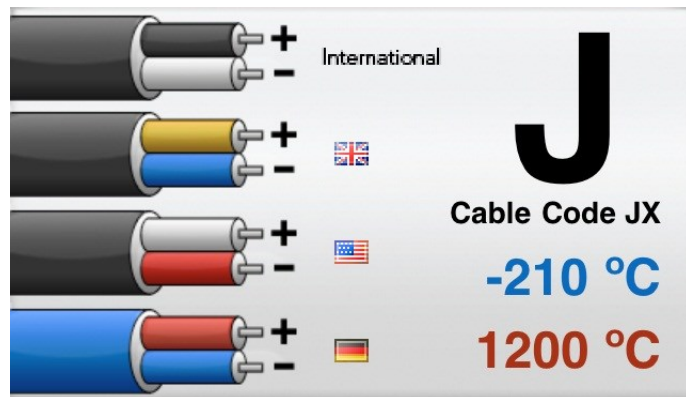
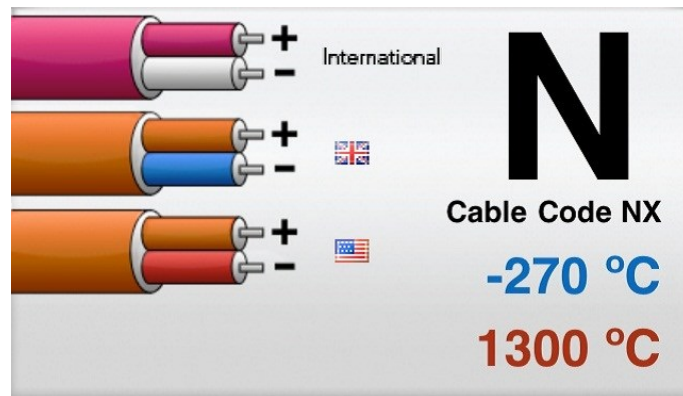
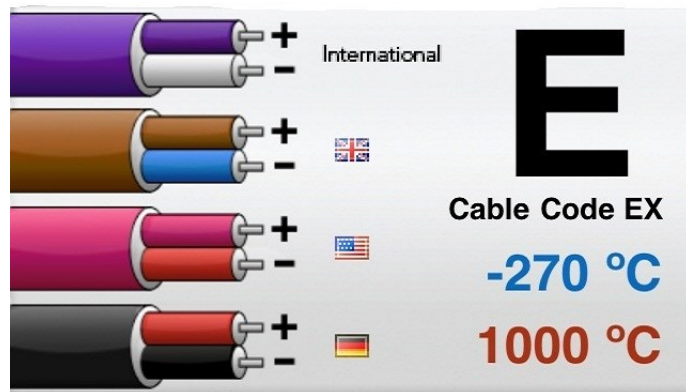
Click F1 to enter the desired temperature.

Click F3 to change Tc Type (K,J,E or N)

Click F4 to switch between °C or °F

More options are available in the Tc setup menu. Use the Up/Down arrow keys to increase or decrease the temperature.





Help Function



Click on the HELP key at any time to get more info on the current function. Press the Help key again or F4 (Exit) and you will get back to the main Menu. Clicking on any function key will bring

the back the function screen. From each help screen you can scroll back or forward to the next screen.

Click F3 to lunch the Conversion Calculator

Conversion Calculator



The conversion calculator allow you to convert the following units:

Temperature (C° or F°)

Pressure (PSI or BAR)

Pressure (PSI or KPA)

Pressure (PSI or Kg/cm²)

Pressure (in of water or BAR)

Use F3 or F4 to enter the unit you wish to convert then click Enter. Use F1 or F2 to scroll to the next calculation

Ramp Function



Click F1 to select the Start value. Press Enter, select the Stop value and press Enter again.

*You can Ramp Up or Down.

The Start value can be lower than the Stop value.

Click F2 to change the time to ramp.

Click F3 to select the function -

Frequency#1, Frequency#2, Vdc1, Vdc2, mA1, mA2 or Tc. Click F4 to Start (Go!) or Stop the operation.

Memory Function



The Memory Manager allows the user to store up to 10 setups by clicking F2.

Use F1 to load previously stored setups.

When you store a setup, every value from every function will be stored in

memory. Click F3 to select the setup that will be used on power-on.

Setup Function



The Setup Screen will display the following information:

- Control display format.
- Calibration information.
- Hardware & Software version.
- Battery information.
- Change LCD brightness.
- Change Thermocouple options.
- Change buzzer and volume.
- Change sleep function on/off.
- LCD, Keypad & Relay tests.

Display Format



The Display Format option allow the user to change Frequency#1 and Frequency#2 amplitude format from Vrms to Vpp or Vpk.

$V_{rms}=0.707 \cdot V_{pp}/2$ - Sine Wave
 $V_{rms}=V_{pp}/2$ - Square Wave
 $V_{pp}=2 \cdot V_{rms}/0.707$ - Sine Wave
 $V_{pp}=V_{rms} \cdot 2$ - Square Wave
 $V_{pk}=V_{pp}/2$ - Sine & Square Wave

Calibration Function



Calibration Info includes the last calibration date as well as 1-year and 2-year spec due dates.

For calibration needs, contact:

Navatek Eng. Corp.

Tel: 949.888.2222

Fax: 949.635.3141

Email: solar@navatek.com

Hardware & Software info



The H/S info screen will display the Hardware & Software, USB and LCD OS versions. Please record the info in case you need to call support or upgrade the software.

LCD Brightness Level



This screen will allow you to change the maximum display intensity. To increase display intensity push the Brightness button to select from 3 levels of intensity.

Turn the Backlight Auto Shutdown On or Off to save battery. When on, the backlight will be reduced to the lowest brightness level after xx seconds. Low brightness can add up-to 1 hour to the battery life.

Thermocouple Options



This screen allows you to change the way the Thermocouple works, selecting a reference temperature of Int. or Ext.

Select the external reference temperature and set the temperature to zero in case your sensor has an internal reference. Alternatively, route the Tc output to the Vdc/mA jack allowing the Tc mV to be output from both the Tc and Vdc/mA connectors at the same time.

Battery Information



The Battery Info screen displays statistics about the BC7240 battery cell in your tool. An "ERROR NO BATTERY" message indicates that the battery is either broken or not installed properly.

To charge the battery while it is inside the tool:

1. Turn the tool OFF.
2. Connect the battery charger to the tool and keep it OFF. The battery will not charge if the tool is on. The battery fully charges in 8 hours while inside the tool.

To charge the battery while it is outside the tool:

1. Turn the tool face down
2. Use a flat-head screwdriver (or a coin) and move the battery lock from locked to unlocked
3. Remove the battery
4. Connect the battery charger to the jack. Outside the tool, the battery will charge in 5 hours.

Battery Charge Level:

Use these two methods to make sure the battery is charged:

- Check the Battery Gauge Bar Graph on the display.
- Check the Battery Charge Indicator on the battery.

Battery Life:

The battery gauge bar graph is shown on the upper right corner of the display.

Battery charge levels:

Green = 80% to 100% - Full

Lime = 50% to 80% - 2/3 Full

Yellow = 20% to 50% - 1/3 Full

Red = Under 20% -Empty



Battery Replacement:

Replace the battery when it no longer holds a charge for the rated interval. The battery normally lasts for up to 300 charge/discharge cycles. To order a replacement battery, contact Navatek Eng. Corp. or order part# FT51010-34 directly from Solar Turbines.



Recycler Note:

Spent batteries should be disposed of by a qualified recycler or hazardous materials handler. Contact an authorized service center for recycling information.

Buzzer Function



This screen allows you to turn the buzzer On or Off, and select the desired volume.

Auto shutdown



This screen allows you to select the auto shutdown time in case no key is pressed (anywhere between 1 to 999 minutes).

When the set time is reached, the tool will beep so you have the option to re-activate and the counter will start all over again.

If Auto Shutdown is turned off, the tool will remain on until the battery is depleted.

LCD Test



This screen allows you to test the LCD display. The test pattern will show the LCD's capability to reproduce all pixels & colors.

Keypad test



This screen allows you to test the keypad. Any key pressed will be displayed on the screen. To exit the test press F4.

Relay Test



In case a Relay gets stuck you can force -toggle it by selecting the Relay number then clicking on Set/Reset; you should hear it toggle.

USB Mode



When you plug the USB cable to the FT51010-32 it will automatically switch to the USB screen. The first time you plug the tool to the USB port Windows will detect a new device and will install the USB drivers. Follow the on-screen instructions. Run the FT51010.EXE on the PC (or laptop) to control the unit from the PC. Please read the user manual for more info on how to use the program.

Keypad test



This screen allows you to test the keypad. Any key pressed will be displayed on the screen. To exit the test press F4.

Relay Test



In case a Relay gets stuck you can force -toggle it by selecting the Relay number then clicking on Set/Reset; you should hear it toggle.

USB Mode



When you plug the USB cable to the FT51010-32 it will automatically switch to the USB screen. The first time you plug the tool to the USB port Windows will detect a new device and will install the USB drivers. Follow the on-screen instructions. Run the FT51010.EXE on the PC (or laptop) to control the unit from the PC. Please read the user manual for more info on how to use the program.

Calibration:



Calibration is necessary only if the FT51010-32 does not pass verification. Always re-verify after calibration. Calibration for the Product is done with internal software. There are no physical adjustments. The subsequent instructions

for calibration are minimal because of the built-in guided procedures. The internal software routines give step-by-step prompts for the correct measurement or stimulus. The guided procedures also illustrate which terminals (jacks) to use when reading a measurement or apply a stimulus. Follow the instructions carefully to complete each calibration routine.

Equipment Required for Calibration:

6.5 Digit DMM

Frequency Counter

Current Source (4-20mA)

Temp. Measurement (K Type)

How to Enter Calibration:

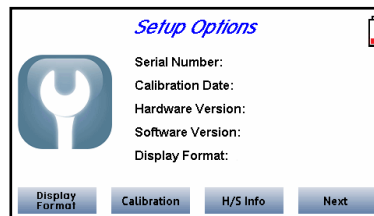
In the calibration setup screen, push F1 to calibrate. The calibration screen requests a password, 12345 is the default. After you put in the password, push Enter to continue.

How to Calibrate:

Follow these general instructions for all calibrations:

- Operate the FT51010-32 on battery power. Make sure the battery is fully charged.
- Let each piece of calibration equipment meet its specified warm up period. Let the FT51010-32 warm up a minimum of 10 minutes.

1. Turn on the FT51010-32.
2. Push Setup and then F2 softkey to open the password screen.

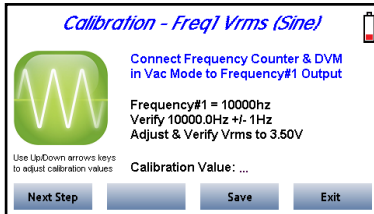


3. Input the password (the default password is 12345) and then push the Exit softkey.



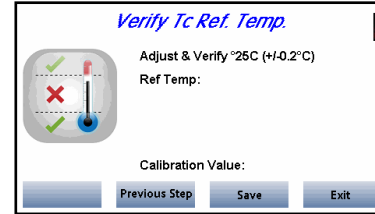


4. Re-enter the Calibration menu and press F1
5. Follow the on-screen instructions.

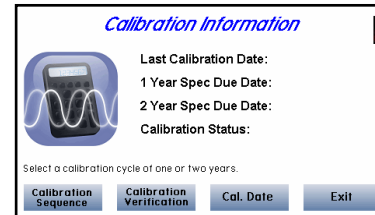


5. Use Up and Down arrow keys to change the calibration values. Push the Next Step softkey to move to the next screen.
6. Each adjustment procedure will give connection instructions and signal levels needed for the step.

7. Press Exit to complete the calibration sequence.



8. Press F3 to change the calibration dates.
The date format is as follow:
Year-Month-Date
For example –Enter 150722 will result in July 22 2015



9. Re-cycle power and run the Calibration Verification (F2) to verify operation.

FT51010-32 Specifications



General Specifications:

All specifications apply from +18 °C to +28 °C unless stated otherwise.

All specifications assume a 5-minute warm-up period.

Size (H x W x L):

Height = 63.35 mm (2.49 inches)

Width = 136.37 mm (5.37 inches)

Length = 244.96 mm (9.65 inches)

Weight = 1.23 kg (2.71 lb) (Batteries included)

Display - 480 by 272 pixel graphic LCD, 95 x 54 mm

Power - Internal battery pack: Lithium Ion, 7.2Vdc, 30Wh

Environmental Specifications:

Operating Altitude 3000 m (9842 ft)

Storage Altitude 13000 m (42650 ft)

Operating Temperature -10 to 50 °C

Storage Temperature -20 to 80 °C

Relative Humidity (Maximum, non-condensing)

90 % to 35 °C

75 % to 40 °C

45 % to 50 °C

Frequency Source #1:

Frequency Range - 10Hz to 20Khz

Signal Type - Sine & Square waves,

Duty cycle fixed 50%

AC Level - 0 to 7Vrms

Display format: Vpp, Vpk or Vrms

DC Level - 0 to (-15)Vdc Voffset

Maximum Sourced Current- 20 mA

Minimum Load Resistance- 1 Kohm

Ground Reference—Instrument Ground

Frequency Accuracy +/-1Hz

Accuracy AC Level 0.1% & ±25mv

Accuracy DC Level 0.1% & ±35mv

Frequency Source #2:

Frequency Range - 10Hz to 20Khz

Signal Type - Sine wave.

Duty cycle fixed 50%

AC Level - 0 to 7Vrms

Display format: Vpp, Vpk or Vrms

Maximum Sourced Current- 20 mA

Minimum Load Resistance- 1Kohm

Ground Reference - NOT Instrument Ground

Frequency Accuracy +/-1Hz

Accuracy AC Level 0.1% & ±25mv

Programmable Power Source #1

Output Voltage 0 to (-20)V

Maximum Sourced Current - 20mA

Minimum Load Resistance -1Kohm

Ground Reference - Instrument Ground

Accuracy 0.1% & $\pm 50\text{mv}$

Programmable Power Source #2

Output Voltage 0 to 80mV

Maximum Sourced Current - 5mA

Minimum Load Resistance - 1Kohm

Ground Reference - Instrument Ground

Accuracy 0.1% & $\pm 100\text{uV}$

Programmable Current Source #1

Output Current 4 to 20mA

Maximum Compliance Voltage 15V

Ground Reference - Instrument Ground

Accuracy 0.1% & $\pm 50\text{uA}$

Programmable Current Source #2

Output Current 0 to 50mA

Maximum Compliance Voltage 15V

Ground Reference - Instrument Ground

Accuracy 0.1% & $\pm 150\text{uA}$

Programmable Tc Source

Output Temperature:

K type = -200 to 1372°C

J Type = -210 to 1200°C

E Type = -250 to 1000°C

N Type = -200 to 1300°C

Temperature Scale - ITS-90

Ground Reference - Instrument Ground

Accuracy 0.5% & $\pm 1^\circ\text{C}$

Instrument Operating Temperature: 0 to 50 °C

<i>Type</i>	<i>(+) Material</i>	<i>(+) Color ANSI</i>	<i>(+) Color IEC</i>	<i>(-) Material</i>	<i>T - Range</i>
E	Chromel	Purple	Violet	Constantan	-250 to 1000
N	Ni-Cr-Si	Orange	Pink	Ni-Si-Mg	-200 to 1300
J	Iron	White	Black	Constantan	-210 to 1200
K	Chromel	Yellow	Green	Alumel	-270 to 1372



CE Certification

This instrument certified to the following standards:

- EN 61326-1 Electromagnetic Emissions and Susceptibility
- EN 61010-1 General Safety

FT51010-32 Part Numbers

The Solar Turbines accessories listed below are compatible with the Tool. For more information about these accessories and their prices, contact Navatek.

FT51010-3201 Signal Source & Calibrator
FT51010-3202 BP7240 7.2V,4.4AH Battery Pack
FT51010-3203 BC7240 Power Supply/Battery Charger
FT51010-3204 Printed Getting Started Manual
FT51010-3205 USB Key containing Users Manuals
FT51010-3206 AC220 SureGrip™ Alligator Clips
FT51010-3207 75X industrial test leads with stackable ends
FT51010-3212 USB Cable: 6 ft. type A to type mini-B
FT51010-3213 Demo - SS&C Control application software
FT51010-3215 Adjustable quick-release strap

Fluke Pressure Modules

FT51010-5 Pressure Module FLUKE-700P00 1 in. H2O
FT51010-6 Pressure Module FLUKE-700P04 15 psi
FT51010-7 Pressure Module FLUKE-700P08 1000 psi
FT51010-9 Pressure Module FLUKE-700P07 500
FT51010-10 Pressure Module FLUKE-700P06 100 psi
FT51010-11 Pressure Module FLUKE-700P09 1500
FT51010-12 Pressure Module FLUKE-700P29 3000

FT51010 Kit Part Numbers

FT51010-33 Fluke 771 AC/DC Current Probe
FT51010-34 BP7240 7.2V,4.4AH Battery Pack
FT51010-35 BC7240 Battery charger
FT51010-36 Set of Stackable Test Leads Red/Black
FT51010-37 Set of TP220 Test Probes Red/Black
FT51010-39 Set AC280 Hook Clips Red/Black
FT51010-40 Set of AC220 Alligator Clips Red/Black
FT51010-41 Cable - BNC to Alligator Clips
FT51010-42 USB Cable: 6 ft. type A to type mini-B
FT51010-43 HART Communication Cable
FT51010-44 HART Drywell Cable Accessory
FT51010-45 Cable - Jumper (three-wire RTD measurement)
FT51010-46 DC/DC Converter With Multiple Ports
FT51010-47 Hard Carrying Case
FT51010-48 Field Soft Case
FT51010-49 Adjustable Quick-Release Strap
FT51010-50 Solar Calibration product Manual (CD)

For Support please call

Navatek Eng. Corp.

22582 Avenida Empresa

Rancho Santa Margarita, CA 92688 - USA

Tel: 949-888-2222

Fax: 949-635-3141

Or email to - support@navatek.com