

TekSmartLab™

TBX3000A, TSL3000B Datasheet



TekSmartLab is the industry's first network-based instrument management solution for teaching labs, enabling a more efficient lab experience. With the TekSmartLab, instructors, students, and lab managers all benefit from improved connectivity, workflow, and automation.

Key features

- Easy to setup with industrial reliability
- Intuitive instructor - course - exercise organization
- Centralized monitoring and remote assistance
- Online editing and submission of test reports
- Automatic instrument asset information recording

Key benefits

- Lab managers can efficiently manage lab instruments:
 - Setup configurations of large fleets of instruments with one click
 - Capture instrument asset information automatically
- Instructors can manage teaching work flow more efficiently:
 - Instrument configuration can be saved and distributed to all the instruments when required
 - Monitor and control the lab instruments remotely to assist the students
 - Define report templates and have them load automatically when students are using smart devices
- Students can interact with their lessons seamlessly:
 - Retrieve and save test results wirelessly via smart devices
 - Edit and submit test reports electronically
 - Download materials that are on the lab server (lab procedures, videos, and more)

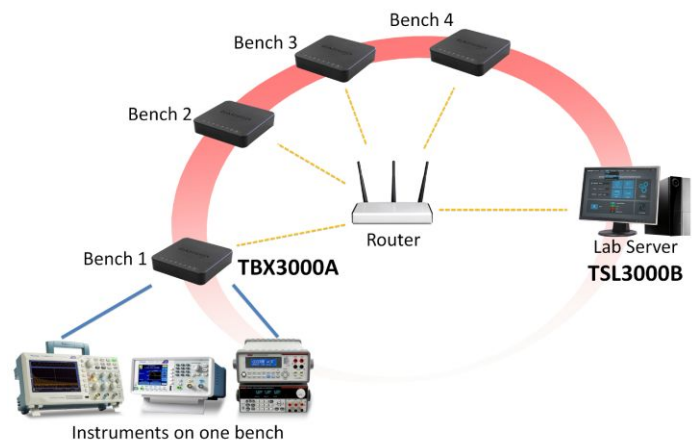
Applications

- Basic teaching laboratory

TekSmartLab network diagram

In traditional teaching labs, connecting instruments to a network can be challenging, building an internal network through cables is tedious, and many lab instruments do not have a LAN port.

Tektronix TekSmartLab is different: On each bench, the TBX3000A connects and controls instruments through USB cables, and communicates with the TSL3000B software on the lab server via the wireless network. The TBX3000A has a LAN port (standard), and can support a WI-FI connection when equipped with a compatible USB-WIFI dongle, such as TEK-USB-WIFI.



On the lab server, the TSL3000B communicates with the TBX3000A on each bench. The TSL3000B gives instructors centralized control of large fleets of instruments and gives students the ability to retrieve test results, and edit test reports online.

Easy to setup with industrial reliability

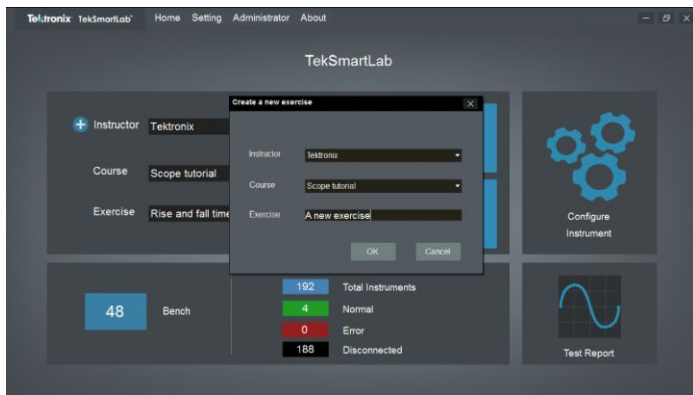
TekSmartLab can be easily setup via WI-FI without laying LAN cables. Without any configuration, instruments are recognized automatically by the system when they are connected to the system.

For the labs which have already equipped with Tektronix and Keithley instruments, instructors can smoothly update their labs to TekSmartLab as most of the Tektronix and Keithley teaching lab instruments are supported, even some instruments that have been phased out in the last five years (see *Specifications*).

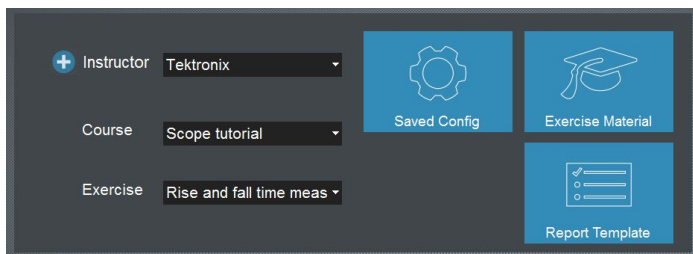
Instead of controlling all the instruments by lab server directly, the TBX3000A on each bench controls the instruments connected to it. Using the TekSmartLab is an efficient and stable way to work. The TBX3000A, which is based on the Tektronix oscilloscope platform, works seamlessly with Tektronix and Keithley instruments, assuring the industrial reliability of the entire system.

Course and exercise based applications

TekSmartLab uses an instructor - course - exercise oriented hierarchy, an organization familiar to instructors at most universities: Instructors have different courses, and within each course there are different exercises. New exercises are easily created using the instructor name and course name, and easily selected with the same information.



Applications, like saved configuration, exercise material sharing, and report templates, for instance, are linked to specific exercises.



Centralized configuration

Instructors can setup the configurations of the instruments and distribute them to over 100 instruments with a single click. Instrument configuration changes can be made and delivered anytime; for example, the Autoset function can be disabled to encourage students to learn how to manually adjust an oscilloscope to display the correct waveform.



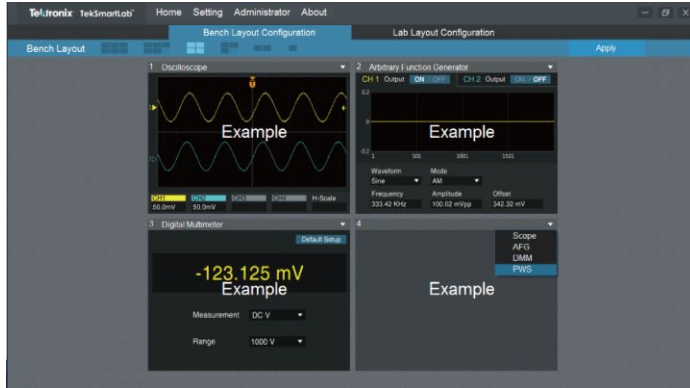
Instrument configuration can also be saved into a specific exercise and recalled when the exercise is selected.



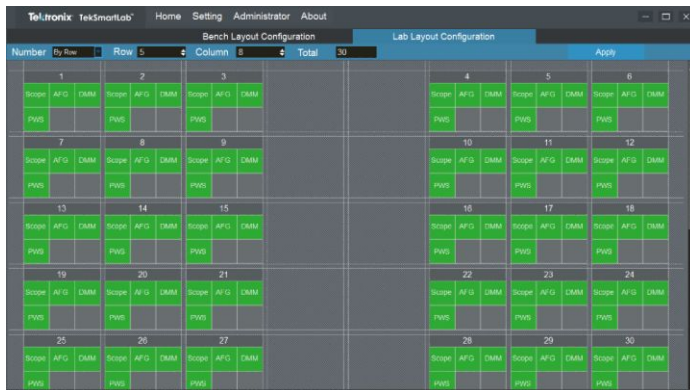
When the TBS1000B-EDU series oscilloscopes are connected to the system, the courseware contents, as well as instrument firmware, can be updated remotely, a manual update for each instrument via USB thumb drives before.

Centralized monitoring and remote assistance

With TekSmartLab, the physical bench layout and lab layout is easily emulated: The number and type of the instruments on the bench can be setup, and the location of each bench within the lab can be customized.



Clicking a bench icon displays the readouts and key configuration settings for the instruments on that bench.



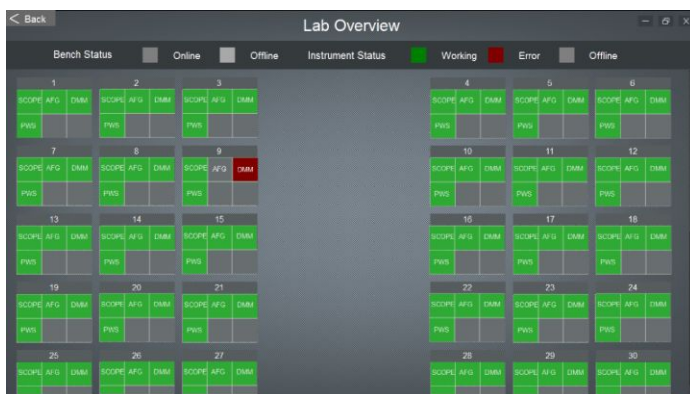
Retrieving and saving test reports online

In a traditional teaching lab, when students need to save test results they typically take snapshots of oscilloscopes and download those to a USB thumb drive or, more often, use a mobile device to take the picture. The result is that the quality of test results is not consistent and test results are difficult to archive for future access.

TekSmartLab provides a more intelligent approach for editing and submitting test reports online: The TSL3000B server software creates a web page available in the local network for each bench. Each web page can be conveniently accessed by bench-specific IP address.

With TSL3000B, instructors can change the IP address to QR (quick response) codes, and place it permanently as a printed sticker on each bench.

Instructors can easily monitor the status of all instruments during the experiment: Green signifies that the instrument is working, gray signifies no connection, and red signifies an error. An instructor can check on or help a specific bench by clicking the corresponding bench icon.



Students can login in to the web page using their mobile device to scan the QR code or by inputting the IP address in the web browser of their laptops. Once logged in, students can easily edit and submit test reports online.

Lab Name: TekSmartLab

Bench: 1

Course Name: Scope tutorial

Exersise: Rise and fall time measurement

Student Name: _____

Student ID: _____

Remember me **Log in**

Scope Snapshot

When students create a new test report, the report template, created by instructor and saved on the server, is loaded automatically.

Test Report Template

Introduction:
Report template can only be in the format of docx created by Microsoft Word. It will be transformed to HTML when it is loaded in the web page on students' devices. When the template in word is transformed to HTML, only the texts and images are kept. You can click Preview to see the uploaded template in HTML or refer to the example shown below.

Test Report Template
C:\Program Files (x86)\Tektronix\Tools\Lab\Course\13\13a\ Rise and fall time measurement\13

Example

Report template in *.docx format

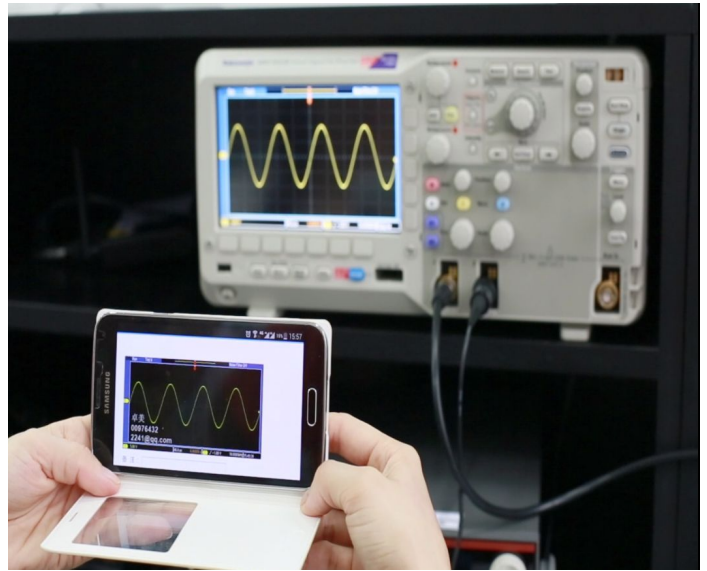
- Text and image can be saved.
- Header and footer cannot be saved.
- Inserted equation, as below, cannot be saved unless it is changed to be an image.

$$(x + a)^n = \sum_{k=0}^n \binom{n}{k} x^k a^{n-k}$$

Report template in HTML format

- Text and image can be saved
- Header and footer cannot be saved
- Inserted equation, as below, cannot be saved unless it is changed to be an image

When students edit their test reports, test results, like snapshots of the oscilloscope retrieved wirelessly, can be inserted at any time.



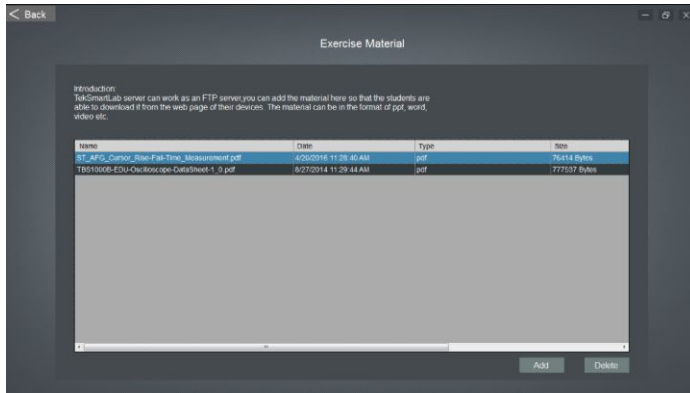
The test report can be downloaded locally or archived on the lab server for future access.

| Date | Instructor | Course Name | Exercise | Bench No. | Student Name | Student ID |
|---------------------|------------|----------------|-----------------------------------|-----------|--------------|------------|
| 2016-04-21 10:28:47 | Tektronix | Scope tutorial | Rise and fall time measurement... | 11 | Ian | C123456 |
| 2016-04-21 10:29:09 | Tektronix | Scope tutorial | Rise and fall time measurement... | 2 | Jacky | C123456 |
| 2016-04-21 10:29:49 | Tektronix | Scope tutorial | Rise and fall time measurement... | 3 | Jerry | C112345 |
| 2016-04-21 10:29:56 | Tektronix | Scope tutorial | Rise and fall time measurement... | 4 | Mary | C111237 |
| 2016-04-21 10:30:27 | Tektronix | Scope tutorial | Rise and fall time measurement... | 5 | Janice Chang | C221245 |
| 2016-04-21 10:31:08 | Tektronix | Scope tutorial | Rise and fall time measurement... | 6 | Marc Edwards | C223256 |
| 2016-04-21 10:31:56 | Tektronix | Scope tutorial | Rise and fall time measurement... | 7 | Steven Tan | C123456 |
| 2016-04-21 10:28:47 | Tektronix | Scope tutorial | Rise and fall time measurement... | 8 | Tina Tang | C123225 |
| 2016-04-21 10:29:09 | Tektronix | Scope tutorial | Rise and fall time measurement... | 9 | Gary Wwe | C123456 |
| 2016-04-21 10:29:43 | Tektronix | Scope tutorial | Rise and fall time measurement... | 10 | Chung Tang | C112212 |
| 2016-04-21 10:29:53 | Tektronix | Scope tutorial | Rise and fall time measurement... | 11 | Mary Yang | C112152 |
| 2016-04-21 10:28:47 | Tektronix | Scope tutorial | Rise and fall time measurement... | 12 | Patrick Ma | C123245 |
| 2016-04-21 10:29:09 | Tektronix | Scope tutorial | Rise and fall time measurement... | 13 | Bryce Li | C123256 |
| 2016-04-21 10:29:47 | Tektronix | Scope tutorial | Rise and fall time measurement... | 14 | Richard Chen | C112212 |
| 2016-04-21 10:30:29 | Tektronix | Scope tutorial | Rise and fall time measurement... | 15 | Jacky Wang | C112152 |
| 2016-04-21 10:30:27 | Tektronix | Scope tutorial | Rise and fall time measurement... | 16 | Tippy Wu | C223456 |
| 2016-04-21 10:31:08 | Tektronix | Scope tutorial | Rise and fall time measurement... | 17 | Harry Ji | C223225 |

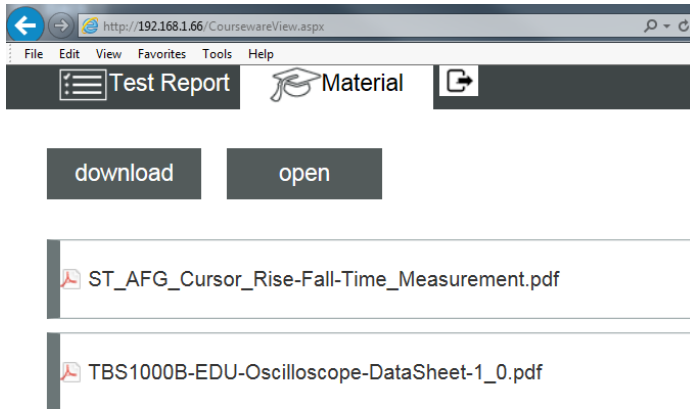
Buttons: Detail, Export, Export Report Files

Sharing exercise material online

TekSmartLab integrates FTP into the distribution of materials, allowing instructors to easily share any type of exercise materials, whether they are PowerPoint, Word, or even video, to students efficiently.



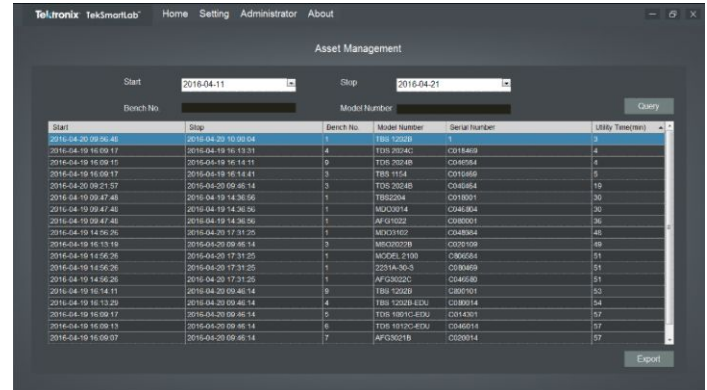
Once instructors load exercise materials onto the lab server, students can download them through the lab server web page onto their smart devices.



Automatic instrument asset information recording

In conventional teaching labs, the asset manager manually checks and records information such as instrument model numbers, serial numbers, and locations. Detailed information like the length of usage can only be estimated by experience or by keeping usage logs.

The TekSmartLab solution automatically records and displays asset information, including time in use. Just one click archives the asset and usage information. TekSmartLab dramatically increases asset management accuracy compared to previous methods and makes managing lab assets much more efficient.



Sample TekSmartLab configuration

The following shows a sample setup of a TekSmartLab system with 15 benches and 60 instruments connected through WI-FI.

| Item | Quantity | Supplier | Comments |
|--------------------------|----------|----------------------|---|
| TSL3000B | 1 | Tektronix | One per lab, installed on lab server. |
| TBX3000A | 15 | Tektronix | One per bench. |
| Instruments | 60 | Tektronix | Supported Tektronix or Keithley instruments, one oscilloscope, one arbitrary function generator, one digital multimeter, and one power supply per bench. Option 2231A-001 required for the power supply 2231A-30-3. |
| TEK-USB-WIFI | 15 | Tektronix | USB-WIFI dongle installed on TBX3000A. |
| WIFI router ¹ | 1 | Provided by customer | TP-LINK TL-ER604W or other WIFI Router that can meet WI-FI networking requirements. |
| Lab server | 1 | Provided by customer | Refer to system requirements. |

¹ To use WI-FI on systems with more than 15 benches, it is recommended to setup the WI-FI network by wired router and access points instead of a WIFI router.

Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

TBX3000A characteristics

General characteristics

| | |
|-----------------------------------|--|
| Max instruments connected | 6, by USB cables |
| Compatible USB-WIFI dongle | TEK-USB-WIFI |
| LAN Port | 1 |
| LED | 6 – Instrument status indicators 1 – Wi-Fi connection status indicator 1 – System status indicator |

Environmental characteristics

| | |
|--------------------|--|
| Temperature | Operating. 0 °C to 40 °C Non-operating. -20 °C to +60 °C |
| Humidity | Operating. (Low) 0 °C to 40 °C, 10% to 90% relative humidity Non-operating. (High) 40 °C to 60 °C, 5% to 60% relative humidity; (Low) 0 °C to 40 °C, 5% to 90% relative humidity. |
| Altitude | Operating. Up to 3,000 m (10,000 ft.) Non-operating. Up to 15,240 m (50,000 ft.) |

Regulatory compliance

| | |
|-----------------------|-------------------|
| EMC compliance | EN61326, Class A. |
|-----------------------|-------------------|

| | |
|--------------------------|--------------|
| Power consumption | Maximum 15 W |
|--------------------------|--------------|

Physical characteristics

| Dimension | mm | in |
|-----------|------|------|
| Height | 31 | 1.22 |
| Width | 127 | 5.0 |
| Depth | 127 | 5.0 |
| Weight | kg | lb |
| Net | 0.24 | 0.53 |
| Shipping | 1.07 | 2.36 |

TSL3000B general characteristics

| | |
|--------------------------------------|--|
| Maximum benches supported | 100 |
| Maximum instruments supported | 600 (six instruments per bench) |
| Bench layout emulation | Select bench layout template (from 1 to 6 instruments), select instrument type |
| Laboratory layout emulation | Add, Delete, Bench Number |
| Large fleet configuration | By exercise, by instrument type |

TSL3000B general characteristics**Supported instruments**

| | |
|--------------------------------------|--|
| Oscilloscopes | Tektronix TBS1000B-EDU series |
| | Tektronix TDS2000C series |
| | Tektronix DPO/MSO2000B series (oscilloscope function only) |
| | Tektronix MDO3000 series (oscilloscope function and spectrum analyzer function only) |
| Arbitrary function generators | Tektronix AFG1000 series |
| | Tektronix AFG2021 |
| | Tektronix AFG3000C series |
| Digital multimeters | Keithley DMM2110 |
| | Keithley DMM2100 |
| Power supplies | Tektronix DMM4000 series |
| | Keithley 2230G(J)-30-1 |
| | Keithley 2220G(J)-30-1 |
| | Keithley 2220(J)-30-1 |
| | Keithley 2230(J)-30-1 |
| Discontinued instruments | Keithley 2231A-30-3 (requires Option 2231A-001) |
| | Tektronix TDS1000B series |
| | Tektronix TDS1000C-SC series |
| | Tektronix TDS1000C-EDU series |
| | Tektronix TBS1000 |
| | Tektronix DPO/MSO2000 |
| | Tektronix AFG3021B |
| | Tektronix AFG3022B |
| | Tektronix AFG3011 |
| | Tektronix AFG3101 |
| | Tektronix AFG3102 |
| | Tektronix AFG3251 |
| | Tektronix AFG3252 |

| | |
|--------------------------|--|
| General functions | Check status, preset, record model number, S/N, time of use and location |
|--------------------------|--|

TSL3000B general characteristics

| | |
|---|--|
| Oscilloscope functions | <p>Analog channel ON/OFF</p> <p>Digital channel ON/OFF (MSO2000 and MDO3000 with digital channel option only)</p> <p>Set/Check input coupling (AC, DC, Ground)</p> <p>Set/Check input attenuation</p> <p>Set/Check horizontal/vertical resolution and scale</p> <p>Set/Check trigger level (support Edge trigger only)</p> <p>Set/Check cursors (support time and amplitude mode only)</p> <p>Set/Check measurement (Frequency, Period, Rise time, Fall Time, Positive Pulse Width, Negative Pulse Width, Peak to Peak, Amplitude, Maximum, Minimum, High, Low, Positive Overshot, Negative Overshot, Mean, RMS)</p> <p>Check/Save snapshot</p> <p>Waveform update (analog channel only)</p> <p>Autoset Enable/Disable</p> <p>Autoset</p> <p>Courseware contents and firmware remote update (support for the TBS1000B-EDU series only)</p> |
| Spectrum Analyzer functions (MDO3000 series only) | <p>Set/Check start/stop frequency, center frequency, span</p> <p>Set/Check reference level</p> <p>Set/Check RBW mode, RBW value, window</p> <p>Waveform update</p> <p>Manual/Peak markers ON/OFF</p> <p>Spectrogram ON/OFF</p> |
| Arbitrary Function Generator (AFG) functions | <p>Set/Check carrier waveform (support Sine, Pulse, Ramp, Square waveforms)</p> <p>Set/Check carrier frequency, amplitude, pulse width (for Pulse only)</p> <p>Set/Check modulating type: AM, FM, PM, Sweep, Burst</p> <p>Output ON/OFF</p> |
| Digital Multimeter functions | <p>Set/Check measurement function: DCI, DCV, ACI, ACV, Ohm (2-wires)</p> <p>Set/Check Auto/Manual range</p> <p>Check measurement result</p> |
| Power supply functions | <p>Set/Check setting voltage/current</p> <p>Check output voltage/current (resolution 3 decimal digits)</p> <p>Output ON/OFF</p> |
| Test report online editing and submitting function | <p>QR code generation Support</p> <p>Web browser access Support</p> <p>Test report template format docx</p> <p>Created test report format HTML</p> <p>Test report edit functions Create a new report, edit text, insert oscilloscope snapshot, insert instrument setting, submit report, download report</p> |

TSL3000B general characteristics**System requirements**

| | |
|--------------------------|--|
| Operating system | Win 7 Professional, Enterprise or Ultimate |
| CPU | Dual core 2.3 GHz or above |
| RAM | 4 GB DDR3 or above |
| Hard disk | 200 GB (minimum) |
| Screen resolution | 1366 x 768 or above |
| Web service | IIS6.0 or above (supplied with system) |
| Database | SQL Server 2014 Express (free download from the Microsoft website) |

WI-FI networking requirements (for labs with 15 benches)

| | |
|-----------------------------|--|
| Signal level | >= -50 dBm |
| Signal to noise | >= 35 dB |
| Max clients accessed | >=31 (15 clients are TBX3000A, 15 clients are students' mobile devices, and one client for the lab server) |

Ordering information

TekSmartLab™

| | |
|----------|-----------------------|
| TBX3000A | TekSmartLab™ hardware |
| TSL3000B | TekSmartLab™ software |

TBX3000A power plug options

| | |
|-----|-----------------------------|
| A0 | North America |
| A1 | Universal EURO |
| A2 | United Kingdom |
| A3 | Australia |
| A4 | 240v North America |
| A5 | Switzerland |
| A6 | Japan |
| A10 | China |
| A11 | India |
| A12 | Brazil |
| A99 | No Power Cord or AC Adapter |

TBX3000A service options

| | |
|----|------------------------|
| R5 | Repair Service 5 years |
|----|------------------------|

TBX3000A warranty

| | |
|----------|---------|
| Warranty | 3 years |
|----------|---------|

Recommended accessories

| | |
|--------------|---|
| TEK-USB-WIFI | This dongle is certified to comply with CE, FCC and IC regulations. Available in Australia, Canada, China, EU Region, New Zealand, and United States. |
|--------------|---|



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

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* European toll-free number. If not accessible, call: +41 52 675 3777

For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit www.tek.com.

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