Tektronix®

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)

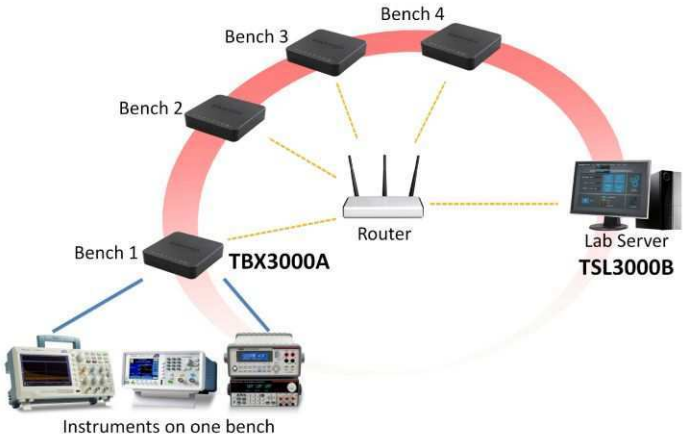
Applications

- 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.

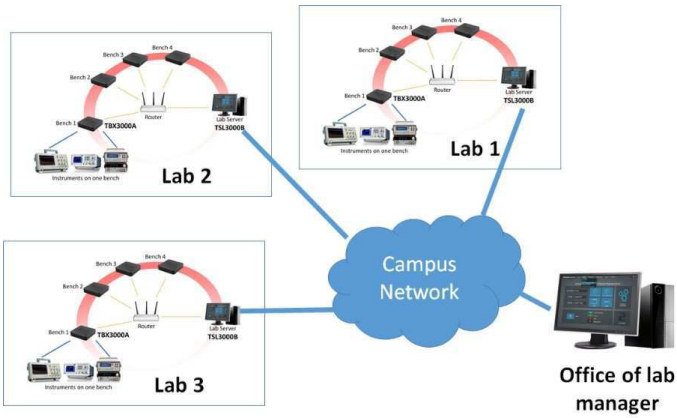
Tektronix TekSmartLab is different: On each bench, the TBX3000A connects and controls instruments through USB cables, and communicates with the TSL3000B software on the lab server via the wireless network. The TBX3000A has a LAN port (standard), and can support a WI-FI connection when equipped with a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

Campus level TekSmartLab

When one lab manager must manage multiple labs, it can be a challenge to manage all of the instruments efficiently since the lab manager needs to spend time visiting each of the different labs. With campus level TekSmartLab, the lab manager can centrally control and monitor the instruments in different labs remotely from his own office.



Campus level TekSmartLab network diagram

As shown in the example above, TekSmartLab systems are setup in each of the labs and the lab servers are connected to a local area network, such as a campus network. TekSmartLab software is installed on the lab manager's computer, which is connected to the same local area network.

When the IP addresses of lab servers and lab manager computers can communicate with each properly, lab manager can access to the lab server in certain lab, and centrally control and monitor the instruments in that lab remotely.

Easy to setup with industrial reliability

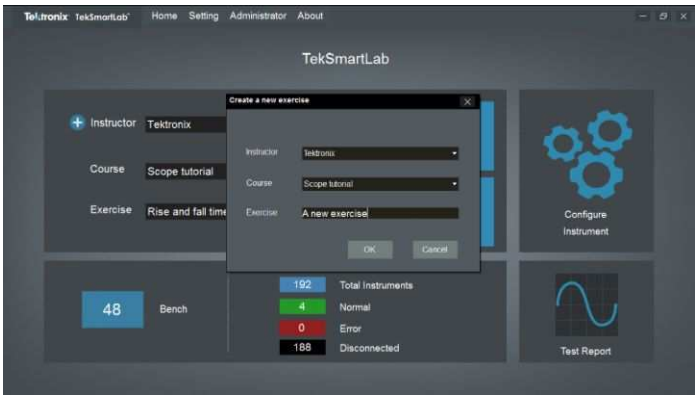
TekSmartLab can be easily setup via WI-FI without laying LAN cables. Without any configuration, instruments are recognized automatically by the system when they are connected to the system.

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*).

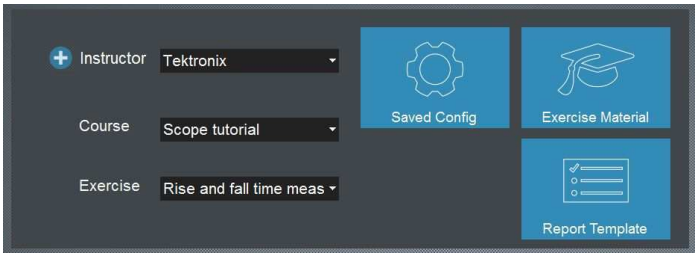
Instead of controlling all the instruments by lab server directly, the TBX3000A on each bench controls the instruments connected to it. Using the TekSmartLab is an efficient and stable way to work. The TBX3000A, which is based on the Tektronix oscilloscope platform, works seamlessly with Tektronix and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

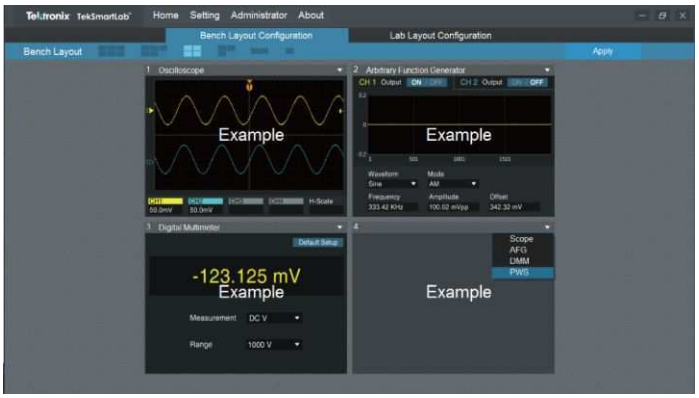
Instructors can setup the configurations of the instruments and distribute them to over 100 instruments with a single click. Instrument configuration changes can be made and delivered anytime; for example, the Autoset function can be disabled to encourage students to learn how to manually adjust an oscilloscope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



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.

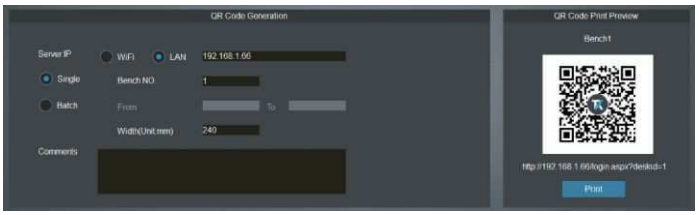
Clicking a bench icon displays the readouts and key configuration settings for the instruments on that bench.

Retrieving and saving test reports online

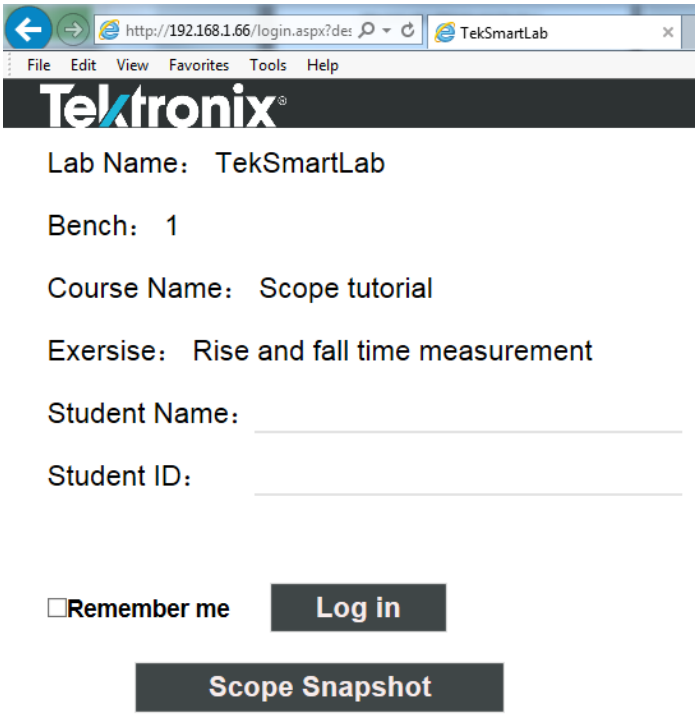
In a traditional teaching lab, when students need to save test results they typically take snapshots of oscilloscopes and download those to a USB thumb drive or, more often, use a mobile device to take the picture. The result is that the quality of test results is not consistent and test results are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

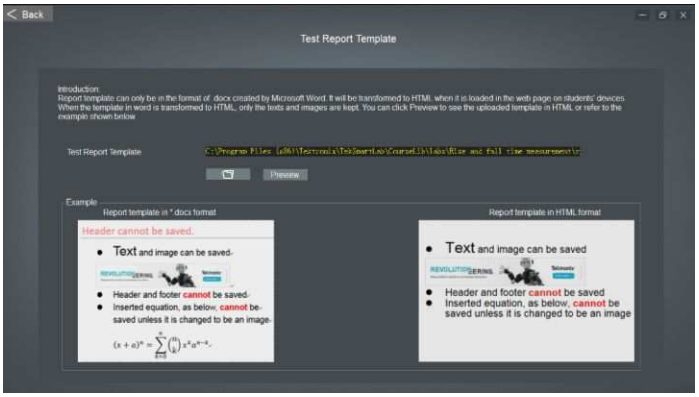
With TSL3000B, instructors can change the IP address to QR (quick response) codes, and place it permanently as a printed sticker on each bench.



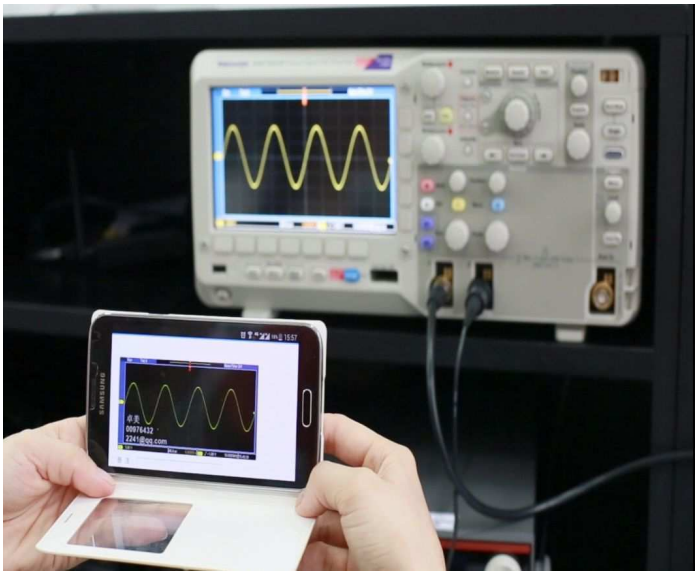
Students can login in to the web page using their mobile device to scan the QR code or by inputting the IP address in the web browser of their laptops. Once logged in, students can easily edit and submit test reports online.



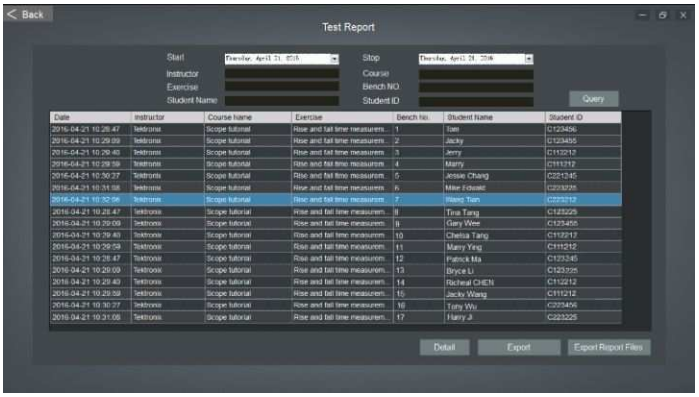
When students create a new test report, the report template, created by instructor and saved on the server, is loaded automatically.



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

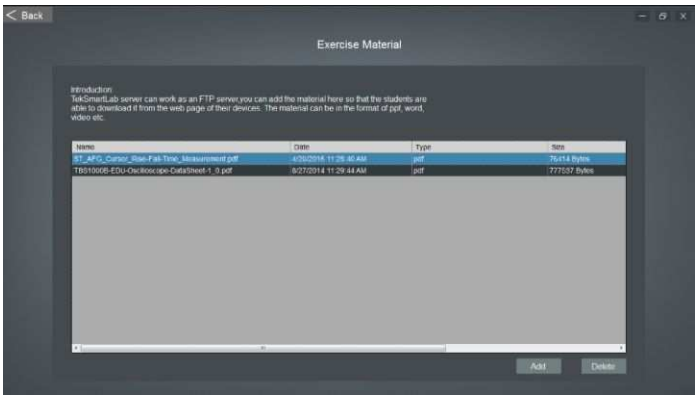


The test report can be downloaded locally or archived on the lab server for future access.

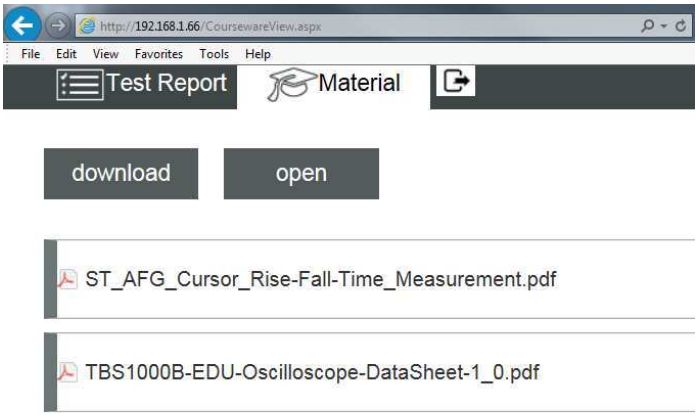


Sharing exercise material online

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.



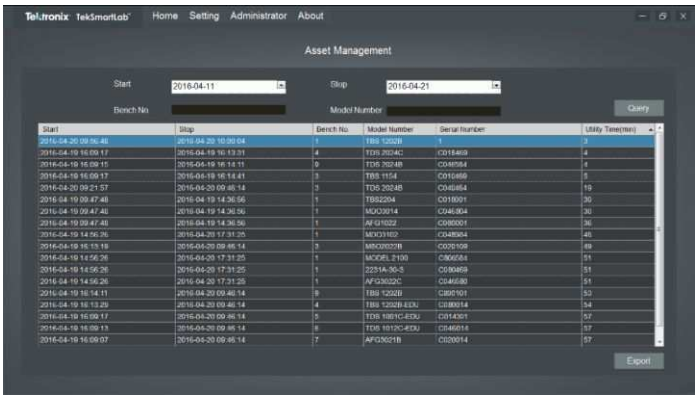
Once instructors load exercise materials onto the lab server, students can download them though the lab server web page onto their smart devices.



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-FL	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
	Tektronix DMM4000 series
Power supplies	Keithley 2230G(J)-30-1
	Keithley 2220G(J)-30-1
	Keithley 2220(J)-30-1
	Keithley 2230(J)-30-1
	Keithley 2231A-30-3 (requires Option 2231A-001)
Discontinued instruments	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	Analog channel ON/OFF
	Digital channel ON/OFF (MSO2000 and MDO3000 with digital channel option only)
	Set/Check input coupling (AC, DC, Ground)
	Set/Check input attenuation
	Set/Check horizontal/vertical resolution and scale
	Set/Check trigger level (support Edge trigger only)
	Set/Check cursors (support time and amplitude mode only)
	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)
	Check/Save snapshot
	Waveform update (analog channel only)
	Autoset Enable/Disable
	Autoset
	Courseware contents and firmware remote update (support for the TBS1000B-EDU series only)
Spectrum Analyzer funtions (MDO3000 series only)	Set/Check start/stop frequency, center frequency, span
	Set/Check reference level
	Set/Check RBW mode, RBW value, window
	Waveform update
	Manual/Peak markers ON/OFF
	Spectrogram ON/OFF
Arbitrary Function Generator (AFG) functions	Set/Check carrier waveform (support Sine, Pulse, Ramp, Square, Noise, DC waveforms)
	Set/Check carrier frequency, amplitude, phase, pulse width (for Pulse only), symmetry (for Ramp only)
	Set/Check modulating type: AM, FM, PM, FSK, Sweep, Burst
	Set/Check output impedance, voltage limit
	Output ON/OFF
Digital Multimeter functions	Set/Check measurement function: DCI, DCV, ACI, ACV, Ohm (2 wires, 4 wires), Frequency, Period, Temperature
	Set/Check Auto/Manual range, Integration Time, Auto Zero, Detector Bandwidth, Reference, Digital Filter
	Check measurement result
Power supply functions	Set/Check setting voltage/current
	Check output voltage/current (resolution 3 decimal digits)
	Output ON/OFF
Test report online editing and submitting function	
QR code generation	Support
Web browser access	Support
Test report template format	docx
Created test report format	HTML
Test report edit functions	Create a new report, edit text, insert oscilloscope snapshot, insert instrument setting, submit report, download report

TSL3000B general characteristics

System requirements	
Operating system	Win 7 Professional (Enterprise or Ultimate), Win 8.1 Professional (Enterprise), Win 10 Professional (Enterprise)
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)	802.11n, 2.4 GHz, 300 Mbps data transfer rate
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-FL	TekSmartLab™ software, floating license

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

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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