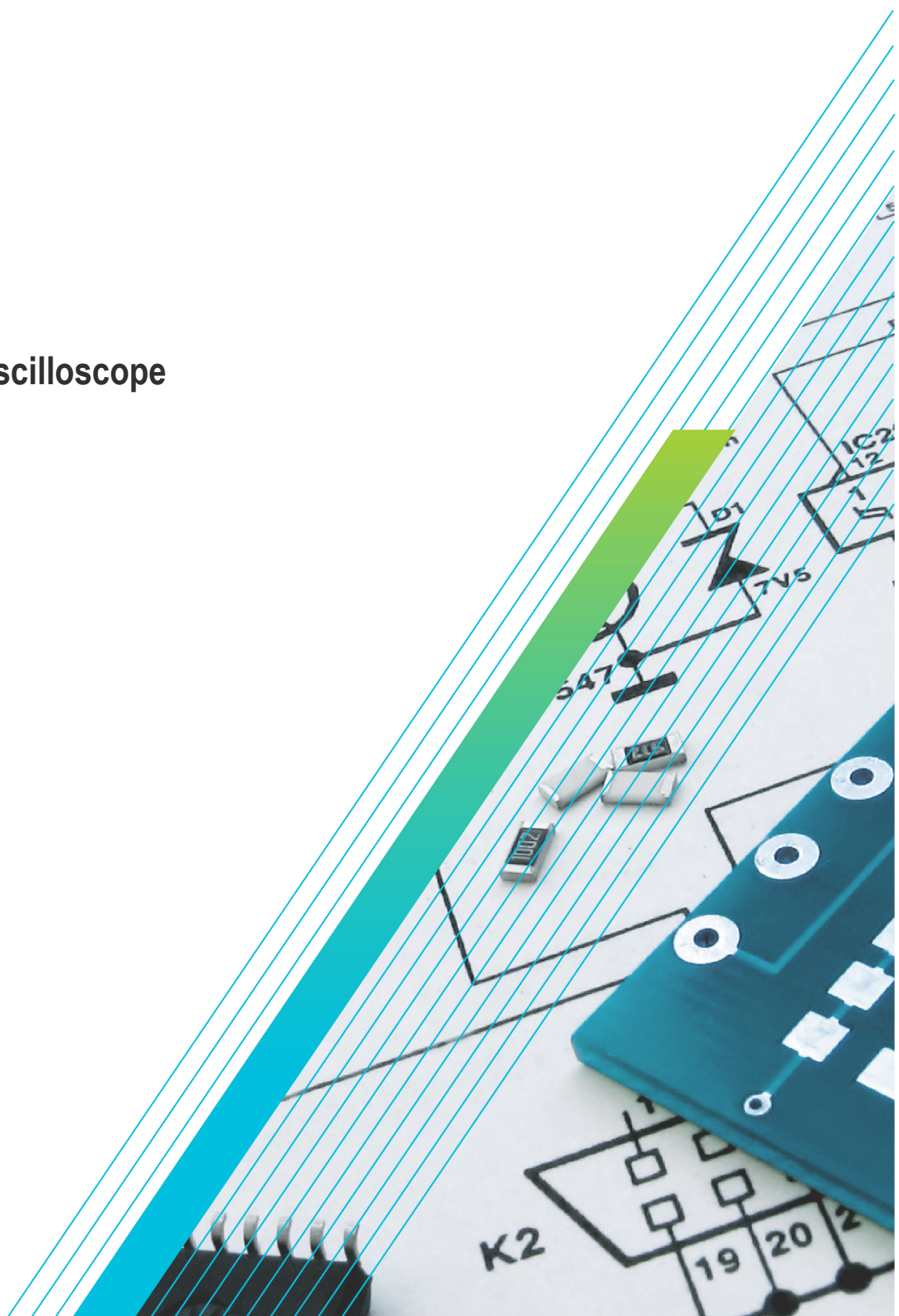




TBS1000C Series
Digital Storage Oscilloscope
Service Manual



077-1584-01





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- In North America, call 1-800-833-9200.
- Worldwide, visit www.tek.com to find contacts in your area.

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Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, see the *Service safety summary* that follows the *General safety summary*.

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

This product shall be used in accordance with local and national codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Use proper power cord	Use only the power cord specified for this product and certified for the country of use.
Ground the product	This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. Do not disable the power cord grounding connection.
Ground-referenced oscilloscope use	Do not float the reference lead of this probe when using with ground-referenced oscilloscopes. The reference lead must be connected to earth potential (0 V).
Power disconnect	The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.
Use proper AC adapter	Use only the AC adapter specified for this product.
Connect and disconnect properly	Do not connect or disconnect probes or test leads while they are connected to a voltage source. Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by Tektronix to be suitable for the product.
Observe all terminal ratings	To avoid fire or shock hazard, observe all rating and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not exceed the Measurement Category (CAT) rating and voltage or current rating of the lowest rated individual component of a product, probe, or accessory. Use caution when using 1:1 test leads because the probe tip voltage is directly transmitted to the product. Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

	Do not float the common terminal above the rated voltage for that terminal.
	The measurement terminals on this product are not rated for connection to mains or Category II, III, or IV circuits.
Do not operate without covers	Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.
Avoid exposed circuitry	Do not touch exposed connections and components when power is present.
Do not operate with suspected failures	If you suspect that there is damage to this product, have it inspected by qualified service personnel.
	Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.
	Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.
	Examine the exterior of the product before you use it. Look for cracks or missing pieces.
	Use only specified replacement parts.
Do not operate in wet/damp conditions	Be aware that condensation may occur if a unit is moved from a cold to a warm environment.
Do not operate in an explosive atmosphere	
Keep product surfaces clean and dry	Remove the input signals before you clean the product.
Provide proper ventilation	Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.
	Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.
Provide a safe working environment	Always place the product in a location convenient for viewing the display and indicators.
	Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.
	Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Probes and test leads

Before connecting probes or test leads, connect the power cord from the power connector to a properly grounded power outlet.

Keep fingers behind the protective barrier, protective finger guard, or tactile indicator on the probes.

Remove all probes, test leads and accessories that are not in use.

Use only correct Measurement Category (CAT), voltage, temperature, altitude, and amperage rated probes, test leads, and adapters for any measurement.

Beware of high voltages	Understand the voltage ratings for the probe you are using and do not exceed those ratings. Two ratings are important to know and understand: <ul style="list-style-type: none"> • The maximum measurement voltage from the probe tip to the probe reference lead • The maximum floating voltage from the probe reference lead to earth ground
--------------------------------	--

These two voltage ratings depend on the probe and your application. Refer to the Specifications section of the manual for more information.



Warning: To prevent electrical shock, do not exceed the maximum measurement or maximum floating voltage for the oscilloscope input BNC connector, probe tip, or probe reference lead.

Connect and disconnect properly

Connect the probe output to the measurement product before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement product.

Connect and disconnect properly

De-energize the circuit under test before connecting or disconnecting the current probe.

Connect the probe reference lead to earth ground only.

Do not connect a current probe to any wire that carries voltages or frequencies above the current probe voltage rating.

Inspect the probe and accessories

Before each use, inspect probe and accessories for damage (cuts, tears, or defects in the probe body, accessories, or cable jacket). Do not use if damaged.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock

Do not touch exposed connections.

Do not service alone

Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power

To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on

Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair

Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in the manual

These terms may appear in this manual:



Warning: Warning statements identify conditions or practices that could result in injury or loss of life.



CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

Symbols on the product



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbols may appear on the product:



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal



Standby



Functional
Earth Terminal

Preface

This service manual provides information to verify the performance, calibrate, troubleshoot, disassemble, and replace parts on the TBS1000C Series Digital Storage Oscilloscopes.

Unless noted otherwise, the term "oscilloscope" refers to all models in the TBS1000C series.

Manual conventions

This manual uses certain conventions that you should become familiar with before attempting service.

Related documentation

To read about	Use these documents
Installation and Operation	The oscilloscope user manual, available on the Tektronix Web site. Go to www.tektronix.com/manuals and search for the user manual for your product (available in 11 languages).
Programmer Commands	The oscilloscope programmer manual, available on the Tektronix Web site. Go to www.tektronix.com/manuals and search for the programmer manual for your product.
Product specifications and performance verification procedures	The oscilloscope specifications and performance verification manual, available on the Tektronix Web site. Go to www.tektronix.com/manuals and search for the specifications and performance verification technical reference manual for your product.

Maintenance

Inspection and cleaning

Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, can prevent oscilloscope malfunction and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the oscilloscope, and using general care when operating it. How often you do maintenance depends on the severity of the environment in which you use the oscilloscope. A good time to perform preventive maintenance is just before adjustment of the oscilloscope.

General care

For best performance, follow these recommendations:

- Protect the oscilloscope from adverse weather conditions. The oscilloscope is not waterproof.
- Do not store or leave the oscilloscope where the liquid crystal display (LCD) is exposed to direct sunlight or high humidity for long periods of time.
- The front and rear cases help to keep dust out of the oscilloscope and must be in place during the normal operation.
- To avoid damage to the oscilloscope or probes, do not expose them to any sprays, liquids, or solvents.

Interior cleaning

Use a dry, low-velocity stream of air to clean the interior of the chassis. Use a soft-bristle, non-static-producing brush for cleaning around components. If you must use a liquid for minor interior cleaning, use a 75% isopropyl alcohol solution and rinse with deionized water.



Warning: To avoid injury, power off the instrument and disconnect it from line voltage before performing any procedure that follows.

Exterior cleaning



CAUTION: Avoid the use of chemical cleaning agents, which might damage the plastics used in this oscilloscope. Use only deionized water when cleaning the menu buttons or front-panel buttons. Use a 75% isopropyl alcohol solution as a cleaner and rinse with deionized water. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

Clean the exterior surfaces of the chassis with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, use a cloth or swab dipped in a 75% isopropyl alcohol solution. Use a swab to clean narrow spaces around controls and connectors. Do not use abrasive compounds on any part of the chassis that may damage the chassis.



CAUTION: To prevent getting moisture inside the oscilloscope during external cleaning, use only enough liquid to dampen the cloth or applicator.

Clean the On/Standby switch using a dampened cleaning towel. Do not spray or wet the switch directly.

If the display is very dirty, moisten the wipe with distilled water or a 75% isopropyl alcohol solution and gently rub the display surface. Avoid using excess force or you may damage the plastic display surface.

Exterior inspection

Inspect the outside of the oscilloscope for damage, wear, and missing parts. Refer [#unique_18/unique_18_Connect_42_T-EXTERNAL.INSPECTION.CHECKLIST](#) for immediate repair defects that could cause personal injury or lead to further damage to the oscilloscope.

Table 1: External inspection checklist

Item	Inspect for	Repair action
Front and rear case	Cracks, scratches, deformations, and damaged hardware.	Repair or replace defective module.
Front-panel knobs	Missing, damaged, or loose knobs.	Repair or replace missing or defective knobs.
Connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Repair or replace defective modules. Clear or wash out dirt.
Carrying handle, and cabinet feet	Correct operation.	Repair or replace defective module.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Repair or replace damaged or missing items, frayed cables, and defective modules.

Interior inspection

To access the inside of the oscilloscope for inspection and cleaning, refer to [Parts Lists and Exploded Views](#) in this manual.

Inspect the internal portions of the oscilloscope for damage and wear. Refer [Table 2: Internal inspection checklist](#) on page 13 to repair any defects immediately.

If any circuit board is repaired or replaced, check the [Table 2: Internal inspection checklist](#) on page 13 to see if it is necessary to adjust the oscilloscope.



CAUTION: To prevent damage from electrical arcing, make sure that circuit boards and components are dry before applying power to the oscilloscope.

Table 2: Internal inspection checklist

Item	Inspect for	Repair action
Circuit boards	Loose, broken, or corroded solder connections. Burned circuit boards. Burned, broken, or cracked circuit-run plating.	Remove and replace damaged circuit board.
Resistors	Burned, cracked, broken, blistered condition.	Remove and replace damaged circuit board.
Solder connections	Cold solder or rosin joints.	Resolder joint and clean with isopropyl alcohol.
Capacitors	Damaged or leaking cases. Corroded solder on leads or terminals.	Remove and replace damaged circuit board.
Wiring and cables	Loose plugs or connectors. Burned, broken, or frayed wiring.	Firmly seat connectors. Repair or replace modules with defective wires or cables.
Chassis	Dents, deformations, and damaged hardware.	Straighten, repair, or replace defective hardware.

Cleaning procedure interior

To clean the oscilloscope interior, perform the following steps:

1. Blow off dust with dry, low-pressure, deionized air (approximately 9 psi).
2. Remove any remaining dust with a lint-free cloth dampened in isopropyl alcohol (75% solution) and then wipe with a lint-free cloth dampened with warm deionized water. A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.

STOP. If, after performing steps [1](#) on page 13 and [2](#) on page 13, a module is clean on inspection, skip steps [3](#) on page 14, [4](#) on page 14, and [5](#) on page 14. Proceed with step [6](#) on page 14.

3. If steps 1 on page 13 and 2 on page 13 do not remove all the dust or dirt, all modules in the oscilloscope except the Display Module and Front Panel Module may be spray washed using a solution of 75% isopropyl alcohol.
 - During cleaning of the Acquisition board (Main board), make sure that no residue is left in the attenuators. Debris or residue can cause several problems with signal fidelity that cannot be corrected by calibration. When handling the board, avoid handling the attenuators since skin oils may cause problems.
 - Extensive cleaning of the Display Module is difficult because water must not be trapped between the display shield and the display. The polarizers integrated into the display degrade with long-term exposure to water. The display shield and display must be replaced as an assembly if significant moisture or debris become trapped inside. Cotton tipped applicators and lint-free rags moistened in isopropyl alcohol and/or deionized water offer the best cleaning with the least opportunity for damage to the assembly.
 - The Front-Panel module can be damaged by deposition of film or debris inside the knob encoders. To avoid this, be careful not to drip liquid or blow debris into the encoders.
4. Spray wash dirty parts with the 75% isopropyl alcohol solution and wait 60 seconds for the majority of the alcohol to evaporate.
5. Use hot (49 °C to 60 °C / 120 °F to 140 °F) deionized water to thoroughly rinse the parts.
6. Dry all parts with low-pressure, deionized air.
7. Dry all components and assemblies in an oven or drying compartment using low-temperature (52 °C to 66 °C / 125 °F to 150 °F) circulating air.

Lubrication

Periodic lubrication is not required for the oscilloscope.

Adjustments

There are no customer-performable adjustment procedures (calibrations) for the TBS1000C Series oscilloscopes. Please return the instrument to Tektronix if an adjustment is required. Calibrations can only be performed at a Tektronix service center and require the use of traceable test equipment (signal sources and measuring equipment) to verify the performance of the instrument.

To determine if an adjustment is required, use the Performance Verification procedure in the TBS1000C Series Digital Storage Oscilloscopes Specifications and Performance Verification manual (Tektronix part number 077-1583-xx), available at www.tek.com/product-support. Adjustment is also required after instrument repair.

Replaceable parts

This chapter contains a list of the replaceable modules for the TBS1000C oscilloscopes. Use this list to identify and order replacement parts.

Parts ordering information

Replacement parts are available through your local Tektronix field office or representative.

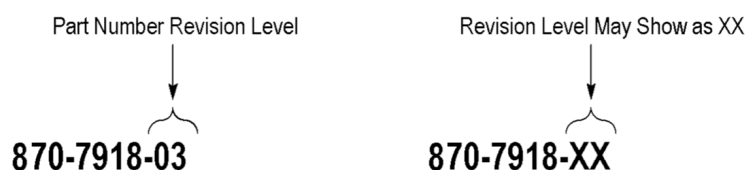
Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Part number revision level

Tektronix part numbers contain two digits that show the revision level of the part. For some parts in this manual, you will find the letters XX in place of the revision level number.



When you order parts, Tektronix will provide you with the most current part for your product type, serial number, and modification (if applicable). At the time of your order, Tektronix will determine the part number revision level needed for your product, based on the information you provide.

Module exchange

In some cases you may exchange your module for a remanufactured module.

These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-833-9200 and select option 2.

New modules

You may purchase replacement modules in the same way as other replacement parts.

Using the replaceable parts list

This section contains a list of the mechanical and/or electrical components that are replaceable for the oscilloscope. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Table 3: Replaceable parts list

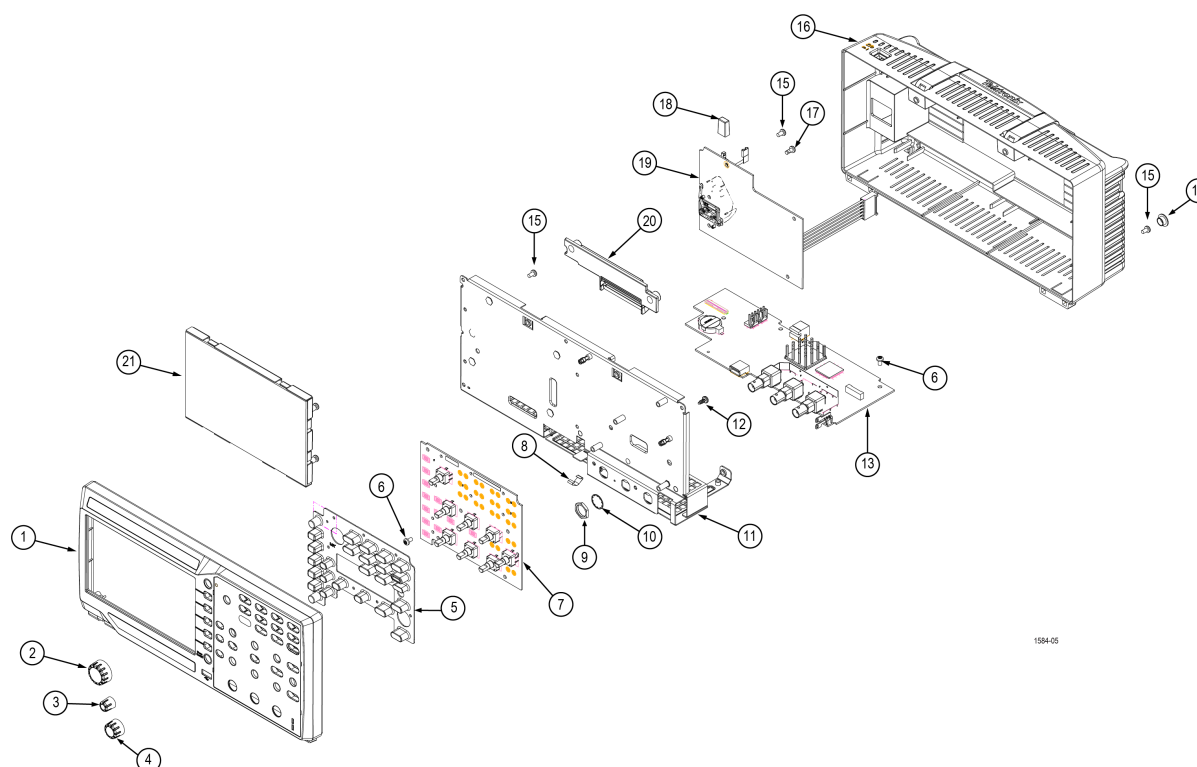
Column	Column name	Description
1	Figure & Index Number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
3	Qty	This indicates the quantity of parts used.
4	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.

Abbreviations

Abbreviations conform to American National Standard ANSI Y1.1-1972.

Parts lists and exploded views

The following table shows the module-level exploded views of the TBS1000C Series Oscilloscopes. Following each exploded view is the list of components, indexed by the numbers in the figure.



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Table 4: Replaceable parts — (LCD, Front panel, Front case, Power supply, Main board, and Rear case)

Figure and index no.	Tektronix part no.	Qty.	Name and description
-1	850-0435-XX	1	Front case assembly
-2	366-0936-XX	4	Knob (large), Multipurpose
-3	366-0934-XX	3	Knob (small), Position
-4	366-0395-XX	3	Knob (medium), Scale
-5	260-3118-XX	1	Key pad, polymer, front panel
-6	211-1272-XX	7	Front panel board (3X), Display (4X)
-7	870-1650-XX	1	Front panel board
-8	131-6417-XX	1	Contact, Electrical
-9	220-0265-XX	3	BNC nuts
-10	210-1039-XX	3	BNC locking washer
-11	441-2909-XX	1	Chassis, ASSY
-12	211-1273-XX	6	Screw, Threaded
-13	870-1704-XX	1	Main PCB assembly
-14	200-5105-XX	2	Cover, ESD protection
-15	211-1272-XX	12	Screw, Machine, 6-32 X .250L
-16	850-0434-XX	1	Rear case assembly
-17	211-1275-XX	2	Screw, Machined, Threadlocking, 6-32 X .312L
-18	366-0956-XX	1	Power switch push button cap
-19	119-8932-XX	1	AC-DC power supply
-20	850-0449-XX	1	Ferrite assembly
-21	850-0399-XX	1	Display assembly