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Tektronix 2 Series MSO MSO22 and MSO24 Oscilloscope



Specifications

- Model: 2 Series MSO MSO22 and MSO24
- Trademark: TEKTRONIX and TEK
- Manufacturer: Tektronix, Inc.
- Address: 14150 SW Karl Braun Drive, P.O. Box 50,0, Beaverton, OR 970,77 US

Product Information

The 2 Series MSO MSO22 and MSO24 are advanced digital oscilloscopes designed for precise measurement and analysis of electronic signals. They are equipped with various features to support a wide range of applications in electronics testing and troubleshooting.

Product Usage Instructions

Important Safety Information:

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

General Safety Summary:

- Read and understand all safety information before operating the product.
- Avoid touching exposed connections to prevent an electric shock.

Service Safety Summary:

- Only qualified personnel should perform service procedures.
- Always have another person present capable of rendering first aid during internal service or adjustments.

Product Usage Safety Tips:

- Disconnect power before servicing to avoid an electric shock.
- Use the proper power cord specified for the product and country of use.
- Ground the product correctly through the grounding conductor of the power cord.
- Do not operate the product with covers removed or the case open to prevent hazardous voltage exposure.

Maintenance:

Always verify safety after repair by checking ground continuity and mains dielectric strength. Follow proper procedures for connecting and disconnecting probes or test leads to ensure safety during measurements..

Power Management:

- Switch off the product power and disconnect the power cord from the mains before servicing.
- Use only the specified AC adapter and power cord for the product.

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.

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 by local and national codes.
- For correct and safe operation of the product, you must 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 the 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.

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 an 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..r

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

To avoid fire or personal injury

Use the proper power cord

Use only the power cord specified for this product and certified for the country of use. Do not use the provided power cord for other products.

Ground the product

This product is grounded through the grounding conductor of the power cord. To avoid an electric shock, the grounding conductor must be connected to the 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.

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 the 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 ratings 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 Category III or IV circuits.
- Do not connect a current probe to any wire that carries voltages above the current probe's voltage rating.

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 failure.s

- 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 the safety of the product, turn it off and

disconnect the power cordMarkrk 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.

Replace batteries properly

- Replace batteries only with the specified type and rating.
- Recharge batteries for the recommended charge cycle only.

Wear eye protection

Wear eye protection if exposure to high-intensity rays or laser radiation exists.

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.
- Use only the Tektronix rackmount hardware specified for this product.

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:

- The maximum measurement voltage from the probe tip to the probe reference lead.
- The maximum floating voltage from the probe reference lead to the 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.

- De-energize the circuit under test before connecting or disconnecting the current probe.
- Connect the probe reference lead to the earth ground only.

Ground-referenced oscilloscope use

Do not float the reference lead of the probe when using it with ground-referenced oscilloscopes. The reference lead must be connected to earth potential (0 V).

Floating measurement use

Do not float the reference lead of the probe above the rated float voltage.

Terms in this manual and on the product

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. These terms may appear on the product:

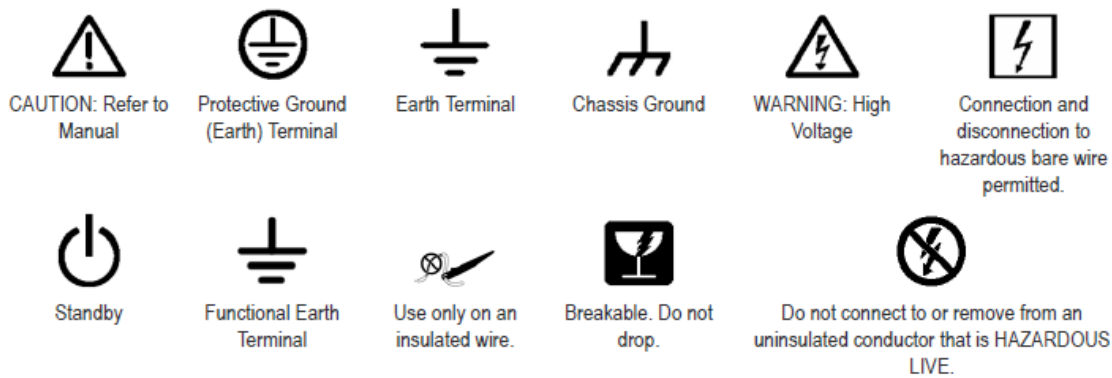
- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property, including the product.

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 that 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(s) may appear on the product.

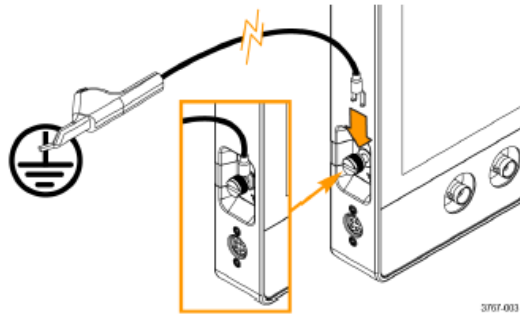


Operating safely with battery power

For safe operation, the instrument chassis should always remain at earth ground potential.

WARNING: To avoid electric shock, always use the Tektronix-provided grounding cable when the oscilloscope is operating on battery power and not connected to the external power supply. The Tektronix-provided grounding cable is not for permanent usage.

- Without a connection between the chassis and earth ground, you may receive a shock from exposed metal on the chassis if you connect an input to a hazardous voltage (>30 VRMS, >42 Vpk). To protect yourself against possible shock, attach the Tektronix-provided grounding cable.
- The grounding cable is necessary to provide protective bonding between the oscilloscope and a dedicated earthing terminal, the NEC, CEC, and local codes. Consider having a qualified electrician approve the installation.
- The grounding cable shall be connected before powering on the oscilloscope and before attaching the probes to any circuit. Connect the grounding cable from the ground lug terminal on the side panel of the instrument to a dedicated earthing terminal. Make sure the teeth of the alligator clip makes good electrical contact and is secured against slipping.
- The alligator clip on the grounding cable must be connected to a dedicated earthing terminal, an earthing terminal bar, or identified equipment grounding points (a rack cabinet, for example). Make sure you have a good electrical connection to an appropriate grounding device that is identified with a Protective Earth symbol, or the word GROUND/GND, or the color green (green ground screw/conductor). If none of these are present, assume the connection is not earthed.



3707-003

- Always verify that the grounding cable is making good electrical contact by using an ohmmeter or continuity meter between the dedicated earthing terminal and the ground lug terminal on the side panel of the oscilloscope. Verify again anytime the oscilloscope has been left unattended.
- Make sure the dedicated earthing terminal is located in close proximity to the circuit under test. Keep the grounding cable clear of heat sources and mechanical hazards such as; sharp edges, screw threads, moving parts, and closing doors/covers. Inspect the cable, insulation, and terminal ends for damage before use. Do not use a damaged grounding cable. Contact Tektronix for a replacement.
- If you choose not to attach the grounding cable, you are not protected against electric shock if you connect the oscilloscope to a hazardous voltage. You can still use the oscilloscope if you do not connect a signal greater than 30 VRMS (42 Vpk) to the probe tip, the BNC connector center, or the common lead. Make sure all probe common leads are connected to the same voltage.

WARNING: Hazardous voltages may exist in unexpected places due to faulty circuitry in the device under test.

CAUTION: When operating the instrument on battery power, do not connect a grounded device, such as a printer or computer, to the oscilloscope unless the instrument grounding cable is connected to the earth ground.

Preface

- Information to help service your instrument.
- Read the General and Service safety summaries before servicing the product.
- Be sure to read the introductions to all procedures. These introductions provide important information needed to perform the service correctly, safely, and efficiently.

Supported products

- This manual contains information that is necessary to service all 2 Series MSO instruments.
- Check for a specific product designation in the header at the top of the page, in a heading, table or figure title, or within text. Material that does not have any specific product designation applies to all products in the manual.

Where to find operating information

For information on installing, operating, and networking the instrument, refer to the online help or user manual that was provided with your oscilloscope.

You can also find the manual at www.tek.com/manuals by searching for your product.

Theory of operation

This section describes the electrical operation of the oscilloscope at the module level. The block diagram shows the oscilloscope module interconnections.

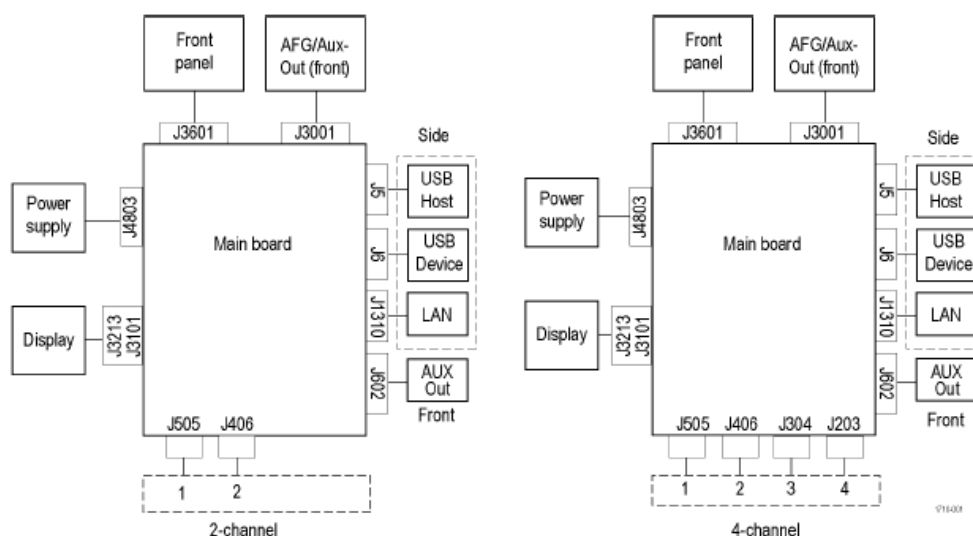


Figure 1: 2 Series MSO block diagram

Figure 1: 2 Series MSO block diagram

Power supply

The external AC/DC power supply converts AC line voltage to +24 VDC to power the instrument.

Main board

The Main boards contain the following functions:

Acquisition system

The acquisition system begins with the analog signal path and ends with a digitized signal in memory. The signal enters a channel input and then passes through an attenuator and preamplifier. The analog signal from each preamplifier goes through a digitizer and then into acquisition memory. The analog signal from each preamplifier is also distributed to a trigger circuit.

Trigger system

The trigger system digitizes the analog signals from the preamplifiers and routes the digitized signal to the trigger circuit. Advanced trigger functions are enabled only when the appropriate application modules and supporting software are installed.

Processor system

The processor system contains an ARM microprocessor that controls the entire instrument. The processor system also contains FLASH ROM, system RAM, and interfaces to USB ports and the ethernet port.

Front panel and display

The front panel circuit contains digital logic that reads the front panel buttons and sends this information to the processor system on the main board. The front panel circuit also contains indicator LEDs to represent system status to the user.

Maintenance

Preventing ESD

Before servicing this product, read the General Safety Summary and the Service Safety Summary at the front of the manual, as well as the following ESD information.

CAUTION: Electrostatic discharge (ESD) can damage any semiconductor component in this instrument.

When performing any service that requires internal access to the instrument, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge:

1. Minimize handling of static-sensitive circuit boards and components.
2. Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive boards.
3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules.
4. Service static-sensitive modules only at a static-free work station.
5. Do not allow any items capable of generating or holding a static charge on the work station surface.
6. Handle circuit boards by the edges when possible.
7. Do not slide the circuit boards over any surface.
8. Avoid handling circuit boards in areas that have a floor or work surface covering capable of generating a static charge.

Inspection and cleaning

This section describes how to inspect for dirt and damage. It also describes how to clean the exterior and interior of the instrument. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent instrument malfunction and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the instrument and using general care when operating it.

How often to perform maintenance depends on the severity of the environment in which the instrument is used. A proper time to perform preventive maintenance is just before instrument adjustment.

Exterior cleaning (other than display)

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.

Clean the On/Standby switch using a cleaning towel dampened with deionized water. Do not spray or wet the switch itself.

CAUTION: Avoid the use of chemical cleaning agents which might damage the plastics

used in this instrument. Use only deionized water when cleaning the front-panel buttons. Use a 75% isopropyl alcohol solution as a cleaner for cabinet parts. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

Inspect the outside of the instrument for damage, wear, and missing parts. Immediately repair defects that could cause personal injury or lead to further damage to the instrument.

Table 1: External inspection checklist

Item	Inspect for	Repair action
Cabinet, front panel, and cover	Cracks, scratches, deformations, and damaged hardware	Repair or replace the 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 brush out dirt
Carrying handle and cabinet feet	Correct operation	Repair or replace the 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

Flat panel display cleaning

Clean the flat panel display surface by gently rubbing the display with a clean-room wipe (such as Wypall Medium Duty Wipes, #05701, available from Kimberly-Clark Corporation), or an abrasive-free cleaning cloth.

If the display is very dirty, moisten the wipe or cloth with distilled water, a 75% isopropyl alcohol solution, or standard glass cleaner, and gently rub the display surface. Use only enough liquid to dampen the cloth or wipe. Avoid using excess force, or you may damage the display surface.

CAUTION: Improper cleaning agents or methods can damage the flat panel display.

- Do not use abrasive cleaners or surface cleaners to clean the display.
- Do not spray liquids directly on the display surface.
- Do not scrub the display with excessive force.

CAUTION: To prevent getting moisture inside the instrument during external cleaning, do not spray any cleaning solutions directly onto the screen or instrument.

Remove and replace procedures.

This section contains procedures for the installation of replaceable modules in the instrument. Refer to Replaceable

Parts on page 23 for lists and exploded views of replaceable modules.

Any module inside of the chassis that does not have a remove and replace procedure requires that the entire instrument be returned to Tektronix Service Center for service.

- **WARNING:** Before performing this or any other procedure in this manual, read the safety summaries found at the beginning of this manual. Also, to prevent possible injury to service personnel or damage to the instrument components, read Preventing ESD on page 13.
- Before performing any procedure in this subsection, disconnect the power cord from the line voltage source. Failure to do so could cause serious injury or death.
- **Note:** Read the cleaning procedure before disassembling the instrument for cleaning.

Required equipment

Most assemblies in this instrument can be removed with a T-10 Torx® screwdriver tip.

Item No.	Name	Description
1	Screwdriver handle	Accepts Torx-driver bits
2	T-10 Torx tip	Used for removing instrument screws. Torx-driver bit for T-10 size screw heads
3	T-8 Torx tip	Used for removing screws securing the internal power cable
4	Instrument Assembly Fixture	Used to hold the instrument in place during service
5	Metal Instrument Stand	Used to mount the instrument in a specific position

Remove front panel knobs

Use this procedure to remove and replace front panel knob assemblies.

Before you begin

To prevent electrostatic damage to components whenever you work on the instrument, wear properly-grounded electrostatic prevention wrist and foot straps, and work in a tested antistatic environment on an antistatic mat.

Procedure

Seven knob assemblies can be removed.

1. To remove a knob assembly, pull the knob straight out of the front panel. Finger strength is adequate to pull knobs. Do not use pliers.
2. To reinstall a knob, align the knob with the shaft indent and press the knob onto the shaft. Turn the knob to make sure there is a smooth rotation.

Disassemble instrument

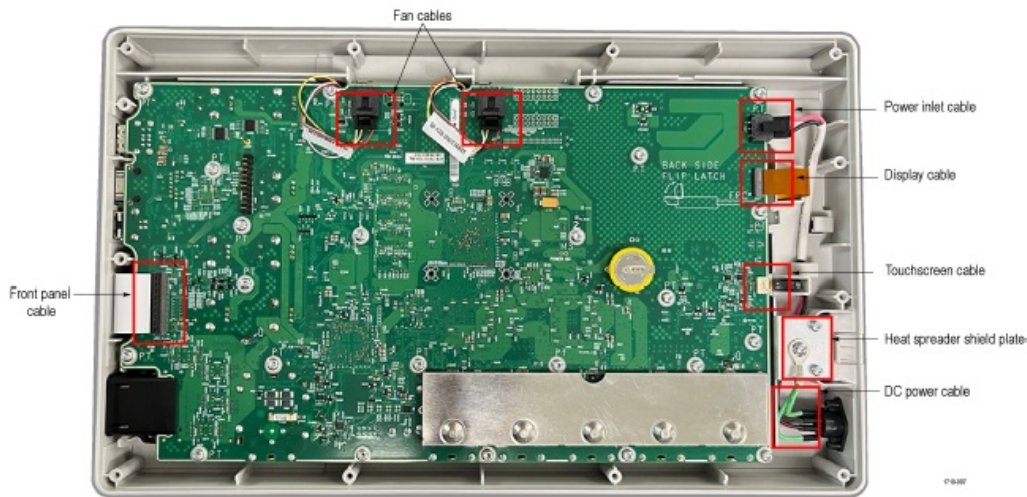
Use this procedure to disassemble the instrument and to replace the parts.

Before you begin

To prevent electrostatic damage to components whenever you work on the instrument, wear properly-grounded electrostatic prevention wrist and foot straps, and work in a tested antistatic environment on an antistatic mat.

Procedure

1. Remove all connected front panel cables and the power cord from the instrument.
2. Set the instrument on its front face, with the bottom of the instrument facing you.
3. Remove the rear case.
 - a) Peel off square label in center of rear case. Leave the silver label containing Model Number and Serial Number intact.
 - b) Remove the four T-10 Torx screws from the center of rear case.
 - c) Remove the twelve T-10 Torx screws around the perimeter of the instrument.
 - d) Remove the rear case.
 - e) To reinstall, reverse the steps. Tighten all T-10 Torx screws to 0.65 N·m when reinstalling.
4. Remove the main board.
 - a) To remove the front panel cable, flip up the front side of the connector latch and lift the flex cable up and away from the board.
 - b) To remove the two fan cables, depress the latch and slide the cable away from the connector.
 - c) To remove the power inlet cable, depress the latch and slide the cable away from the connector.
 - d) To remove the display cable, flip up the connector latch on the back side (away from the cable) and slide the flex cable out of the connector.
 - e) To remove the touchscreen cable, flip up the front side of the connector latch and slide the flex cable out of the connector.
 - f) Remove the two T-10 Torx screws near the center of the board marked "M3". These metal screws are unique, keep them separated from the rest of the removed screws.
 - g) Remove the remaining twenty-two T-10 Torx screws from the board.
 - h) Remove the main board.
 - i) To reinstall, reverse the steps. Tighten all T-10 Torx screws to 0.65 N·m when reinstalling. Reconnect all the cables to the connectors.



5. Remove the main heat spreader shield plate and DC power cable assembly.
 - a) Remove the three T-10 Torx screws. One screw is marked “M3” and the other two are marked “PT”.
 - b) Remove the main heat spreader shield plate.
 - c) Remove the two T-8 Torx screws from the side of the enclosure.
 - d) Remove the DC Power cable assembly.
 - e) To reinstall, reverse the steps. Tighten all T-8 Torx screws to 0.45 N·m and T-10 Torx screws to 0.65 N·m when reinstalling. Reconnect the DC Power cable.

Troubleshooting

- Before performing this or any other procedure in this manual, read the General Safety Summary and Service Safety Summary found at the beginning of this manual.
- To prevent possible injury to service personnel or damage to electrical components, please read information on Preventing ESD. (See Preventing ESD on page 13)
- This section contains information and procedures designed to help you isolate faults to a module and requires that service personnel have the appropriate skills to work on this instrument, including PC troubleshooting and Microsoft Windows operating system skills. Details of PC and Windows operation and service are not in this manual.
- For assistance, contact your local Tektronix Service Center.

Service level

This subsection contains information and procedures to help you determine if a faulty power supply is the problem with your instrument. If replacing the power supply does not fix the fault, you will need to return the instrument to a Tektronix Service Center for

repair, as no other internal electronic assemblies or modules are user-replaceable.

Check for common problems.s

Use the following table to help isolate possible failures.

The table lists problems and possible causes. The list is not comprehensive, but it may help you eliminate a problem that is quick to fix, such as a loose power cord. For more detailed troubleshooting, see the Troubleshooting procedures on page 19.

Symptom	Possible cause(s)
Power on, but the instrument will not boot	Power on configuration
	Clock Tree
	Board ID
	Serial bus issues
Black display	Bad display
	Bad cable
	Board-level connectivity
	Black screen detection circuit
Display flicker	Bad display
	Bad cable
	Board-level connectivity
	Black screen detection circuit
Cannot set time/date	RTC device
	I2C Bus issues
	I2C Bus issues

The touch screen is not working	Interrupt or Reset issues
	Bad cable
	Bad touch sensor
License keys will not load	Bad encryption EEPROM
Table continued...	

Symptom	Possible cause(s)
The instrument will not power on	Power enable
	Power supplies
The instrument will not power off properly	MFG JTAG connection
	Processor/Power control communication
	Button press logic
Power on momentarily, then off	Power enable
	Power supplies
The instrument will not remember the previous power state	Power enable
No battery communication	PMBus isolator
No ethernet	Ethernet phy
Power on and boot, but no serial console	Serial buffers
DPG not functional	Not a failure
	Serial present detection

Fan speed abnormal	Fan Tach logic
	Fan control The
USB device port is not functional	26 MHz generator
	USB receiver
USB host port is not functional	26 MHz generator
	USB phy
	USB hub
	USB power
Digital calibration failure	Digital threshold circuitry
	Digital comparator circuitry
Power drops when the battery is attached	Main board battery circuit
Front panel button issues	Flex circuit
	Shift logic
Front panel LED issues	Flex circuit
	Shift logic
Encoder problem	Encoder hardware
	Encoder control

Troubleshooting procedures

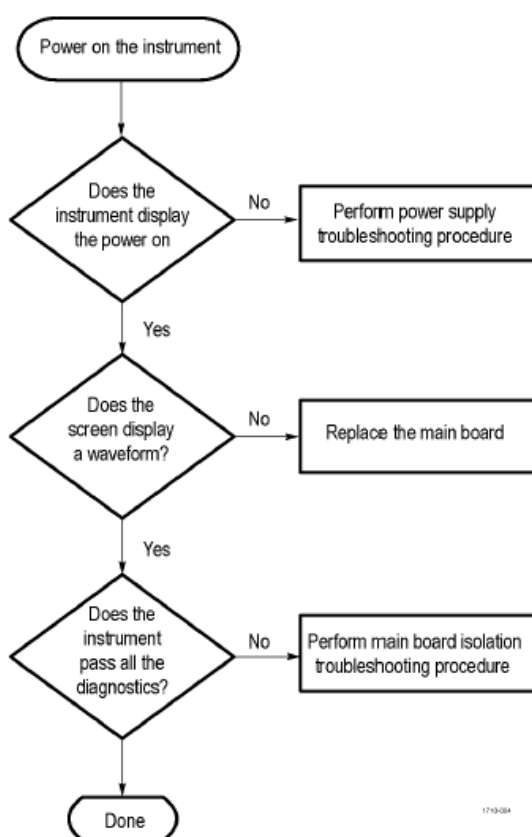
Use the following diagrams to troubleshoot an instrument failure. Begin with the Primary troubleshooting procedure.

Before you begin

- Use a digital voltmeter to check power supply voltages.
- Ensure an antistatic work environment. To prevent electrostatic damage to components whenever you work on the instrument, wear properly grounded electrostatic prevention wrist and foot straps, and work in a tested antistatic environment on an antistatic mat.

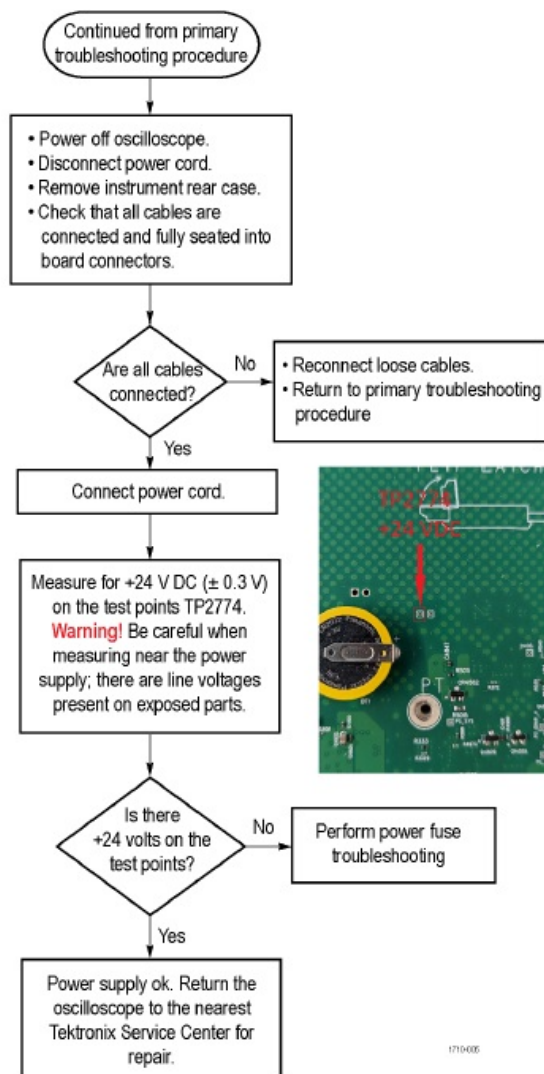
WARNING: Before removing the rear case, disconnect the power cord from the line voltage source. Failure to do so could cause serious injury or death.

Primary troubleshooting procedure



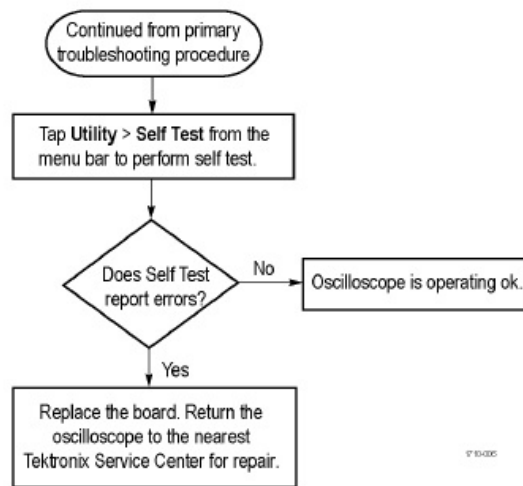
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Power supply troubleshooting procedure

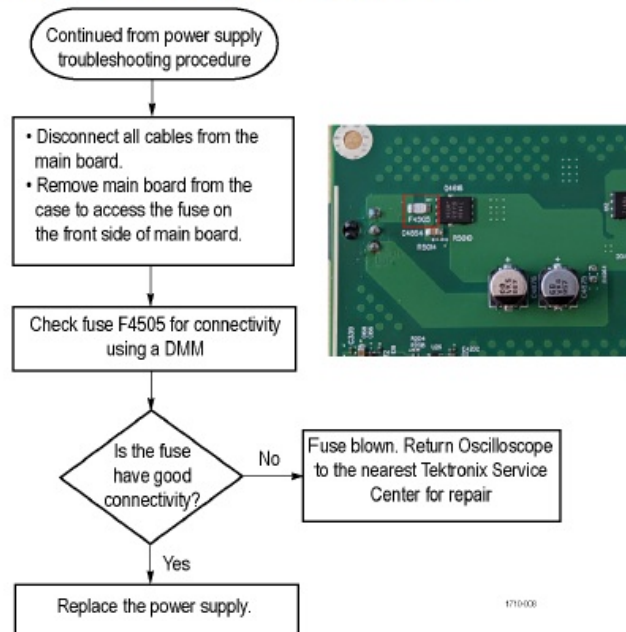


Note: Images show the power supply cable disconnected from the main board to better show the test point locations. The power cable from the power supply must be connected to the main board to test the +24 VDC value.

Main board isolation troubleshooting procedure



Power fuse troubleshooting procedure



Instrument self-tests

- The instrument runs self-test diagnostics during every power-on. The power of self-tests ensures that the hardware and software are functionally working. The tests provide limited diagnostic information and provide no performance information.
- If the instrument detects errors during power-on, a pop-up message indicates that a failure has occurred. To display the self test menu and results, select **Utility** > **Self Test**. Select a test mode and run the self tests. If you continue to get errors on one or more tests, you will need to return the instrument to your nearest Tektronix Service Center for repair.

Adjustment procedures and interval

- Adjustment and calibration can be performed only by a Tektronix Service Center.

- The voltage and timing references inside the instrument are very stable over time and do not need routine adjustment.
- If the instrument fails the performance tests in the specifications and performance verification manual, adjustment may be required. To download the manual, go to tek.com, enter the instrument model number in the search field. The specification and performance verification document is listed under manuals.
- If periodic calibration is required, a general rule is to verify performance and make adjustments (only if needed) every 2000 hours of operation or once a year if the instrument is used infrequently.

Adjustment after repair

- After the removal and replacement of any module, you must complete the performance verification procedures, found in the specifications and performance verification manual.
- Replacement of the 2 Series MSO main board, front panel assembly, or chassis requires adjustment and completion of the performance verification procedures.

Replaceable parts

Use the replaceable parts diagram and table to identify replaceable parts for your product.

You cannot order internal parts for the 2 Series MSO. For more information about replacing parts, contact your local Tektronix Service Center. Include the following information when contacting Tektronix.

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

Abbreviations conform to the American National Standard ANSI Y1.1- 19722.

Returning the instrument for service

- Use the following instructions for returning your instrument for service.
- When repacking the instrument for shipment, use the original packaging. If the packaging is not available or unfit for use, contact your local Tektronix representative to obtain new packaging.
- If you need to return your instrument for repair or calibration, call 1-[800-438-8165](tel:8004388165) or complete the form at tek.com/services/repair/rma-request. When you request service, have the serial number, firmware, and software version of the instrument.
- If you want to see the warranty or service agreements on your products, or if you want to create your own service price estimate, visit our quick service quote site at tek.com/service-quote.

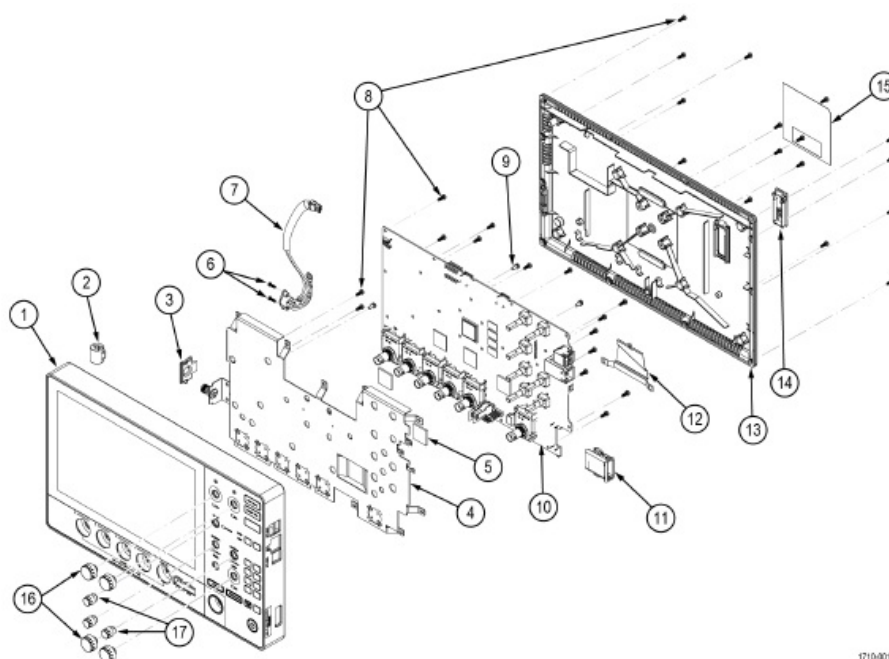
Full assembly parts list

Use the parts list table to identify mechanical and electrical components.

Table 2: Parts list guide

Column name	Description
Index number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
Tektronix part number	Use this part number when referencing parts from Tektronix.
Qty	This indicates the quantity of parts used.
Name and 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 US Federal Catalog handbook H6-1 for further item name identification.

Replaceable parts



1710-001

Index number	Tektronix part number	Qty	Name and description
1	065-1087-X X	1	SERVICE REPLACEMENT KIT; FRONT PANEL & CHASSIS FOR MSO22
	065-1086-X X	1	SERVICE REPLACEMENT KIT; FRONT PANEL & CHASSIS FOR MSO24
2	276-0894-X X	1	EMI SUPPRESSION; BROADBAND FERRITE; SPLIT ROUND CABLE, PKG APPROX 15X15X18MML, IMPEDANCE 123 OHMS AT 100MHZ Also included in the Front Panel Service Replacement Kit
3	200-5547-X X	1	HOUSING, GROUND LUG
4	407-6225-X X	1	PLATE, MAIN HEAT SPREADER & EMI SHEILD

5	342-1321-X X	2	THERMAL INTERFACE MATERIAL 20M M SQUARE, 2MM THICK
6	211-1721-X X	2	SCREW, DELTA-PT, M2.5 X 8MM, T8
7	174-7435-X X	1	DC POWER CABLE ASSEMBLY
8	211-1585-X X	40	SCREW, DELTA-PT, 3MM X 8MM, T10
9	211-1584-X X	3	SCREW, MACHINE, M3 X 0.5 X 6MM PA N HEAD, TORX T10
Table continued...			

Index num ber	Tektronix p art number	Qty	Name and description
10	878-1798-X X	1	CIRCUIT BOARD ASSEMBLY; BUILD OP TION A; MAIN; 2 CH; 2 SERIES; 3895547XX; MSO22
	878-1797-X X	1	CIRCUIT BOARD ASSEMBLY; STANDAR D; MAIN; 4 CH; 2 SERIES; 3895547XX; MSO24
11	351-1162-X X	1	GUIDE, MSO GUIDE
12	337-4908-X X	1	SHIELD, BACKSIDE AFG
	337-4909-X X	1	INSULATOR, BACKSIDE AFG SHIELD

13	202-0592-X X	1	CASE, REAR
14	200-5543-X X	1	COVER, BATTERY INTERFACE DOOR
15	335-4466-X X	1	LABEL, REAR
16	366-0968-X X	4	ASSEMBLY, KNOB WITH SPRING, MEDIUM
17	366-0969-X X	3	ASSEMBLY, KNOB WITH SPRING, SMALL

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For product information, sales, service, and technical support, visit tek.com to find contacts in your area. For warranty information, visit tek.com/warranty.

Frequently Asked Questions

- **Q: Can I operate the oscilloscope without the covers?**

A: No, operating the oscilloscope without covers or panels removed is not safe, as it may expose you to hazardous voltages. Always ensure the device is properly enclosed when in use.


• **Q: How do I ground the product?**

A: The product is grounded through the grounding conductor of the power cord.
Ensure the grounding conductor is connected to the earth ground before making any connections to input or output terminals.

• **Q: What should I do if there is a power issue?**

A: If you encounter power-related problems, disconnect the power cord immediately and follow the specified procedures for further troubleshooting or seeking technical support.

Documents / Resources

	<p>Tektronix 2 Series MSO MSO22 and MSO24 Oscilloscope [pdf] Instruction Manual</p> <p>MSO22, MSO24, 2 Series MSO MSO22 and MSO24 Oscilloscope, 2 Series MSO, 2 Series MSO22, 2 Series MSO24, 2 Series MSO Oscilloscope, MSO Oscilloscope, 2 Series MSO22 Oscilloscope, MSO22 Oscilloscope, 2 Series MSO24 Oscilloscope, MSO24 Oscilloscope, Oscilloscope</p>
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References

- [User Manual](#)

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◆ 2 Series MSO, 2 Series MSO MSO22 and MSO24 Oscilloscope, 2 Series MSO Oscilloscope, 2 Series MSO22, 2 Series MSO22 Oscilloscope, 2 Series MSO24, 2 Series MSO24 Oscilloscope, MSO Oscilloscope, MSO22, MSO22 Oscilloscope, MSO24, MSO24 Oscilloscope, Oscilloscope, Tektronix

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