

11301 and 11302

Programmable Oscilloscopes


Incoming Inspection Procedure

Please check for CHANGE INFORMATION at the rear of this manual.

INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag, or stamped on the chassis. The first number or letter designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B000000	Tektronix, Inc. Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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Contents

Operators Safety Summary	ii
Introduction	1
Using This Procedure	1
Test Equipment	2
Part 1: Power-Up Diagnostics	4
Part 2: Extended Diagnostics	6
Part 3: Enhanced Accuracy	7
Part 4: Vertical Cursor Accuracy	8
Part 5: Measurement Accuracy	10
Part 6: Vertical Bandwidth	11
Part 7: Horizontal Timing with Cursors	13
Part 8: Delta Delay Accuracy	15
Part 9: Trigger Filters	16
Part 10: Trigger Sensitivity	18
Part 11: Trigger Accuracy	20
Part 12: A and B External Inputs	22
Part 13: Counter Timer	24
Part 14: Front Panel Calibrator	25
Part 15: Rear Panel Input/Output Signals	27
Part 16: Clock In/Out	30
Part 17: Vertical Bandwidth	32
Part 18: Vertical Cursor Accuracy	34
Part 19: Measurement Accuracy	36
Part 20: X-Axis Cursor Accuracy	37
Part 21: Right Plug-In Compartment	39

Operators Safety Summary

The following general safety information applies to all operators and service personnel.

Terms

In Manuals

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked On Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Symbols

In Manuals



Static Sensitive Devices.

As Marked on Equipment



DANGER – High voltage.



Protective ground (earth) terminal.



ATTENTION – refer to manual.

Warnings

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Grounding the Instrument

The 11301 and 11302 are grounded through the grounding conductor of the power cord. To avoid electric shock, plug the power cord into a properly wired receptacle, where earth ground has been verified by a qualified service person, before making connections to the input or output terminals of the instrument. A protective-ground connection, by way of the grounding conductor in the mainframe power cord, is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating), can render an electric shock.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Do Not Operate In Explosive Atmospheres

To avoid explosion, do not operate the instrument in an atmosphere of explosive gasses.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the protective covers. Do not operate this instrument without the panels or covers properly installed.



Introduction

The 11000-series mainframes contain precise internal references—a stable dc source for vertical and trigger circuits, and a crystal for timing circuits—which are used for the self-calibration necessary to enter the Enhanced Accuracy mode. The following procedure verifies these sources and the overall functionality of the instrument by comparing vertical and horizontal measurement results with external standards while in the Enhanced Accuracy mode.

WARNING

To avoid personal injury, do not remove the protective cabinet panels or covers. Operate this instrument only when the panels or covers are properly installed.

Using This Procedure

In the text of the steps, words with initial capital letters (e.g., Amplitude) indicate front-panel controls, indicators, and connectors on associated test equipment. Words containing all capitals (e.g., UTILITY) indicate the same classes of controls on the 11301/11302 or its plug-ins. Finally, words presented in bold (e.g., **INIT**) indicate items appearing on the display of the 11301/11302 mainframe.

This Incoming Inspection Procedure is written assuming that the various Parts will be performed in sequential order at a single session. If you wish to break the procedure into several sessions or perform specific checks in isolation, this can be done provided you make certain that all plug-ins, test equipment, and the instrument itself are all thoroughly warmed up, and the instrument is in Enhanced Accuracy when you begin testing. Part 3 details the procedure to calibrate the 11301/11302 to Enhanced Accuracy.

This procedure allows you to perform an electrical inspection of all Mainframe/Plug-In combinations with a minimum number of steps. You may check the mainframe alone provided you have at least one calibrated plug-in, or you may check the mainframe and a plug-in as a system. If you are performing an Incoming Inspection Procedure on one or more plug-ins (as opposed to this procedure which inspects the mainframe), places are noted in the text where you should detour to perform those procedures.

In the 11301/11302, the RIGHT plug-in compartment cannot be used for performing an Incoming Inspection Procedure on a plug-in. If you wish to inspect more than two plug-ins, you will need to reconfigure the system and perform the procedure more than once.

Operating the Instrument

Details of how to operate the instrument are not included in this Incoming Inspection Procedure. Tutorial exercises are presented in the manual *Introducing the 11301 and 11302 Programmable Oscilloscopes*. This manual is strongly recommended to first-time users of these instruments. Comprehensive information on

using the instrument is found in the *11301 and 11302 Programmable Oscilloscopes User Reference Manual*.

Initializing the Instrument

Most of the tests in the Incoming Inspection Procedure begin with the instrument in an initialized state. This is achieved by pressing the **UTILITY** button, touching the word **INIT** on the screen to highlight it if it isn't already, and touching the screen area labeled **Touch here to initialize Scope settings**.

Test Equipment

Table 1 below lists the test equipment required to complete the Incoming Inspection Procedure, and gives examples of equipment that qualifies. The procedure steps are based on the suggested example equipment, but equivalent test equipment that meets the listed specifications may be substituted. Test results and setup information may be altered, and related connectors or adapters may need to be changed, if substitute equipment is used.

Table 1 – Test Equipment

Description	Minimum Specification	Examples of Applicable Test Equipment
Medium Frequency Sine Wave Generator	250 kHz to 250 MHz, variable amplitude, 50 kHz reference	TEKTRONIX SG 503 Leveled Sine Wave Generator with a TM 500-Series Power Module
High Frequency Sine Wave Generator	250 MHz to 1000 MHz, variable amplitude, 6 MHz reference	TEKTRONIX SG 504 Leveled Sine Wave Generator with a TM 500-Series Power Module
Plug-In Amplifier	11000-Series	11A32, 11A33, 11A34, 11A52, or 11A71
<i>NOTE – The Amplifier/Mainframe combination will determine system bandwidth.</i>		
Time Mark Generator	1 ns through 5 s markers in a 1-2-5 sequence, at least 5 parts in 10^7 accuracy	TEKTRONIX TG 501 Time Mark Generator with a TM 500-Series Power Module
Calibration Generator	Square wave output, 0.25% accuracy, 1-2-5 amplitude selection from 200 μ V p-p to 100 V p-p, \sim 1 ms period	TEKTRONIX PG 506 Calibration Generator with a TM 500-Series Power Module
Digital Counter	At least to 1 part in 10^7 accuracy	TEKTRONIX DC 503A Opt. 1 Universal Counter/Timer with a TM 500-Series Power Module

(Continued)

Table 1 (Continued) — Test Equipment

Description	Minimum Specification	Examples of Applicable Test Equipment
Test Oscilloscope	50 MHz or greater bandwidth, 1 M Ω input impedance	TEKTRONIX 2225 50 MHz Oscilloscope
Feedthrough Terminator	50 Ω impedance, dc - 500 MHz, one male and one female BNC connector	Tektronix Part 011-0049-01
2X Attenuator	14 dB attenuation, 50 Ω , one male and one female BNC connector	Tektronix Part 011-0069-02
5X Attenuator	14 dB attenuation, 50 Ω , one male and one female BNC connector	Tektronix Part 011-0060-02
T Adaptor	Two female, one male BNC connectors	Tektronix Part 103-0030-00
Coaxial Cable (2 required)	50 Ω , 18 inch, two male BNC connectors	Tektronix Part 012-0076-00
Coaxial Cable (2 required)	50 Ω , 42 inch, two male BNC connectors	Tektronix Part 012-0057-01
Adaptor	BNC female to BNC female	Tektronix Part 103-0028-00

Part 1: Power-Up Diagnostics

CAUTION

To avoid instrument damage, set the mainframe ON/STANDBY switch to STANDBY before installing or removing plug-in units.

Setup

- a. With the rear-panel PRINCIPAL POWER SWITCH set to OFF, connect the 11301/11302 to a suitable power source.
- b. Install an 11A-Series Amplifier in the instrument's LEFT compartment. Your choice of plug-in will determine the system bandwidth characteristics.

If additional plug-ins are available, they may be installed in the center and right compartments as well. A removable blank plug-in is shipped in the right compartment.

- c. Set the rear-panel PRINCIPAL POWER SWITCH to ON, and then the front-panel ON/STANDBY switch to ON.

When the 11301/11302 is first installed, the rear-panel PRINCIPAL POWER SWITCH should be set to the ON position and left there. Thereafter all power switching should be done by using the front-panel ON/STANDBY switch.

- d. Power on all test equipment to be used, so that it is warmed up with the instrument to be tested. A complete list of test equipment is shown in Table 1 on pages 2-3.

Procedure

Each time the front-panel ON/STANDBY switch is set to ON, the oscilloscope performs diagnostics on its internal circuits. This testing could take as long as two minutes with three plug-in units installed. Upon successful completion, the oscilloscope will enter the normal operating mode. You will be prompted to press the ENHANCED ACCURACY button if different plug-in units were installed while the power was off. If the diagnostic test fails, a diagnostic screen will appear; it can be identified by the words **HALT/ERROR** at the center bottom of the screen.

CHECK—to ensure that the diagnostic screen is not displayed.

CAUTION

Turning the instrument power off during the execution of the diagnostic tests may result in losing some or all of the Non-Volatile RAM data, including stored settings, calibration constants, etc. This could affect normal instrument operation in unpredictable ways, and could require a complete instrument recalibration.

Also, during the diagnostic testing, front-panel controls are active. Touching or changing controls during diagnostic testing may result in test failures.

Successful completion of the diagnostic tests verifies the following major circuits:

1. Processor
2. Front Panel
3. Scope Logic
4. Timebase
5. Vertical
6. Left Plug-In
7. Center Plug-In
8. Right Plug-In
9. Plug-In Interface

Failure of any portion of the diagnostic tests will halt the routine and either present an error message on the display or light a combination of major menu labels. Refer this type of test failure to qualified service personnel, noting the light combination or screen message.

NOTE

On instruments with firmware versions V2.2 or earlier, a completely cold instrument may cause certain spurious failures. Should such failures occur, simply allow the machine to warm up completely for 20 minutes, and then cycle power off and then on to re-execute the Power-Up Diagnostics.

The specific failures that may occur will leave the screen with a diagnostics display, where the center of the screen will have a test failure number. The following numbers can be spuriously generated in a cold instrument: M432x, M433x, and M442x, where the x may be any digit. If any other test numbers are shown, or if the firmware version number is V2.3 or higher, call your qualified service personnel.

To verify the firmware version number, look at the top center of the diagnostic display generated by the failure. If you wish to determine the firmware version even if no failure was generated, you may observe the diagnostic screen display containing the version number during Part 2: Extended Diagnostics.

Part 2: Extended Diagnostics

Setup

As left from previous test.

Procedure

- a. Press the **UTILITY** button.
- b. Highlight the **EXT TEST** selector by touching it if it isn't highlighted already.
- c. Touch the **Run** under the notation **FOR QUALIFIED SERVICE PERSONNEL ONLY**.
- d. Touch the selector in the lower right corner, labeled **off** over **RUN**. The tests will be run, during which the screen will flash on and off repeatedly. The entire process will take 2 minutes or less.
- e. **CHECK**—that the **Index** column down the center of the screen contains no notations of failure. Each entry should either be **pass** or, in the case of plug-ins that are not installed, either **L????**, **C????**, or **R????** depending upon which plug-in compartment is noted.

If any **fail** notations are present, note also the number in the **Fault** column and call your qualified service person.
- f. Return the oscilloscope to the normal operating mode by pressing the **UTILITY** button. Wait a moment for the message indicating the extended diagnostics are completed.

Part 3: Enhanced Accuracy

Setup

As left from previous test.

Procedure

- a. Ensure that the instrument has been powered on continually for 20 minutes.
- b. Press the ENHANCED ACCURACY button.
- c. When the message **Press EA again to confirm request** appears, press the ENHANCED ACCURACY button. The calibration procedure will start, displaying blinking dots and bars of light on the screen. After a short time, the message:

**ENHANCED ACCURACY IN PROGRESS
APPROX 90 SECONDS TO GO**

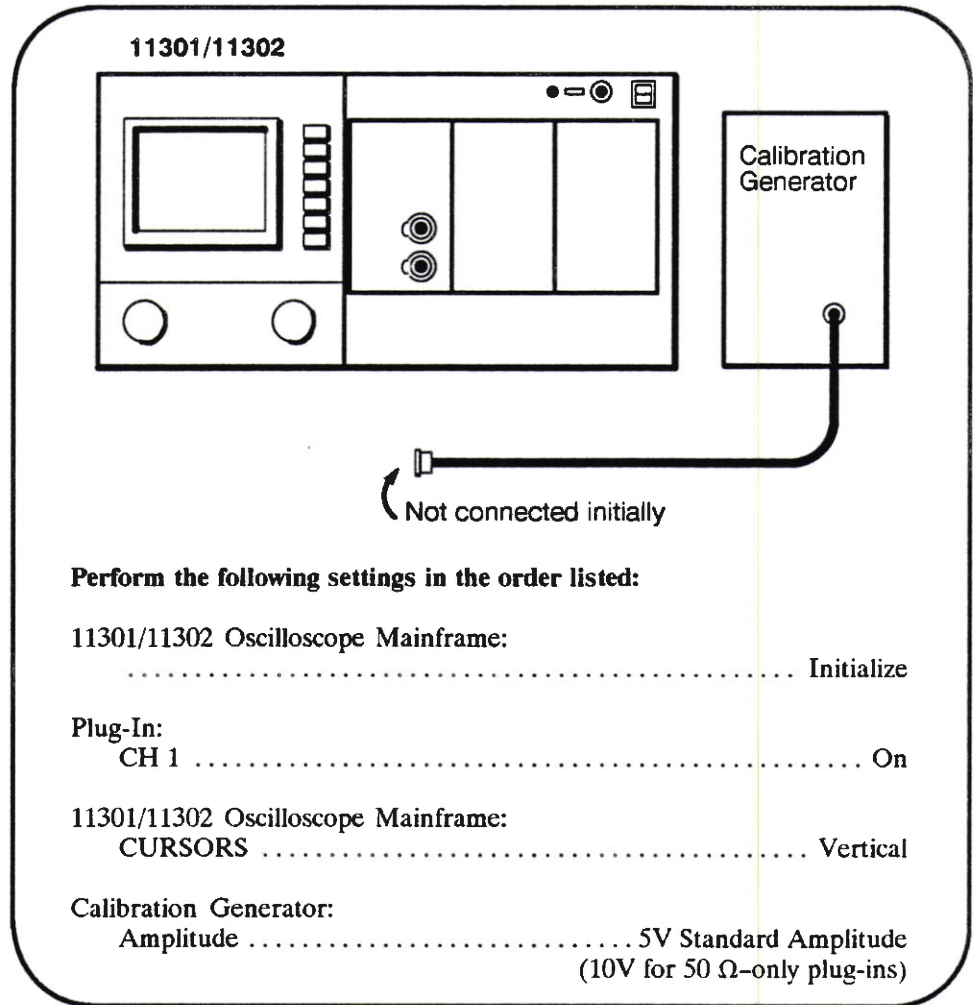
will appear on the screen, signaling that the test is proceeding on track.

- d. **CHECK**—that when the calibration is done, the message **Self calibration completed successfully** appears on the screen, and the **EA** symbol will be displayed at the right edge of the screen. If any other message appears, verify that the instrument configuration is correct and that a plug-in is installed. If unable to get the correct message upon retry, contact your qualified service person.

Once the instrument has been calibrated to Enhanced Accuracy, any change of internal temperature by more than five degrees Celsius will require a recalibration to maintain the state. Should this happen, you will be notified by a message that you should press the ENHANCED ACCURACY button again.

Part 4: Vertical Cursor Accuracy

Setup



Procedure

- Adjust the reference cursor (**LEFT KNOB**) to the vertical center of the trace. Bisect the trace as exactly as possible, using the **FINE** setting of the knob.
- CHECK**—that the **Vert Ref** readout is within specifications of Table 2 on the next page.
- Connect the Calibration Generator output to Plug-In CH 1 input.
- Center the trace vertically on the screen.
- Set the main horizontal size to 500 μ s/div.
- Align the cursors to the waveform base and top. Place the reference cursor at the waveform base, and the other cursor at the top.

- g. *CHECK*—that the Δ Vert readout is within the specifications of Table 2.

Table 2 - Vertical Cursor Tolerances

Plug-In Type	DC Balance (Step b.)	Δ Vert Accuracy (Step g.)
11A32	± 230 mV	4.910 – 5.090 V
11A33	± 180 mV	4.890 – 5.110 V
11A34	± 230 mV	4.910 – 5.090 V
11A52	± 150 mV	4.910 – 5.090 V
11A71	± 200 mV	4.905 – 5.095 V

Part 5: Measurement Accuracy

Setup

As left from previous test.

Procedure

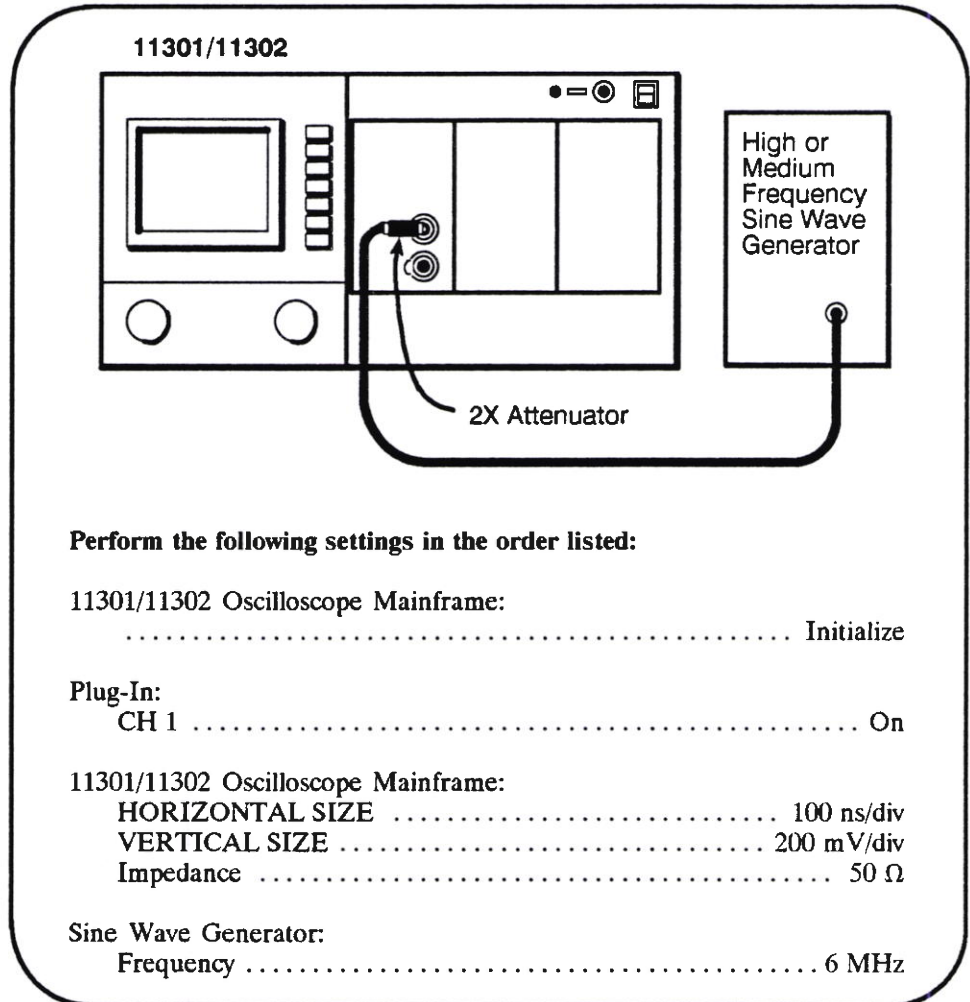
- a. Press the **MEASURE** menu button, and select **Min**, **Max**, and **P-P** measurements. Touch **START**.
- b. **CHECK**—that the measurement values that appear on the screen fall within the following ranges:

Table 3 - Measurement Tolerances

Plug-In Type	P-P	Max	Min
11A32	4.360 – 5.640 V	4.370 – 5.630 V	± 630 mV
11A33	4.340 – 5.660 V	4.420 – 5.580 V	± 580 mV
11A34	4.360 – 5.640 V	4.370 – 5.630 V	± 630 mV
11A52	4.360 – 5.640 V	4.450 – 5.550 V	± 550 mV
11A71	4.355 – 5.645 V	4.400 – 5.600 V	± 600 mV

Part 6: Vertical Bandwidth

Setup



Procedure

- Press the VERTICAL SIZE button below the screen. **CHECK**—to ensure that Sine Wave Generator you are using is capable of producing the frequency listed on the screen as the **HF Limit**.
- Adjust the amplitude of the Sine Wave Generator to produce a 6-division high displayed waveform. Use VERTICAL POS to vertically center the waveform if necessary.
- Display the vertical cursors, and adjust them to the top and bottom of the waveform.
- Touch the **Set Ref** region of the screen.
- Touch the **%-dB** region of the screen to select it on.

- f. **CHECK**—that the readout indicates $\Delta\text{Vert} = 100\%$ and $\Delta\text{Vert} = 0 \text{ dB}$, and that the reference amplitude (immediately above **Set Ref**) is between 5.90 and 6.10 divisions.
- g. Set the Sine Wave Generator to the frequency indicated as the **HF Limit**. If necessary, you can display this limit by pressing the **VERTICAL SIZE** button. Do not change the amplitude of the Sine Wave Generator.
- h. Adjust the **INTENSITY** and **HORIZONTAL SIZE** as required to achieve a viewable waveform on the display.
- i. Realign the vertical cursors to the new top and bottom of the waveform.
- j. **CHECK**—that the ΔVERT cursor readout indicates a value of 70.7% or greater.