

# SERVICETEKNOTES

TEKTRONIX—EVER SEARCHING FOR NEW AND BETTER PRODUCTS TO SERVE YOUR NEEDS!

## TEKTRONIX: TEST AND MEASUREMENT SERVICE



Published by Tektronix  
Sales & Service Publications

**Tektronix**

## TO OUR CUSTOMERS

The Tektronix Test & Measurement Sales/Service Organization firmly supports a policy of assuring continued utility of products sold by Tektronix.

This publication is meant to provide technical information to customers who have elected to maintain their own Tektronix products. It contains product servicing information and is written for the technician. The notation at the bottom of each article (W<sup>2</sup> Issue: XX-XX) signifies that the article has previously been published in a internal publication known as *WIZARDS' WORKSHOP*.

Articles are submitted primarily by Service Support personnel thoroughly familiar with the products they support.

*SERVICETEKNOTES* also encourages you, the customer, to submit articles for publication. If you have knowledge of a technique, procedure or idea that enables you to service your Tektronix product more effectively, share it so others may benefit from your experience.

Articles for publication should be submitted directly to:

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# TEKTRONIX: TEST AND MEASUREMENT SERVICE

## THE THREE CHALLENGES

### *Tektronix Test and Measurement Service*

Over the last forty-plus years, we have talked to a lot of technicians, maintenance supervisors, and cal lab managers—people who keep an organization's precision instruments on line and in calibration.

Lately, what we hear is that today's environment makes it tougher than ever to get the job done.

We are glad to have this chance to talk to *SERVICETEKNOTES* readers about the three challenges that make today's environment so demanding. We offer alternatives that you may not have thought about, to help you and your organization meet these challenges. Our services now range from calibrating one instrument to managing an entire metrology function—scheduling, record keeping, standards compliance, and even staffing and supervision.

You can choose standard services, mix custom services, or create a unique solution to meet your needs. Let's see how our capabilities can be tailored to help you meet today's three challenges.

- **Fast calibration and repair services.**
- **Pre-planned calibration and repair programs.**
- **Technical classes and self-study packages.**
- **Overnight replacement parts.**
- **Shared support and instrument up-time programs.**
- **Resident engineering and technician services.**
- **Comprehensive calibration scheduling and recall services.**
- **Standards compliance report services and on-line calibration audit records.**
- **Sole-source services for all metrology requirements, including electronic and dimensional instrumentation and standards, regardless of manufacturer.**

### *The First Challenge: Keeping Up with New Technology*

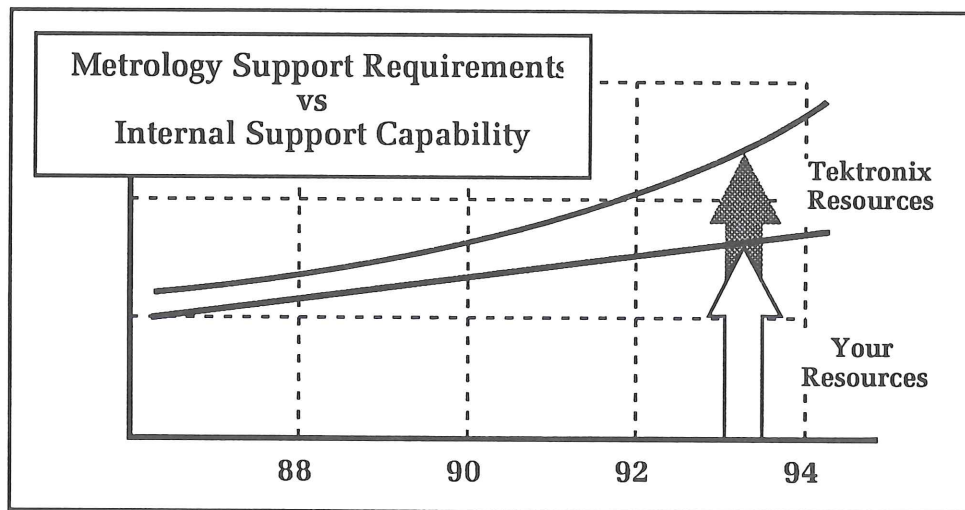
What we hear today is that supporting extremely fast and powerful new test and measurement systems requires growing investments in new skills and equipment. The first challenge is to keep up with technology that is moving faster than ever.

As a developer of leading-edge measurement technology, Tektronix has the expertise to help you close the gap. Our **Metrology Center of Excellence** and our **Service Centers** nationwide are ready to assist you with **Electronic & Dimensional Metrology** support.

Recent expansion of our Metrology Center of Excellence features an electrical measurement capability ranging from DC and low frequency to microwave and optical measurements, and

our physical and dimensional measurement capability includes length, mass, flatness, angle deviation, pressure, and torque. All the primary metrology standards of Tektronix—electrical, physical, and dimensional—are now maintained within this single organization. These primary standards are traceable to the National Institute of Standards and Technology (NIST) or the highest physical standard available, to ensure full confidence. In short, Tektronix has the expertise to support your organization.

Still, most technical people prefer to keep their personal expertise current. People often tell us the problem is that they can't afford to sit through hours of training in academic theory they don't need.



We understand. Our **Product Service Training** emphasizes the *How-to-Fix* philosophy of troubleshooting, fault isolation, and repair. We provide the latest service techniques through the same courses we use to train Tektronix technicians. Intensive classes combine lectures and hands-on labs. We also offer **User Technique Workshops** that emphasize the *Make Measurements* philosophy. You can arrange for **On-Site Classes** anywhere in the world, and save travel expenses. We can tailor the course to your exact needs, and provide instructor packages as well. **Self-Study Materials**, video and audio, are also available so you can quickly develop instrument operation or service skills on your own.

Knowledge isn't enough without **Service Parts and Documentation**. Exchanging modular components is often the fastest way to resolve a problem, at a price well below a part's full replacement cost. Hardware and firmware upgrade kits are available with documentation for self-installation. Parts price lists, manuals, and information for many older products are available on microfiche. All these can be ordered by calling the **Tektronix FastParts Center at (800) 848-5083**, between 5AM and 5PM, PST. Overnight delivery can be arranged if you order before noon, and you can even use VISA or MasterCard.

### ***The Second Challenge: Meeting New Quality Standards***

Competing in international markets may mean you face stepped-up quality assurance requirements, such as **ISO 9000**. To meet this European standard, your organization may decide it's necessary to calibrate more instruments, more often. Audit record keeping frequently must increase, too—ISO 9000 can require records even for instruments that aren't on a regular calibration cycle. The challenge is to meet these increased workload and tracking requirements.

If you need to bring instruments into compliance with a new standard in a hurry, we can help with this peak calibration workload. We can also help you plan for any overflow on a longer term basis, and pass along a price advantage in the bargain.

We expect our own ISO 9000 certification in 1993, and we enthusiastically support ISO, which complements our existing quality and MIL-STD-45662A programs. You are probably aware that our **Certificates of Traceable Calibration** establish an audit link to NIST. Did you also know our tracking system automatically notifies you when it is time to recalibrate an instrument we have serviced, and establishes your compliance with MIL-STD-45662A? We can help meet other regulatory and quality requirements, too, in fields including aerospace, avionics, telecommunications, high-energy physics, computer and semiconductor manufacturing, medical, automotive and industrial products.

As you prepare to meet new audit requirements, you may want to learn more about the **TekStars Calibration Record System**. TekStars CRS records every service we perform, along with instrument-specific calibration and certification requirements. This supports flexible reporting that we can tailor to meet your needs for information and administrative tools. All the instrumentation in a cal lab, or a national network of metrology installations, can be managed by this one system. You save administrative time and still assure your instruments stay on schedule. Historical cal record data can come to you on disc in ASCII, and cal status information is even available on-line (with some restrictions.) In fact, TekStars CRS may be all the record keeping support you need to meet your organization's scheduling and audit requirements.

### ***The Third Challenge: Resources are More Limited***

Almost everywhere, dollars and people have to stretch farther than before. So, while technology accelerates, and workload grows, funding and staffing can get spread thinner. As a result, organizations must get the very most from their core strengths.

To meet this third challenge, you can partner with Tektronix for the additional resources you require. Consider a few examples.

Tektronix training is an affordable, easy way to increase your knowledge resources.

Tektronix Service Centers nationwide can promptly absorb your workload peaks. This provides you with back-up technician resources, so your organization gets uninterrupted support. Long-term technician support can also be arranged at your location.

Tektronix Service Agreements allow you to pre-arrange support for a block of instruments, regardless of manufacturer. This lets you plan some or all of your extra resource requirements. Sole-sourcing all of your extra requirements from Tektronix offers a variety of additional cost reductions. For example, sole-sourcing eliminates the need for multiple vendor performance audits. In fact, ISO certification will soon provide independent audits, eliminating any need for you to do the audit at all.

And so on. Tektronix **Outsource Programs** let you rely on us for whatever level of resource you need—our capabilities range all the way to managing the entire metrology function.

Providing metrology support is our core strength. Partnering with us for the resources you need lets you concentrate on core strengths, and increase performance for your organization.

***Test and Measurement Unconditional Service Guarantee***

Over forty years of proven experience, and the recent expansion of our Metrology Center of Excellence, promise world-class metrology expertise that is worthy of your confidence. That's why we can offer a truly unconditional guarantee—

*If, for any reason, our services fail to fully meet your requirements as promised, we will resolve the problem at our expense.*

***Visit Our Metrology Center of Excellence***

We welcome you to personally visit and evaluate our Metrology Center of Excellence, at Tektronix in Beaverton, Oregon, or any of our outstanding Tektronix Service facilities. Call (800) 835-9433, ext. 7-6630 to arrange for a Metrology Center of Excellence visit.

For further information about Tektronix Test and Measurement Services, call Stephen E. Leijon, Service Product Marketing, at (503) 627-3487, or contact a Tektronix Service Account Manager near you.



## AM503A: Battery Backup Error (Pullout A)

REF: AM503A Service Manual,  
P/N 070-8174-00

S/N: B010100 to B010260

It has come to our attention that several units have been released to the field that have a problem with the battery backup circuit. This could cause the battery low indicator on the front panel to illuminate. Two components on the Main board need to be swapped to insure that it operates properly.

To keep the manual schematic correct, A1CR130 and A1R132 should be swapped. Circuit board orientation of A1CR130 will have the cathode going to the square pad from where A1R132 was located. See *Pullout A* for component nomenclature and location changes. Also the battery, A1BT130 P/N 146-0087-00, should be replaced.

After the two components have been swapped, and the battery replaced, the cal constants must be reinstalled in NVRAM. Refer to page 6-28 of the service manual to run test numbers 97 and 99 for the procedure.

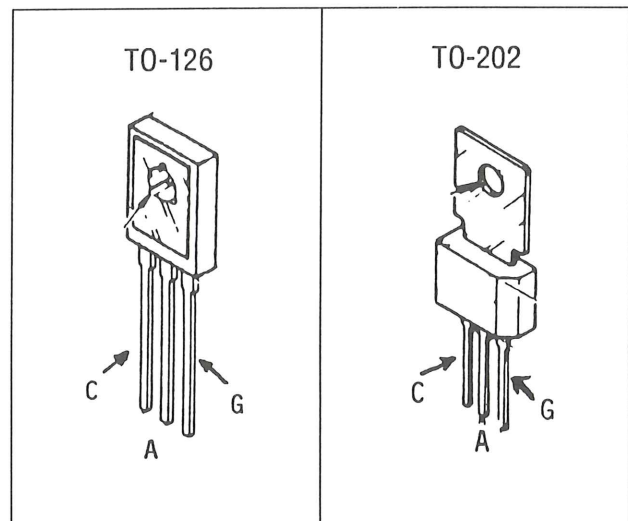
U.S. customers having affected instruments will be notified by mail by the product marketing manager. International customers will be notified by each country's marketing organization.

W2 Issue: 22-6

## Case Style Change: P/N 151-0506-00

This SCR, which is used in various 300 Series, 400 Series and 2200 Series scopes, has been sold with two different case styles, both as a TO-202 and TO-126. This has caused some confusion when trying to replace one style with the other style.

When looking at the front (or top) of the SCR, both case styles have the pins in the same configuration, as shown in the diagrams below. From left to right: Cathode, Anode, Gate.



W2 Issue: 22-6

## Customer Product Service Training Courses

Our product service training courses provide technicians the opportunity to learn the latest maintenance techniques in the same courses used to train Tektronix technicians.

Our formal classroom training is intensive, combining lectures and hands-on labs, with emphasis on the *How-to-Fix* philosophy.

(continued on following page)

Tektronix product service training instructors sharpen skills in troubleshooting, fault isolation and repairing Tektronix products. Learn factory-approved product service and maintenance procedures for prolonged product utilization and maximum uptime.

Following is a listing of courses currently available.

#### **LOGIC ANALYZER PRODUCTS**

DAS9200 Digital Analysis System/  
LV500 Logic Verifier System

May 17-28, 1993 – Beaverton, OR

#### **SPECTRUM ANALYZER PRODUCTS**

RF/Spectrum Analyzer Concepts

May 5-7, 1993 – Beaverton, OR

49X/275X Portable Spectrum Analyzers

May 10-28, 1993 – Beaverton, OR

#### **TELEVISION PRODUCTS**

1780 Measurement Set

March 29-April 9, 1993 – Beaverton, OR

TSG Series Generators

May 3-14, 1993 – Beaverton, OR

#### **TEST & MEASUREMENT PRODUCTS**

2235/2236 Portable Oscilloscopes

April 19-23, 1993 – Chicago, IL

224X/2252 Portable Oscilloscopes

April 26-30, 1993 – Chicago, IL

243X/2440 Digital Storage Oscilloscopes

March 22-April 2, 1993 – Beaverton, OR

243X/2440 DSO Main Board

April 5-9, 1993 – Beaverton, OR

24XX Microprocessor-Based Oscilloscopes

May 17-28, 1993 – Washington, DC

AFG5X01/PFG5X05 Arbitrary/Pulse  
Function Generators

March 22, 1993 – Beaverton, OR

CSA404/1140X Digitizing Programmable  
Oscilloscopes

March 15-19, 1993 – Beaverton, OR

CSA803/1180X Digitizing Signal Analyzers

March 29-April 2, 1993 – Beaverton, OR

DSA601/602 Digitizing Signal Analyzers

March 22-26, 1993 – Beaverton, OR

ScopeCal CFE (Control File Editor)

April 19-23, 1993 – Beaverton, OR

TDS40X/50X Digitizing Oscilloscopes

March 8-12, 1993 – Beaverton, OR

Attend regularly scheduled product service training courses or enjoy the efficiencies and cost savings of having the training held at your location. We make on-site custom training available and by providing training at your location, enables you to save on costly travel expenses. By tailoring the content and materials to your exact needs, you receive maximum value for your training investment.

For further information on any of these courses or for information on other training services, please call (800) 835-9433 ext. WR1407 or (503) 629-1407.

## CG5010/CG5011: Improve Pulse Head Drive

REF: CG5010/CG5011 Service Manual  
Volume 2, P/N 070-7746-01  
MOD # 76495

S/N: CG5010 S/N B010208  
CG5011 S/N B010400

The pulse head drive delay circuit has insufficient range for proper adjustment due to the slow turn on time of A7Q1200. To improve the turn on time of Q1200, change the value of A7R1203 from 681 ohms (P/N 321-3177-00) to 475 ohms (P/N 322-3162-00). (A7) Output Circuit board.

W2 Issue: 22-4

## CRT Field Contacts

The CRT group is making some changes in order to improve our responsiveness to customer needs. Doug Behrend has become the focal point for handling technical CRT issues. The change to one primary contact will allow us better documented, more consistent, and rapid response inquiries. Doug may be reached at (503) 627-5242. Our goal is to respond to all inquiries within 24 hours. The CRT Receptionist at (503) 627-6807 is equipped with an alternate contact list for handling urgent issues when Doug is away.

Improving our reliability depends on feedback. We are asking that failures be returned to us whenever practical. Our shipping address is:

Tektronix, Inc.  
CRT Operations, M/S 46-372  
Regional Distribution Center  
Beaverton, Oregon 97077

W2 Issue: 22-6

## CSA803: Manual Insert (*Pullout B*)

REF: Change Reference C5-0492

Corrections have been made to the CSA803 Service Manual (P/N 070-7721-01), plus some clarification has been added to the Checks and Adjustment Procedure. Two important changes have been made. They are:

1. The Vertical Accuracy spec is now 1%. This will make it the same as the EIS Advertised Spec.
2. The Vertical Accuracy spec is now stated as +/-1.0% full scale. An explanation of full scale has been added to the procedure to clarify how Table 2-3 in the procedure was calculated.

The insert is in *Pullout B*.

W2 Issue: 22-9

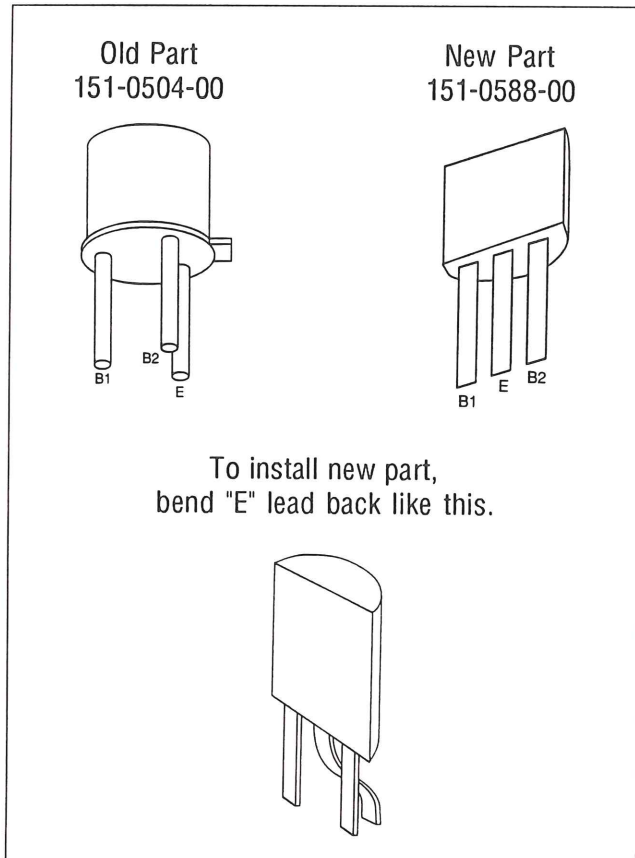
## DC503A: Transistor Part Number Changed Due To Availability

REF: DC503A Instruction Manual,  
P/N 070-2971-00  
MOD # 75838

S/N: DC503A S/N B060182

A14Q1300 in the Measurement Cycle Timing circuit, Schematic 5, has changed from a uni-junction transistor (P/N 151-0504-00) to a thrysistor (P/N 151-0588-00). A replaceable parts kit is available as P/N 050-2854-00. The kit should be ordered upon failure of the affected part.

*(continued on following page)*



W2 Issue: 22-6

### DSA60X/A: DSA6FD And DSA6FDF Adjustment SW

When a DSA601 or DSA602 is upgraded to the 'A' level, the nomenclature does not change. However, when the upgraded DSA601 or DSA602 is being calibrated, the DSA601A or DSA602A adjustment program needs to be used. If the appropriate 'A' program is not selected, the program will not allow you to proceed.

W2 Issue: 22-9

### DSA60X/A: Field Adjustment SW (Pullout C)

REF: SAR # 47218

The Field Adjustment SW (P/N 063-0112-02) has one incomplete file which causes the DSA601 program to lock up. The incomplete file is DSA601.EIS. The work-around for this problem is to copy the DSA602.EIS file into the DSA601.EIS file. Once this is done, the DSA601 program will run properly.

The problem has not been observed in the previous versions. This disk is included with the DSA600 Series Service Manual, P/N 070-8184-00. This manual is shipped with all DSA60XA products. Even though this disk supports all four DSA600 Series products, it was developed primarily to adjust the DSA60X/A products. Therefore, we have few customer complaints.

An insert has been written to address this problem. Please refer to *Pullout C*. This insert has been added to the service manual.

W2 Issue: 22-10

### ECO170A, SPG170A, TSG170A, TSG170D, TSG271, TSG300, TSG300E, TSG370, TSG371, TSG422, TPG625, 728D, 728M: Low Voltage Power Supply Reliability Improvement

REF: ECO170A Instruction Manual,  
P/N 070-6113-00  
SPG170A Instruction Manual,  
P/N 070-5965-00  
TSG170A Instruction Manual,  
P/N 070-6814-00  
TSG170D Instruction Manual,  
P/N 070-5680-00

(continued on following page)

TSG271 Instruction Manual,  
P/N 070-6943-00  
TSG300 Instruction Manual,  
P/N 070-5722-00  
TSG300E Instruction Manual,  
P/N 070-8374-00  
TSG370 Interim Manual  
P/N 061-3656-00  
TSG371 Instruction Manual,  
P/N 070-7707-00  
TSG422 Instruction Manual,  
P/N 070-7022-00  
TPG625 Interim Manual  
P/N 061-3677-00  
728E Service Manual,  
P/N 070-7630-02  
728M Service Manual  
P/N 070-8045-00

Several parts on the Low Voltage Power Supply board (P/N 671-0572-03) used in the TSG Series instruments have been recently changed to new parts to improve power supply turn-on characteristics, and to improve long-term reliability.

A set of improved electrolytic capacitors covering several circuit locations on this board can be obtained by ordering P/N 050-2935-00. Installation of this kit is recommended whenever an instrument is in for repairs in the power supply section, and should be strongly considered as a preventative measure for an instrument that is in for routine service where a substantial number of operating hours have accumulated on the current parts.

An additional change that has occurred on the Low Voltage Power Supply board at this time is that the regulator IC (A4U722) has been changed from P/N 156-2524-00 to P/N 156-4236-00. A resistor (A4R622) is also changed to provide correct operating potentials for the new IC. This IC/resistor change is for your information only.

W2 Issue: 22-7

## TDS Family: Push Button Standards

Due to confusion regarding what determines a push button problem, the following standards have been developed for manufacturing. These same standards are good guidelines for determining customer failures.

All push buttons on the front panel are expected to function when pushed anywhere on the front surface hard enough to activate it. All push buttons should function whether the instrument is hot or cold.

The following are invalid operations:

1. Push the button with extreme force.
2. Hold the button in for more than 2 seconds.
3. Push button from the side.

Please use these standards when determining whether the push buttons on the front panel are functioning correctly.

W2 Issue: 23-1

## TDS400/500/600/800 Series: CRT/HV Module

The CRT/HV modules for the TDS family of products need to be exchanged as a complete module. These modules are built and adjusted as a module by the CRT manufacturing group. Therefore, when a failure occurs replace the module, CRT and HV board, instead of exchanging just one of the items.

The reasons for this strategy are:

1. The CRT manufacturing group evaluates all failed modules in an ongoing effort for continuous product improvement. The CRT group needs the complete module back to properly determine root cause.

*(continued on following page)*

2. The shipping material is designed to protect the module. Shipping the CRT or HV board separately could result in damage during shipping, especially to the CRT.
3. The assembly and adjustment process for the CRT/HV module is done using unique fixtures that are not available to the field.

W2 Issue: 22-5

### TDS400/500/600/800 Series: Signal Path Compensation (SPC)

Tektronix Service Centers have received some units in for servicing with the customer complaint of DC Offset. After evaluating the problem, the service technicians have found that the only problem was that the customer did not run SPC, Signal Path Compensation. After running SPC, the DC Offset problem was resolved.

There are three reasons why this problem may occur.

1. SPC is a new term, the customer may not understand its function.
2. SPC is not directly accessed; it is two menu levels down.
3. The manuals that we provide to the customer do not fully explain the importance of SPC.

SPC is similar to the Enhanced Accuracy function in the 11K products and the Self-Cal for the 2400 DSO. SPC needs to be run 20 minutes after power up to optimize the accuracy of the product. SPC should also be run if the instrument's ambient temperature has changed more than 5 degrees C.

SPC can be found using the following sequence:

1. SHIFT
2. UTILITY
3. System (Bezel Button) until the Cal section is lit.
4. Signal Path (Bezel Button)
5. OK Compensate Signal Path (Side Bezel Button)

A clock icon will appear in the upper left hand corner. It will remain there until SPC is completed. SPC takes roughly one minute to complete its sequence.

Therefore, if you are experiencing DC Offset, var balance, or step balance, run the SPC first to see if that will resolve the problem.

W2 Issue: 22-10

### TDS420/460: CRT Bezel Labels

The part numbers for the CRT Bezel Labels for the TDS420 and TDS460 were omitted in the first printing of the Module Level Service Manuals (P/N 070-8036-00 and 070-8037-00 respectively). The part numbers are: TDS420 P/N 334-8214-00 and TDS460 P/N 334-8215-00.

W2 Issue: 22-5

### TDS520/540/620/640/820: Dust On CRT

REF: Service Update Plan 55-004  
MOD # 78093

In late August, Service Update Plan 55-004 was mailed out to the Service Organization. This update plan addresses the customer complaints regarding the accumulation of dust on the face of the CRT and inside the CRT filter. Accumulation of dust causes the display to appear dim or out of focus.

*(continued on following page)*

To resolve this problem, the CRT Filter Retainer (P/N 386-6211-00) is replaced with a new CRT Filter Retainer (P/N 386-6211-01). The new retainer has a gasket on it that blocks the air flow from going across the face of the CRT. The new retainer is a direct replacement.

A no-charge kit was set up so that the customer, as well as the service centers, could order this kit. The part number for the kit is 045-0213-00. This kit contains:

CRT Filter Retainer	386-6211-01
3 Screws	211-0730-00
Label	006-3362-00
Instruction Sheet	

When reassembling the unit, the CRT Filter (P/N 378-0366-00) may be broken if the CRT Filter, CRT Filter Retainer, and Display Frame are not aligned properly. Please use caution during assembly. If an on-site installation is necessary, a spare CRT Filter should be taken along in case one is broken.

W<sup>2</sup> Issue: 22-9

## Tools Available For PLCC IC Sockets

Several new IC sockets are being used in our instruments to carry PLCC style ICs. In many cases the technician may find the removal of an IC from this type of socket difficult if the proper tools are not used. And, in some cases, the socket may be damaged.

One manufacturer of these sockets has developed a line of IC extractor tools that are inexpensive and easy to use. The manufacturer is AMP Inc. of Harrisburg, Pennsylvania. It is strongly recommended that one of each of these tools is to be purchased for the Tek Service Centers that are doing component level repair on our newer products.

The Tektronix part numbers of the applicable IC sockets and the corresponding AMP tool number are as follows:

Tektronix Socket Part Number	Amp Tool Part Number
136-1005-00	821900-1
136-1047-00	821591-1
136-0959-00	821648-1
136-0871-00	821566-1
136-0965-00	821590-1
136-1109-00	821958-2

You can contact an AMP distributor in your area, or you can contact the home office directly for price and availability.

W<sup>2</sup> Issue: 22-7

## VM700, VM700A: Low Voltage Power Supply Fan Cap

REF: VM700A Service Manual,  
P/N 070-8165-00

The Low Voltage Power Supplies (P/N 119-2630-00 and P/N 119-2630-01), as used in the VM700 and VM700A families, have experienced a higher than desirable failure rate associated with a specific electrolytic capacitor in the fan drive circuitry. The primary cause of these failures has been isolated to defective parts from a specific lot code (8838) of capacitors. New power supplies from the vendor and older power supplies that have been repaired through the vendor's facilities are getting new capacitors installed in the affected location where appropriate. We expect to see an immediate improvement in power supply failures as a direct result.

*(continued on following page)*

A Tektronix part numbered replacement capacitor (P/N 290-1200-00) has been evaluated and recommended for the specific circuit location (C176). This capacitor should be replaced in any VM700 or VM700A that is returned for service where not already done, if the existing part is of the suspected lot code.

W2 Issue: 22-7

### VS211: ADC Boards Being Returned With No Problem Found

REF: VS211 Service Manual,  
P/N 070-8164-00  
RC211 Operator's Manual  
P/N 070-8075-00

Several ADC boards from the VS211 PAL Frame Synchronizer have recently been returned to the factory for repair via TV Board Exchange that have had no problems found after Test and Cal.

Upon further investigation, it is our belief that some situations associated with the user definable timing offsets that can be inserted via the RC211 Remote Control may be contributing to this condition.

When you are troubleshooting a VS211 (or assisting a customer), and are presented with the following symptoms, it is highly recommended that you initialize the ADC (by exercising the ADC diagnostics through the RC211) before troubleshooting further.

The symptoms that have been observed or reported on the ADC boards that we have seen were:

#### ADC Board

"PGM UNLOCK"	LED	on
"GENLK ACQ"	LED	on
"PGM ABS"	LED	on
"BURST ABS"	LED	on

#### RC211 Display

In the FRAME SYNC STATUS menu, the next sub-menu would be: PROGRAM INPUT STATUS ABSENT.

Another ADC "fault" has been noticed in two boards that were returned for exchange. Upon examination of the contents of the NVRAM we found that the instrument had been set up for >DIGITAL INPUT.

The solution here is to inspect the program input source set up through the menus of the RS211, and verify that the instrument is set for ANALOG INPUT instead of DIGITAL INPUT.

W2 Issue: 22-7

### 015-0309-01: Cable Assembly Available

REF: 015-0309-01 Remote Variable  
Instruction Manual, P/N 070-2819-00  
MOD # 76583

The cable assembly (P/N 175-2024-00) for the 015-0309-01 Remote Variable is now available as a replaceable part.

W2 Issue: 22-4



**11A16: FW Version 1.2 (P/N 160-6636-01)**

REF: MOD # 76446

The 11A16 FW has been revised from Version 1.1 (P/N 160-6636-00) to Version 1.2 (P/N 160-6636-01). This change has a significant impact on the operation of the 11A16.

The main problem was that when connecting a current probe, a 15V fuse or some input protection diodes would be damaged. The problem appears to be current spikes being generated during connection of the probe to the 11A16.

Normally the power amp is switched on (by firmware) when a current probe is detected at the input. The problem is that all of the probe pin connections may not be stable when the power amp is switched on. To prevent this, the power amp will not be switched on until the probe has been degaussed.

This presents a new problem. With the power amp off, only AC characteristics above a certain frequency are used by input amplifier. If a user connects a probe and does not push the degauss button, they could get erroneous measurements. This is due to the power amp not being switched on.

To avoid the erroneous measurements, the display path is turned off until the probe has been degaussed. If the channel display is on, only a flat trace will be seen by the user since no signal is passed to the mainframe.

The display will be unaffected when using the voltage adaptor since degauss is inoperable in that mode.

W<sup>2</sup> Issue: 22-1**11A72: FW Version 2.2 (P/N 160-4845-08)**

When upgrading the FW from Version 2.12 to Version 2.2, you will get a "Cksum Tweak" error on power up. To clear this error, two cal constants, CAL 70 and CAL 198, need to be re-entered.

The procedure is:

1. Prior to replacing the firmware, record the values of CAL 70 and CAL 198. This can be done using a controller.
2. Move J850 from pins 2 and 3, to pins 1 and 2. This removes the cal lock.
3. Replace 160-4845-07 with 160-4845-08.
4. Install 11A72 into mainframe, turn on power and exit Extended Diagnostics.
5. Change CAL 70 and CAL 198 to the values recorded in step 1. Note: You must write the calconstants again to clear the Extended Diagnostic failure.
6. Run Extended Diagnostics to clear the error.
7. Move J850 back to pins 2 and 3.

W<sup>2</sup> Issue: 21-12**11A72: Service Manual (Pullout D)**

REF: SAR# 19338

The Checks and Adjustment Procedure in the 11A72 Service Manual, P/N 070-7257-00, currently has two methods for measuring the Step Response (Part 6). One procedure uses an 11801/2 mainframe and the other uses a 7854 mainframe. Since both of these products are no longer available, a third option using a current product was needed.

*(continued on following page)*

A third procedure has been developed using the 067-1338-00 Step Calibration Generator. Please refer to *Pullout D*. This insert will be added to the 11A72 Service Manual, P/N 070-7257-00.

The 11801A and the CSA803 are not suitable replacements for the 11801 and the 11802 in this application. The calibrator output for the 11801A and the CSA803 do not have the needed rise time, as compared to the 11801 and 11802.

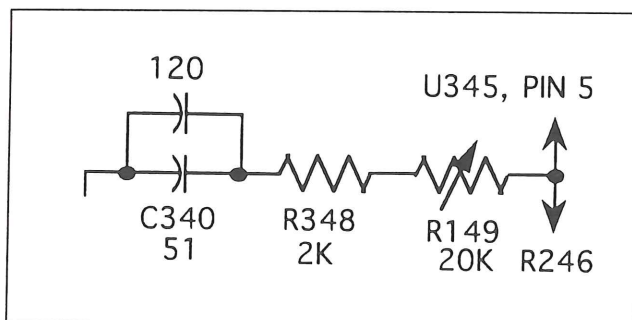
W2 Issue: 22-10

## 110S: Improvement In Frequency Response Flatness Through The ADC Board

REF: 110S Service Manual,  
P/N 070-4213-01

A small modification can be added to the ADC board in your 110S Frame Synchronizer that has been shown to improve Line Time Distortion of the processed signal. (In a few instances, the Line Time Distortion value, as measured with a VM700A, has been less than or equal to 0.1%.) This mod has proven to be of particular value where several synchronizers are in the signal path and optimum short time distortion of the total path is highly desired.

The modification consists of adding a 100 pF capacitor in parallel with C340 on Schematic 1 of the 110S Service Manual as illustrated below.



The change is suggested as a "fine tuning" type of adjustment, and the actual value of the capacitor may need to be test selected to achieve best results in your 110S.

W2 Issue: 22-7

## 1130X/A: Adjustment Procedure

The following potential problem with the 1130X/A adjustment procedure has been reported.

In Section 4, CVR Accuracy, in the service manual, if you are not using the recommended DVM (or equivalent), you may get erroneous measurements resulting in causing the test to fail.

As an example, if you use a DM5120, the input resistance on the 30V setting is 11M ohms. At the test point TP421, where the CVR measurement is taken, there is a 10K ohm series resistor. The input resistance, in parallel with the 10K ohm resistor will create a 10mV when the CVR is being adjusted at -10.000V and +9.9951V. If, on the next step, A/D Converter Gain and Offset, you stay in the 30V setting, the tests may pass. However, if the DM5120 is allowed to auto range, it will switch to a lower setting where the input resistance is higher. The subsequent steps will have no error voltage.

This will result in the miscalculation of the A/D Converter Gain and Offset values, and the test will most likely fail.

To prevent this, make sure that the DVM that you are using has a high enough input resistance at all the ranges that you intend to use.

W2 Issue: 22-9

## 11801, 11801A, 11802, CSA803: Vertical Reference Voltage

There is an error in the Checks and Adjustment Procedure for all the 11800 Series products. The error is in the Vertical Reference Voltage Check.

The specification is written as: "The measured voltage must be within the limits of 5V +/-200 $\mu$ V and -5V +/-200 $\mu$ V." This spec is incorrect.

The specification should read: "The measured voltage must be within the limits of 5V +/-1mV and -5V +/-1mV." This spec is valid for all 11800 Series products.

W<sup>2</sup> Issue: 21-11

## 11801A: Manual Insert (*Pullout E*)

REF: Change Reference C4-0492

Corrections have been made to the 11801A Service Manual (P/N 070-8024-00), plus some clarification has been added to the Checks and Adjustment Procedure. Two important changes have been made. They are:

1. The Vertical Accuracy spec is now 1%. This will make it the same as the EIS Advertised Spec.
2. The Vertical Accuracy spec is now stated as +/-1.0% full scale. An explanation of full scale has been added to the procedure to clarify how Table 2-3 in the procedure was calculated.

The insert is in *Pullout E*.

W<sup>2</sup> Issue: 22-9

## 11801A: Manual Insert (*Pullout F*)

In the 11801A Service Manual, P/N 070-8024-00, two pieces of equipment were in the Test Equipment list that were not used in the Checks and Adjustment procedure. These two pieces of equipment were:

Power Meter	HP 436A
Power Sensor	HP 8485A

See *Pullout F* for the revised test equipment List.

W<sup>2</sup> Issue: 22-10

## 11802: Manual Correction (*Pullout G*)

REF: SAR # 29092

The 11802 Service Manual (P/N 070-7047-01) did not get updated when the other 11800, and CSA803 Service Manuals were revised. In the test equipment and Checks and Adjustment Procedure for the 11802, a sampling head was specified instead of the calibration head (P/N 067-1413-00).

A manual insert was generated to correct this. Please refer to *Pullout G* for the manual insert. This will make the 11802 Checks and Adjustment Procedure the same as the other 11800 and CSA803 mainframes.

W<sup>2</sup> Issue: 22-10

## 1500B, 1500C: Use Common Parts

In the past, 1500B (1502B and 1503B) and 1500C (1502C and 1503C) were made with different circuit boards and mechanical parts. To reduce cost and make replaceable parts easier to handle, we have made most parts common.

(continued on following page)

1500Cs serial number B02XXXX and above will be similar to their 1500B counterparts. The 1500B Series remains the same. All circuit boards, and most mechanical parts are now the same for Bs and Cs.

A new service manual is available for the 1500Cs serial number B02XXXX and above:

Serial Number Range	Service Manual
1502C, B01XXXX	070-7168-00
1502C, B02XXXX	070-7168-01
1503C, B01XXXX	070-7170-01
1503C, B02XXXX	070-7170-02

The main customer differences between the Bs and Cs remain.

- The Bs meet stricter military EMI and environmental specifications. The Cs meet all applicable commercial specifications. The Cs meet all applicable commercial specifications (UL, CSA, VDE) but have not been approved for the stricter military specs.
- The Bs use a plug-in nicad battery pack module. The Cs use an internal lead-gel battery.

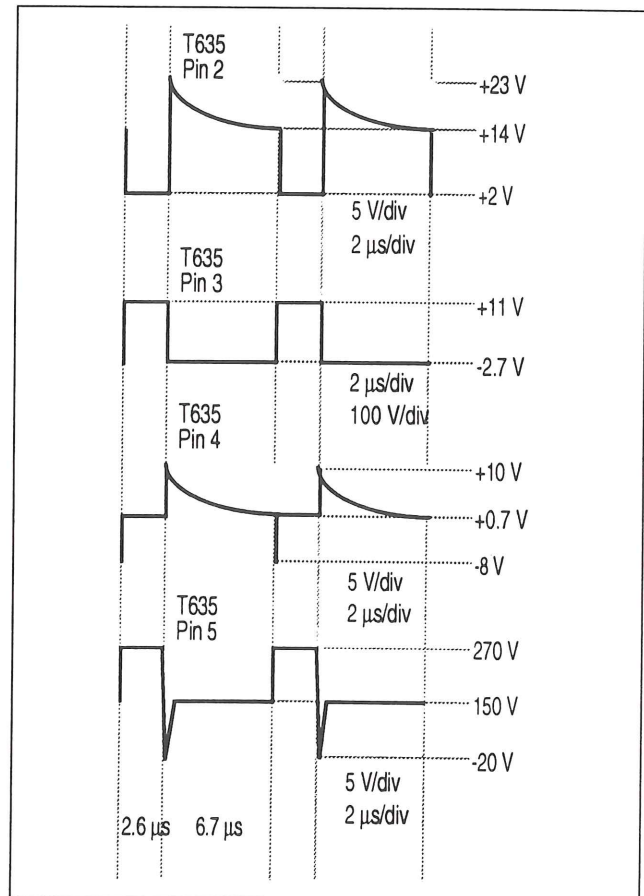
Replaceable parts for the B01XXXX Cs will continue to be available. Converting a B01 to a B02 version C is not possible.

W2 Issue: 22-6

## 1750 Series: Low Voltage Power Supply Waveforms

REF: 1750 Series Instruction Manual,  
P/N 070-5664-00

The following set of waveforms was acquired at the input and output pins of T635 on the 1750 Series Low Voltage Power Supply board.



These waveforms should not be considered as absolute values. Instead, they are intended to provide the technician with additional troubleshooting information.

W2 Issue: 22-7

## 1900, 1910: Matching VITS Burst To Program Burst (Insertion Delay Switch Factory Ship Position)

REF: 1910 Service Manual,  
P/N 070-4523-00

Problems can occur when trying to match VITS burst to Program burst if the Insertion Delay switch is not in its default or "no offset" position. VITS insertion timing will

*(continued on following page)*

be outside the 10 degree range of the front panel Insert Subcarrier Phase Adjust pot. (See Adjustment Procedure Step 30.)

The Insertion Delay switch is a dip switch on the Sync and Memory board. **The No Offset or Factory Ship Position for this switch is: 1910 = 1 and 8 open, all others closed; 1900 = 1 open, all others closed.** These default switch positions ensure Genlock of the test signal generator to the program signal with no offset. Minor circuit offsets are eliminated using the front panel Insert Subcarrier Phase Adjust to match inserted VITS burst phase to Program burst phase. The Insertion Delay switch has  $\pm 8\mu\text{sec}$  range in 70nsec increments. The front panel pot has minimum 10 degree range total.

VITS mode does not use the Insertion Delay switch. When a customer uses the 1910 or 1900 as a Full Field Test Signal Generator it can be Genlocked to black burst. The generator can then be timed into the TV system using the Insertion Delay switch and the front panel pot. This functions the same as the front panel Genlock Timing Offset feature in the TSG Series generators.

W2 Issue: 22-7

### **2220, 2221, 2230: Variable Holdoff Potentiometer, Incorrect Part and Incorrect Part Number**

The variable holdoff pot, R9521, is a 50K ohm part, P/N 311-2135-00. A 2220 oscilloscope was found with no holdoff control. The holdoff pot was found to be only a 5K ohm part. The sweeps functioned normally but holdoff control did not work.

Also, the part number in the 2230 Service Manual is incorrect. Change R9521 in the Chassis parts to P/N 311-2135-00.

W2 Issue: 22-2

### **2245A, 2246A, 2246 1Y/2Y, 2246 Mod A, 2247A, 2252: Battery Failure Warning**

The warning that is occasionally displayed on the screen during Self Cal: "Warning Probable Battery Failure, Power On/Off to Verify" is nearly always caused by a Self Cal step failure and not the battery itself. Very few battery failures have been found.

This warning can normally be ignored as a battery indication. After a few seconds, the message disappears and the Self Cal routine continues. You can then proceed to identify the problem by the Self Cal routine.

W2 Issue: 22-2

### **2245A, 2246A, 2246 1Y/2Y, 2246 Mod A, 2247A, 2252: Part Number For Rear Feet**

REF: MOD # 77028

A part number has been established for the rear feet on the 2240 Series portable scopes (including 2252). The part number is for an individual foot and is 348-0919-00.

W2 Issue: 22-5

### **2402/A: AC Line Wiring**

REF: 2402 User's Manual,  
P/N 070-6977-00  
2402A User's Manual,  
P/N 070-7860-00

Manufacturing has informed us that the wiring on the line filter could be reversed, thus having the line fuse on the neutral side. All 2402s and 2402As below serial number B011716 could have this problem. Covers need not be removed to check for this.

*(continued on following page)*

To check for this problem, remove the power cord from the instrument. Next, using a T-10 torque bit, remove the two screws holding the line receptacle/filter and carefully slide it out. Inspect that the top wire on the line filter is a gray/brown, 9-1. The bottom wire should be a gray/blue, 9-6. If incorrect, reverse them and replace line filter. Power up the unit and check for proper operation.

W2 Issue: 22-8

### 7A13: BNC

A recent change by the vendor of the BNC, P/N 131-0679-00, has a slight change in the physical dimensions of the part. This change causes the BNC to still be loose when the washer and nut are installed.

To remedy this situation, the manufacturing line is adding a second washer, P/N 210-1039-00. It has been verified that adding the second washer will correct this situation.

If you need to replace the BNC and it will not tighten up properly, add the second washer, P/N 210-1039-00.

W2 Issue: 22-3

### 751: Decoupling Capacitor Changed To Improved Part

REF: 751 Instruction Manual  
P/N 070-7631-00  
MOD # 76801

Four power supply decoupling caps used within the 751 Stereo Demodulation Monitor have exhibited a greater than desired failure rate and have been changed to an improved part.

Failure symptoms associated with the degradation of C775, C870, C875 and C970 on the Stereo Processor board (A2) have been noted as one or more of the following:

- During a calibration cycle, an error message would indicate that calibration of the L+R, L-R, L or R signal could not be completed.
- After a successful calibration, with monophonic signal components present in a BTSC broadcast signal, L, R, and L+R would not match.
- After a successful calibration, with stereo signal material having balanced audio levels present, L and R signals would not match on average.

The solution for this fault will be to install parts kit 050-2920-00. This kit contains four new capacitors and appropriate installation instruction.

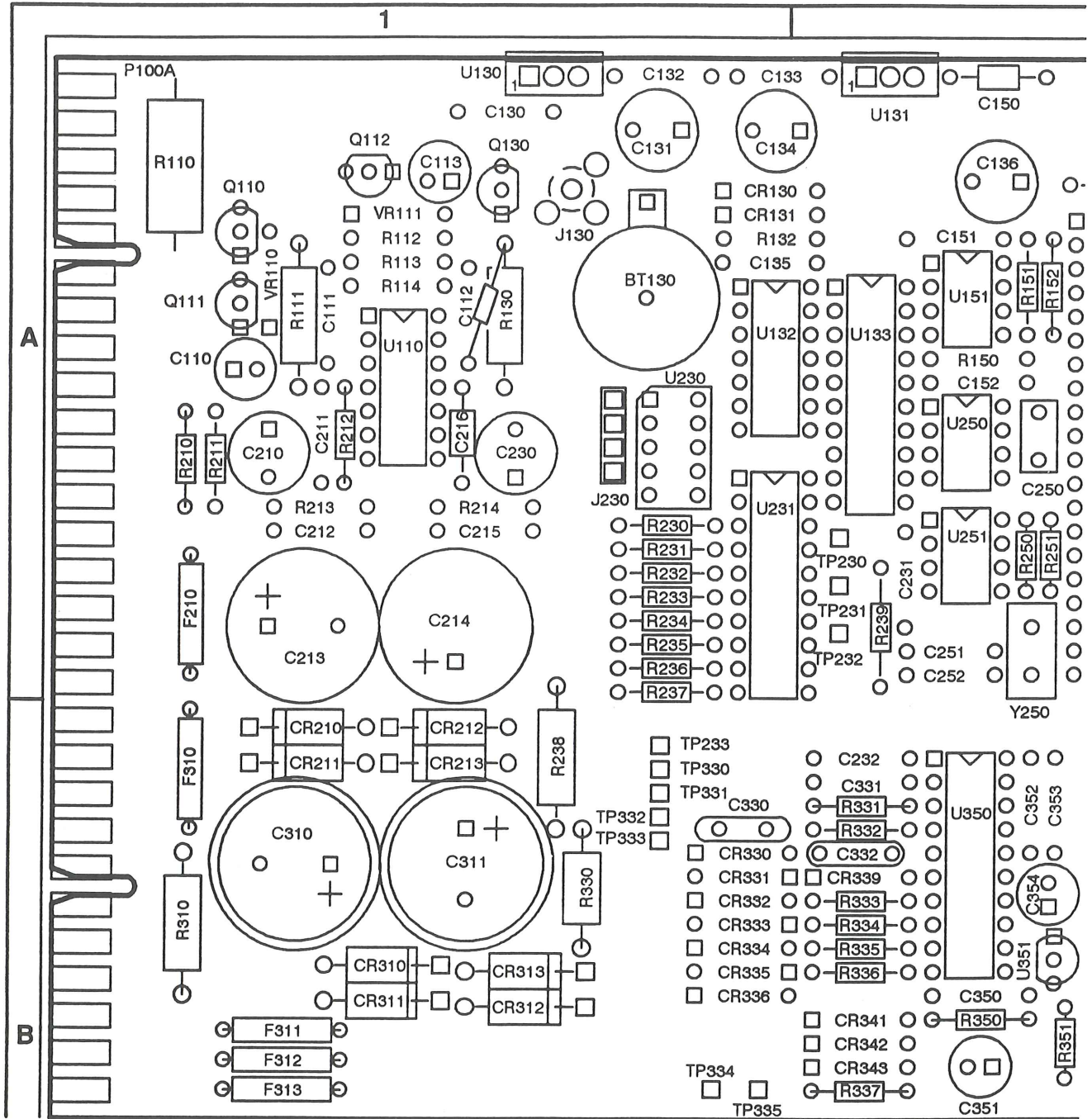
Note: 751 owners of record have been notified of the problem, and have been offered a free parts kit upon return of a reply card. Customers that may not have received the letter announcing the availability of this kit should be referred to their TV Sales Engineer immediately.

Those few customers that may desire to have the kit installed by Tektronix may send the 751 to a designated service center for a routine calibration (C2). The kit will be installed at no additional charge.

New 751s from the factory and Stereo Processor boards obtained from TV Board Exchange will have the improvement installed starting immediately.

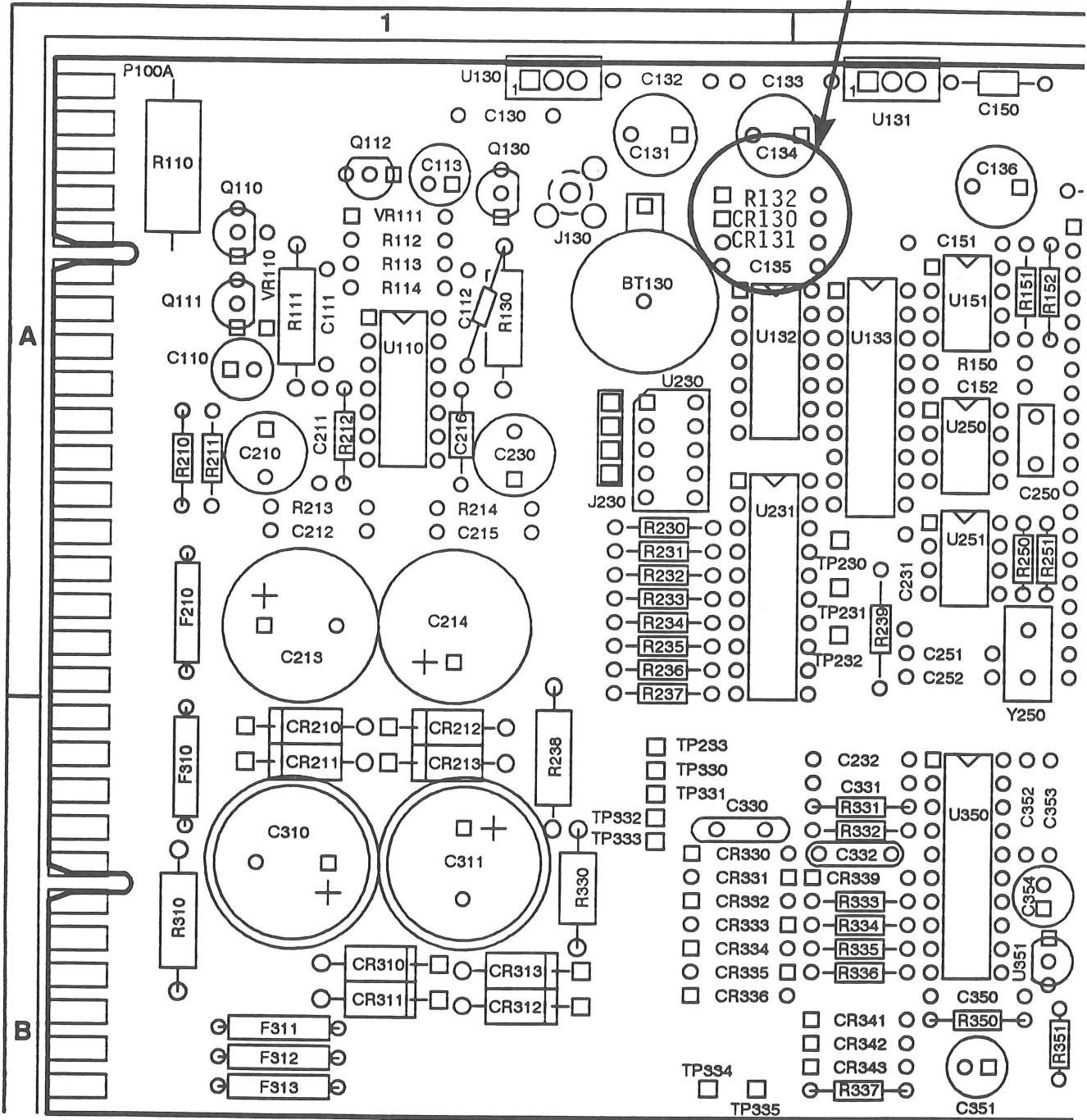
W2 Issue: 22-7

BEFORE



# AFTER

Affected Components





**Table 2-1 – Measurement Limits, Specifications, Adjustments, and Functional Test (cont)**

<b>Part and Description</b>	<b>Measurement Limits (Examine)</b>	<b>Specifications (Check)</b>	<b>Adjustments (Adjust)</b>	<b>Functional Test</b>
<b>Part 9 Vertical Accuracy</b>				
Vertical Gain	none	±1.0% full scale	none	yes
Offset Accuracy	none	±2 mV	none	yes
Vertical Linearity	none	±1%	none	no
<b>Part 10 System Vertical RMS Noise</b>	200 μV at 2 mV/div 500 μV at 5 mV/div 1 mV at 10 mV/div 632 μV at 20 mV/div 1.58 mV at 50 mV/div 3.16 mV at 100 mV/div 6.32 mV at 200 mV/div	none	none	yes
<b>Part 11 Sweep Rate Accuracy</b>	.05% at 2 ns/div .05% at 1 ns/div 1% at 100 ps/div 5% at 10 ps/div 20% at 1 ps/div	none	none	yes
<b>Part 12 Triggering</b>				yes
200 MHz Sensitivity	40 mV p-p at 200 MHz	40 mV stable display	none	
800 MHz Sensitivity	150 mV p-p at 800 MHz	150 mV stable display	none	
2.5 GHz Sensitivity	250 mV p-p at 2.5 GHz	250 mV stable display	none	
<b>Part 13 Internal Clock</b>				yes
Rise Time	≤2.5 ns	≤2.5 ns	none	
Frequency	100 kHz ±3%	100 kHz ±3%	none	
Duty Cycle	50% ±3%	50% ±3%	none	
<b>Part 14 Prescaler</b>	600 mV p-p at 2 GHz 600 mV p-p at 8 GHz 2 V p-p at 10 GHz	600 mV stable display 600 mV stable display 2 V stable display	none none none	yes
<b>Part 15 Calibrator Output</b>				yes
Rise Time	≤250 ps (20% – 80%)	≤250 ps (20% – 80%)	none	
Peak-to-peak Amplitude	250 mV ±10%	250 mV ±10%	none	

## Test Equipment

The Table 2-2 (Test Equipment), contains suggested test equipment for use in this manual. Procedure steps are based on the test equipment examples given, but you may substitute other equipment with similar specifications. The use of different equipment may alter test results, setup information, and related connectors and adapters.

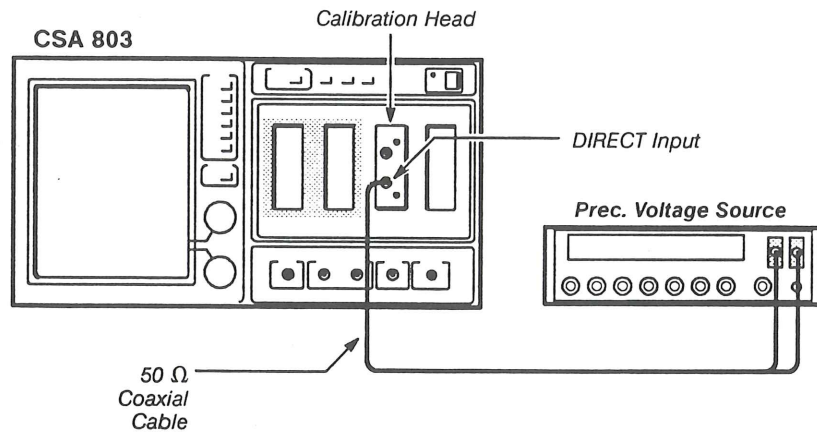
*Table 2-2 – Test Equipment*

Description	Minimum Specification	Examples of Applicable Test Equipment
High Frequency Sine Wave Generator	10 MHz to 10 GHz	WILTRON 6759B Opt 2
Sampling Head	SD-Series	Any Tektronix SD-Series Sampling Head
Digital Voltmeter (w/test leads)	≤0.005% Accuracy	FLUKE 8842A Digital Voltmeter
Calibration Generator	DC output, 0.25% accuracy 1 V output amplitude	TEKTRONIX PG 506 Calibration Generator with a TM 500-Series Power Module
Calibration Step Generator		TEKTRONIX 067-1338-0X Calibration Step Generator (where X represents either 1, 2, 3, 5, or 6 depending on the power supply appropriate for your country)
Frequency Counter	One Part in 1,000,000 Accuracy	TEKTRONIX DC 5010 Universal Counter/Timer with a TM 5000-Series Power Module
Calibration Head		TEKTRONIX Calibration Head 067-1413-00
Precision Voltage Source		DATA PRECISION 8200
Test Terminal	Any GPIB (IEEE-1978) controller, or ASCII terminal equipped with an RS-232-C port. Requires compatible RS-232-C serial interface cable	Compaq Portable II PC with terminal emulation software
Coaxial Cable, 50 Ω (3 required)	50 Ω, 36-inch, male BNC connectors	Tektronix Part 012-0482-00

**Part 9**  
**Vertical Accuracy**

This part shows the setups and lists the procedures to check the vertical accuracy of the CSA.

**Setup to Check Vertical Gain**



Setup to Check Vertical Gain

**Procedure to Check Vertical Gain**

- Step 1: Install a Calibration Head (067-1413-00) into the position shown in the setup diagram (CH 1/CH 2 slot). If the unit was in Standby mode, set the power switch to ON. Set the Precision Voltage Source to 0 V and connect it to Channel 2 of the Calibration Head.

**Note:** If powering up from a cold start, The diagnostics will report an error using the Calibration Head. The report will indicate a **Time Base** error. To clear this, exit the diagnostics. Then, ignore the subsequent time base calibration failure notice and continue with the following steps.

- Step 2: Initialize the mainframe as follows:
  - UTILITY button ..... press
  - Initialize** (in major menu) ..... touch
  - Initialize** (in verification pop-up menu) ..... touch
- Step 3: Trigger the CSA as follows:
  - TRIGGER button ..... press
  - Source** (in major menu) ..... touch
  - Internal Clock** (in pop-up menu) ..... touch

- Step 4: Identify the trace as follows:
  - Def Tra icon ..... touch
  - Identify Channel (2) ..... touch
  - Select **Enter Desc** ..... touch

- Step 5: Set the mainframe Vert Offset as follows:
  - Vert size icon ..... touch
  - Set **Vert Size:M2** to 2 mV/div ..... dial / upper knob

- Step 6: Set Averaging as follows:
  - Acquire Desc** (in major menu) ..... touch
  - Average N** (in pop-up menu) ..... touch

- Step 7: Select the Mean Measurement as follows:
  - MEASURE button ..... press
  - Measurements** (in major menu) ..... touch
  - Mean** (in the **Measurements** pop-up menu) ..... touch
  - Compare & References** (in major menu) ..... touch
  - Save Current Meas Values as References** (in pop-up menu) .... touch
  - Compare off** (to **on** in pop-up menu) ..... touch

- Step 8: Set the Voltage source to 8 mV.
  - Select **Remove/Clr Trace** (in major menu) ..... touch
  - Select **Clear Trace** (in pop-up menu) ..... touch

- Step 9: Wait for averaging to complete. Then, check that the  $\Delta$ Mean value is to be within 7.8 mV (lower spec) and 8.2 mV (upper spec).

*Note: Averaging will complete faster if you exit the measurement menu and then return when averaging is complete. Alternatively, use the dial to move the Main Size setting two notches higher than the default setting.*

- Step 10: Change the polarity of the voltage differential coming from the precision voltage Source. Check that the  $\Delta$ Mean value is between -7.8 mV and -8.2 mV.

- Step 11: Refer to Table 2-3 and check actual results against the table specifications for the setting levels indicated.

*Note: Specifications are percent of full scale at each volts/div setting. Example: at 5mv/div full scale for 10 div is 50 mV, which gives an upper and lower spec tolerance of +0.5mV and -0.5mV.*

**Tektronix®**

**MANUAL CHANGE INFORMATION**

Date: 11/4/92

Change Reference: C1-1192

Product: DSA 600 Series Service Reference

Manual Part No: 070-8184-00

DESCRIPTION

**FOR DSA 601 ONLY**

The following information should be added to **Checks and Adjustments** section, **Procedure 9 Field Calibration**, page 2-45, **Step 6: Start the Checks and Adjustments Software.**

The Checks and Adjustments Software, part number 063-0112-02, contains a bug in one of the files. To correct this problem copy the DSA602.EIS file to the DSA601.EIS file.

**Example:** copy A: DSA602.EIS A: DSA601.EIS



Date: 11/12/92

Change Reference: C4-1092

Product: 11A72 Service Reference

Manual Part No: 070-7257-00

## DESCRIPTION

Effective for Serial Numbers: All

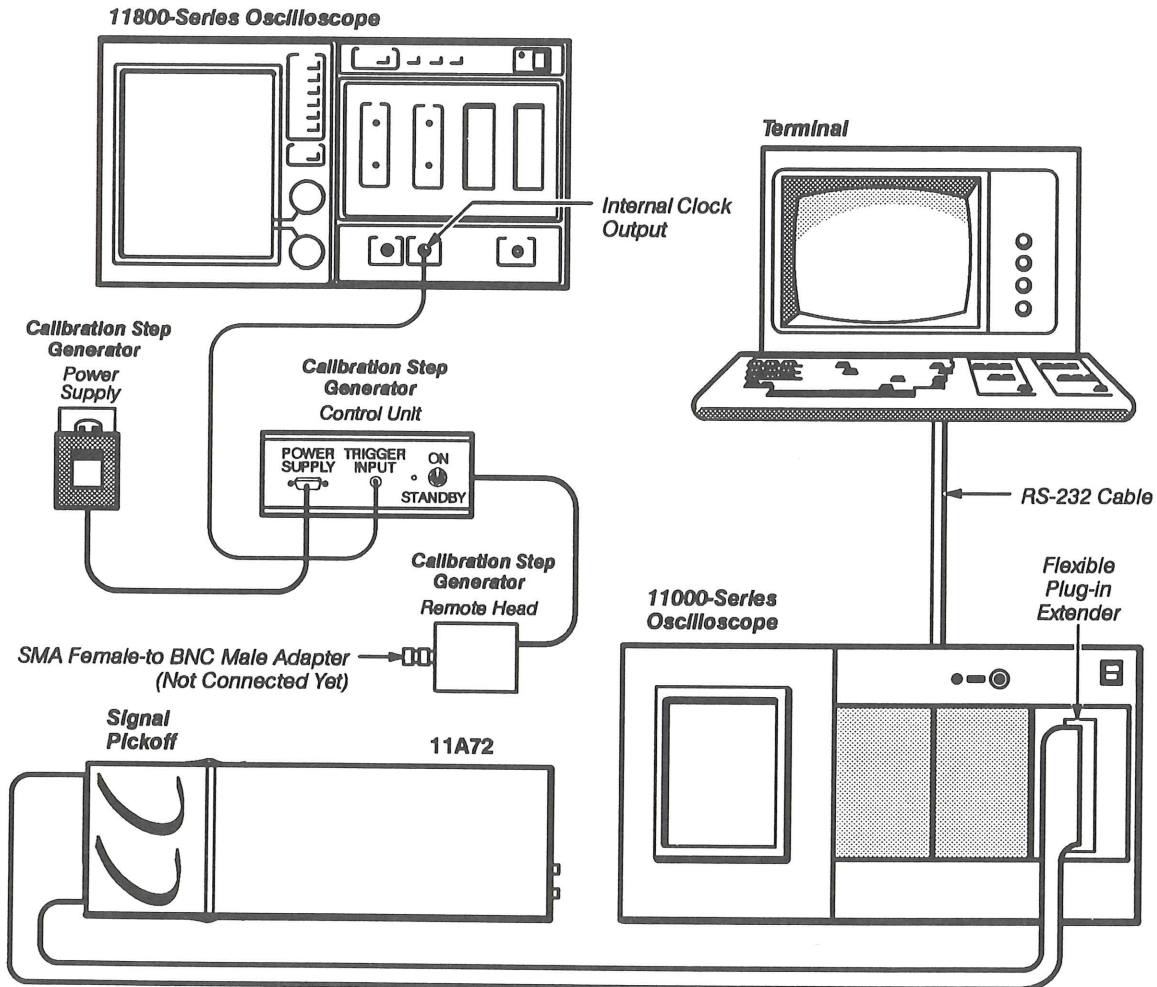
Pull and Replace the following pages:

Pages 2-3 thru 2-6

Pages 2-15 thru 2-18

Add the following information to Checks and Adjustments, Part 6 Step Response.

### Standard Setup to Examine/Adjust Step Response



Standard 11801A/CSA 803 Setup to Examine/Adjust Step Response

**Table 2-2 — Test Equipment (cont)**

<b>Description</b>	<b>Minimum Specification</b>	<b>Examples of Recommended Test Equipment</b>	<b>Functional Test</b>
Flexible Plug-in Extender		TEKTRONIX 067-1261-00 Flexible Plug-in Extender	
Signal Pickoff	Provides output signal access	TEKTRONIX 067-1262-00 Signal Pickoff	
Terminal	Any terminal with an RS-232-C serial port	TEKTRONIX 4205 Color Graphics Terminal	
High Frequency Sine Wave Generator	250 MHz to 1000 MHz, leveled variable amplitude, 50 kHz or 6 MHz reference	TEKTRONIX SG 504 Leveled Sine Wave Generator with a TM 500-Series Power Module	✓
Signal Standardizer	Tektronix Calibration Fixture with interface connector modified for 11000-Series use	TEKTRONIX 067-0587-02 Signal Standardizer	✓
Calibration Generator	Period, 0.1 ms – 10 ms, variable amplitude to 100 V peak-to-peak, rise time, <1 ns aberrations after 1 μs <0.1%	TEKTRONIX PG 506 Calibration Generator with a TM 500-Series Power Module	✓
Power Supply	Continuously variable from 0–40 V; current limit adjustable from 0–400 mA	TEKTRONIX PS 503A Dual Power Supply with a TM 500-Series Power Module	✓
DC Voltage Calibrator	Output, 0–4 V	Data Precision 8200	✓
Digital Multimeter (w/test leads)	Accuracy ≤0.01%	Fluke 8842A Digital Multimeter	✓
Serial Cable	RS-232-C Cable	Tektronix Part 012-0911-00	✓
Coaxial Cable, 18"	50 Ω, 18-inch male BNC connectors	Tektronix Part 012-0076-00	✓
Coaxial Cable, 36"	50 Ω, 36-inch, male BNC connectors	Tektronix Part 012-0482-00	✓
Adapters	BNC female-to-alligator clip	Tektronix Part 013-0076-00	✓
	BNC female-to-dual banana (2 required)	Tektronix Part 103-0090-00	✓
	Coaxial pin receptacle (4 required)	Tektronix Part 103-0169-00	
	SMA male-to-coaxial pin (4 required)	Tektronix Part 175-7420-00	
	SMA male-to-BNC female	Tektronix Part 015-1018-00	



**Table 2-2 — Test Equipment (cont)**

<b>Description</b>	<b>Minimum Specification</b>	<b>Examples of Recommended Test Equipment</b>	<b>Functional Test</b>
Adapters (cont)	SMA female-to-BNC male	Tektronix Part 013-0126-00	
Connector, T	BNC, T: two female and one male BNC connector	Tektronix Part 103-0030-00	✓
Resistor	430 Ω; tolerance, 10%; power rating, 1 W	Tektronix Part 303-0431-00	✓
Termination, 50 Ω (2 required)	Impedance 50 Ω SMA connectors	Tektronix Part 015-1020-00	
Attenuator, 2X	6 dB attenuation, 50 Ω, one male and one female BNC connector	Tektronix Part 011-0069-02	✓
Attenuator, 5X	14 dB attenuation, 50 Ω, one male and one female BNC connector	Tektronix Part 011-0060-02	✓
Alignment Tool (insulated slot)	Insulated slot	Tektronix Part 003-0675-01	
Magnetic Screwdriver	Holder for Torx tips	Tektronix Part 003-0293-00	
Torx Screwdriver Tips	#6 tip #7 tip #8 tip #9 tip #10 tip (narrow shank) #15 tip	Tektronix Part 003-1415-00 003-1293-00 003-0964-00 003-0814-00 003-0815-00 003-0966-00	
Integrated Circuit Extracting Tools	IC insertion-extraction pliers, 28-pin type	General Tool P/N U505BG or equivalent	
24-pin Socket		Tektronix Part 136-0751-00	
Needle-nose pliers			
Tweezers			
Static Control Mat		Tektronix Part 006-3414-00	
Wrist Strap		Tektronix Part 006-3415-00	

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## Using These Procedures

The first-time user should familiarize themselves with the proceeding information prior to performing the procedures in the parts that follow:

### Conventions in this Manual

In these procedures, the following conventions are used:

- CAPITAL letters within the body of text identify front panel controls, indicators, and connectors on the oscilloscope (for example, MEASURE) and amplifier.
- **Bold** letters identify menu labels, display messages, and commands typed in from a terminal or controller.
- Initial Capital letters identify connectors, controls, and indicators on associated test equipment (for example, Position).
- In some steps, the first word is italicized to identify a step that contains a performance verification and/or an adjustment instruction. For example, if *Check* is the first word in the title of a step, an electrical specification is checked. If *Adjust* appears in the title, the step involves an electrical adjustment. If *Examine* is the first word in the title, the step involves measurement limits that are used as calibration guides; these limits are not to be interpreted as electrical specifications.
- An instruction that has a symbol in front of it gives specific information on how to execute a function on a particular oscilloscope. An experienced user could by-pass this specific information to perform the parts in this section more expediently.

Table 2-3, Oscilloscope Symbols, lists the symbols used in this manual and the particular oscilloscope to which they pertain.

*Table 2-3 —Oscilloscope Symbols*

Symbol	Oscilloscope Type
▲	11300-Series Oscilloscopes
◆	11400-Series Oscilloscopes

### Initialized and Stored Settings

At the beginning of most steps, you are instructed to **Initialize** the oscilloscope as part of the setup. The **Initialize** feature, available through the UTILITY menu, presets all oscilloscope controls and functions to known values. Initializing the oscilloscope at the beginning of a step eliminates the possibility of settings from previous parts causing erroneous or confusing results.

### Menu Selections and Measurement Techniques

Details on measurement techniques and instructions for making menu selections are generally not included in this manual. Comprehensive descriptions of

11400-Series Oscilloscope

Acquire Desc pop-up menu ..... Average N to On  
..... Set Avg N to 4  
Vertical Desc ..... touch  
\* ..... touch  
1 ..... touch  
Enter Desc ..... touch  
Main Size ..... 5  $\mu$ s/div

- Step 7: Touch the vertical icon, and then set the **Vert Mag** to 1 mV/div.
- Step 8: Set the **Vert Pos** so that the trace is on the horizontal centerline.
- Step 9: *Examine* that the waveform aberrations are less than 0.25 divisions in height after the first 2  $\mu$ s from the rising edge of the waveform (0.25% of the step amplitude).



*DO NOT attempt to adjust the low-frequency compensation adjustment CH 1 VTHERM (or CH 2 VTHERM for CH 2) if the waveform is within the stated limits or if you are only performing a functional test. Proceed to Step 6.*

- Step 10: *Adjust* the low-frequency compensation adjustment CH1 VTHERM (or CH2 VTHERM for CH2) on the A1 Main board for the flattest trace possible after 2  $\mu$ s from the rising edge of the waveform.
- Step 11: Repeat all of this part for CH 2.

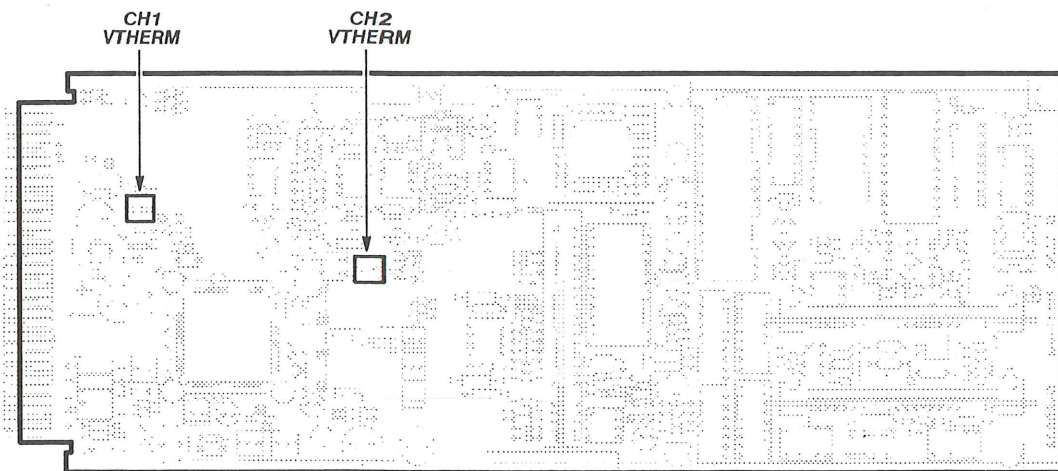


Figure 2-2 Low-Frequency Compensation Adjustment Locations

## Part 6 Step Response



This part provides two standard and one alternative setup and the steps to examine/adjust the trigger step response so that it matches the display step response. The standard procedures require the use of 11800-Series sampling equipment and the alternative procedure requires the use of 7000-Series sampling equipment. Prior to performing the standard procedure you must perform the Procedure to Calibrate a Sampling Head.

Since the adjustments in Parts 5 and 6 are interrelated, perform these parts in numerical order.

You can perform this part with the 11A72 Amplifier installed in the following oscilloscopes:

- ◆ 11400-Series Oscilloscopes
- ▲ 11300-Series Oscilloscopes

Prior to performing this part, complete these preliminary steps:

- Locate the CAL LOCK jumper pins, J450, on the A6 Time Base board of the 11400-Series Oscilloscope, and install a black short circuit jumper across the pins; or, locate DIP switch 5 on the A11 Main Processor board of the 11300-Series Oscilloscope, and set the switch to the closed position.
- Locate the J850 jumper pins on the 11A72 Amplifier, and install the black short circuit jumper so that it is in the UID position (see Figure 3-1).
- Determine the baud rate of your terminal.
- Set the **Baud Rate** on the 11000-Series oscilloscope to match the baud rate of the terminal you are using as follows:
  - ◆ Press the UTILITY button, and then touch **RS232C Parameters**.
  - ◆ Set the **Baud Rate** to match the baud rate of the terminal you are using.
  - ◆ Set **Echo** and **Verbose** to **On**.
  - ▲ Press the UTILITY button, and then touch **RS232**.
  - ▲ Touch the  icon or the  icon to set the **Baud Rate** to match the baud rate of the terminal you are using.
  - ▲ Type : e <cr>  
          V <cr>  
          on the terminal keyboard (<cr> represents the return or enter key).

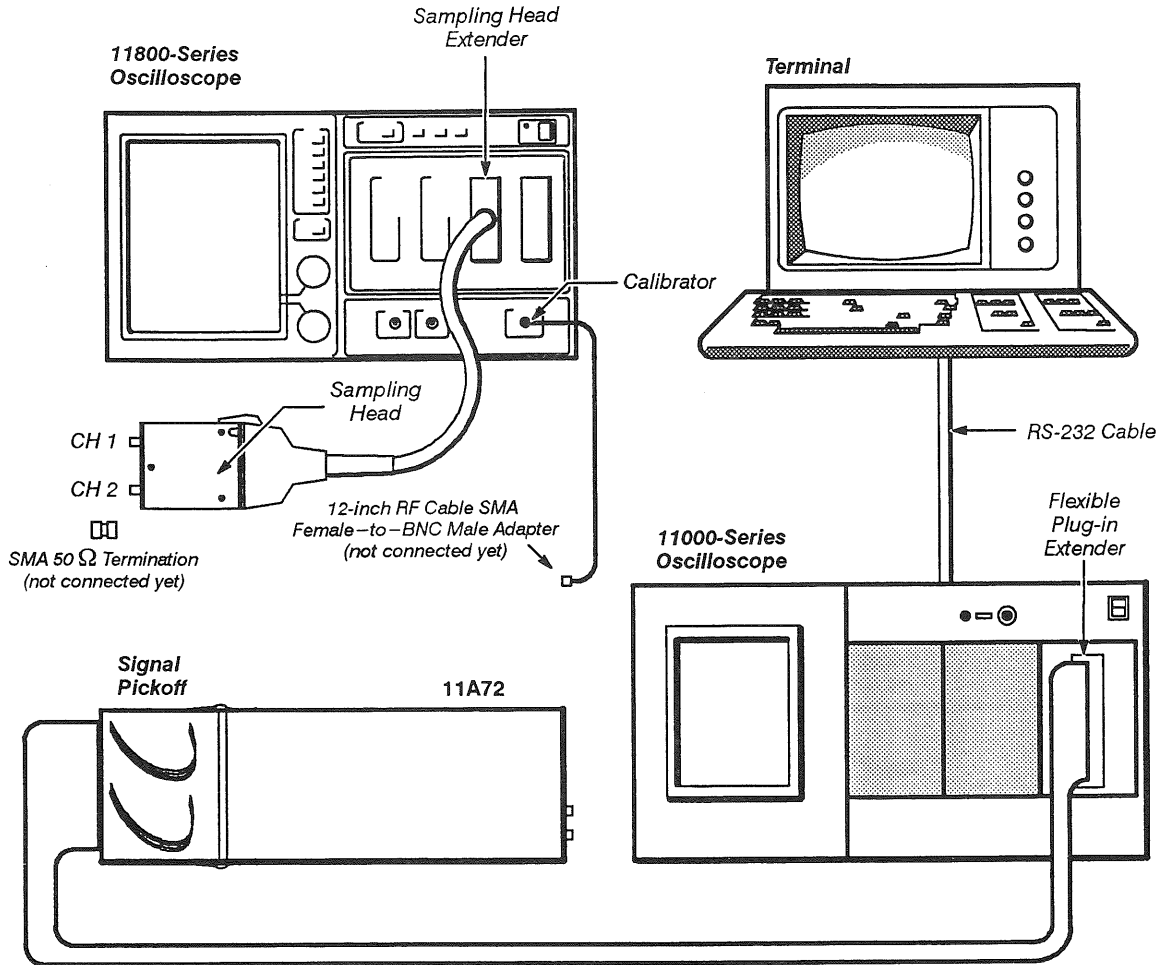
Connect all equipment as shown in the setups.

### Measurement Limits

The measurement limits for this part are as follows:

- The first overshoot and first undershoot of the Display high-frequency aberrations must be of equal magnitudes.
- The 11A72 Amplifier Display and Trigger signals must match each other within 3% for the first 4 ns after the rising edge.

Standard Setup to Examine/Adjust Step Response



Standard 11801/11802 Setup to Examine/Adjust Step Response

**Procedure to Calibrate a Sampling Head**

- Step 1: **Initialize** the oscilloscope settings, then perform the following settings in the order listed:
  - 11800-Series Oscilloscope ..... no settings required
  - Sampling heads ..... no settings required
- Step 2: Press the ENHANCED ACCURACY button.
- Step 3: Touch **Loop Gain**.
- Step 4: Touch the channel number to be calibrated and then **Automatic Calibrate** in the **Loop Gain Calibration** pop-up menu.

- Step 5: Connect the 12-inch RF cable from the CALIBRATOR output to the sampling head input channel to be calibrated.
- Step 6: Touch **Proceed** and then **Store Constants** in the **Loop Gain Calibration** pop-up menu.
- Step 7: Disconnect the CALIBRATOR from the sampling head input.
- Step 8: Touch **Offset Null** in the ENHANCED ACCURACY major menu and then **Automatic Calibrate** in the **Offset Nulling** pop-up menu.
- Step 9: Connect a 50  $\Omega$  termination to the sampling head input.
- Step 10: Touch **Proceed** and then **Store Constants** in the **Offset Nulling** pop-up menu.
- Step 11: Touch **Exit**.

Repeat Steps 3 through 11 for the other sampling head channel.

Once both of the sampling head channels have been calibrated, ensure that the 11800-Series Oscilloscope's ON/STANDBY switch and PRINCIPAL POWER SWITCH remain in the ON position. If the oscilloscope is powered-off before performing this part, then the sampling heads must be recalibrated.

**Standard Procedure to Examine/Adjust Step Response**

- Step 1: **Initialize** the settings for both oscilloscopes shown in the setup, and then perform the following settings in the order listed:

```

11A72 Amplifier
  CH 1 display on/off ..... on
11000-Series Oscilloscope
  TRIGGER button ..... press
  Main Trigger Source ..... R1
  Vertical Size ..... 50 mV/div
Sampling head ..... no settings required
11800-Series Oscilloscope
  TRIGGER button ..... press
  Source ..... Internal Clock
  Def Tra ..... touch
  Avg( ..... touch
  Mainframe Channel ..... touch
  1 ..... touch
  - ..... touch
  Mainframe Channel ..... touch
  2 ..... touch
  ) ..... touch
  * ..... touch
  1 ..... touch
  Enter Desc ..... touch
  Vert Mag: Tra ..... 12.5 mV/div
    
```

**Table 2-1 – Measurement Limits, Specifications, Adjustments, and Functional Test (cont)**

Part and Description	Measurement Limits (Examine)	Specifications (Check)	Adjustments (Adjust)	Functional Test
<b>Part 9 Vertical Accuracy</b>				
Vertical Gain	none	±1.0% full scale	none	yes
Offset Accuracy	none	±2 mV	none	yes
Vertical Linearity	none	±1%	none	no
<b>Part 10 System Vertical RMS Noise</b>	200 µV at 2 mV/div 500 µV at 5 mV/div 1 mV at 10 mV/div 632 µV at 20 mV/div 1.58 mV at 500 mV/div 3.16 mV at 100 mV/div 6.32 mV at 200 mV/div	none	none	yes
<b>Part 11 Sweep Rate Accuracy</b>	.05% at 2 ns/div .05% at 1 ns/div 1% at 100 ps/div 5% at 10 ps/div 20% at 1 ps/div	none	none	yes
<b>Part 12 Triggering</b>				
200 MHz Sensitivity	40 mV p-p at 200 MHz	40 mV stable display	none	yes
800 MHz Sensitivity	150 mV p-p at 800 MHz	150 mV stable display	none	
2.0 GHz Sensitivity	250 mV p-p at 2.0 GHz	250 mV stable display	none	
<b>Part 13 Internal Clock</b>				
Rise Time	≤2.5 ns	≤2.5 ns	none	yes
Frequency	100 kHz ±3%	100 kHz ±3%	none	
Duty Cycle	50% ±3%	50% ±3%	none	
<b>Part 14 Calibrator Output</b>				
Rise Time	≤250 ps (20% – 80%)	≤250 ps (20% – 80%)	none	yes
Peak-to-peak Amplitude	250 mV ±10%	250 mV ±10%	none	

## Test Equipment

The Table 2-2 (Test Equipment), contains suggested test equipment for use in this manual. Procedure steps are based on the test equipment examples given, but you may substitute other equipment with similar specifications. The use of different equipment may alter test results, setup information, and related connectors and adapters.

**Table 2-2 – Test Equipment**

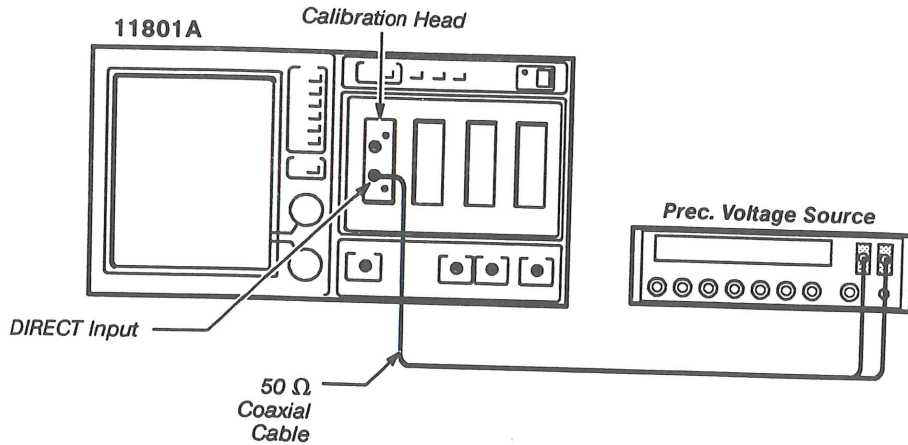
Description	Minimum Specification	Examples of Applicable Test Equipment
High Frequency Sine Wave Generator	10 MHz to 10 GHz	WILTRON 6759B Opt 2
Sampling Head	SD-Series	Any Tektronix SD-Series Sampling Head
Digital Voltmeter (w/test leads)	≤0.005% Accuracy	FLUKE 8842A Digital Voltmeter
Calibration Generator	DC output, 0.25% accuracy 1 V output amplitude	TEKTRONIX PG 506 Calibration Generator with a TM 500-Series Power Module
Calibration Step Generator		TEKTRONIX 067-1338-0X Calibration Step Generator (where X represents either 1, 2, 3, 5, or 6 depending on the power supply appropriate for your country)
Frequency Counter	One Part in 1,000,000 Accuracy	TEKTRONIX DC 5010 Universal Counter/Timer with a TM 5000-Series Power Module
Calibration Head		TEKTRONIX Calibration Head 067-1413-00
Precision Voltage Source		DATA PRECISION 8200
Test Terminal	Any GPIB (IEEE-1978) controller, or ASCII terminal equipped with an RS-232-C port. Requires compatible RS-232-C serial interface cable	Compaq Portable II PC with terminal emulation software
Coaxial Cable, 50 Ω (3 required)	50 Ω, 36-inch, male BNC connectors	Tektronix Part 012-0482-00



**Part 9**  
**Vertical Accuracy**

This part shows the setups and lists the procedures to check the vertical accuracy of the oscilloscope.

**Setup to Check Vertical Gain**



Setup to Check Vertical Gain

**Procedure to Check Vertical Gain**

- Step 1: Install a Calibration Head (067-1413-00) into the position shown in the setup diagram (CH 1/CH 2 slot). If the unit was in Standby mode, set the power switch to ON. Set the Precision Voltage Source to 0 V and connect it to Channel 2 of the Calibration Head.

*Note: If powering up from a cold start, The diagnostics will report an error using the Calibration Head. The report will indicate a **Time Base** error. To clear this, exit the diagnostics. Then, ignore the subsequent time base calibration failure notice and continue with the following steps.*

- Step 2: Initialize the mainframe as follows:
  - UTILITY button ..... press
  - Initialize** (in major menu) ..... touch
  - Initialize** (in verification pop-up menu) ..... touch
- Step 3: Trigger the oscilloscope as follows:
  - TRIGGER button ..... press
  - Source** (in major menu) ..... touch
  - Internal Clock** (in pop-up menu) ..... touch

**Part 9 Vertical Accuracy**

Step 4: Identify the trace as follows:

- Def Tra icon ..... touch
- Identify Channel (2) ..... touch
- Select **Enter Desc** ..... touch

Step 5: Set the mainframe Vert Offset as follows:

- Vert size icon ..... touch
- Set **Vert Size:M2** to 2 mV/div ..... dial / upper knob

Step 6: Set Averaging as follows:

- Acquire Desc** (in major menu) ..... touch
- Average N** (in pop-up menu) ..... touch

Step 7: Select the Mean Measurement as follows:

- MEASURE button ..... press
- Measurements** (in major menu) ..... touch
- Mean** (in the **Measurements** pop-up menu) ..... touch
- Compare & References** (in major menu) ..... touch
- Save Current Meas Values as References** (in pop-up menu) ..... touch
- Compare off** (to **on** in pop-up menu) ..... touch

Step 8: Set the Voltage source to 8 mV.

- Select **Remove/Clr Trace** (in major menu) ..... touch
- Select **Clear Trace** (in pop-up menu) ..... touch

Step 9: Wait for averaging to complete. Then, check that the  $\Delta$ Mean value is to be within 7.8 mV (lower spec) and 8.2 mV (upper spec).

*Note: Averaging will complete faster if you exit the measurement menu and then return when averaging is complete. Alternatively, use the dial to move the Main Size setting two notches higher than the default setting.*

Step 10: Change the polarity of the voltage differential coming from the precision voltage Source. Check that the  $\Delta$ Mean value is between -7.8 mV and -8.2 mV.

Step 11: Refer to Table 2-3 and check actual results against the table specifications for the setting levels indicated.

*Note: Specifications are percent of full scale at each volts/div setting. Example: at 5mv/div full scale for 10 div is 50 mV, which gives an upper and lower spec tolerance of +0.5mV and -0.5mV.*

**Table 2-2 – Test Equipment (cont)**

<b>Description</b>	<b>Minimum Specification</b>	<b>Examples of Applicable Test Equipment</b>
Coaxial Cable, RF	RF cable, 12 in., SMA connectors	Tektronix Part 174-1364-00
	RF cable, 8.5 in., SMA connectors	Tektronix Part 174-1120-00
Adapters	BNC female-to-male Dual Banana	Tektronix Part 103-0090-00
	BNC male-to-female Dual Banana	Tektronix Part 103-0035-00
	SMA male-to-BNC female (8 required)	Tektronix Part 015-1018-00
	SMA female-to-BNC male	Tektronix Part 013-0126-00
	SMA male-to-N male	Tektronix Part 015-0369-00
Power Divider, 50 $\Omega$	6 dB load isolation, 50 $\Omega$ , SMA connectors	Tektronix Part 015-1014-00
Termination, 50 $\Omega$	Impedance, 50 $\Omega$ ; accuracy, within 2%; connectors, SMA	Tektronix Part 015-1022-00
Attenuator, 10X	20 dB attenuation, 50 $\Omega$ , one male and one female	Tektronix Part 011-0059-02
Attenuator, 2X	50 $\Omega$ , SMA, one male and one female	Tektronix Part 015-1001-00
Power Supplies Troubleshooting Fixture		TEKTRONIX 067-1264-00 Extended Diagnostics 11000-Series Power Supplies troubleshooting fixture
Pickoff, 10X		Picosecond Pulse Labs 5520A

**Table 2-2 – Test Equipment (cont)**

<b>Description</b>	<b>Minimum Specification</b>	<b>Examples of Applicable Test Equipment</b>
Alignment Tool	Plastic hex	Tektronix Part 003-0301-00
	Insulated slot	Tektronix Part 003-0675-01
	Square Tip (ceramic)	Tektronix Part 003-1400-00
Magnetic Screwdriver	Holder for Torx head tips	Tektronix Part 003-0293-00
Torx Head Screwdriver	#10 tip	Tektronix Part 003-0814-00
	#15 tip	Tektronix Part 003-0966-00
	#20 tip	Tektronix Part 003-0866-00
External Loopback Connector	RS-232-C connector	Tektronix Part 013-0198-00
Shorting Strap	Two alligator clips on a short pigtail conductor	
Integrated Circuit Extracting Tool	IC Insertion-Extraction Pliers, 28-pin type	General Tool P/N U505BG or equivalent
Board Removal Tools	Straight-slot screwdriver, large	
	Torx-drive screwdriver. T-7, T-8, T-10, T-15, T-20, T-25	
	Allen (hex) Wrench, 1/16-inch	
	Nutdrivers, 3/16-inch, 1/4-inch, 7/16-inch	
	Needle-nose pliers	
Small Ruller	Half inch rullings	

**Tektronix®**

**MANUAL CHANGE INFORMATION**

Date: 9/13/92

Change Reference: C1-0992

Product: 11802 Service Manual

Manual Part No: 070-7047-01

DESCRIPTION

**Effective for Serial Numbers: All**

**Add the following information to Table 2-2, Test Equipment,  
Page 2-4:**

When procedures in the Vertical Sections require a Sampling Head,  
use a Tektronix, Inc. Calibration Head pn 067-1413-00.

