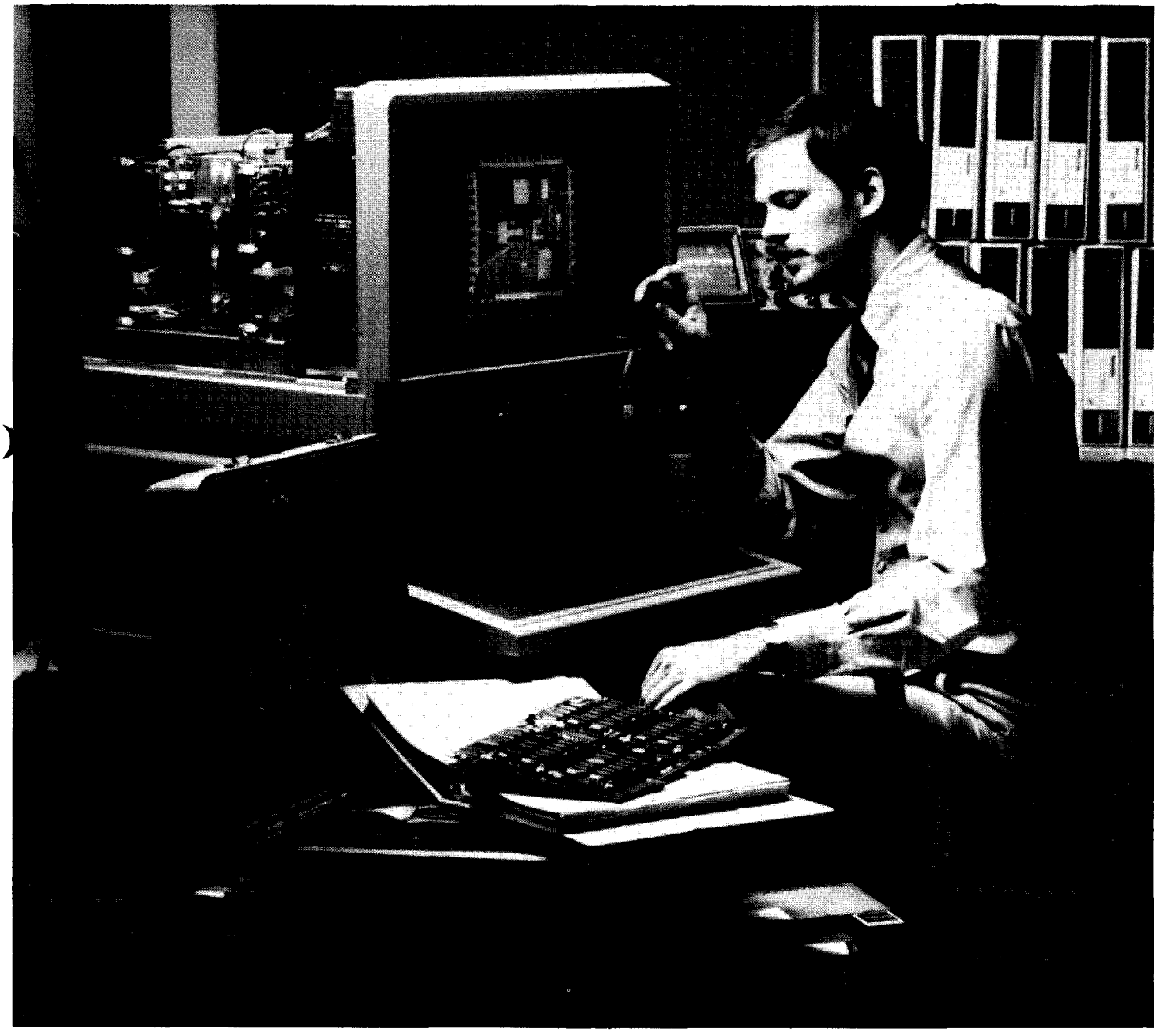
SERVICETEKNOTES



Published by Tektronix Service Administrative Support

Tektronix®
COMMITTED TO EXCELLENCE

TABLE OF CONTENTS

DM5010 ELECTRICAL PARTS REPLACEMENT LIST DISCREPANCY

It has been found that parts A16Q1320 and A16Q1420 located on schematic three are missing from the Replaceable Electrical Parts List.

The part number for these parts is 156-1527-00.

W2 Issue 14-17

DM5010 HIGH VOLTAGE MONITORING

When using any high voltage probe (Ex. 010-0277-00) with the DM5010 inaccurate readings will be displayed on lower ranges. The reason for this is input impedance at the meter. To ensure a 1% accuracy with this probe, a 10 Mega ohm input impedance at the meter is required. The DM5010's 200mV, 2V and 20V ranges have an input resistance greater than 1 gega ohm. The 200V and 1000V ranges provide proper input resistance, but provides only two digits of resolution. To enable the use of the lower ranges and maintain proper accuracy, a precision 10 mega ohm resistor can be strapped across the probe input at the meter.

W2 Issue 14-17

MEASURING AC VOLTAGE ON HIGH DC VOLTAGE (I.E. FILAMENT VOLTAGE)

AC voltmeters provide straightforward answers to simple questions such as: What is the average voltage of a 60-Hz sinewave? But if the waveform is nonsinusoidal or of a high frequency, the instrument's answer can be wrong. Wrong answers accepted at their face value caused some CRT reliability problems recently. This article describes how these wrong answers could have been avoided by using correct methods of measuring the voltages and currents of waveforms rich in harmonics.

Tektronix oscilloscopes generally use radio frequency (25 to 40 KHz) oscillator power supplies to generate high voltages for CRT operation. These supplies also provide the heater voltage, nominally 6.3 VAC - elevated to cathode potential. When measured with a typical average responding voltmeter, the heater voltage reads 6.3 VAC but when measured by a true RMS voltmeter, having sufficient bandpass, we found some heater voltages that exceeded the nominal value by as much as 13% or approximately 800 mv.

The resultant over-heating of the cathode had reduced the reliability of some of our products. Cathode engineers in the CRT Reliability Failure Analysis group have verified that the cathode emission of Tektronix CRTs is reduced 10% for every 100 mv the 6.3 VAC voltage exceeds the design nominal.

Because heater voltages are primarily determined by the number of turns on the secondary of the HV transformers, filament voltages are not routinely measured. However, these voltages should be measured during the transformer design, verified when design of the power supply is completed, and checked any time there is concern about premature CRT emission failure in a particular oscilloscope or family of oscilloscopes.

Measurement Method

CRT heaters are elevated to cathode potential to prevent cathode to heater conduction. Since these voltages can be as high as -10 KV (typically about -2 KV), AC powered RMS voltmeters cannot be used unless an isolation transformer rated at 15 KV or above is used to isolate the power line. Some battery powered meters can be used to measure the true RMS voltage of filaments accurately if their

(ARTICLE CONTINUED ON THE NEXT PAGE)

MEASURING AC VOLTAGE ON HIGH DC VOLTAGE (I.E. FILAMENT VOLTAGE) (CONT.)

frequency response is above 40 KHz; the Tektronix 213 Oscilloscope/DMM fits this requirement. The 213 is battery powered and its voltmeter function has a bandpass that permits AC RMS values to be determined to within 2% at 40 KHz.

It is critical that extreme caution be used in measuring heater potentials because the voltmeter will be at the cathode potential. Consult the voltmeter manual to ensure it has proper isolation characteristics to allow it to be safely used to make an elevated measurement. The instrument under test must be turned off (power removed) while attaching and removing the voltmeter connections.

Figure 1 shows the performance of five true RMS voltmeters including voltmeter accuracy and input impedance.

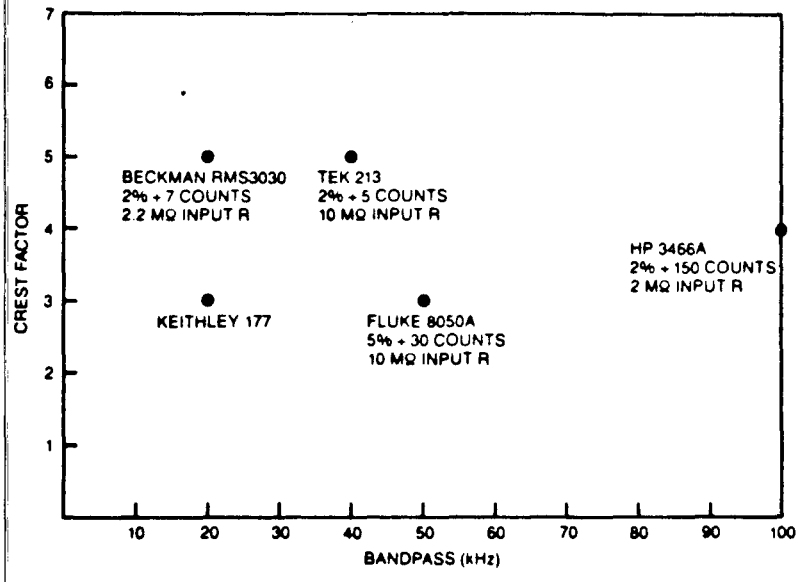


Figure 1. The performance of a few true-RMS voltmeters.

True RMS Measurements

Complex or random waveforms may be characterized by their total energy content as indicated by the root-mean-square (RMS) amplitude given from the formula:

$$\Psi = \sqrt{\frac{1}{T}\int_0^T (X(t))^2 dt}$$

where Ψ = RMS Value
T = Integration Time
$X(t)$ = Input Waveform

Effects on Measurement

Digital voltmeters (DVMs) typically measure voltage and current using one of two types of AC to DC converters.

The average-responding converter responds to the average voltage or current of the rectified wave times a constant (1.11 for a sine wave). If the waveform contains harmonics, the average value will vary as a function of the amplitude and phase of the harmonics. Therefore multiplying this average by a constant produces the wrong RMS reading.

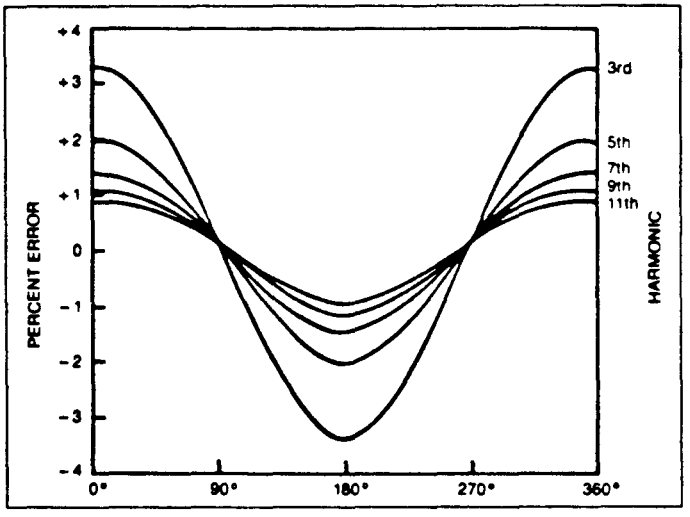


Figure 2. Error versus harmonic phase. The amplitude of each harmonic is 1% of the amplitude fundamental.

Since errors in average-responding converters are produced by harmonics in a waveform, the magnitudes of the

(ARTICLE CONTINUED ON THE NEXT PAGE)

MEASURING AC VOLTAGE ON HIGH DC VOLTAGE (I.E. FILAMENT VOLTAGE) (CONT.)

harmonics as well as the phase relationships of the harmonics to the fundamental waveform determine the amount of error. Figure 2 shows error percentages for several harmonics as a function of harmonic phase.

This error, caused by the magnitude of the distortion, can be calculated from the equation:

$$\text{Error} = Eh/(N*Ef)$$

where Eh = magnitude of the harmonics
Ef = magnitude of the fundamental
N = order of the odd harmonics

The true-RMS converter responds to the DC heating effects of the DC component in the rectified waveform, the heating effect of the fundamental, and each harmonic of the AC components. The true-RMS converter in essence sums each component of the waveform by the square root of the sum of the squares method. The converter analyzes the wave and "computes" RMS economically. Harmonic phase relationships do not effect the converter's response.

True-RMS Measurement Precautions

Typically, two interrelated reasons dictate the use of an RMS-responding instrument: a desire for accuracy and the need to measure nonsinusoidal waveforms. However, it is important to understand that even true-RMS instruments are subject to fundamental errors caused by the DC-coupling, inadequate crest factors, and low bandwidth.

DC coupling

Many waveforms contain a DC component. That is, the average voltage or current of the waveform isn't zero. Depending on the application, you may want to measure just the AC component; in other cases, the DC component is definitely part of the desired measurement result. Yet most AC voltmeters - true RMS or not - are not DC coupled. (AC-coupled circuits are simpler and less expensive to make).

Sizeable errors can result from omitting the DC term. Such DC-omission errors can be accounted for by separately measuring DC and AC and then performing some arithmetic:

$$V_T rms = \left[(V_{ac} rms)^2 + (V_{dc})^2\right]^{\frac{1}{2}}$$

This process is inconvenient and you may need to watch for error in the DC measurement if the DC voltmeter does not sufficiently reject AC.

Crest factor (CF)

Crest factor is the ratio of the peak value to RMS value of a waveform.

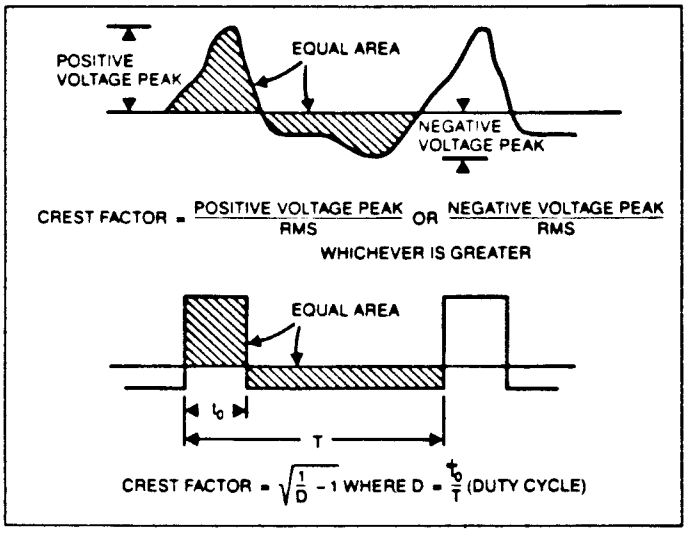


Figure 3. Definitions of crest factor.

Specification sheets for RMS voltmeters typically account for the effect of crest factor on dynamic range. All a specified crest factor really means is that signals lower

(ARTICLE CONTINUED ON THE NEXT PAGE)

MEASURING AC VOLTAGE ON HIGH DC VOLTAGE (I.E. FILAMENT VOLTAGE) (CONT.)

than the CF will not exceed the dynamic range of the instrument. But you should consider more than just dynamic range: i.e. bandwidth.

Bandwidth

Anyone familiar with Fourier analysis knows that you can produce any periodic waveform by the appropriate summation of harmonically related sinusoids. For a system (such as a voltmeter) to pass such a waveform it must respond to all of these sinusoidal components. If a given component is not faithfully transmitted through the system, then the error in transmitting that component shows up as an error in the RMS value indicated by the voltmeter.

It is interesting to note that although the primary reason for using RMS voltmeters is to measure accurately the voltage of a nonsinusoidal waveform, bandwidth specifications are always determined using sinewaves. This means bandwidth specs alone are inadequate.

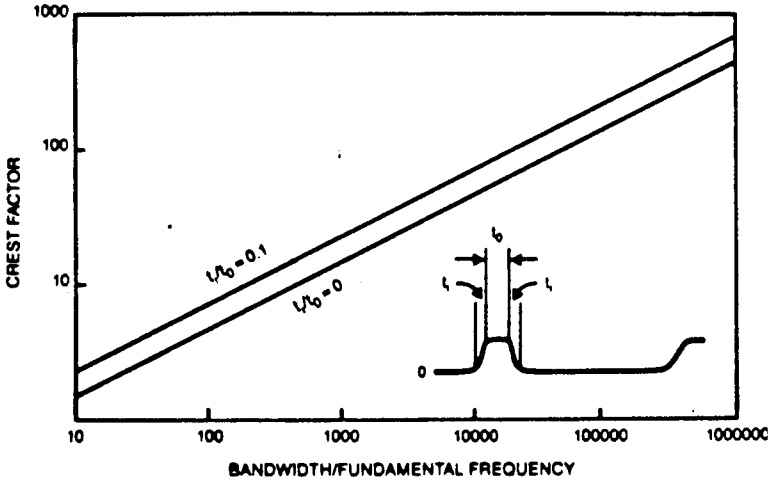


Figure 4. Bandwidths required to pass the RMS value of a train of rectangular pulses with 1% accuracy.

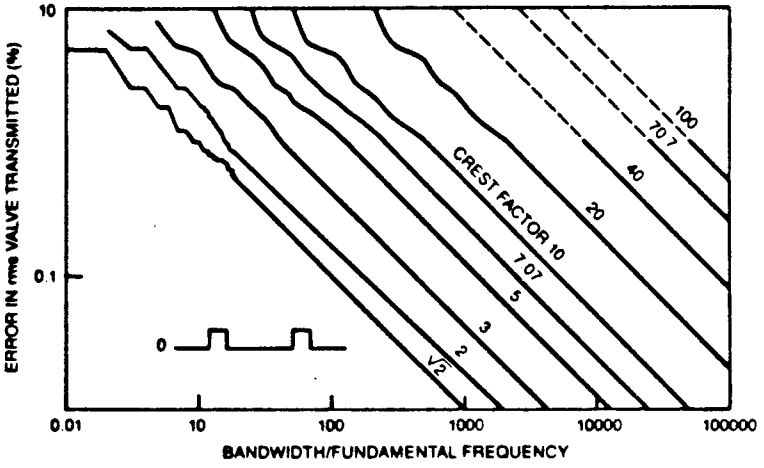


Figure 5. Error versus crest factor and bandwidth for rectangular pulse trains.

How much error will you get if the voltmeter's bandwidth is limited? Figures 4 and 5 show the relationships between crest factors, bandwidth limits, and resulting transmission errors. These plots were made from data obtained by passing a given pulse train through various sharp-cutoff filters.

Figures 4 and 5 point out two important facts:

1. Precise voltage measurements (better than 0.1% accuracy) of waveforms with large crest factors require a measuring system with extreme bandwidth.

2. Low to moderate accuracy (1.0% to 0.1%) requires wide bandwidths where the crest factor is high.

Accuracy-bandwidth tradeoff

Unfortunately, design techniques that achieve high accuracy tend to limit bandwidths. Conversely, techniques that offer wide bandwidths usually result in lower accuracies.

Many digital RMS voltmeters boast accuracies around 0.1%, but most of

(ARTICLE CONTINUED ON THE NEXT PAGE)

MEASURING AC VOLTAGE ON HIGH DC VOLTAGE (I.E. FILAMENT VOLTAGE) (CONT.)

these have narrow bandwidths. These instruments are adequate only when the measured waveforms have low crest factors (below 4 or 5). For some measurements, more bandwidth at lesser accuracies would actually give better results.

W2 Issue 14-17

R7103 SERVICE MAINTENANCE INFORMATION

INTENT:

Provide supplementary or additional maintenance information not available in the Service Implementation Plan or Service Manual. Reference should be made to the published Service Implementation Plan dated July 27, 1984 and revision dated August 3, 1984.

ORIGINATOR: Ivan Jackson, PAE, 53-108, Ext. 8690 Merlo Road

I. DESCRIPTION

The R7103 is a seven inch high, three plug-in compartment (two verticals and one horizontal) rackmount, real time oscilloscope that features the 1 GHz vertical and the high photographic writing speed of the 7104. The R7103 is compatible with most 7000 series plug-in's. The plug-in's that are not compatible with the R7103 and the reasons for incompatibility are listed in the operators manuals.

II. MANUALS

A. OPERATORS MANUAL P/N 070-5038-00

The operators manual is divided into three sections of information to explain the operation of the R7103. Section 1 is general information containing an instrument description along with power requirements for operation. System electrical specifications and assessory information is also in this section. Section 2 provides complete operating instructions and preliminary check out procedures. Section 3 contains instrument option information.

B. SERVICE MANUAL P/N 070-5039-00

The service manual is divided into nine sections with all information you would expect to find, such as theory of operation, performance and adjustment procedures, schematics, electrical and mechanical parts lists, and a maintenance section which has complete troubleshooting information along with charts and diagrams.

III. SERVICE STRATEGY

The R7103 will be serviced at all currently established 7104 centers (Level III centers per the Service Equipment Manual) or self-serviced by the customer to the component level.

IV. TEST EQUIPMENT AND FIXTURES

No new test equipment is required for the R7103 beyond the equipment required to service the 7104.

W2 Issue 14-17

7B92A LOGIC BOARD EXTENDER AVAILABLE

A Logic Board (A7) extender is available for the 7B92A. The extender is orderable under part number

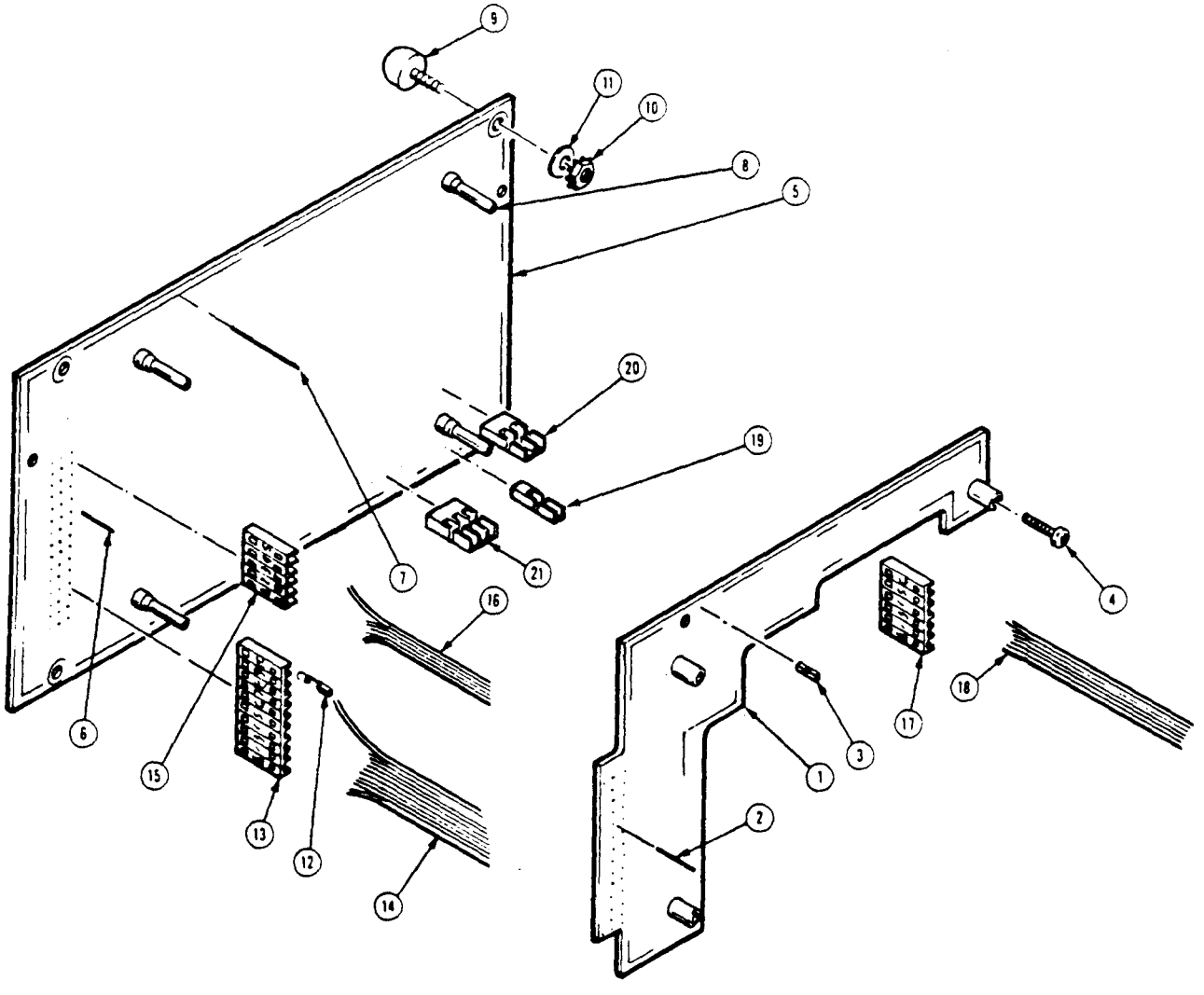
(ARTICLE CONTINUED ON THE NEXT PAGE)

7B92A LOGIC BOARD EXTENDER AVAILABLE (CONT.)

067-0725-00. This extender allows access to the circuits on the interface board (A6) and is to be used for basic circuit function checks and measurements only. Circuit calibration with the extender installed is not recommended.

LOGIC BOARD EXTENDER for 7B92A

Part No. 067-0725-00



THIS EXTENDER IS FOR TROUBLESHOOTING ONLY, NOT ADJUSTMENTS.

NO. ~~062-7393-01~~
DATE JUN 1984 (R)

COPYRIGHT © 1983
TEKTRONIX, INC.
ALL RIGHTS RESERVED.

(ARTICLE CONTINUED ON THE NEXT PAGE)

7B92A LOGIC BOARD EXTENDER AVAILABLE (CONT.)

067-0725-00 LOGIC BOARD EXTENDER

Fig & Index No.	Tektronix Part No	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	670-8481-00			1		CKT BOARD ASSY:40 X 8	80009	670-8481-00
-2	131-0589-00			51		.TERMINAL,PIN:0.46 L X 0.025 SQ	22526	48283-029
-3	136-0263-04			36		.SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
-4	211-0155-00			3		.SCREW,EXT,RLV B:4-40 X 0.375 INCH,SST	80009	211-0155-00
-5	670-8480-00			1		CKT BOARD ASSY:UPPER & LOWER LIMITS	80009	670-8480-00
-6	131-0589-00			45		.TERMINAL,PIN:0.46 L X 0.025 SQ	22526	48283-029
-7	131-0590-00			42		.CONTACT,ELEC:0.71 INCH LONG	22526	47351
-8	351-0188-00			4		.GUIDE-POST,LOCK:0.65 INCH LONG	80009	351-0188-00
-9	348-0048-00			4		.FOOT,CAMERA:BLACK VINYL,W/6-32 STUD	80009	348-0048-00
						.••••••••••••(ATTACHING PARTS)••••••••••		
-10	210-0457-00			4		.NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	83385	ORD BY DESCR
-11	210-0803-00			4		.WASHER,FLAT:0.15 ID X 0.032 THK,STL CD	12327	ORD BY DESCR
						.••••••••••(END ATTACHING PARTS)•••••••••		
	198-5382-00			1		WIRE SET,ELEC:	80009	198-5382-00
-12	131-0621-00			102		.CONNECTOR,TERM:22-26 AWG,BRS & CU BE GOLD	22526	46231
-13	352-0206-05			2		.HLDR,TERM CONN:10 WIRE GREEN	80009	352-0206-05
	352-0206-06			2		.HLDR,TERM CONN:10 WIRE BLUE	80009	352-0206-06
	352-0206-07			2		.HLDR,TERM CONN:10 WIRE VIOLET	80009	352-0206-07
-14	175-0833-00			AR		.WIRE,ELECTRICAL:10 WIRE RIBBON	08261	SS-1026-7
	----- -----			-		.(3,1 FT LENGTHS REQUIRED)		
-15	352-0201-05			2		.CONN BODY,PL,EL:5 WIRE GREEN	80009	352-0201-05
	352-0201-06			2		.CONN BODY,PL,EL:5 WIRE BLUE	80009	352-0201-06
	352-0201-07			2		.CONN BODY,PL,EL:5 WIRE VIOLET	80009	352-0201-07
-16	175-0828-00			AR		.WIRE,ELECTRICAL:5 WIRE RIBBON	08261	SS-0526-710610C
	----- -----			-		.(3,1 FT LENGTHS REQUIRED)		
-17	352-0202-00			1		.HLDR,TERM CONN:6 WIRE BLACK	80009	352-0202-00
-18	175-0829-00			AR		.WIRE,ELECTRICAL:6 WIRE RIBBON	08261	SS-0626-710610C
	----- -----			-		.(1 FT REQUIRED)		
-19	352-0197-00			2		.CONN BODY,PL,EL:1 WIRE BLACK	80009	352-0197-00
-20	352-0198-02			1		.HLDR,TERM CONN:2 WIRE RED	80009	352-0198-02
-21	352-0199-03			1		.CONN BODY,PL,EL:3 WIRE ORANGE	80009	352-0199-03
						STANDARD ACCESSORIES		
	062-7393-01			1		DATA SHEET:LOGIC BOARD EXTENDER	80009	062-7393-01

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

W2 Issue 14-15

606/606A MANUAL CORRECTION

Ref: 606 Service Manual, 070-2025-00
606A Service Manual, 070-2507-00

Please make the following corrections to the Electrical Parts Lists in the 606 and 606A Service Manuals:

Circuit Number	Part Number
CR693	152-0242-00
CR695	152-0242-00
CR696	152-0242-00

W2 Issue 14-16

1410 SERIES HARDWARE PROBLEM

RE: 1410 Instruction Manual, 070-2759-00
1411 Instruction Manual, 070-2322-00
1412 Instruction Manual, 070-2323-00

A possible problem exists with the screws that are used to attach the chassis side covers for the cabinet versions of the 1410, 1411 and 1412 mainframes.

The screws that are presently specified are longer than necessary, and protrude through the inside of the chassis. Because of the physical layout of the interior components, there is a possibility that the screw may contact the cables that are used to connect the chassis-mounted transistors to the power supply board.

Until a shorter screw has been part numbered, please insure that the affected cables are dressed away from the chassis mounted pem-nuts in order to prevent unnecessary electrical failures.

W2 Issue 14-16

1480 CHAN B OSCILLATION

RE: 1480 Manual, 070-2338-00

A recent customer complaint of oscillations in the Chan. B amplifier was cured by the replacement of several transistors in the minus amp.

The problem only occurred at the customer's transmitter site and was, therefore, nearly impossible to duplicate at the Service Center.

A small oscillation can show up as several types of anomalies.
- A response drop with IRE Filter selected.
- A compression of the signal on the bottom of the CRT display.
- Spurious signals at the AUX VIDEO out port.

At present, the only known cure is to select transistors in the minus amp, with transistors from Motorola appearing to function best.

W2 Issue 14-15

1480 SPARK GAP/LINE FUSE FAILURES

REF: 1480 Series Instruction Manual P/N 070-2338-00
Mod 53495

Some 1480's in certain locations have shown a tendency for the line fuse to open due to transients on the power line. The spark gap, E9400 (P/N 119-0181-00) will fire, thereby protecting the 1480 by opening the line fuse whenever transients of sufficient amplitude occur.

An improved method is now available to absorb the transients, and still allow the 1480 to continue functioning. The spark gap has been replaced with a MOV using kit #050-1912-00.

W2 Issue 14-15

1750 SERIES FREQUENCY RESPONSE

REF: 1750 Series Instruction Manual
P/N 070-4472-00

When using a swept sinewave signal to check or adjust the frequency response of a 1750, a small dip at about 2MHz may be seen. This is caused by the Sync Separator IC's (U 400) inability to handle non-video signals, and a circuit layout configuration that, together, may allow a small oscillation to occur in this area. The oscillation may also show up as a 1% Diff Gain area after the 1750 has been operating for a period of time.

To correct the problem, the emitter and base leads of Q615 have been removed from the circuit board, along with the corresponding ends of R702 and R701. These parts are then reconnected "teepee" fasion, raised off of the circuit board.

This change removes the affected circuitry from its proximity to other ECB runs, thereby, preventing the cross-coupling responsible for the oscillation.

W2 Issue 14-16

1910 EXCESSIVE GAIN

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

If a problem of excessive signal amplitude from the FULL FIELD OUT port is encountered, and R918 doesn't have sufficient range, one of the possible faults may be in the DAC IC (U715) and its associated circuitry. Of particular importance is the reference voltage applied to pin 4.

U632, which is a precision voltage reference, must be at 10 volts. This IC, when combined with U730 and its circuitry, is designed to deliver -1.000 volts to pin 4 of U715. A difference of a few millivolts here will make a substantial change in the Analog Out signal amplitude. For example in a recent case, the signal amplitude at FULL FIELD OUT was approximately double the desired amplitude when the VREF voltage was slightly less than 0.1 volts less than specified.

W2 Issue 14-16

1980 PROGRAM ERRORS

REF: 1980 Service Manual
P/N 070-2921-00

1980 Opt. 4 Manual
P/N 070-4655-00

1980 Opt. 5 Manual
P/N 070-4757-00

1980 Opt. 6 Manual
P/N 070-4791-00

1980 F04, F05, F06 Manual
P/N 070-4920-00

Due to some errors in the Opt. 4, 5 and 6 Applications firmware, some mods were written to implement the required solutions.

The first mod (52383) adds U311 (P/N 160-2334-00) and U351 (P/N 160-2335-00) to 1980 Opt. 4 assembly A44 at S/N B030276. The next mod (53929) changed U311 to P/N 160-2334-01 and U351 to P/N 160-2335-01 starting at S/N B040282. The third mod (53930) changed U311 to P/N 160-2334-02 and U351 to P/N 160-2335-02 starting at S/N B040308.

Some or all of the following problems will be taken care of by implementing the changes:

--Processor "hangs" during port setup
--Print bug in monitor mode
--NTSC Multiburst measurement bug
--Diff Gain/Phase measurement repeatability

(ARTICLE CONTINUED ON THE NEXT PAGE)

1980 PROGRAM ERRORS (CONT.)

--NTSC Vertical Interval Display bug
--PAL Vertical Interval location and display bug
--Fatal Error S-9 at 460 during monitoring

The correct parts are to be installed in 1980's that exhibit these problems. The affected boards are 672-1151-00, -01, or -02, (Opts. 4 & 5) which becomes 672-1151-03, or 672-0092-00 which becomes 672-0092-01 (Opt. 6).

A parts replacement kit is available to implement the change. Order 050-1926-00.

W2 Issue 14-17

1980 RTC/NVM BATTERY CURRENT

RE: 1980 Service Manuals, Vol. I and II, 070-2921-00, 070-4494-00

The Real Time Clock and Non-Volatile Memory circuits in the 1980 are designed to be kept electrically active during power-down situations by the use of battery back-up. Under normal circumstances, these batteries have adequate capacity to keep the circuits alive for several weeks. However, certain failure modes can cause higher than normal current drain, thereby shortening the "OFF" time available.

To verify that the current being drawn from the two batteries in question is not excessive, the following checks can be made using a DVM that is capable of reading mV (such as a DM501A):

- The voltage across R388 (schematic 5a) should be less than 5mV, as measured between TP388 and TP887.
- The voltage across R181 (schematic 5c) should be less than 65mV, as measured between TP180 and TP181.

W2 Issue 14-16

4006-1, 4051/52/52A DISPLAY BOARD MOD

Ref: 4006-1 Computer Display Service Manual P/N 070-1892-01

4051 Graphic Computer Service Manual P/N 070-2286-02

4052 and 4052A Graphic Computer System Parts and Schematics Service Manual P/N 070-2829-01

Corporate Mod #54922

The display board in the 4006-1, 4051/52/52A products is experiencing a high failure rate due to high AC line voltages causing the failure of R64, R339, and Q165. The failure of R64 can generate enough heat to scorch, or even burn, the board.

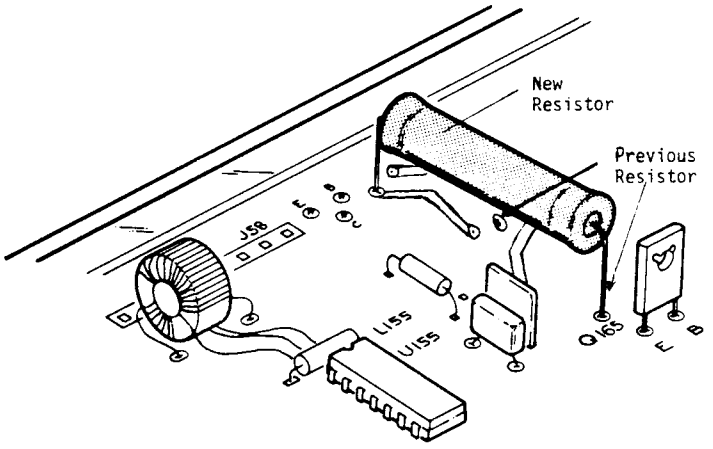


Figure 1

Corporate modification #54922 fixes this failure mode by changing the value, wattage and placement of R64, and changing the source voltage of the CE1/CE2 circuit from +320 volts to +185 volts. To accomplish this, R64 is physically repositioned. It now connects between the +185-volt source (R39) and the collector of Q165. Physically, it will be positioned as shown in Figure 1.

(ARTICLE CONTINUED ON THE NEXT PAGE)

4006-1, 4051/52/52A DISPLAY BOARD MOD (CONT.)

R64 changes from 68K 2W resistor, P/N 305-0683-00, to a 30K 8W resistor, P/N 308-0105-00. The Display board for the 4006-1 changes from a 672-0537-11 to a 672-0537-12 and the Display board for the 4051/52/52A changes from a 672-0546-11 to a 672-0546-12.

W2 Issue 14-17

4016/GMA125(A)/616 MAKING POOR HARD COPIES

Ref: GMA125 Instruction Manual, 070-2618-00
GMA125A Instruction Manual, 070-4895-00
4016 Service Manual, 070-2661-00
616 Instruction Manual, 061-2875-00

Many deflection amplifier boards in GMA125(A), 616, and 4016 products have been found with the wrong values for resistors R416 and R418. Rather than the 1.00K ohms specified in the schematic and parts list, the value of 287 ohms has been prevalent. Some boards have also had the same problem with R401 and R404. This may explain a number of problems encountered with hard copy units, as these resistors are in the ramp input circuits.

When investigating ramp-related hard copy problems and one of the products connected is a 25-inch display, check the values of R401, R404, R416 and R418 on the display's deflection board.

W2 Issue 14-17

4041 FIRMWARE CHANGES

There is now a new firmware version for the 4041. The new version 2.1 improves compatability with the 41XX graphics terminals, as well as improving internal memory management. Since these changes do not benefit all users, we have decided to continue availability of the version 2.0 firmware.

To provide the support for two versions more easily, the ROMs have been removed from the circuit boards. In addition, several new kits have been set up to provide V2.0 FOXX options, as well as firmware upgrade kits. Each ROM will also be individually orderable.
Due to the quantity of firmware on the CPU board, two 672 numbers have been set up for board exchange that already have the ROMs installed. The other boards will be supplied from board exchange without any firmware.

Please note that the 672 number is for board exchange use only, new CPU boards should be ordered using the 670 number.

The following list shows the part numbers available for the various kits and boards for both firmware versions.

(ARTICLE CONTINUED ON THE NEXT PAGE)

4041 FIRMWARE CHANGES (CONT.)

CPU board w/o firmware	670-7048-05	
I/O opt. board w/o firmware	670-7047-04	
	V. 2.0	V. 2.1
CPU with firmware (board exchange)	672-1174-00	672-1175-00
4041F01 (opt 1)	020-1324-00 plus 040-1131-00	4041 F01
4041F030 (opt 30)	020-1322-00 plus 040-1133-00	4041 F30
4041R01 (graphics) with F/W	020-1323-00	020-1323-10
Sys Ver Tape	062-5828-01	062-5828-03
CPU F/W Update Kit	040-1130-00	040-1130-10
Opt 1 F/W Update Kit	040-1131-00	040-1131-10
Opt 30 F/W Update Kit	040-1133-00	040-1133-10

W2 Issue 14-17

4109 HORIZONTAL DRIFT

REF: 4109 Computer Display Service Manual, P/N 070-4890-00

19-Inch Color Monitor for GMA301 and 4109 Service Manual, P/N 070-4899-00

Corporate Mod #55235

Malfunction:

Horizontal hold position drifts after a warm-up of 15 to 20 minutes. This drift can be tweeked out but may reappear at the next power up.

Solution:

A solution has been found to the horizontal drift problem as described above. Corporate modification #55235 corrects the horizontal drift by changing the temperature coefficient of a capacitor in the phase lock loop circuitry of the horizontal processor circuit. The capacitor is C642. It changes from a 285-0627-00 to a 283-0655-00. The deflection amp board changes from a 670-7686-02 to a 670-7686-03. When available the serial number break for this change will be published in the mod summary section of the 4109 microfiche.

W2 Issue 14-17

4115B RASTER BACKGROUND LUMINANCE GRADUALLY BECOMES VISIBLE

REF: Modification Number: M54608

A modification to the CRT socket board part number 670-7661-00 corrects for a gradual increase in the background luminance over a period of time. This is a condition of C214, C324 and C132 on the CRT socket board becoming leaky or having a high resistance short. It was determined the Monolithic ceramic capacitors C214, C324 and C132 exhibit inner layer migration when used in high impedance circuits. These capacitors have been changed to a new type and size: .1 uf, 400 volts, part number 285-1320-00.

When this condition occurs replace C214, C324 and C132 with a .1 uf, part number 285-1320-00, or replace the CRT socket board with a new board, part number 670-7661-01.

W2 Issue 14-17

4691 WASH STATION GASKETS

REF: 4691 Service Manual, 070-4498-00

The 4691 wash station gaskets are available as a separate part under part number 118-3854-00. The part number is setup for a quantity of one.

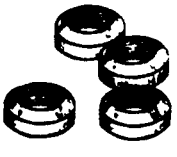


Figure 1.
Wash Station Gaskets

It is recommended that the wash station gaskets be checked whenever a 4691 is serviced. The ink used in the 4691 seems to have a deteriorative effect on said gaskets.

W2 Issue 14-17

4695 FEED/SELECT BUTTONS

REF: 4695 Service Manual, 070-4645-00

The FEED and SELECT buttons on the 4695 can fall off easily when the front panel board is removed from the cabinet top. These buttons are not available by themselves. Instead, the entire front panel board assembly kit, P/N 118-2934-00 must be ordered. This kit contains two buttons, two screws, two washers, a control board, a mounting bracket and a bezel.

W2 Issue 14-15

4695 PANEL REPLACEABLE

Ref: 4695 Service Manual, 070-4645-00

The front panel overlay on the 4695 is replaceable in the event of damage and can be ordered under the part number 118-3624-00. Please make this correction to your existing documentation.

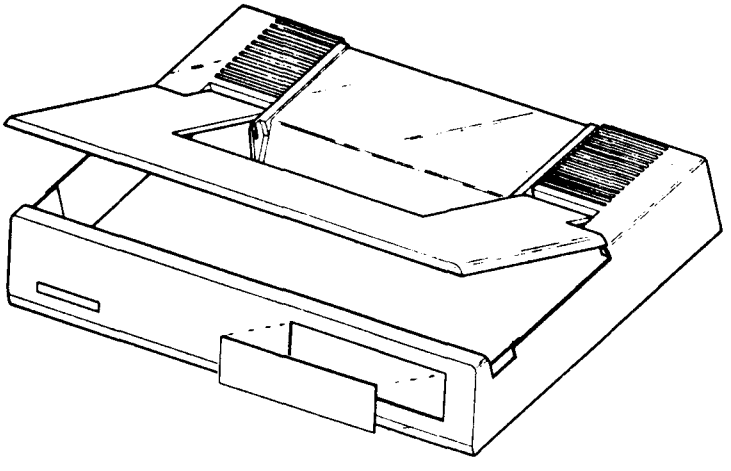


Figure 1
Front Panel Overlay; 118-3624-00

W2 Issue 14-15

7612D FAN DRIVE RELIABILITY IMPROVEMENT

Ref: Fig 8-27. Line Circuit board, assembly A80.

To prevent possible collector to base shorting of switching transistors A80Q501 and A80Q521, resulting in loss of Fan Drive Power, the installation of mica washers (P/N 342-0202-00) between the transistors and circuit board is recommended for all units.

W2 Issue 14-17

7912AD INTERNAL CABLE SECURING

Ref: Exploded View Figure 1 (Front and Rear)

The two cables index numbered 54 and 55 of exploded view figure 1 (front and rear) need to be secured to the front panel frame (index #73).

These cables have a metal shielding that is at ground potential. Failure to secure them could cause various component shorts to ground on the Scan Amp Board.

The securing of these cables requires the following parts:

1 ea.	211-0559-00	Screw, machine
1 ea.	210-0457-00	Nut, Pl, Assem
1 ea.	210-0863-00	Washer, Loop Clamp
1 ea.	343-0003-00	Clamp, Loop

The cable should be secured to the front panel frame at the vacant hole next to the hole where index #76 screw resides (refer to exploded view figure 1).

W2 Issue 14-17

7704A MAIN INTERFACE BOARD (A20) AVAILABILITY

REF: 7704A Manual P/N 070-1260-00

The 7704A main interface board (A20) as listed in the manual under part number 670-1880-02 is being deleted from CMS availability. It is being replaced with a more complete assembly under part number 672-0571-00 which includes the 670-4347-00 readout protection board (A51). The 670-4347-00 is still available.

W2 Issue 14-15

The Tektronix Service Organization firmly supports a policy of assuring continued utility of products sold by Tektronix.

This publication is meant to provide technical information to the customer who has decided to maintain his own Tektronix products. It contains product servicing information and is written for the technician.

Articles are submitted primarily by Corporate Service Support & Planning Personne. thoroughly familiar with the products they support. SERVICE TEKNOTES also encourages you 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, write it down so others may benefit from your experience.

Articles for publication should be submitted directly to:

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Attention: Janet Hemenway
SERVICE TEKNOTES Editor

Delivery Station: 53-102

The Editor and staff of SERVICE TEKNOTES provide the material in this publication as a service to users of Tektronix Products. While we have tried to be diligent in assuring the accuracy of the material which we have printed, we cannot guarantee its accuracy. Neither SERVICE TEKNOTES, its editor and staff, Tektronix, Inc., nor its representatives assume any responsibility for the use of the material printed in SERVICE TEKNOTES; nor can we assume any responsibility for any errors or for the resulting effects of any errors.

SERVICE TEKNOTES is distributed by Service Administrative Support free of charge to customers who maintain their own Tektronix equipment. A customer may be added to the distribution list by applying through his local Tektronix Sales Engineer.

Copyright © 1981, Tektronix, Inc. All rights reserved. Printed in U.S.A. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX, TEK, SCOPE-MOBILE, and [redacted] are registered trademarks of Tektronix, Inc. TELEQUIPMENT is a registered trademark of Tektronix U.K. Limited.