TEK CUSTOMER PRODUCT SERVICING INFORMATION

November 1989, Issue 57

SERVICETEKNOTES

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

TEK:
YOU'RE LOOKING GOOD!

Tektronix Corporate Trade Show Department

Published by Tektronix Service Publications

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COMMITTED TO EXCELLENCE

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^2 Issue: XX-X) signifies that the article has previously been published in a internal publication known as *WIZARDS' WORKSHOP*.

Articles are submitted primarily by Division 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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THE EDITOR

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TEK: YOU'RE LOOKING GOOD!

TEKTRONIX CORPORATE TRADE SHOW DEPARTMENT

Beaverton, Oregon –
The Trade Show Department is part of Corporate Communications. It exists to serve the display and exhibit needs of Tektronix.

We are here to provide the divisions, the field and the corporation with show suggestions, guidance, support and assistance for successful participation at trade shows. The exhibits used by Tektronix have established a professional corporate image in the trade show industry. Trade shows are an integral part of the Tektronix marketing mix. Our exhibits create a sales environment supportive of the marketing objectives. The Trade Show Department offers a research/analysis program to provide data and costs on past and existing shows, as well as recommendations and cost estimates for future shows and their markets.

Exhibits and trade shows provide opportunities to showcase Tektronix products. Our equipment can be demonstrated, touched, felt and experienced in a way unique from any other marketing media.

As an important element in Tektronix' total merchandising plan, exhibits are powerful sales tools helping our sales force in both its reach and effectiveness. When implemented correctly, they can:

- accelerate the sales process by compressing actual selling time,
- provide an environment for uninterrupted personal selling to prospects specifically interested in our products,
- reinforce Tektronix' corporate image,
- position our company and our products in specific markets, and
- introduce new products.

Bringing a strong, cost-effective Tektronix exhibit to each show means measurable results – such as helping improve our sales, our market share, and our profits.

This commitment to quality also makes each of our exhibits-related jobs just a little more satisfying. Among other things, we:

- suggest shows to the various divisions

- develop the show estimate
- select exhibit space and sign contracts with show management
- manage booth layout and design
- order show services from outside contractors and arrange for internal service support
- distribute pertinent information and conduct preshow meetings
- arrange for transportation of exhibit materials and demonstration equipment
- supervise on-site installation and dismantling of exhibits
- conduct booth training
- provide guidance to all Tektronix personnel working in the booth

The Trade Show Department works with the Marcom Manager from the divisions exhibiting at a show. The Marcom Manager is the liaison between the Trade Show Department and the Product Marketing Manager. Among other duties, Marcom Managers recommend the level of division participation and exhibit floor space needed and coordinate the availability of demonstration equipment.

The Marcom Manager must convey the "show theme" to the Product Marketing Manager, to ensure that they have an understanding of how their specific product lines fit into the overall show objectives.

Product Marketing Managers play a critical role: they ensure that our exhibit demos begin smoothly and proceed effectively. Once the products for an exhibit are identified, the Product Marketing Manager works with the Marcom Manager to ensure that proper technical support people are at the floor.

Any seasoned trade show salesperson can tell you, pulling booth duty has many benefits:

- You are not fighting traffic,
- You are using time effectively,
- You are able to demonstrate real products, and
- You are backed up by product and technical specialists who are there to answer questions.

The Trade Show Department conducts a preshow meeting for the booth personnel to get a feel for what we are exhibiting and why; our current product positionings; what is hot and what is not; and other business considerations that will help our sales force help existing customers and help make new customers.

Preparation for exhibiting at a trade show follows a plan. To be effective, our trade show and exhibits program needs long-range planning that involves the Marcom Managers, the Product Marketing Managers, the sales force, and all key personnel, right from the start. The following is an ideal trade show timetable.

12 months before	Booth space is contracted
12 months before	Hospitality suite and block of hotel rooms are contracted
4 months before	Show theme is identified
3 months before	Equipment is identified by Product Marketing Manager
3 months before	Booth design and layout is finalized
6 weeks before	Booth personnel list is finalized
7-10 days before	Show materials shipped
3-5 days before	Booth and equipment are set up
1 day before	Booth training is conducted

The Tektronix Trade Show Department has a team of eleven employees who handle a show schedule of over 100 shows per year. They are: Jan Woods (Manager), Marguerite Carter, Dean Staley, Barb Davis, Mike Panasewich, Sharon Bese, Evelyn Heppner, Tim Beer, Wayne Cox, Vachelle Peters and Kay Olson. This team has achieved a high-level of success in meeting our customers trade show needs.

TRADE SHOW SCHEDULE

Nov. 7-9, 1989	GOMAC	Orlando, FL
Nov. 7-9, 1989	DEXPO West	Anaheim, CA
Nov. 13-17, 1989	COMDEX Fall	Las Vegas, NV
Nov. 14-15, 1989	SPSE	San Diego, CA
Nov. 14-16, 1989	WESCON	San Francisco, CA
Nov. 27-29, 1989	GIS/LIS	Orlando, FL
Nov. 29-Dec. 1, 1989	MAC Business Conference	Long Beach, CA
Dec. 1-5, 1989	AVA	Orlando, FL
Dec. 6-8, 1989	Sun User Group	Anaheim, CA
Dec. 13-15, 1989	WCTV	Anaheim, CA
Jan. 9-11, 1990	ATE West '90	Anaheim, CA
Jan. 23-25, 1990	UNIFORUM '90	Washington DC
Jan. 23-25, 1990	OFC '90	San Francisco, CA
Jan. 29-Feb. 1, 1990	IMAC '90	Orlando, FL
Feb. 5-7, 1990	COMNET '90	Washington, DC
Feb. 8-9, 1990	Measurement Science Conference	Anaheim, CA
Feb. 13-15, 1990	SPIE/Electronic Imaging	Santa Clara, CA
Feb. 14-16, 1990	BUSCON West	Long Beach, CA
Feb. 26-Mar. 1, 1990	NEPCON West '90	Anaheim, CA
Feb. 26-Mar. 1, 1990	SAE '90	Detroit, MI
Feb. 27-Mar. 1, 1990	EI West '90	Pasadena, CA

1421/1422 Series S1820 Part Number

Ref: 1420 Series Instruction Manual, P/N 070-2899-00

The part number for S1820, the INT/EXT subcarrier switch, is P/N 260-1608-00. Add this note to your instruction manuals.

W2 Issue: 19-8

1440 Modification for Use with Some UHF Transmitters

Ref: 1440 Instruction Manual, P/N 070-1498-02

Many UHF transmitters have been or are being equipped with a device that pulse modulates the visual carrier at an H rate. This "pulser" allows the output device (usually a Klystron) to function in a more linear region of its operating envelope, and it saves the owner a lot of money in the form of reduced power consumption. Operating with a pulser, however, affects the way a 1440 Corrector is used. In most cases, the 1440 has had an internal modification that will disable automatic sync amplitude correction. This mod has probably been installed in several ways, but the method that we would like to recommend is similar to the implementation used on RCA transmitter 1440's.

On the Error Amp Board, A5, automatic sync correction can be disabled by grounding the junction of R5305 and R5342. Implemented in this fashion, the mod will still allow preset switching and manual control.

On a 1440 that is returned for service, the ground wire can be temporarily disconnected for circuit checkout, but should be left in place upon shipment unless otherwise instructed by the end-user.

W2 Issue: 19-10

1441 Rear Interface Assembly Part Number

Ref: 1441 Instruction Manual, P/N 070-1499-00

Make a note in your instruction manual. The complete rear interface assembly for the 1441 can be ordered as P/N 610-0584-00.

W2 Issue: 19-10

1450 Series Transistor Part Number Changed

Ref: 1450-1 Instruction Manual, P/N 070-5568-00
1450-2 Instruction Manual, P/N 070-2998-00
1450-3 Instruction Manual, P/N 070-3660-00

MOD # 66791

Due to increased reliability of parts from our vendors, all occurrences of P/N 156-0130-02 are being replaced by P/N 156-0130-00 in the listed instruments.

Use the new part on an "as fails" basis.

The new part will be installed in new instruments from the factory beginning with the following serial numbers.

Product Type	Serial Number
1450-1	B020700
1450-2	B020229
1450-3	B010287

W2 Issue: 19-8

1450 Series/067-0886-XX/ 1980 Part Number Changed to Reduce Cost

Ref: 1450-1 Instruction Manual,
P/N 070-5568-00
1450F20 Instruction Manual,
P/N 070-5595-00
1450-2 Instruction Manual,
P/N 070-2998-00
1450-3 Instruction Manual,
P/N 070-3660-00
1980 Instruction Manual,
P/N 070-2921-00
067-0886-XX Instruction Manual,
P/N 070-3530-00

MOD # 64736

As a cost reduction measure, all occurrences of P/N 120-0382-00 have been changed to P/N 120-0382-01 in the listed instruments.

Use the new part on an "as fails" basis.

W2 Issue: 19-8

1450 Series/TDC Series/1980/ 067-0886-XX IC Sockets Changed to a More Reliable Part

Ref: 1450-1 Instruction Manual,
P/N 070-5568-00
1450-2 Instruction Manual,
P/N 070-2998-00
1450-3 Instruction Manual,
P/N 070-3660-00
1980 Instruction Manual,
P/N 070-2921-00
TDC1/2 Instruction Manual,
P/N 070-2754-00
TDC1/2 OPT 2-12 Instruction Manual,
P/N 070-3719-00
067-0886-XX Instruction Manual,
P/N 070-3530-00

MOD # 65071

To provide more reliable parts in the listed instruments, all occurrences of P/N 136-0514-00 have been changed to P/N 136-0727-00, and all occurrences of P/N 136-0269-02 have been changed to P/N 136-0728-00. P/N 136-0727-00 is an 8 pin DIP socket. P/N 136-0728-00 is a 14 pin DIP socket. Use these new part numbers to address failures on an as required basis.

The new parts will be installed in instruments from the factory starting with the following serial numbers.

Product Type	Serial Number
TDC1	B010643
TDC2	B010451
1450-1	B020618
1450-2	B020226
1450-3	B010284
1980	B040445
TDC1 Opt 2-12	B010635
TDC2 Opt 2-12	B010447

W2 Issue: 19-8

1480 Series Part Number Changed

Ref: 1480 Series Instruction Manual,
P/N 070-2338-00

MOD # 68924
MOD # 68986

Due to increasing reliability from our vendors, Q6562 on the power supply board has been changed from P/N 151-0133-03 to P/N 151-0133-00.

For the same reason, all usage of P/N 151-0423-02 within the 1480 Series instruments is being changed to P/N 151-0423-00. Use the new part numbers on an "as fails" basis.

MOD # 68924 is being installed in new instruments from the factory starting with S/N B094834 (1480 Series) and S/N B107116 (1480R Series).

W2 Issue: 19-8

150XB: YT-1 Recorders Causing Power Supply Problems *(Pullout A)*

This problem occurs in the older 150XB's with YT-1 Chart Recorders made before June of 1988. YT-1's are used on 1502B and 1503B MTDR's. Symptoms are high current draw when running a chart or when first turning on the instrument with the YT-1 plugged in (problem may be intermittent). A3A1T1030 (power supply secondary transformer) may short if the instrument was run with the supply loaded down.

The problem is occurring in older YT-1's because of insufficient space between the Paper Roller and the Controller board. The bottom of the Paper Roller can touch a pad on the Controller board, shorting the +5V power supply to ground. This problem was fixed in YT-1's made after June of 1988 by a change to the frame, allowing more space between the roller and board. Refer to Figure 1 to identify Old/New style frames.

We suggest preforming the mod in ***Pullout A*** on all YT-1's with the old style hinge as they come in for service even if they are not shorting.

To fix the shorting problem place a piece of non-conductive tape, between the Paper Roller and the Controller board. Use P/N 255-0319-00, a 12 x 9 inch mylar square for about 40 cents, enough to do more than 150 YT-1's when cut into 0.75 inch squares.

W2 Issue: 19-8

1705 Oscillator Failing at Elevated Temperature

Ref: 1705 Instruction Manual, 070-6355-00

MOD # 70458

There have been a few instances of a failure in the 1705's local oscillator when the instrument was exposed to warm operating environments.

The solution for this problem is to change A3Q257 to P/N 151-0472-00, and to add a 0.1 µF capacitor (P/N 281-0775-00) from the emitter lead of A3Q170 to ground.

Install these changes on an "as required" basis in instruments returned for service.

MOD # 70458 will be installed in new instruments from the factory starting with S/N B020601.

W2 Issue: 19-9

1705, 1710B Series, 1720 Series, 1730 Series, 1740 Series, 1750 Series, 1480 Series, R520A Series, WFM300 Part Numbers Changed

Ref: 1705 Instruction Manual, P/N 070-6355-00
1710B Instruction Manual, P/N 070-5522-00
1720 Instruction Manual, P/N 070-5846-00
1730 Instruction Manual, P/N 070-4474-02
1740 Instruction Manual, P/N 070-4473-00
1750 Instruction Manual, P/N070-5664-00
1480 Instruction Manual, P/N 070-2338-00
R520A Instruction Manual, P/N 070-1709-00
R521A Instruction Manual, P/N 070-1794-00
R522A Instruction Manual, P/N 070-1874-00
WFM300 Instruction Manual, P/N 070-6039-00

MOD # 64562

Due to the increasing reliability of parts from our vendors, two IC part numbers have been changed. Part number 156-0158-07 is changing to 156-0158-00, and part number 156-0130-02 is changing to 156-0130-00 in specified circuit locations within TV products.

The following list details affected circuit locations by product, with effective serial numbers as delivered from the factory.

1705 (S/N B010245)
156-0158-07 becomes 156-0158-00 at A1U242.

1710B Series (S/N B021322, 1710B; B020279, 1711B)
156-0158-07 becomes 156-0158-00 at A1U242.

1720 Series (S/N B012565, 1720; B010856, 1721)
156-0158-07 becomes 156-0158-00 at A1U242 and A3U734.

1730 Series (S/N B022983, 1730; B020908, 1731; B010145, 1735)
156-0158-07 becomes 156-0158-00 at A1U242.

1740 Series (S/N B014412, 1740; B011619, 1741; B010175, 1742)
156-0158-07 becomes 156-0158-00 at A5U353. 156-0130-02 becomes 156-0130-00 at A5U325 and A5U622.

1750 Series (S/N B032007, 1750; B031068, 1751)
156-0158-07 becomes 156-0158-00 at A5U353, A4U327 and A4U210. 156-0130-02 becomes 156-0130-00 at A5U325 and A5U622.

1480 Series (S/N B094560, 1480C; B106123, 1480R)
156-0158-07 becomes 156-0158-00 at A6U3380, A6U3120, A13U9443 and A16U8118.

R520A Series (S/N B540995, R520A; B334945, R521A; B260542, R522A)
156-0158-07 becomes 156-0158-00 at A2U2200. 156-0130-02 becomes 156-0130-00 at A2U2050 and A2U2060.

WFM300 (S/N B010503)
156-0158-07 becomes 156-0158-00 at A1U242.

Use the new part number upon failure of the previous part.

W2 Issue: 19-10

1705/1710 Series/1720 Series/ 1730 Series/WFM300/1730HD/ 760 Power Switch Part Number Changed

Ref: 1705 Instruction Manual,
P/N 070-6355-00
1710B Instruction Manual,
P/N 070-5522-00
1720 Instruction Manual,
P/N 070-5846-00
1730 Instruction Manual,
P/N 070-4474-02
1730HD Instruction Manual,
P/N 070-6758-00
WFM300 Instruction Manual,
P/N 070-6039-00
760 Instruction Manual,
P/N 070-5992-00

MOD # 68598

In order to provide a power switch that operates more reliably under various installation circumstances, the listed instruments have had S595 on the power supply board changed to P/N 260-2274-02.

This change should help address those occasions where the instrument would work fine on the test bench, then would not power up once screwed into the cabinet or rack.

The switch should be replaced in instruments that are returned for service on an "as fails" basis.

The new part will be used in new instruments shipped from the factory starting with the following serial numbers.

Product Type	Serial Number
1705	B020510
1710B	B022201
1711B	B020333
1720	B016250
1721	B012004
1730	B027165
1731	B022325
1735	B010381
1730HD	B020199
WFM300	B011586
760	B021170

W2 Issue: 19-8

1710B Adjustment Hint

Ref: 1710B Series Instruction Manual,
P/N 070-5522-00

If you have had occasional complaints about the 1710B burst phase indicator going to the red LED's when the input signal was switched from one signal to another, the following hint will assist in nulling most of this change.

When performing the "Adjust Burst Phase Display Zero Point" step (step 15, page 5-11) of the adjustment procedure, complete the step as written. Then, on your test signal generator, select another color signal such as linearity ramp. Now, if you adjust R915 a very small additional amount, you should reach a point where the burst phase indictor will stay in the "green" with additional signal changes.

W2 Issue: 19-8

1710B Now Available with Option 47

Ref: MOD # 68991

In order to support "Tek Direct" market requirements, Option 47 has been added to the 1710B.

Option 47 simply adds the 1700F02 case to the 1710B, along with a UL sticker. These are then shipped, assembled, in a single carton.

W2 Issue: 19-8

1720, 1780R XY (Audio) Inputs

Ref: 1720 Instruction Manual,
P/N 070-5846-00
1780R Interim Manual,
P/N 061-3612-00

The following information is provided for those that may wish to make use of the XY (Audio) inputs provided on the 1720 and 1780R. This information is meant to supplement the instruction manuals, as well as provide some surrounding data.

BALANCED XY INPUTS

The 1720 and the 1780R are provided with balanced (differential), DC-coupled, high-impedance (>20 K ohms) inputs for audio applications. Note that while these inputs are specified for 600 ohm systems, internal termination is not provided. External capacitors must also be added if AC-coupled inputs are required. These inputs can be used in a single-ended mode by driving the "+" inputs and grounding the "-" inputs, or vice versa.

Both instruments are shipped from the factory calibrated for a 0 dBm (600 ohm) system, and can be recalibrated for 600 ohm systems ranging from 0 dBm to 12 dBm. To calibrate the XY inputs, connect an appropriate sine wave test signal. Adjust the two gain potentiometers on the circuit board until the ends of the Lissajous fall on the crosses in the graticule boxes. The gain pots are R308 and R113 on the vectorscope board (A6) in the 1780R, and R846 and R948 on the main board (A3) in the 1720.

HIGH-GAIN INPUTS

Two additional connections are provided for "high-gain" XY inputs. These inputs are intended for XY applications other than audio, particularly ICPM. The high-gain inputs are single-ended, so the -X and -Y inputs must be grounded when they are in use.

To use the high-gain inputs, two jumpers must be installed to hook up the connector to the circuitry inside the instrument. The connection is broken to provide noise immunity during normal operation.

To use the high-gain inputs, install jumpers J208 and J105 on the 1780R vectorscope board (A6). Install jumpers J920 and J921 on the 1720 main board (A3).

SCHEMATIC

Early versions of the 1780R manual do not show the complete schematic for the XY inputs – consult a 1720 manual if you need to know what the circuit looks like. The circuits are identical.

CONNECTOR

Both instruments use a 15 pin female D connector for the XY inputs. Connector pinouts are identical for the two instruments.

dBm TO PEAK-TO-PEAK VOLTAGE CONVERSION

Questions frequently arise regarding the input voltage specifications for the XY inputs. The specifications state that the inputs are adjustable for 0 to 12 dBm (600 ohm systems), corresponding to a voltage range of 2 volts to 9 volts peak-to-peak. The relationship between dBm and peak-to-peak voltage is not immediately obvious to those accustomed to working with DC voltage ratios. The two basic things to remember are:

- One milliwatt is the reference power level for dBm. For power ratios, dB is defined at 10 $\log_{10}$ (P/P ref).
- A DC voltage delivers the same amount of average power as a sine wave with a peak-to-peak amplitude of $2\sqrt{2}$ times that DC voltage.

(continued on following page)

Examples are given below for the two limits of the 1720/1780R specification.

0 dBm = 10 $\log_{10}$ (Power/0.001 Watt)
=> Power = 0.001 Watts

Power = Voltage (dc)^2 Resistance

0.001 Watt = Voltage (dc)^2/600 Ohms
=> Voltage (dc) = 0.775 Volts

Voltage (pp) = $2\sqrt{2}$ x Voltage (dc)
=> Voltage (pp) = 2.19 Volts

A 2.19 volt peak-to-peak sine wave corresponds to 0 dBm

12 dBm = 10 $\log_{10}$ (Power/0.001 Watt)
=> Power = 0.0158 Watts

Power = Voltage (dc)^2/Resistance

0.0158 Watts = Voltage (dc)^2/600 Ohms
=> Voltage (dc) = 3.084 Volts

Voltage (pp) = $2\sqrt{2}$ x Voltage (dc)
=> Voltage (pp) = 8.72 Volts

An 8.72 volt peak-to-peak sine wave corresponds to 12 dBm

W2 Issue: 19-10

1730HD Corrections for Operation at 1125 Lines

Ref: 1730HD Instruction Manual,
P/N 070-6758-00

MOD # 69025

While operating at 1125 line rates, a few 1730HD's have exhibited one or more of the following symptoms:

- Loss of trigger
- Master-slave comm errors
- Random actuation of the "RECALL" function
- Reference key intermittent operation

All of these symptoms were addressed by changing the programs in U177 and U241, which are now P/N 160-5467-03 and P/N 160-5579-03, respectively.

These parts are not direct replacements for earlier devices. To obtain the corrected versions, order a kit, P/N 050-2517-00.

Install this change on an as required basis on instruments returned for service.

MOD # 69025 is being installed in new instruments from the factory starting with S/N B020127.

W2 Issue: 19-8

1730HD Procedure Corrections *(Pullouts B, C, D, and E)*

Ref: 1730HD Instruction Manual,
P/N 070-6758-00

Enclosed with this issue as *Pullouts B, C, D, and E* are changes to the adjustment procedures and specifications for the 1730HD.

W2 Issue: 19-10

1740 Series Additional Part Added

Ref: 1740 Series Instruction Manual,
P/N 070-4473-01

MOD # 68232

In order to prevent possible manufacturing errors, a 470 K ohms resistor was added to the interface board near RV789.

This resistor is meant solely to occupy a space, and does not otherwise enter into the circuitry of the 1740 Series.

This is for information purposes only.

W2 Issue: 19-8

2201/2210/2211 Vertical Storage Acquisition Extension Cable Available

When servicing the instruments listed, it is necessary to extend the vertical storage acquisition cables. Tektronix P/N 174-1673-00 will provide the extension necessary to work on the instrument with the store board in the Service position.

W2 Issue: 19-8

2205 Vertical Waveform Distortion

Ref: MOD # 69394
S/N HK11408
HK51241

When a 20 MHz signal is applied to the vertical input of a 2205 and the gain is set to display seven divisions or more, distortion can be seen on the tips of the sine wave.

To correct this a modification was implemented at the referenced serial numbers. NOTE: The 2205 is manufactured at two sites in Hong Kong, therefore mods will usually reference two serial numbers. One site uses HK10000-HK49999, the other site uses HK50000-UP.

To install this mod perform the following:

1. Change A1R245 and A1R250 to 1.3K ohm resistors, Tektronix P/N 315-0132-00.

2. Change A1R238 and A1R249 to 51K ohm resistors, Tektronix P/N 315-0513-00.

3. Apply a thick layer of Thermal Joint Compound, Tektronix P/N 006-2655-00, to the top of the heat sinks and heat sink bracket used for the Vertical Output Transistors.

W2 Issue: 19-20

2211 A/D Converters Damaged When Instrument Powered Up Without Vertical Storage Acquisition Cables Connected

Ref: MOD # 70358
S/N 200398

When the storage board is in the Service position the vertical acquisition cables must be connected to the board or damage can occur to A10U1103 and A10U1104.

This can be corrected by adding a diode A10CR1103 to A10U1104 between pins 11 and 15 with the cathode towards pin 15. Use Tektronix P/N 152-0581-00 which can be added to the solder side of the board.

To operate the instrument with the storage board in the Service position an extender is now available. Order Tektronix P/N 174-1673-00.

W2 Issue: 19-8

2211 Readout Blanks or Not Updating

Ref: MOD # 70249
S/N 200170-200201

The readout system may behave unpredictably or stop updating altogether when switching between STORE and NONSTORE modes. This may be most noticeable at elevated temperatures. This can be corrected by removing transistor A11Q1312.

The transistor can be easily removed without separating the Storage board from the Cursor Readout board. It is situated at the front of the board next to A11U1328 at the section angled at 45 degrees.

W2 Issue: 19-8

2211 Roll Mode Display 'Sparkle'

Ref: MOD # 69900
S/N 200172

Instruments below the referenced serial number will display an occasional flash while in the STORAGE ROLL MODE. This depends on the vertical deflection of the trace. These flashes of single pixels, or 'sparkles' are difficult to observe under normal conditions of lighting and trace intensity.

Due to the susceptibility of damage to the circuit board, extreme caution should be taken when removing this part.

To correct this, replace A11R1274 with Tektronix P/N 307-1175-00.

W2 Issue: 19-8

2220/2221/2230 Reduced Sensitivity of the Trigger Level Control

Ref: MOD # 71047

The trigger level control for the 2220, 2221, and 2230 is sensitive enough to sometimes cause difficulties triggering the sweep at the desired trigger point while in Single Sweep.

A common correction for this customer complaint has been to install custom mod GJ. However mod GJ reduces the trigger level range of the instrument.

A modification has been written to reduce the sensitivity of the trigger level control. To perform this mod install two 240 ohm resistors (Tektronix P/N 313-1241-00) on the back of the front panel board from either end of the trigger level control to the wiper.

W2 Issue: 19-20

2236 Display Drivers Failures

Ref: MOD # 61300
S/N B023850
MOD # 67046
S/N B027865

The display drivers fail when the grid of V9900 is shorted to ground. A likely cause of this in the instrument range listed above is that the intensity pot has shorted it to ground.

It is recommended that you check for the presence of a spacer between the intensity pot and the front panel especially if you replace A10U1508 and/or A10U1507. If a spacer is not present replace the pot with a 311-2177-02 and a spacer 361-1192-00.

W2 Issue: 19-10

2236 First and Last Digits in Readout Dim

Ref: MOD # 67046
S/N B027865

The intensity of the first and last digits in the 2236 readout may be dim in some instruments. This will occur if the filament voltage is less than the specification of 2.43 to 2.97 volts.

To correct this, change A10R1514 to 68 ohms, Tektronix P/N 315-0680-00, and A10R1513 to 91 ohms, Tektronix P/N 315-0910-00.

W2 Issue: 19-10

2245A/2246A/2247A Field Kit to Add Option 15

Ref: MOD # 70350
S/N 2245A B016000
S/N 2246A B016000
S/N 2247A All

A kit has been set up to retrofit Option 15 into a 2245A, 2246A, and 2247A. This kit installs outputs on the rear panel for Channel 2 Out and A Gate Out. Due to main board incompatibility, it can only be installed in a 2245A and 2246A above the listed serial numbers.

To install this option, order Tektronix P/N 040-1301-00.

W2 Issue: 19-8

2424L/2431L Service Manuals Now Available

The 2424L/2431L Service Manuals are now available. Order Tektronix part number 070-7346-00 for the 2424L and 070-7702-00 for the 2431L.

W2 Issue: 19-10

2445B/2455B New Vertical Output Hybrid A1U600 165-2393-00

2445B/2455B are now using a different Vertical Output hybrid with improved position effect and pulse response. The new hybrid is a direct replacement for the previous 155-0237-00; but ONLY for the 2445B/2455B instruments. the 165-2393-00 hybrid does not have sufficient bandwidth in this vertical system to be used for 2465B/2467B instruments.

The 165-2393-00 hybrid will serve as a direct replacement for the 155-0237-00 part in 2445, 2455, 2445A, and 2455A instruments as well. It will NOT retrofit to the 2465, 2465A, or 2467.

W2 Issue: 19-10

4220/4230 Series Board Compatibility Mods for the XD88F01 Products

Ref: 4220 Field Service Manual,
P/N 070-6646-0X
4230 Field Service Manual,
P/N 070-6647-0X
4220 2D GEM Field Service Manual,
P/N 070-7374-00
4230 3D GEM Field Service Manual,
P/N 070-7377-00

MOD # 69096
MOD # 70042
MOD # 70379
MOD # 68848

The Blimp board for the 422X products, the CP board for the 423X products, and the 4230 Series Options 20 and 21 (16/8 meg memory boards) have been modified for compatibility with the XD88 Series products. With these mods, the Blimp/ALU Sequencer Field Replaceable Unit (FRU) is Tektronix P/N 672-0236-09, the CP FRU is P/N 672-0238-08, the 16 Meg Memory is P/N 670-9612-01, and the 8 Meg Memory is P/N 671-0597-01. If installing an XD88F01 to an existing 422X/423X/432X/ 433X product, first verify that the FRU's listed above is the same suffix level (or higher), for compatibility.

The following information gives specific details about each mod, including part changes, wire mods, and starting product serial numbers that incorporates the mod.

MOD # 69096

The mod in the 422X only affects a change in ROM, U961 (P/N 160-4829-04), causing the Blimp/ALU Sequencer FRU P/N 672-0236-06 to roll to -07, and the Blimp board P/N 670-9953-04 rolls to -05.

Mods in the 4230 series affect a change in three ROM/PAL's in U1074 (P/N 160-4829-04), U270 (P/N 160-4817-01), and U670 (P/N 160-4826-01), and includes several wire mods.

The wire mods are: lift pin 5 of U670 and run wire from pin 5 to U760, pin 9. On the back of the circuit board (solder side), run wire from U270 pins 13, 14, and 15, to U264, pin 8.

After these mods, the CP FRU P/N 672-0238-06 rolls to -07. The 670 CP board part number also rolled, but is a subset of the 672 board part number and cannot be ordered.

Products that contain these mods (MOD # 69096) can be identified by their serial numbers on the 422X/423X products starting with B04xxxx, the 432X/433X products start at B05xxxx, and the XD8820/30 products start at B010100.

MOD # 70042

This mod changes a PAL in U126 on the Blimp board from P/N 160-4648-00 to P/N 160-4648-01, leaving pins 15 and 16 lifted; solder wire from U126 pin 15 to U126 PAD 16 (not pin 16); solder wire from U126 pin 16 to the backplane connector J17 pin 30A; solder a resistor P/N 315-0103-00 (10 K ohms, 0.250 Watt, 5%) from U126 pin 16 to U326 pin 24. The next mod is done on the Backplane P/N 670-9955-00 and requires soldering a wire from J33 pin 10A to RP32 (resistor pack) pin 1. Solder another wire from RP32 pin 1 to P17 pin 30A.

After these mods, the Blimp/ALU Sequencer FRU P/N 672-0236-07 rolls to -08, and the Blimp board P/N 670-9953-05 rolls to -06. The Backplane board P/N 670-9955-00 rolls to -01.

422X products that contain these mods (MOD # 70042) can be identified by their serial number starting at B05xxxx, and the 432X products start at B06xxxx.

MOD # 70379

This mod affects changing the ROM in U961 on the Blimp board, and in U1074 on the CP board from 160-4829-04 to 160-4829-05.

(continued on following page)

After this mod, the Blimp/ALU Sequencer FRU P/N 672-0236-08 rolls to -09, and the Blimp board P/N 670-9953-06 rolls to -07. The CP FRU P/N 672-0238-07 rolls to -08, and its 670 subset P/N also rolled.

The following serial number list show products that incorporate MOD # 70379 into the Blimp and CP boards.

Product Type	Serial Number
4224	B051022
4225	B052875
4235	B041113
4236	B040608
4237	B040307
4324	B060237
4325	B060524
4335	B050288
4336	B050444
4337	B050298
XD8820	B010108
XD8830	B010182

MOD # 68848

4230 Series Options 20/21, 16 Meg Memory board/8 Meg Memory board mod is also necessary for compatibility with the XD88 products.

The mod requires lifting U4058 pin 2, and run wire from pin 2 to U5056 pin 11. After this mod, the 16 Meg Memory board P/N 670-9612-00 rolls to -01, and the 8 Meg Memory board P/N 671-0597-00 rolls to -01.

The following serial number list shows products that incorporate the 8/16 Meg Memory board mod (MOD # 68848).

Product Type	Serial Number
4200F20	B010223
4235F20	B020966
4236F20	B020548
4237F20	B020247
4335F20	B030211
4336F20	B030408
4337F20	B030274
4200F21	B010140
4235F21	B020960
4236F21	B020544
4237F21	B020249
4335F21	B030201
4336F21	B030414
4337F21	B030271

Note: Products below the stated serial numbers, may require these mods only if their Blimp, CP, or 16/8 Meg Memory FRU's are below the suffix level, as stated in this article.

W2 Issue: 19-8

520, 520A Series Subcarrier Regenerator Circuit Board Replacement Kit Available

A replacement kit has been established to allow you to install the latest version of the subcarrier regenerator board into many older models of 520 or 520A.

Order P/N 050-1979-03.

This kit is applicable to SN's B010100 thru B332999 in the 520, and thru B540233 in the 520A.

W2 Issue: 19-9

520A/521A/522A/650HR/ 656HR Series Crystal Part Number Changed

Ref: 520A Instruction Manual,
P/N 070-1709-00
521A Instruction Manual,
P/N 070-1794-00
522A Instruction Manual,
P/N 070-1874-00
650HR Instruction Manual,
P/N 070-2646-02
656HR Instruction Manual,
P/N 070-2647-00

MOD # 66729

To insure reliable performance in the applicable circuits, the crystals in the listed instruments have had their part numbers changed to specify a certain vendor.

The new part number should be used as required to address failures or suspected operational difficulties that are associated with their circuit locations.

Y2315 in the 520A is now P/N 158-0069-01
Y2315 in the 521A is now P/N 158-0075-01
Y2315 in the 522A is now P/N 158-0080-01
A4-1Y2115 in the 650HR and 655HR is now P/N 158-0069-01
A4-1Y3114 in the 651HR and 655HR is now P/N 158-0075-01
A4-2Y3114 in the 656HR is now 158-0075-01
A4-2Y3114 in the 652HR is now 158-0080-01

The new parts were installed in new instruments from the factory starting with the following serial numbers.

Product Type	Serial Number
520A	B541262
521A	B333155
522A	B260546
650HR Series	B057309
656HR Series	B050714

W2 Issue: 19-8

650HR Series Analog Component Input Kits

Ref: 650HR Series Instruction Manual,
P/N 070-2646-02

A field mod kit, previously available as custom mod C4M, allows owners of 650HR Series color displays to add the parts necessary to input, process and display video information that is in one of four analog component formats. The formats addressed are GBR, MII, Betacam and SMPTE Parallel. These kits can be ordered now by the following part numbers.

For 650HR, order 040-1293-00
For 651HR, order 040-1294-00
For 655HR, order 040-1295-00

W2 Issue: 19-8

DP100 Adjustment Step Change

Ref: DP100 Instruction Manual,
P/N 070-6506-00

When adjusting the internal power regulation circuits within the DP100, it is important that the probes are attached to the instrument in order to adjust for total load.

Add the following step to the preliminary set-up for DP100 adjustments.

6. Connect the Data and Clock probes to the DP100, as shown in SECTION 1 OPERATORS INFORMATION.

W2 Issue: 19-8

ECO170A Performance Improvements

Ref: ECO170A Instruction Manual,
P/N 070-6113-00

MOD # 65481

MOD # 65481 has been implemented in the ECO170A in order to address or improve the following characteristics:

- Improve return loss on channel 4
- Improve crosstalk performance
- Improve diagnostic routines

These changes were addressed primarily by redesigning the circuit board (A2), therefore they should only be solved, as required, by changing the board. The new version of the board was P/N 670-9838-03.

MOD # 65481 is being installed in new instruments from the factory starting with S/N B010265.

W2 Issue: 19-10

ECO170A Series Power Supply and Reference Voltage Checks

Ref: ECO170A Instruction Manual,
P/N 070-6113-00

The following voltages are provided to assist you in determining the functionality of the various power supplies and references within the ECO170A.

SUPPLY	RANGE	TEST POINT
+12 V	+11.64 V to +12.36 V	U547 Pin 8
-12 V	-11.64 V to -12.36 V	U547 Pin 4
+5 V	+4.9 V to +5.1 V	U649 Pin 1
+2.5 V	+2.45 V to +2.55 V	U649 Pin 2
-5 V	-5.1 V to -5.9 V	U637 Pin 7
SPD	+1.94 V to +2.05 V	TP644
SM	+0.600 V to +0.650 V	TP643
VPD	-0.220 V to -0.280 V	TP453
VM	-0.208 V to -0.218 V	TP452
PPD	+1.90 V to +2.05 V	TP552 (J543 1-2)
PPD	+0.540 V to +0.700 V	TP552 (J543 2-3)
PM	-1.39 V to -1.43 V	TP551 (J543 2-3)
PM	-2.78 V to -2.85 V	TP551 (J543 1-2)

W2 Issue: 19-8

R148, 1430, 1440, 1910, TSP1, TSP11, TSP21 Channel Switch IC 155-0022-00 Being Replaced

Ref: R148 Instruction Manual, P/N 070-1266-00
1430 Instruction Manual, P/N 070-1455-00
1440 Instruction Manual, P/N 061-1448-00
1910 Instruction Manual, P/N 070-4523-00
TSP1 Instruction Manual, P/N 070-2621-00
TSP11 Instruction Manual, P/N 070-2664-00
TSP21 Instruction Manual, P/N 070-4569-00

MOD # 63608

Our supply of part number 155-0022-00 is running out, and the replacement part, 234-0408-20, has slightly different characteristics. Therefore, in the following instruments, the changes that are detailed will be necessary once the 155-0022-00 supply is depleted.

R148
Boards Affected:
A0 ITS Insertion Board
A9 Subcarrier and Sync Out Board

If U861 on board A0 is replaced, there are no other parts affected. If U761 on board A0 is replaced, change R382 (on A9) to 910 ohms, P/N 315-0911-00, add C659 (95 pF), P/N 283-0631-00 in parallel with R659, and remove the wire "gimmick" on U761 that went from pin 11 to pin 1. Also, remove C749, rotate it 180°, and reinstall it in the board.

1430
Board Affected:
A3 Amplifier Board

If U3363 or U3547 are replaced, there are no other parts affected.

1440, I2R, I3B, I3C
Board Affected:
A2 Insertion Control Board

If U2177 is replaced, there are no other parts affected.

1910
Boards Affected:
A6 VIT/VIR Inserter Board
A17 External VITS Input Board
A51 Digital to Analog Converter Assembly

If U528 on board A6 is replaced, C519 and C553 must be changed to 1-5 pF, P/N 281-0218-00.

If U230 or U435 on board A17 are replaced, both parts must be replaced and R418 must be changed to 576 ohms, P/N 321-0170-00.

If U638 on board A51 is replaced, there are no other parts affected.

TSP1, TSP11, TSP21
Board Affected:
A36 Switcher Board

If U394, U424, or U454 are replaced, each one's associated circuitry will need several changes. Since these changes are identical for each IC's circuitry, a change to U394 will be used as an example of what must be done in each instance.

A. U394 is replaced.

B. C386 is replaced with two electrolytic capacitors, (33 µF) that have been previously wired in series, positive lead to positive lead. The two free negative leads are then put into the board in C386's previous location. The two new part numbers are 290-0535-00.

C. C396 is changed in a similar fashion to C386.

D. C380 (0.01 µF), P/N 283-0204-00, is connected in series with R371.

(continued on following page)

E. C372 becomes test selectable, with a nominal value of 1.0 pF, P/N 283-0158-00, and a range of selection of 0-5 pF.

F. C406 becomes test selectable with the same nominal value and selection range as C372.

Note: Selectable capacitors that are used to null circuit crosstalk are not used in all channels. Some of the channels only have one variable capacitor. This is normal.

It is anticipated that when supplies of 155-0022-00 are exhausted, the changes listed in this mod that require more than one part will be addressed with parts replacement kits. Applicable kit part numbers will be published at that time.

These changes are presently being installed in new instruments from the factory starting with the following serial numbers:

Product Type	Serial Number
R148	B103181
1430	B101125
1910	B021526
TSP1	B021858
TSP11	B021525
TSP21	B010131

W2 Issue: 19-10

SPG170A, TSG170A Changes and Improvements

Ref: TSG170A Instruction Manual, P/N 070-5680-00
SPG170A Instruction Manual, P/N 070-5965-00

MOD # 62651 (TSG170A)
MOD # 62653 (SPG170A)

A major change to improve several areas of operation on the TSG170A/SPG170A Digital Board has been implemented. The items that were addressed are:

1. An improvement to the function of the microprocessor reset circuitry.

2. An improvement to address EPROM/RAM timing margins.

3. Change from a 6 layer to a 4 layer circuit board (TSG170A only).

4. The addition of a buffer to an output line.

5. A timing improvement in the Genlock Data Acquisition circuit.

6. A redesign of the crystal oscillator drive/support circuitry that will accommodate an improved oscillator assembly.

7. The addition of a CW (3.58 MHz) lock function.

Changes 1 and 3

For two of these changes, items 1 and 3 in particular, the improvements will only be available in new instruments or by installing a new Digital board. In these cases, the changes, or lack thereof, should not have any noticeable impact on the operation of the instrument. However, the impact of the remainder of the changes may be visible to the service technician, so the following information is provided.

(continued on following page)

Change 2
This change need only be installed on earlier instruments if U245 (TSG170A) or U224 (SPG170A) is replaced with a part from INTEL, and consists of a series of cuts and straps that can be most easily accomplished on the bottom of the circuit board.

- Cut the ECB run that provides $\overline{\text{EPROM EN}}$ signal to pin 20 of the IC.
- Connect pin 20 to pin 14 (ground).
- Connect the $\overline{\text{EPROM EN}}$ run to pin 22 of the IC.
- Insure that the run that provides the $\overline{\text{RD}}$ signal to pin 22 has been cut.

Change 4
This change could be necessary if upon the installation of the Option 1 board, you noticed that the $\overline{\text{I02}}$ line (J955, pin 1B) has insufficient drive to provide valid TTL signals.

To add a buffer/line driver to this output line, the following changes could be implemented:

- Cut the $\overline{\text{I02}}$ line going to J955 pin 1B.
- On the TSG170A, add a wire to connect U455 pin 10 to U755 pin 11, and another wire to connect U755 pin 9 to J955 pin 1B.
- On the SPG170A, add a wire to connect U438 pin 9 to U531 pin 8, and another wire to connect U531 pin 12 to J955 pin 1B.

Change 5
If changing IC's in the Genlock Data Acquisition circuitry does not quite seem to correct an elusive problem that has been isolated to this area, the only sure fix will be a new Digital board.

Change 6
If a new oscillator is required to address a failure, the required changes are fairly extensive.

For failures of the crystal oscillator assembly, 119-2321-01, use parts kit 050-2349-02.

Change 7
CW lock was added for those few customers that have this requirement. The installation of 050-2349-02 (see Change 6, above) will provide this function.

This change should only be installed upon request.

These mods (MOD # 62651 and 62653) also change the top covers for the instruments due to the relocation of the oscillator adjustment hole. Therefore, replacement of the Digital boards will also be accomplished via parts kits. The applicable part numbers are 050-2497-00 (TSG170A) and 050-2521-00 (SPG170A).

These modifications are being implemented in new instruments from the factory starting with S/N B041719 (TSG170A) and B020637 (SPG170A).

W2 Issue: 19-10

SPG2 Adjustment Hint

Ref: SPG2 Instruction Manual,
P/N 070-2104-00

The Line Frequency Adjustment step (step 1, page 4-5) in the SPG2 instruction manual instructs you to adjust C159 for approximately +5 volts at interface line 55. In many cases, this adjustment works well, but there are some internal conditions within the SPG2 that may cause a slight amount of Subcarrier Out sine wave jitter (3-4 nsec).

To check for this condition, make the adjustment as stated in the instruction manual, and then perform the following check.

Trigger your scope on H Drive and observe the Subcarrier Out signal using a Time/Div factor great enough to allow you to see a 3 nsec jitter. If this jitter is present, a very slight readjustment of C159 should significantly reduce it immediately.

Note: With the circuit improvements that were implemented in the SPG2A, this subcarrier jitter has been substantially reduced, and may not be noticeable or curable using the preceding procedure.

W2 Issue: 19-8

SPG271, TSG271 Option Board Performance Improvements

Ref: TSG271 Interim Manual,
P/N 061-3457-00
SPG271 Interim Manual,
P/N 061-3546-00
TVGF02 Data Sheet,
P/N 062-9693-00

MOD # 65385

MOD # 65385 has been implemented in the option board of the TSG271 and SPG271 in order to improve the following characteristics:

- Better character/ID rise time
- Crosstalk between audio and video
- Audio tone gain matching
- Audio distortion specs

Since the characteristics, in general, were addressed with a redesign of the option circuit board, the repair method will be to replace the board if one of the symptoms matches the customer's complaint. The improved board is P/N 671-0219-02 or newer.

MOD # 65385 was installed in new instruments from the factory starting with S/N B020308 (TSG271), S/N B010129 (SPG271), and S/N B010102 (TVGF02).

W2 Issue: 19-10

TDC1 Series Transistor Bias Changed for Channel 5-6

Ref: TDC1 Instruction Manual,
P/N 070-2754-00

MOD # 66891

On occasion, excessive light output from Q25 (Dial Tape Photo-Transistor) has prevented the PLL circuit from switching to the Channel 5-6 circuit, therefore causing these two channels to appear defective.

In order to prevent this condition, some circuitry has been added near Q25 to allow bias adjustments for proper performance.

If erratic Channel 5-6 operation is experienced, or if Q25 is replaced due to failure, make the necessary changes by installing parts kit 050-2512-00.

This change is being installed in new instruments from the factory starting with S/N B010637.

W2 Issue: 19-8

TSG Series Power Supply Reliability Improvement

Ref: TSG170A Instruction Manual,
P/N 070-5680-00
SPG170A Instruction Manual,
P/N 070-5965-00
ECO170A Instruction Manual,
P/N 070-6113-00
SPG271 Interim Manual,
P/N 061-3546-00
TSG271 Interim Manual,
P/N 061-3457-00
TSG422 Interim Manual,
P/N 061-3596-00
TPG625 Interim Manual,
P/N 061-3677-00
TSG170D Instruction Manual,
P/N 070-6943-00
TSG300 Instruction Manual,
P/N 070-5722-00
SG370 Interim Manual,
P/N 061-3656-00

MOD # 69986

In the listed instruments that have the newer version of the power supply board (P/N 671-0572-00) installed, there is the possibility of the -5 volts and +5 volts diodes being subjected to voltages during instrument turn-on that exceed the specified reverse voltage ratings.

To prevent this excess voltage condition from occurring, a pair of series RC networks are being installed, one network across each diode.

The affected diodes are CR320 and CR575, and the RC network consists of a 10 ohm resistor, P/N 315-0100-00, and a 0.01 µF capacitor, P/N 283-0005-00.

Two resistors, two capacitors and two diodes are available as a kit, P/N 050-2585-00. It is recommended that this kit be installed on any of the affected instruments that are returned for service, and that all six components get installed to prevent unnecessary failures.

This change is being installed at the factory starting with the following serial numbers.

Product Type	Serial Number
TSG170A	B042071
SPG170A	B020808
CO170A	B020454
SPG271	B020618
TSG271	B031007
TSG422	B010145
TPG625	B010110
TSG170D	B010143
TSG300	B031150
TSG370	B010100

W2 Issue: 19-8

TSG170A Black Burst to Test Signal Timing and SCH Phase Improvements

Ref: TSG170A Instruction Manual, P/N 070-5680-00

MOD # 64661

In order to more closely match the timing and SCH phase of the Black Burst output to that of the Test Signal output, a number of changes were made to the A3 Analog Board.

1. A circuit board trace was cut as shown in Figure A.

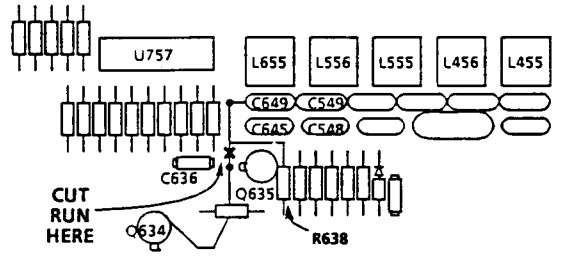


Figure A. Cut circuit board run as shown, between "T" in run and closest pad.

2. A3R538 was changed to 200 ohms, P/N 321-0126-00.

3. A3R745 was changed to 150 ohms, P/N 321-0114-00.

4. A3R649 was changed to 10 ohms, P/N 321-0001-00.

5. A3R756, 10.0 K ohms, P/N 321-0289-00 was added as shown in Figure B.

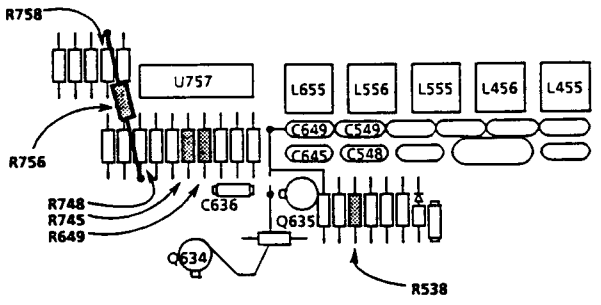


Figure B. Change R538, R745, and R649 to their new values, and add R756 between R748 and R758 as shown.

6. A3R644, 200 ohms, P/N 321-0126-00 and A3C635, 5-35 pF, P/N 281-0219-00 were added as illustrated in Figure C.

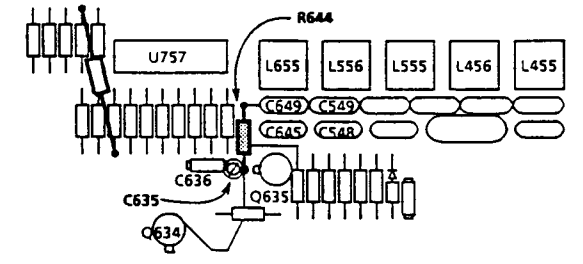


Figure C. Add R644 in the pads provided for W645, and add C635 from the ground end of C636 to R644.

These changes should only be made if the TSG170A is returned for service for the symptoms mentioned.

MOD # 64661 is being installed in new instruments from the factory starting the S/N B031041.

W2 Issue: 19-10

TSG170A, SPG170A, TSG300, TSG271 Oscillator Circuitry Improved

Ref: TSG170A Instruction Manual,
P/N 070-5680-00
SPG170A Instruction Manual,
P/N 070-5965-00
TSG300 Instruction Manual,
P/N 070-5722-00
TSG271 Interim Manual,
P/N 061-3457-XX

MOD # 65186

MOD # 65186 has been installed in the instruments listed above to take advantage of common design elements of the oscillator board and support circuitry.

Upon failure of the oscillator, the following table details the replacement kits to use.

Instrument	Old Oscillator P/N	Replacement P/N
TSG170A	119-2321-00	050-2349-00
SPG170A	119-2321-00	050-2349-00
TSG300	119-2323-00	050-2350-00
TSG271	119-2501-01	119-2501-02

The changes made by MOD # 65186 will be installed in new instruments from the factory beginning with the following serial numbers:

Product Type	Serial Number
TSG170A	B031193
SPG170A	B010415
TSG300	B020571
TSG271	B020257

W2 Issue: 19-10

TSG170A/SPG170A Blanking Width Change *(Pullouts F and G)*

Ref: TSG170A Instruction Manual,
P/N 070-5680-00
SPG170A Instruction Manual,
P/N 070-5965-00

MOD # 70117

In order to bring the TSG170A and SPG170A into conformance with EIA Standard RS-170A, the test signal and black burst blanking widths have been changed.

The SPG170A is now in full conformance with black burst and the Option 01 color bar output both at the 10.9 microseconds nominal.

The TSG170A test signal blanking widths are also in conformance except for those signals where no information is present at the start or end of the active line. Mod ramp, 5 step, and pulse & bar are the only signals in this group. The NTC7 composite signal blanking width remains at 13.6 microseconds, a width determined by where the signal elements are specified in the NTC7, ANSI T1.502, and proposed EIA/TIA-250-C standards.

The TSG170A black burst blanking width changes from 9.8 to 10.2 microseconds. As the black burst signal is derived from the test signal, its width must be narrower than that of the narrowest test signal blanking width. For most users, this will limit the application of the TSG170A black to its primary function of equipment synchronization.

The blanking width mod has been implemented in new instruments from the factory starting with the following serial numbers.

(continued on following page)

Product Type	Serial Number
TSG170A	B042143
SPG170A	B020853
TVGF01	B010143

Kits to retrofit existing instruments are available.For TSG170A's, order P/N 040-1298-00. For SPG170A's, order P/N 040-1299-00. Option 01 parts are included in both kits. Price of the kits is $150.

Included in this issue as ***Pullouts F and G*** are the new signal specifications effective with this change.

W2 Issue: 19-8

TSG271 Genlock Timing Advance and Delay Adjustment Centered

Ref: TSG271 Interim Manual,
P/N 061-3457-00

MOD # 64698

MOD # 64698 has been implemented in the TSG271 to address an unequal advance and delay of genlock timing relative to the 50% point of H Sync.

The change was simply an alteration to some input lines going to A2-1U870 and A2-1U770, and can be installed in earlier instruments, if desired, by:

- carefully lifting pins 3 and 6 of U870 from the board and connecting pin 3 to pin 4, and pin 6 to pin 5; and
- carefully lifting pin 3 of U770 from the board and connecting it to pin 6 with a small piece of wire.

In addition to this change, some of the circuitry supporting the subcarrier oscillator was moved. If an oscillator assembly, P/N 119-2501-00, is replaced due to failure, the change instructions and parts will be contained in a kit, P/N 050-2337-00.

MOD # 64698 is being installed in new instruments from the factory starting with S/N B020144.

W2 Issue: 19-10

TSG271 Improvements

Ref: TSG271 Interim Manual,
P/N 061-3457-00

MOD # 64779

Several improvements have been made to the TSG271. The problems addressed, and the solutions provided, are as follows:

1. Improved return loss characteristics were obtained by removing A3C940 and A3C934, and by changing A3C960 to 27 pF, P/N 283-0779-00.

2. Improved subcarrier amplitude performance was obtained by:

   - changing A3R393 to 3.65 K ohms, P/N 321-0247-00
   - changing A3R392 to 787 ohms, P/N 321-0183-00
   - adding A3R288, 50 ohms, P/N 311-0643-00 in series with A3C290

3. Color bars output switching to ID was slowed a bit by changing A5C755 to 385 pF, P/N 283-0707-00.

4. The color bar output amplifier DC offset characteristics were improved by changing A5R767 to 464 ohms, P/N 321-0161-00.

5. For improved temperature stability, A3CR250 and A3CR350 were changed to Shottky diodes, P/N 152-0322-00.

6. The test signal output amplifier circuit's resistance to oscillations was improved by hanging A3R844 to 15 ohms P/N 315-0150-00, and by changing A3R850 to a 0 ohm (dummy) resistor, P/N 131-0566-00.

These changes should be installed in earlier generators as they are returned for service.

MOD # 64779 is being installed in the new TSG271's from the factory starting with S/N B020116.

W2 Issue: 19-10

TSG271 Jumper Colors Changed

Ref: TSG271 Interim Manual,
P/N 061-3457-00

MOD # 65843

Due to a new definition on present and future feature sets, the colors of several jumpers were changed in the TSG271, beginning with S/N B020235.

The following plug locations changed from green (P/N 131-0993-05) to red (P/N 131-0993-02) jumpers on the boards indicated.

- On 670-9905-XX, P156 and P164 were changed.

- On 670-9906-XX, P115, P511, P807 and P815 were changed.

This is for information only. No service action is required.

W2 Issue: 19-10

TSG271 Software Changes

Ref: TSG271 Interim Manual,
P/N 061-3457-00

MOD # 64696
MOD # 64697
MOD # 64739

Certain sections of the TSG271's software have been upgraded to address concerns as listed below.

MOD # 64696 (starting with S/N B020114)
The diagnostic routines were improved for power-up, memory mapping and genlock test concerns.

A2-1U333 was changed to part number 160-4338-01.

MOD # 64697 (starting with S/N B020114)
The software that determines sync pulse timing was changed to improve equalizer and serrated pulse durations.

A2-1U780 was changed to part number 160-4350-01.

MOD # 64739 (starting with S/N B020116)
The base part for A2-1U796 was changed to insure a part with adequate electrical speed.

A2-1U796 was changed to part number 160-4337-01.

These changes can be implemented on an "as required" basis to address the stated symptoms.

W2 Issue: 19-10

TSG3/TSG13/TSG23 Series Cam Switch Changed

Ref: TSG3 Instruction Manual,
P/N 070-2108-01
TSG13 Instruction Manual,
P/N 070-2330-00
TSG23 Instruction Manual,
P/N 070-2334-00

MOD # 61389

The cam switch, S108, that is used in the listed instruments has been changed to a drum switch for cost savings and reliability reasons. The new part number is P/N 263-1149-01, and replacement is only recommended upon failure.

The new switch is being installed in new instruments starting with the following serial numbers.

Product Type	Serial Number
TSG3	B013088
TSG13	B012619
TSG23	B010138

W2 Issue: 19-8

TV Products Resistor Change *(Pullout H)*

In order to reduce inventory, TV Division has implemented a change of resistor types that affects all currently produced TV products to some extent.

The new resistors that are being used are, in all cases, functional equivalents for the parts they replaced. The primary differences are that most of the new parts can use 0.3 inch lead spacing, and are rated at 0.3 watts of power dissipation. The previous parts required 0.4 inch lead spacing and dissipated 0.25 watts max.

(continued on following page)

The change affects the instruments and manuals as follows:

- Most circuit boards will not be redone to take advantage of the smaller lead spacing capability. Instead, the new components will be inserted in the present boards as is. The smaller lead spacing may become useful when the board is redesigned for other reasons. (Most new instrument development is expected to take advantage of the smaller spacing almost immediately.)

- The instruction manuals for the products will not have old and new parts history for each circuit location affected by this change. Instead, at the next available rebind time, each manual will have the part numbers changed in total. In other words it is highly recommended that you keep your old manual in order to have the old information available to you.

For the service technician, three replacement options are suggested.

1. Use the new part if it is available in your local inventory, and is the correct part number of the circuit location of interest.

2. Consider using the older part if, and only if, this part number change is the only difference. If there have been any other circuit mods in the area of interest subsequent to this mod, use only the parts specified unless otherwise advised.

3. For those new instruments and circuit boards that have been built to take advantage of the 0.3 inch lead spacing, use only the part specified.

The list of affected part numbers is included in this issue as ***Pullout H.***

W2 Issue: 19-8

VM700/751/760/1980/ 067-0886-XX/067-1115-01 Capacitor Part Number Changed

Ref: 1980 Instruction Manual,
P/N 070-2921-00
751 Instruction Manual,
P/N 061-3584-02
760 Instruction Manual,
P/N 070-5992-00
VM700 Instruction Manual,
P/N 061-3552-02
067-0886-XX Instruction Manual,
P/N 070-3530-00
067-1115-01 Instruction Manual,
P/N 070-4508-00

MOD # 66263

Due to changes in specifications of parts being delivered from our vendors, part numbers have been changed for all occurrences of 0.1 µF bypass capacitors in the listed instruments of the following types. The new part number will specify a particular part that meets our requirements.

P/N 281-0775-00, P/N 281-0775-01, and P/N 281-0272-00 are to be replaced by P/N 281-0775-02 in the listed instruments on an "as fails" basis.

W2 Issue: 19-8

WFM300 Instruction Manual Corrections *(Pullout I)*

Ref: WFM300 Instruction Manual,
P/N 070-6039-00

Included in this issue as ***Pullout I*** is a manual correction (C5/389) that changes some of the text on WFM300 operation and controls.

W2 Issue: 19-8

DETAILED INSTRUCTIONS

1. Remove the Front Panel Plate:

   • Remove the three mounting screws that attach the front panel plate. There are two screws accessible with the door closed, and one screw accessible with the door open. Refer to Figure 2.

   • If necessary, rotate the front panel thumbscrew to move the latch to free the front panel. Unscrew the PRINT pushbutton harness by holding the switch and rotating the front panel around it. Take care not to twist the wiring harness. Remove the front panel plate.

2. Note the position of the roller on the Controller board. Open the roller by sliding it to the right. You may need to remove the two springs to allow the roller/motor assembly to move fully to the right.

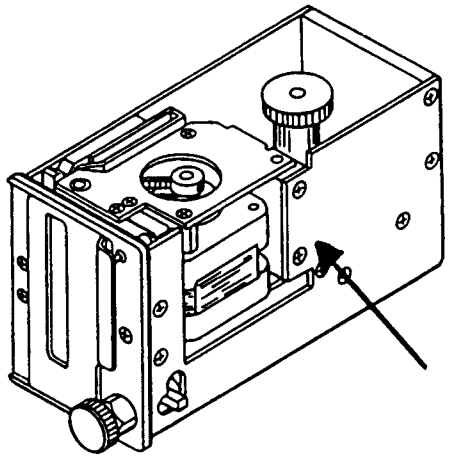
3. Place the tape on the controller board so it covers the area where the roller was before the roller/motor assembly was moved to the right. Refer to Figure 3.

4. Replace the two springs if necessary.

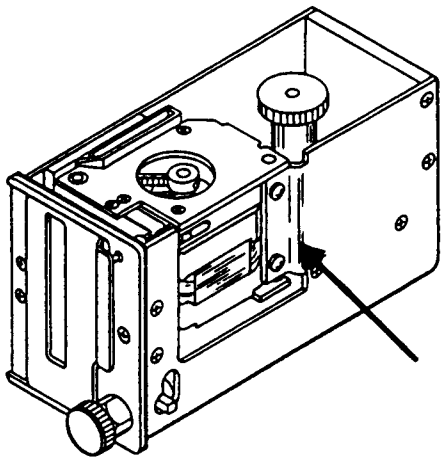
5. Replace the Print pushbutton and the front panel. Make sure the gasket does not get caught between the front panel and frame.

(continued on following page)

150XB: YT-1 Recorders Causing Power Supply Problems *(Pullout A)*



Old Style YT-1 Hinge



New Style YT-1 Hinge

Fig. 1

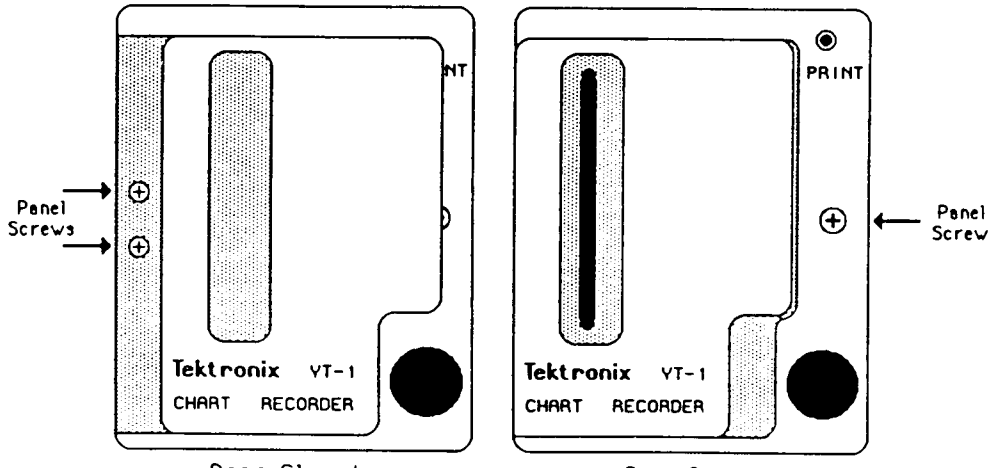


Fig. 2

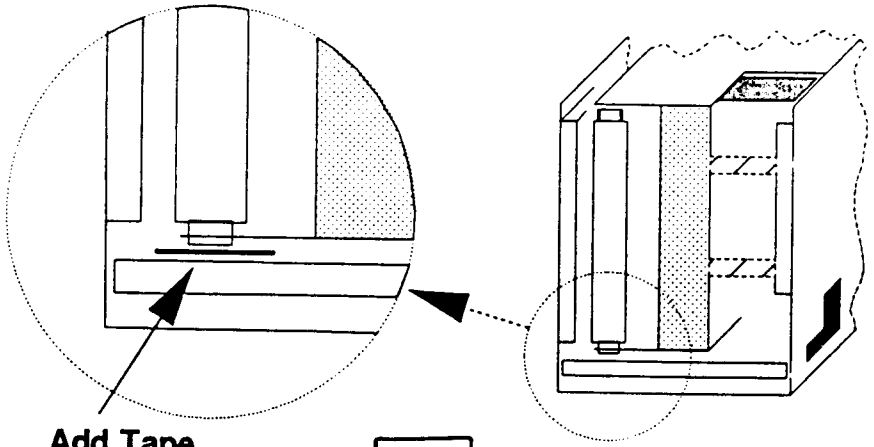


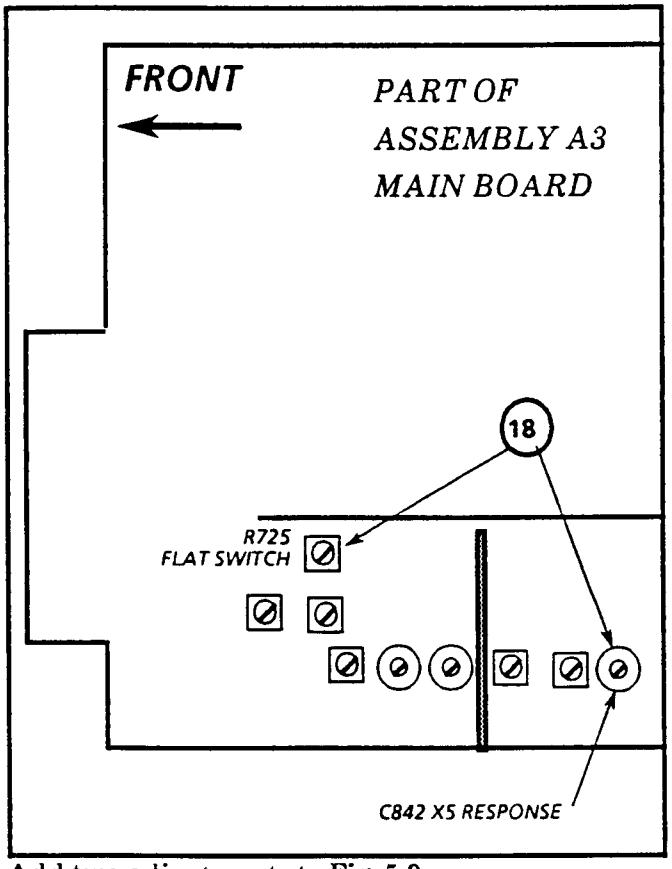
Fig. 3

Date: 11/22/88	Group Code 24	Change Reference: C1/1188
Product: 1730HD		Manual Part No: 070-6758-00

Section 5, Page 5-12,
Step 21. *b. Set the Leveled Sine-Wave Generator to 50 kHz.*

Section 5, Page 5-13,
Step 19. *Adjust* Flat Response X5.

Section 5, Page 5-16,



Add two adjustments to Fig. 5-9.

Section 5, Page 5-22,
Step 18. Adjust Flat Response X1

k. Move the X10 test probe to the collector of Q727.

l. ADJUST — A3R725 (flat switch) for best flat response on the test oscilloscope.

ii. Remove the Leveled Sine Wave Generator connection from CH1A. Use the same cable to connect CH1A with the Sweep Generator.

Section 5, Page 5- 23,

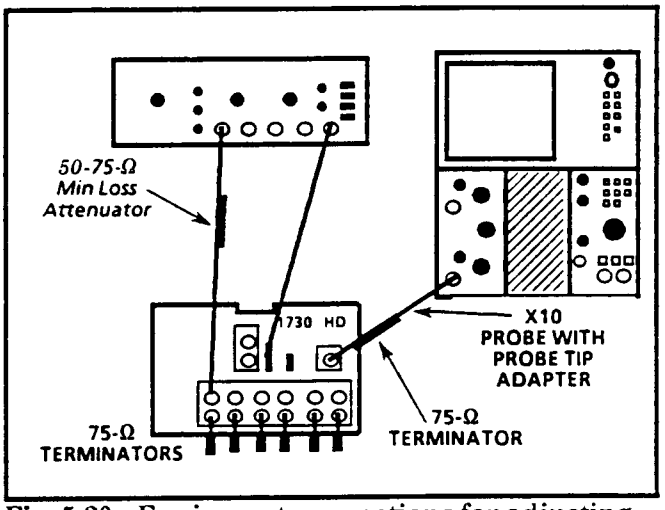


Fig. 5-20. Equipment connections for adjusting PIX MON OUT flat response.

Section 5, Page 5-24,
Step 19. Adjust X5 Flat Response

a. Select ONE FIELD, CH1A, AND X5 Gain on the 1730 HD.

b. Adjust the Sweep Generator amplitude for a 700 mV display on the 1730 HD.

c. ADJUST — A3C842 (X5 Response) for the best flat response as viewed on the 1730 HD.

d. Connect the Leveled Sine-Wave Generator to the 1730 HD CH1A INPUT.

e. Set the Leveled Sine-Wave Generator frequency to 50 kHz and adjust its amplitude for a 700 mV display on the 1730 HD.

f. CHECK — for flatness of ±5% (35 mV or 1.5 minor divisions) while varying the Leveled Sine-Wave Generator frequency from 50 kHz to 6 MHz.

g. Repeat steps a. through f. for CH2A, CH3A, CH1B, CH2B, and CH3B.

h. Remove all cables and terminators from the 1730 HD.

Date: 11/22/88	Group Code 24	Change Reference: C1/1188
Product: 1730HD		Manual Part No: 070-6758-00

Section 5, Page 5-25,

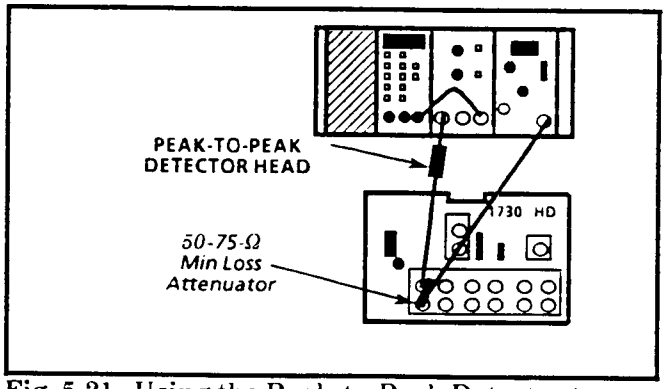


Fig. 5-21. Using the Peak-to-Peak Detector to check 1730 HD flatness.

Section 5, Page 5-27,

Step 25. *t. Turn off the MAG.*

u. Return J510 to the desired operating position.

Step 26. e. *Remove remote cable.*

Section 5, Page 5-27,

Delete Adjustment Step 25 k.

ADD:

Section 6, Page 6-11,

REPLACING SMALL BOARDS ON MAIN BOARD

Step 5. Replacement small boards are shipped with right-angle square pins installed in the proper position. If a board is repaired rather than replaced, and new square pins are installed, a gap of .070" must be allowed between the plastic portion of the square pin and the small circuit board, for purposes of fit.

Section 6, Page 6-11,

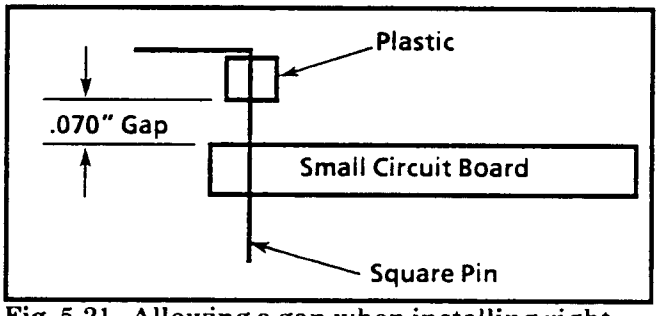


Fig. 5-21. Allowing a gap when installing right-angle square pins.

Date: 11/23/88 **Group Code 24** Change Reference: C2/1188

Product: 1730HD Manual Part No: 070-6758-00

SPECIFICATIONS CHANGES

Table 1-1 Vertical Deflection System

CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	CHECK STEP
Return Loss (75Ω) Video Inputs	At least 35 dB from 50 kHz to 30 MHz. *>35 dB from 50 kHz to 20 MHz. >32 dB from 20 MHz to 30 MHz.*	Loop-through terminated in 75Ω. *Instrument power on , all deflection factor settings.* *Instrument power off.*	21
CH1B Subtract Common Mode Rejection	*>30 dB for 50 kHz to 5 MHz.*		13
Dc Level on Output	*0.1 V* or less into 75Ω load.	Input DC coupled and 75 Ω terminated.	

Table 1-2 DC Restoration

CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	CHECK STEP
DCRestorer Level	Dc level of blanking is 0 V, *±100 mV.*	DC Coupled: DC Restorer On or Off. AC Coupled: DC Restorer On.	14

Table 1-4 Horizontal Deflection System

CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	CHECK STEP
Sweep	Sweep will occur in all HORIZONTAL mode settings with or without synchronization.		4
READOUT		When READOUT is selected: Lines per Frame/Frame Rate, and Time/Div are shown across the bottom of the screen. In Line Select, the number of the selected line is displayed in the upper left portion of the screen. If 14-LINE mode is also selected, [14] is shown to the right of the selected line number.	

Tektronix
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MANUAL CHANGE INFORMATION Group Code 24

Date: 11/28/88 Change Reference: C3/1188

Product: 1730HD Manual Part No: 070-6758-00

DESCRIPTION

ELECTRICAL PARTS LIST AND SCHEMATICS CHANGES

CHANGE TO READ:

			DIAG. LOC
A3C724	281-0759-00	CAP,FXD,CER DI:22PF,20%,50VDC	4
A4U177	160-5467-01	MICROCKT,DGTL:CMOS 32768 X8 EPROM, PRGM	8
A4U241	160-5579-01	MICROCKT,DGTL:NMOS MICROCOMPUTER, PRGM	11
A4U422	160-6236-00	MICROCKT,DGTL:CMOS,PLD,16 IN 8 OUT REG	9

SCHEMATICS CHANGES ONLY

DELETE:

A3A195Q500	151-5001-00	TRANSISTOR:NPN,SI,SOT-23	3
A3A195Q506	151-5001-00	TRANSISTOR:NPN,SI,SOT-23	3
A3A195R506	321-5010-00	RES,FXD,FILM:221 OHM,1%,0.125W	3

TEXT CHANGES

Table 1-4
Horizontal Deflection System

CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	CHECK STEP
Sweep Magnifier Registration		Magnification occurs about the center of the screen *in 2 LINE*.	

Table 1-6
External Horizontal

CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	CHECK STEP
External Horizontal	*A +5V to -5V ramp will result in a left to right displacement of 9 divisions, ±1 major division.*		7

Tektronix
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MANUAL CHANGE INFORMATION Group Code 24

Date: 12/22/88 Change Reference: C5/1188

Product: 1730HD Manual Part No: 070-6758-00

DESCRIPTION

CHECKS AND ADJUSTMENT CHANGES

Change:

Replace the manual Performance Check Procedure, Page 5-1 through Page 5-12, with the following procedure.

SECTION 5
CHECKS AND ADJUSTMENTS

This sections consists of two separate procedures. First is the Performance Check, used to determine compliance with the Performance Requirements in the Specification. Next is the Adjustment Procedure, used to return the instrument to operation within specifications.

In both procedures, controls and connectors on the 1730 HD front panel and rear panel are fully capitalized (e.g., TWO LINE). Control and connector names on test equipment, as well as internal controls and adjustments for the instrument under test, are initial capitalized (e.g., Time/Div).

RECOMMENDED EQUIPMENT LIST

The following equipment and accessory items are required to do the Performance Check and/or Adjustment Procedures. Broad specifications are followed by an example of equipment that meets these specifications. In most cases, the following procedures were prepared using the recommended equipment.

Electrical Instruments

1. **Test Oscilloscope**

   Vertical Amplifier:
   100 MHz Bandwidth, 5 mV Sensitivity.
   Time Base:
   10 ns/div to 5 ms/div sweep speeds, triggering to 5 MHz.

   For example: a TEKTRONIX 7603 Oscilloscope with a 7A26 Dual-Trace Amplifier, a 7B53A Dual Time Base, and a 10X probe (P6122).

2. **Television Signal Generator**

   Capable of delivering a color bar test signal, a multiburst signal, and black burst signal for the television standard of the monitor to be tested.

   For example: NTSC — TEKTRONIX 1410 SPG2, TSG6, and TSG7.
   PAL — TEKTRONIX 1411 SPG12, TSG16, and TSG11.

3. **Sine-Wave Generator**

   Frequency Range: at least 250 kHz to 30 MHz.

   For example: a TEKTRONIX SG503 Leveled Sine-Wave Generator installed in a TEKTRONIX TM500 Series Power Module.

4. **Function Generator**

   Signal: capable of a +5 V / –5 V square wave at 2 kHz.

   For example: a TEKTRONIX FG 504 Function Generator installed in a TEKTRONIX TM500 Series Power Module.

5. **Voltmeter**

   Range: 0 to greater than 100 Vdc.
   Accuracy: ±0.1%.

   For example: a TEKTRONIX DM501A in a TM500 Series Power Module.

6. **Video Amplitude Calibrator**

   Signal: adjustable square wave 0.0 mV to 999.9 mV p-p with a resolution of 0.1 mV.
   Accuracy: ±0.05%.
   Frequency: approximately 270 Hz.

   For example: a TEKTRONIX 067-0916-00 in a TM500 Series Power Module.

7. **Peak-to-Peak Detector Amplifier**

   Tektronix Part Number 015-0408-00 (includes one 015-0413-00 Peak-to-Peak Detector Head), installed in a TEKTRONIX TM500 Series Power Module.

8. **Power Module** (required for items 3, 4, 5, 6, and 7)

   For powering up and housing SG503, DM501A, 067-0916-00, and 015-0408-00.

   For example: a TEKTRONIX TM506 Power Module.

9. **Sweep Generator**

   Swept Frequency from 1 to 50 MHz, with ±0.25 dB output flatness and 5 MHz markers.

   For example: a Wavetek 1062-A2 Sweep Generator.

10. **Time Mark Generator**

    Signal: capable of producing 1 μs and 10 μs markers, with external trigger.
    Accuracy: timing ±.01%.

    For example: a TEKTRONIX CG5001 Oscilloscope Calibration Generator in a TM5006 mainframe.

Auxiliary Equipment and Accessories

11. **75Ω End-Line Terminations** (at least seven are needed)

    For example: a 75Ω end-line termination (011-0102-00).

12. **75Ω Feed-Through Termination** (two are needed)

    For example: Tektronix Part No. 011-0055-01.

13. **Dual Input Coupler**

    Matched BNC cable-T. Matched length of the two arms within ± 0.1 inch.

    For example: Tektronix Part No. 067-0525-02.

14. **50Ω-to-75 Ω Minimum Loss Attenuator**

    For example: Tektronix Part No. 011-0057-00

15. **10X, 75 Ω Attenuator**

    For example, Tektronix Part No. 011-0061-00.

16. **Step Attenuator**

    75Ω constant impedance attenuator variable from 0 to 14 dB in 1-dB steps.
    For example: A Wavetek 7580A Step Attenuator.

17. **75Ω Coaxial Cables** (at least four are needed)

    For example: 42-inch, with male BNC connectors (012-0074-00).

18. **50Ω Feed-Through Termination** (one is needed)
    For example: Tektronix Part No. 011-0049-01.

19. **50Ω Precision Coaxial Cable** (one is needed)

    For example: 42-inch with male BNC connectors (012-0482-00).

20. **Probe Tip to BNC Male Adapter** (one is needed)
    For example: Tektronix Part No. 013-0145-00.

21. **Remote Sync Input Connector**

    15-pin, sub-miniature, D-type connector modified to enable and input Remote Sync. See Fig. 5-1.

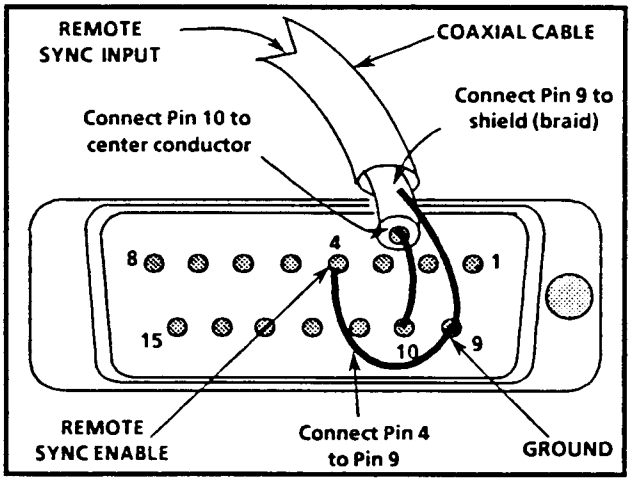

Fig. 5-1. REMOTE connector modified for Remote Sync input.

PERFORMANCE CHECK

The Short Form Performance Check is provided for those familiar with the complete check procedure, and the Standard Performance Check Procedure is provided for those who need more detailed instructions.

Both forms of the performance check procedure use the same step numbers, so the short form can be used as an index to the standard form.

Short-Form Procedure

1. Preliminary Setup
2. Check Power Supply Operation
3. Check Trace Rotation Range
4. Check Sweep Operation
5. Check Sweep Timing and Linearity
6. Check RGB/YRGB Display
7. Check Operation of External Horizontal
8. Check X1 and X5 Vertical Gain
9. Check Variable Gain Range
10. Check Calibrator Amplitude
11. Check PIX MON OUT Operation
12. Check Clamped and Unclamped DC Levels
13. Check Offset Operation
14. Check PIX MON OUT Gain
15. Check DC Restorer Operation
16. Check X1 and X5 Flat Response
17. Check PIX MON OUT Freq.Response
18. Check CH1B Subtract
19. Check X1 Transient Response
20. Check X5 Transient Response
21. Check Square Wave Tilt
22. Check Filter Response
23. Check Return Loss
24. Check PIX MON OUT Return Loss

Performance Check Procedure

1. Preliminary Setup

   a. Connect the 1730 HD ac power cord to the variable autotransformer. Turn power on and set the autotransformer for the voltage shown by the rear-panel line voltage indication.

   b. Set the 1730 HD front panel as shown in Table 5-1.

Table 5-1
1730 HD Initial Control Settings

CONTROL	SET TO
POWER	ON
INPUT	CH 1A
CLAMP	off
REF	CH 1
VAR	off
X5	off
CAL	off
FLAT - FILTER	FLAT
ONE - TWO - THREE	ONE
LINE - FIELD	LINE
MAG - READOUT	off
LINE SELECT	off
FOCUS	as desired
SCALE	as desired
INTENS	as desired

2. Check Power Supply Operation

   REQUIREMENT — Check ac input range, 90–132 V or 180–243 V, as determined by the line voltage indication.

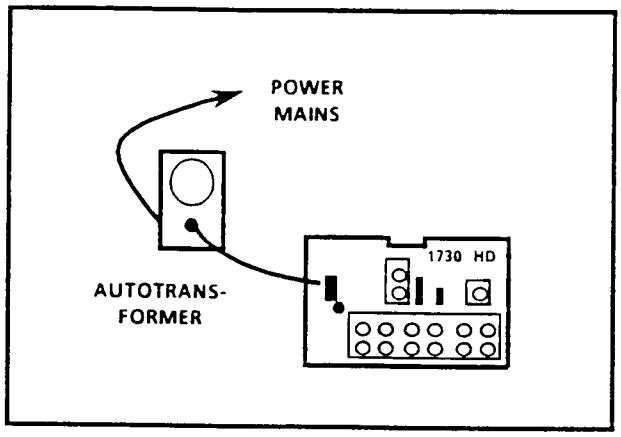

Fig. 5-2. Initial equipment hook-up for the Performance Check Procedure.

a. Turn on the 1730 HD Readout and verify that the instrument is set for the desired line rate. If the line rate must be changed, enter the MENU, select LINES/FRAME, then select the desired line rate. Exit the MENU. Turn off the Readout.

b. Turn on the 1730 HD and adjust the controls for a usable display.

c. Vary the autotransformer from low-line to high-line voltage (as dictated by the rear-panel line voltage indication).

d. **CHECK** — for stable operation over the prescribed voltage range.

3. **Check Trace Rotation Range**

REQUIREMENT -- Adjustment range should be more than ±1° from horizontal.

a. **CHECK** — that the trace rotates more than ±1° from the base line as the front-panel TRACE ROTATION control is turned throughout its range.

b. Set the TRACE ROTATION control so the trace is aligned parallel to the graticule base line.

4. **Check Sweep Operation**

REQUIREMENT — Sweep occurs in all horizontal sweep modes with or without synchronization. TWO FIELD sweep repetition rate is equal to frame rate of applied video or external sync. Synchronization: Internally, sweep will synchronize to a sync amplitude of 300 mV peak-to-peak ±6 dB or tri-level sync of ±300 mV ±6 dB; externally 143 mV to 4 V.

a. **CHECK** — that a sweep occurs in all the horizontal sweep modes when no signals or external reference are applied to the instrument.

b. Connect a 75Ω cable from the Television Test Signal Generator color bar output to the 1730 HD CH1A input. Terminate the remaining side of the loop-through input in 75Ω. Connect a Television Test Signal Generator black burst signal to the 1730 HD EXT input and terminate the remaining side of the loop-through input in 75Ω.

c. Select CH1A INPUT and EXT reference. Black burst sync amplitude should be 300 mV when loaded by 75Ω.

d. **CHECK** — that a sweep occurs in all the unmagnified horizontal sweep modes. TWO FIELD sweep should be equal to the frame rate of the applied video or external sync.

e. Remove the termination from the EXT REF connector.

f. **CHECK** — that the waveform display stays locked.

g. Connect three 75Ω terminators to the EXT REF INPUT.

h. **CHECK** — that the waveform display stays locked.

i. Remove two of the terminators from the EXT REFerence.

j. Remove the terminator from CH1 INPUT. Loop-through connect the input signal from CH1 to CH2 and CH3. Terminate CH3 in 75Ω.

k. **CHECK** — that the ONE LINE, TWO LINE, and THREE LINE sweep modes display one, two, and three lines of the color bar, respectively.

l. Select TWO LINE sweep and center the display. Push the MAG button.

m. **CHECK** — that some portion of the sync pulse is displayed.

n. **CHECK** — that both lines of the display can be positioned on screen with the HORIZONTAL Position control.

o. Select THREE LINE sweep.

p. **CHECK** — that all three lines of the display can be positioned on screen.

q. Disconnect all input signals from the 1730 HD.

5. **Check Sweep Timing and Linearity**

REQUIREMENT — 1 μs/division (TWO LINE sweep with MAG on): Timing accuracy to within ±2%, Linearity, including differential linearity, to within ±2%; 0.2 μs/division (ONE LINE sweep with MAG on): Timing accuracy to within 3%, Linearity, including differential linearity, to within ±2%.

a. Connect the output of the Time Mark Generator to CH1A on the 1730 HD.

b. Connect the Time Mark Generator Trigger Output to the 1730 HD EXT REF INPUT.

c. Set the Time Mark Generator as follows:

Markers	ON, 10 μs
Output	ON
Trigger Output	ON, ÷10

d. Select the following on the 1730 HD:

INPUT	CH1A
REF	EXT
FILTER	FLAT
ONE/TWO/THREE	TWO
LINE	LINE
MAG	OFF

e. Use the 1730 HD VERTICAL and HORIZONTAL Position controls and the VAR gain as needed to position the display so that the tips of the time marks align with major divisions on the graticule blanking level.

f. **CHECK** — for 1 time mark/division over the center 10 divisions of the display. With the 2nd and 12th marks directly on major divisions, each of the other marks should fall within 0.2 major divisions of a major division graticule marking. Check for proper linearity, ±.2%, excluding the first and last 10% of sweep.

g. Select MAG on the 1730 HD. Select 1 μs markers on the CG5001.

h. **CHECK** — for 1 time mark/major division over the center 10 divisions of the display, to ±2% (.2 major division). Check linearity as described in step f.

i. Select ONE LINE on the 1730 HD.

j. **CHECK** — for 1 time mark per five major divisions (two time marks over the center 10 divisions), to ±3% (.3 major division). Check linearity as descrbed in part f.

k. Disconnect the Time Mark Generator. Turn off the 1730 HD MAG and VAR.

6. **Check RGB/YRGB Display**

REQUIREMENT — Attenuated sweep: 3.4 to 4.1 divisions for 3-step display, or 2.5 to 3.1 divisions for 4-step display. Staircase input gain: a 10 V input will equal 9 horizontal divisions, ±1 division. Attenuated sweep responds to sweep rate and magnification controls.

a. Connect the Test Signal Generator Color Bar signal to the 1730 HD CH1A, and the Black Burst signal to EXT. Terminate CH1A and EXT loop-throughs in 75 Ω.

b. Display the color bar signal in TWO LINE. Center the display.

c. Set the Function Generator for a -5 to +5 V, 2 kHz square wave.

d. Connect the output of the Function Generator to pin 10 of the REMOTE connector and connect pin 2 (RGB Enable) to pin 9 (Ground) as shown in Fig. 5-3.

e. **CHECK** — that the sweep has shortened to 3.4 to 4.1 divisions for a 3-step display, and 2.5 to 3.1 divisions for a 4-step display (moving J510 as needed to obtain 3-step and 4-step displays).

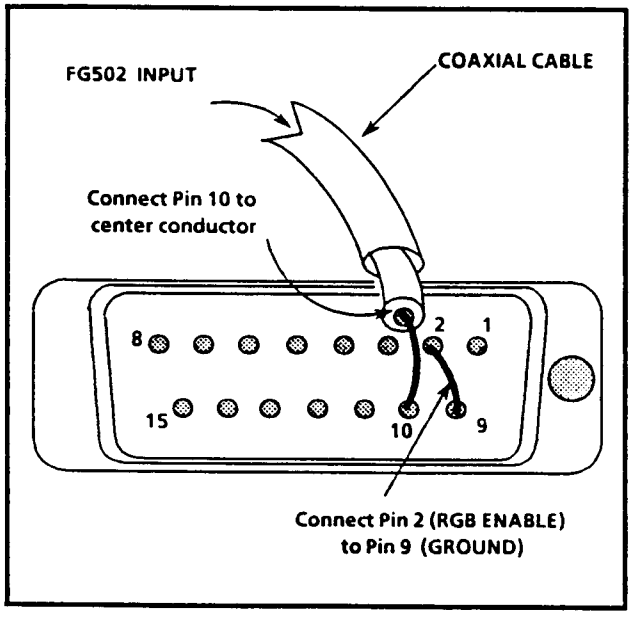

Fig. 5-3. REMOTE connector modified to check RGB operation.

f. **CHECK** — for a one line display.

g. Select FIELD.

h. **CHECK** — for a one field display.

i. Turn on the 1730 HD MAG.

j. **CHECK** — that the sweep is magnified.

k. **CHECK** — that the display can be moved to the sides of the screen with the HORIZONTAL Position control.

l. Turn off the MAG.

m. **CHECK** — that there are 8 to 10 divisions of separation between the first display and the second display.

n. Return J510 to the desired operating position.

7. **Check Operation of External Horizontal**

REQUIREMENT — A 10 V input will result in a horizontal display of 9 divisions, ±1 major division.

a. Leave the Function Generator and REMOTE connector set up as in step 6.

b. Enter the MENU and select EXT HORIZ ENABLE. Exit the MENU.

c. **CHECK** — that there are 8 to 10 divisions of horizontal deflection.

d. Enter the MENU and select EXT HORIZ DISABLE. Exit the MENU.

e. Disconnect the REMOTE connector.

f. Disconnect the Color Bar signal from the 1730 HD.

8. **Check X1 and X5 Vertical Gain**

REQUIREMENT — With V GAIN control in detent and 1 V signal applied, the vertical deflection of the displayed signal should be 1 V peak-to-peak within a tolerance of ±1%. X5 Gain within 5%.

a. Connect a 1 V calibrator signal from the VAC to the 1730 HD CH1A INPUT. Leave the loop-through unterminated. See Fig. 5-4.

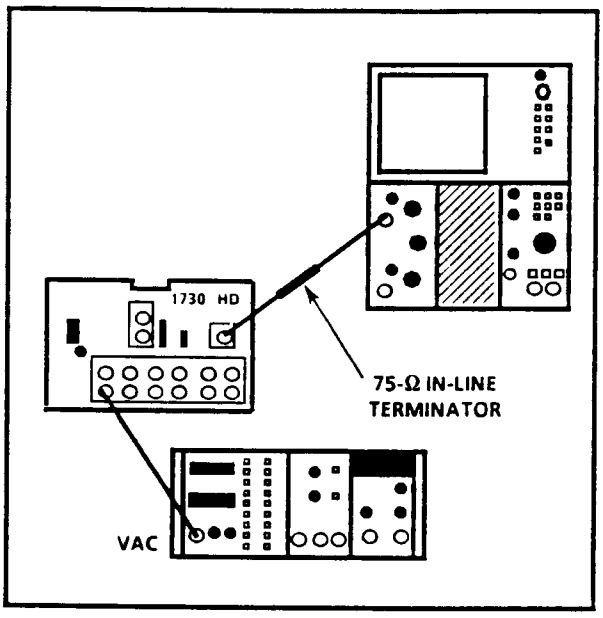

Fig. 5-4. Equipment hook-up for adjustment of input amplifier gains.

b. Select the following settings on the VAC: CHR P-P, NTSC, and Manual.

c. Select 1730 HD CH1A INPUT (all other input channels off) and turn off the READOUT.

d. **CHECK** — that the peak-to-peak amplitude of the display is 1 V. Measure from the –0.3 graticule line to the 0.7 graticule line. Tolerance is ±1% (10 mV).

e. Repeat steps a. through d. for INPUTs CH2A, CH3A, CH1B, CH2B, and CH3B.

f. Connect the VAC signal to the 1730 HD CH1A INPUT.

g. Set the VAC to 0.200 V and change the 1730 HD gain to X5.

h. Select the 1730 HD CH1A INPUT (all other input channels off).

i. **CHECK** — that the peak-to-peak amplitude of the display is 1 V, ±5% (50 mV).

j. Repeat steps f. through i. for INPUTs CH2A, CH3A, CH1B, CH2B, and CH3B.

9. **Check Variable Gain Range**

REQUIREMENT — Range = +0 dB, -14 dB.

a. Leave the VAC signal connected to CH1A input.

b. Set the VAC to 999.9 mV.

c. Select X1 and VAR Gain on the 1730 HD.

d. **CHECK** — using VAR Gain, that the signal can be adjusted to 200 mV or less.

e. Select X5 and VAR Gain.

f. **CHECK** — using VAR Gain, that the signal can be adjusted to 1 V or less.

g. Turn off X5 and VAR.

h. Disconnect the VAC from the 1730 HD CH1A.

10. **Check Calibrator Amplitude**

REQUIREMENT — Amplitude should be 700 mV within a tolerance of ±1%.

a. Select the 1730 HD CAL mode.

b. **CHECK** — for a displayed amplitude of 700 mV, ±1% (7 mV).

c. Turn off the CAL.

11. **Check PIX MON OUT Operation**

REQUIREMENT -- Dc level within ±100 mV of 0 V. Selected line dc offset by approximately 180 mV.

a. Move all input coupling jumpers to the DC (2–3) position:

CH1A	A3J297	CH1B	A3J697
CH2A	A3J397	CH2B	A3J897
CH3A	A3J498	CH3B	A3J996

b. Connect a 75Ω cable with a 75Ω in-line terminator from the 1730 HD rear-panel PIX MON OUT to the test oscilloscope vertical input. See Fig. 5-5.

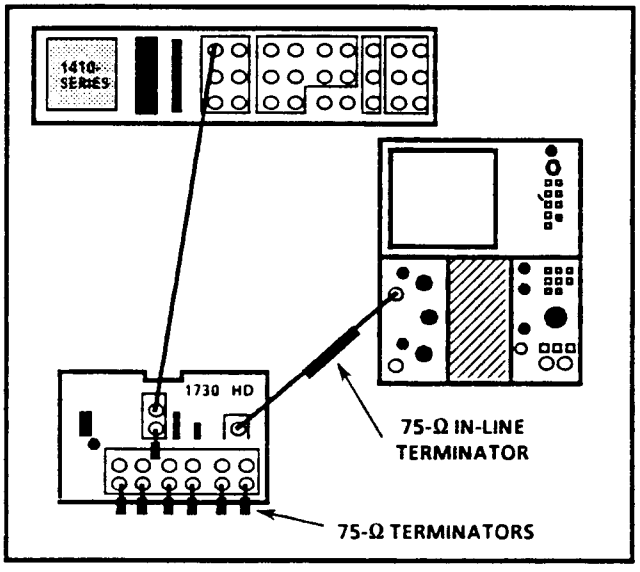

Fig. 5-5. Equipment hook-up for checking PIX MON OUT DC Level.

c. Connect the Television Test Signal Generator Black Burst signal to the 1730 HD EXT.

d. Terminate all six video inputs (CH1A through CH3B) and the EXT with 75Ω terminators.

e. Set the test oscilloscope as follows:

Time	20 μs
Trig In	Auto/Ac
Slope	-
Volts per Div.	50 mV
Trig	Int/Auto/AC
Coupling	DC

f. Set the Coupling to Ground. Set Reference to center screen, then return the Coupling to DC.

g. Set the 1730 HD front-panel controls as follows:

All INPUTs	off
REF	EXT
LINE, FIELD	LINE
ONE, TWO, THREE	TWO
CLAMP	off
READOUT	off

h. **CHECK** — that the level at the PIX MON OUT is 0 V, ± 100 mV.

i. Leave the connections in place for the next step.

12. **Check Clamped and Unclamped DC Levels**

REQUIREMENT — Dc level of blanking is 0V, ± 100 mV with the DC Restorer On or Off for dc coupled, and DC Restorer On for ac coupled.

a. Set the 1730 HD as follows:

INPUT	A
CH 1	on
REF	EXT
LINE, FIELD	LINE
ONE,TWO,THREE	THREE
CLAMP	off
READOUT	off

b. **CHECK** — CH1A, CH2A, and CH3A for a dc level of 0V, ± 100 mV as viewed on the test oscilloscope.

c. Select the B input on the 1730 HD.

d. **CHECK** — CH1B, CH2B, and CH3B for a dc level of 0V, ± 100 mV as viewed on the test oscilloscope.

e. Select CLAMP on the 1730 HD.

f. **CHECK** — CH1B, CH2B, and CH3B for a dc level of 0V, ± 100 mV as viewed on the test oscilloscope.

g. Select the A input on the 1730 HD.

h. **CHECK** — CH1A, CH2A, and CH3A for a dc level of 0V, ± 100 mV as viewed on the test oscilloscope.

i. Turn off the CLAMP.

13. **Check Offset Operation**

REQUIREMENT — CH2 and/or CH3 can be offset from CH1 by ±350 mV. CHB can be offset from CHA by ±350 mV.

a. Select THREE LINE and A input on the 1730 HD.

b. Enter the MENU and select OFFSETS, then ENABLE. Exit the MENU.

c. Use the VERTICAL Position to place the CH1 input trace on the 400 mV graticule line.

d. **CHECK** — using the CH2 and CH3 OFFSET controls, that CH2 and CH3 can each be positioned to the +750 mV graticule line and to the +50 mV graticule line.

e. Select no input, so that both A and B led's are off. Use the Vertical Position control to position the CH1 trace on the 400 mV graticule line. Select B input and use the CHB OFFSET control (push in and rotate), to position the CH1B trace to the 400 mV graticule line. Use the CH2 & CH3 Offset controls to place the CH2 and CH3 traces on the 400 mV graticule line.

f. Repeat step d.

g. Select both A and B inputs on together.

h. **CHECK** — using the CHB OFFSET control (push in and rotate), that CH1B, CH2B, and CH3B can be positioned to the +750 mV graticule line and to the +50 mV graticule line. Channels 1A, 2A, and 3A will not move.

i. Enter the MENU and select OFFSETS, then DISABLE. Exit the MENU.

j. Remove the 75 Ω terminators from all six inputs. Leave the 75 Ω cable and terminator connected from PIX MON OUT to the Test Oscilloscope for the next step.

14. **Check PIX MON OUT Gain and Strobe Pulse**

REQUIREMENT — Rear panel input to PIX MON OUT has unity gain, to ±5%.

a. Connect a 75 Ω cable from the VAC output to the 1730 HD CH1A INPUT. Do not terminate.

b. Set the VAC for .9999 mV and Chr/PP Manual.

c. Set the Test Oscilloscope as follows:

Volts/Div	200 mV
Coupled	DC
Time/Div	10 μs
Trig	Int/Auto/AC
Trig Slope	-

Adjust for a triggered display.

d. **CHECK** — that the amplitude of the VAC signal, as viewed on the Test Oscilloscope, is between .950 and 1.05V.

e. Disconnect the VAC signal from CH1A.

f. Turn on the 1730 HD LINE SELECT.

g. Set the Test Oscilloscope for 5 ms/Div and adjust for a triggered display.

h. **CHECK** — that the intensified pulse has a dc level shift of approximately 180 mV.

i. Turn OFF the 1730 HD LINE SELECT.

15. **Check DC Restorer Operation**

REQUIREMENT — Attenuation of 60 Hz input signal 90% or greater. Blanking level shift with APL change, less than 1% (7 mV).

a. Connect the color bar signal from the Television Test Signal Generator to the 1730 HD CH1A INPUT.

b. Display the color bar signal at TWO FIELD SWEEP rate. Connect the output of a Function Generator to the opposite side of the CH1A INPUT with a 10X, 75Ω attenuator.

c. Set the Function Generator frequency to 60 Hz, and adjust the amplitude of the sine wave to displace the sync tips by 357 mV p-to-p.

d. Turn on the CLAMP.

e. Select the 1730 HD CH1A INPUT.

f. **CHECK** — that the displacement of the sync tips is 35 mV or less.

g. Changing input cables and 1730 HD INPUT selection to each input channel in turn, repeat step e. for all remaining input channels: CH2A, CH3A, CH1B, CH2B, and CH3B.

h. Disconnect the sine-wave generator and the test signal generator.

i. Connect a five-step linearity signal to CH1A and terminate the loop-through in 75Ω.

j. Select the 1730 HD CH1A INPUT.

k. Position the blanking level to the baseline.

l. **CHECK** — for less than 7 mV (1%) shift of the blanking line as the Test Signal Generator linearity signal is adjusted between 10 and 90% APL.

m. Changing input cables and 1730 HD INPUT selection to each input channel in turn, repeat step k. for all remaining input channels: CH2A, CH3A, CH1B, CH2B, and CH3B.

n. Turn off the CLAMP and disconnect the input cable and terminator from the 1730 HD.

16. **Check X1 and X5 Flat Response**

REQUIREMENT — Flat response with 50 kHz as a reference; 50 kHz to 10 MHz within ±2%, 10 MHz to 20 MHz within ±3%, 20 MHz to 30 MHz within +3%, -5%. X5 Flat response with 50 kHz as a reference; 250 kHz to 6 MHz, within ±5%.

a. Connect the Leveled Sine-Wave Generator output, through a 50Ω precision cable and a 50-to-75Ω minimum loss attenuator, to the 1730 HD CH 1A INPUT.

b. Connect the peak-to-peak detector head to the remaining side of the 1730 HD CH1A INPUT. Connect the peak-to-peak detector head to the + (plus) input of the peak-to-peak detector. Connect the output of the peak-to-peak detector, through a bnc-to-dual banana plug adapter, to the Digital Voltmeter (DVM). Enable the peak-to-peak detector + (plus) input.

c. Select the following on the 1730 HD:

INPUT	CH1A
REF	CH1
FILTER	FLAT
ONE,TWO,THREE	ONE
LINE,FIELD	LINE

d. Set the Leveled Sine-Wave Generator Frequency Range to 50 kHz and adjust its Output Amplitude for a 700 mV display on the 1730 HD.

e. Set the DVM range for three-place accuracy and adjust the peak-to-peak detector + level for a reading as close to zero as possible. Note the reference reading.

NOTE

To calculate the deviation from flatness, set the Leveled Sine-Wave Generator to the frequency being checked and adjust the output amplitude to obtain the same level on screen as seen at the 50 kHz reference. Note the DVM reading at the frequency being checked and subtract it from the DVM reading observed at the 50 kHz reference.

f. Use the Leveled Sine-Wave Generator frequency controls to provide all frequencies from 250 kHz to 30 MHz.

g. **CHECK** — frequency response for:

±2% or 14 mV from 250 kHz to 10 MHz.
±3% or 21 mV from 10 MHz to 20 MHz.
+3% or 21 mV and –5% or 35 mV from 20 MHz to 30 MHz.

h. Repeat steps a. through f. for CH2A, CH3A, CH1B, CH2B, and CH3B.

i. Select the 1730 HD X5 gain

j. Disconnect the peak-to-peak detector head from the 1730 HD.

k. Terminate all 1730 HD input channels in 75Ω.

l. Connect the Leveled Sine-Wave Generator output to the 1730 HD CH1A INPUT. Select CH1A INPUT on the 1730 HD.

m. Set the Leveled Sine-Wave Generator to 50 kHz and adjust its Output Amplitude for a 700 mV display.

n. Use the Leveled Sine-Wave Generator frequency controls to provide all frequencies from 250 kHz to 6 MHz.

o. **CHECK** — frequency response for ±5% or 35 mV from 250 kHz to 6 MHz.

p. Repeat steps k. through n. for CH2A, CH3A, CH1B, CH2B, and CH3B.

q. Return 1730 HD to X1 gain.

17. **Check PIX MON OUT Frequency Response**

REQUIREMENT — Frequency Response within ±5% of 50 kHz, up to 30 MHz.

a. Connect the peak-to-peak detector head to the PIX MON OUT.

b. Connect the Leveled Sine-Wave Generator to the 1730 HD CH1A. Terminate the loop-through in 75Ω.

c. Select CH1A on the 1730 HD.

d. Set the Leveled Sine-Wave Generator Frequency Range to 50 kHz and adjust its Output Amplitude for a 700 mV display on the 1730 HD.

e. Set the DVM range for three-place accuracy and adjust the peak-to-peak detector level for a reading as close to zero as possible. Note the reference reading.

f. Use the Leveled Sine-Wave Generator frequency controls to provide all frequencies from 250 kHz to 30 MHz.

g. **CHECK** — that display voltage on the DVM is equal to that noted at 50 kHz, ±5% (35 mV).

h. Disconnect all inputs and 75Ω terminators from the 1730 HD.

18. **Check CH1B Subtract**

REQUIREMENT — ±3% for 50 kHz to 5 MHz; ±6% for 10 MHz to 20 MHz.

a. Connect the output cable from the Leveled Sine-Wave Generator, through a 50Ω precision cable, a 50-to-75 Ω minimum loss attenuator, a 75Ω in-line terminator and dual-input connector, to the 1730 HD CH1A and CH1B inputs.

b. Select the 1730 HD CH1B INPUT.

c. Set the Leveled Sine-Wave Generator frequency to 50 kHz and adjust the amplitude for a 700 mV display on the 1730 HD.

d. Enter the 1730 HD MENU. Select SUBTRACT, the select YES. Exit the MENU.

e. Select the 1730 HD CH1A INPUT.

f. Use the VERTICAL Position control to position the trace to a minor graticule mark at center screen.

g. CHECK — while varying the frequency on the Leveled Sine-Wave Generator from 250 kHz to 5 MHz, for less than 3% (21 mV) of residual sine wave.

h. Disconnect the Leveled Sine Wave Generator from the CH1A input and connect it to the CH2A input. Select CH2A.

i. Repeat steps g and h for CH3A, CH2B, and CH3B.

j. Disconnect the Leveled Sine Wave Generator from the 1730 HD.

k. Select MENU. Select SUBTRACT, then DISABLE. Exit the MENU.

19. **Check X1 Transient Response**

REQUIREMENT — Transient response for the 700 mV, 150 ns rise-time step: preshoot 1% or less, overshoot: 2% or less, ringing: 2% or less, tilt: 1% or less for field-rate square wave or 25 μs bar.

a. Connect a precision 50Ω cable and a 50-to-75Ω minimum loss attenuator to the Function Generator Output. Connect a barrel connector and a 75Ω inline terminator to the attenuator. Connect the 75Ω terminator, through a probe-tip adapter and a X10 probe, to the the Test Oscilloscope Channel 1 input. See Fig. 5-6.

b. Set the test oscilloscope as follows:

Volts per Div.	100 mV
Time	500 ms
Coupling	DC
Trig Source	CH1
Input	CH1
Trig	Auto/AC/Int
Trig Slope	–
X10	ON

c. Set the Function Generator as follows:

Freq	300 kH
Trig	Free Run

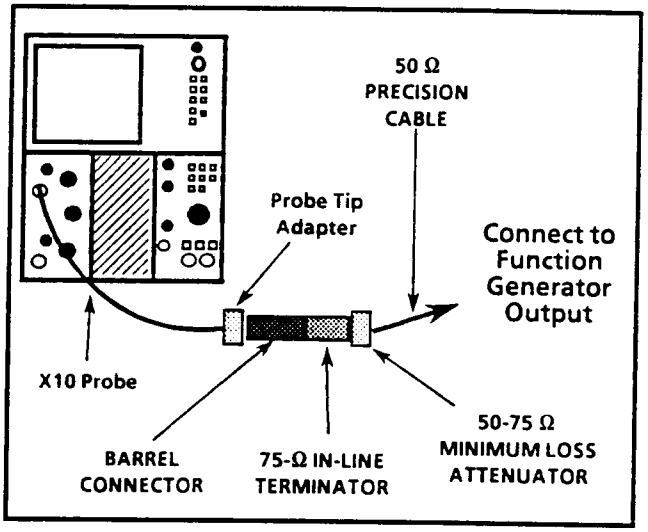

Fig. 5-6. Connecting Test Oscilloscope to Function Generator before checking Transient Response.

Sweep	Trig Sweep
Square Wave	.1 µs
Atten	3 V
Offset	In detent

d. Adjust the Test Oscilloscope for a triggered display. Use the 1730 HD Vertical Position control to view the positive going step.

e. Adjust the Function Generator attenuator for a 700 mV step. Adjust the rise time for 150 ns between the 10% and the 90% levels of the step.

f. CHECK — for aberration of the positive-going slope on the Test Oscilloscope. Note the amount of aberration.

g. Terminate all six INPUT channels in 75 Ω.

h. Connect a 50Ω cable from the Function Generator Triggered Out to the EXT REF input on the 1730 HD.

g. Disconnect the precision 50Ω cable and 50-to-75Ω minimum loss attenuator from the Test Oscilloscope. Connect the Function Generator Output, through the precision 50Ω cable and 50-to-75Ω minimum loss attenuator, to the CH1A input on the 1730 HD.

h. Set the 1730 HD as follows:

Input	CH1A
One, Two, Three	ONE
Field, Line	LINE
MAG	ON
REF	EXT

i. Use the Vertical Position controls to position the display between the 0V and 700 mV graticule lines. Use the Horizontal Position Control to view the positive-going transition.

j. **CHECK** — for the following differences between the aberration noted in step f. and that now viewed on the 1730 HD: less than 1% preshoot, less than 2% overshoot, and less than 2% ringing.

k. Changing the Function Generator connection and 1730 HD input channel selection to each input channel in turn, repeat step j. for all remaining input channels: CH2A, CH3A, CH1B, CH2B and CH3B.

20. **Check X5 Transient Response**

REQUIREMENT — Transient response for a 140 mV, 150 ns rise-time step: preshoot 1% or less, overshoot: 4% or less, ringing: 4% or less.

a. Disconnect the Function Generator input from the 1730 HD CH3B. Connect the Function Generator, through the precision 50Ω cable and the 50-to-75Ω minimum loss attenuator, to the top BNC on the Variable Attenuator.

b. Adjust the Variable Attenuator for 14 dB attenuation.

c. Connect a 75Ω cable from the bottom BNC of the Variable Attenuator to the 1730 HD CH1A input.

d. Select CH1A and X5 Gain on the 1730 HD.

e. Use the Vertical Position controls to position the display between the 0V and 700 mV graticule lines. Use the Horizontal Position Control to view the positive-going transition.

f. **CHECK** — for the following differences between the aberration noted in step 19 f. and that now viewed on the 1730 HD: less than 1% preshoot, less than 4% overshoot, and less than 4% ringing.

g. Changing the Function Generator connection and the 1730 HD INPUT selection to each channel in turn, repeat step f. for all remaining input channels: CH2A, CH3A, CH1B, CH2B, and CH3B.

h. Disconnect all input signals.

21. **Check Square Wave Tilt**

REQUIREMENT — Field Rat Square Wave or Vertical Window, 1% or less.

a. Connect a precision 50Ω cable and a 50-to-75Ω minimum loss attenuator to the Function Generator Output. Connect a barrel connector and a 75Ω inline terminator to the attenuator. Connect the 75Ω terminator, through a probe-tip adapter and a X10 probe, to the the Test Oscilloscope Channel 1 input. See Fig. 5-6.

b. Set the Test Oscilloscope as follows:

X10 Mag	Off
Time	2 ms
Volts/Div	100 mV
Coupling	DC
Trig Source	CH1
Input	CH1
Trig	Auto
AC	Int
Trig Slope	–

c. Set the Function Generator as follows:

Freq	30 Hz
Trig	Free Run
Sweep	Trig Sweep
Atten	3 V
Offset	In detent

Adjust the attenuator for a 700 mV display on the Test Oscilloscope.

d. Adjust the Test Oscilloscope for a triggered display. Note the amount of tilt in the square wave.

e. Disconnect the precision 50Ω cable and 50-to-75Ω minimum loss attenuator from the Test Oscilloscope. Use the precision 50Ω cable and 50-to-75Ω minimum loss attenuator to connect the Function Generator Output to the 1730 HD CH1A input.

f. Connect a 50 Ω cable from the Function Generator Triggered Out to pin 10 of the 1730 HD REMOTE connector (Remote Sync Input). Ground Pin 4 (Remote Sync Enable) to pin 9 (ground).

g. Set the 1730 HD as follows:

INPUT	CH1A
Flat,Filter	Flat
Gain	X1
One, Two, Three	Two
Line, Field	Field

f. CHECK -- that there is 1% or less difference between the amount of tilt noted in step d. and that now viewed on the 1730 HD display.

g. Disconnect REMOTE connector.

22. **Check Filter Response**

REQUIREMENT — Response at 15 kHz does not vary between FLAT and FILTER by more than 1%.

a. Set the 1730 HD as follows:

INPUT	CH1A
REF	EXT
FLAT, FILTER	FLAT
ONE,TWO,THREE	ONE
FIELD, LINE	LINE

b. Set the Function Generator as follows:

Freq	15 kHz
Trig	Free Run
Function	Sine Wave

Adjust the attenuator for a 700 mV display on the 1730 HD.

c. Switch back and forth between FILTER and FLAT.

d. **CHECK** — that the amplitude of the display in FILTER, is within ±1% of the displayed amplitude in the FLAT mode.

e. Set the 1730 HD to FLAT.

f. Disconnect the precision 50Ω cable and 50-to-75Ω minimum loss attenuator from the Function Generator Output. Use the 50Ω precision cable and 50-to-75Ω minimum loss attenuator to connect the output of the Leveled Sine-Wave Generator to the 1730 HD CH1A INPUT.

g. Set the Leveled Sine-Wave Generator frequency to 50 kHz, and adjust the amplitude to 700 mV as viewed on the 1730 HD.

h. Select FILTER.

i. **CHECK** — that the displayed amplitude rolls off to 70 mV or less at 20 MHz, and continues to roll off at frequencies up to 30 MHz.

j. Select FLAT on the 1730 HD and disconnect all inputs and terminators.

23. **Check Return Loss**

REQUIREMENT — Return loss for all six INPUTs at least 35 dB from 250 kHz to 30 MHz with instrument power On; at least 35 dB from 250 kHz to 20 MHz and 32 dB from 20 MHz to 30 MHz with power Off.

a. Connect a precision 50Ω cable and a 50-to-75Ω minimum loss attenuator to the Leveled Sine-Wave Generator Output. Connect a barrel connector and a 75Ω in-line terminator to the attenuator. Connect the 75Ω terminator, through a probe-tip adapter and a X10 probe, to the the

Test Oscilloscope Channel 1 input. See Fig. 5-7.

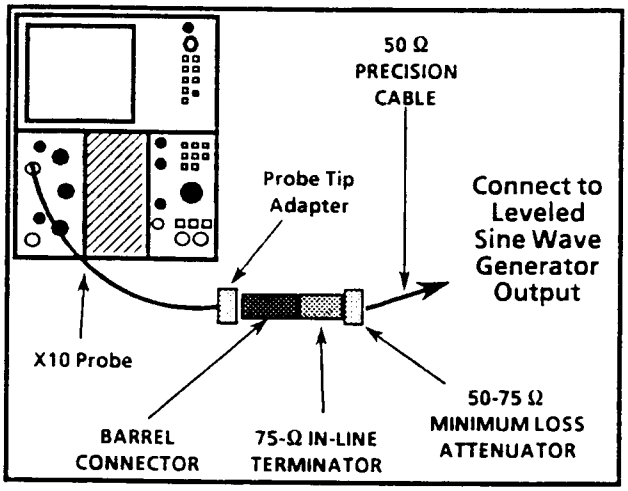

Fig. 5-7. Connecting Test Oscilloscope to Leveled Sine-Wave Generator before checking Return Loss.

b. Set SG503 to 50 kHz.

c. Set the 7A26 to 100 mV/Div, DC Input, and CH1 Trigger.

d. Adjust the amplitude control on the SG503 for a 700 mV display on the test oscilloscope.

e. Connect a 75Ω cable from the + input on the peak-to-peak detector to the peak-to-peak detector head. Connect the peak-to-peak detector head to the 1730 HD CH1A INPUT.

f. Using a 75Ω cable and banana plug, connect the output of the peak-to-peak detector to the DVM. Check for proper polarity. Set the DVM for three-place accuracy.

g. Disconnect the 75Ω in-line terminator from the Leveled Sine-Wave Generator cable.

h. Connect the attenuator end of the cable coming from the Leveled Sine-Wave Generator to the 1730 HD CH1A loop-through.

i. Adjust the level of the peak-to-peak detector + input for a DVM reading as close to zero as possible. Note this reference reading.

j. Vary the frequency control on the Leveled Sine-Wave Generator from 250 kHz to 30 MHz, checking for less than 12 mV of deviation from the reference reading, as read on the DVM.

k. Move the peak-to-peak detector head and Leveled Sine Wave Generator connections from the 1730 HD CH1A input to CH2A. Repeat step j.

l. Repeat steps j. and k. for CH3A, CH1B, CH2B, and CH3B.

m. Turn off the 1730 HD power switch.

n. CHECK — CH3B for less than 12 mV deviation from the 50 kHz reference reading while varying frequency from 250 kHz to 20 MHz.

o. CHECK — CH3B for less than 22 mV deviation from the 50 kHz reference reading while varying the frequency from 20 MHz to 30 MHz.

p. Repeat steps n. and o. for CH2B, CH1B, CH3A, CH2A, and CH1A.

q. Disconnect the peak-to-peak detector head and the Leveled Sine-Wave Generator from CH1A and connect them to the EXT REF input.

r. Set the Leveled Sine-Wave Generator to 50 kHz.

s. Readjust the peak-to-peak + input for a reading on the DVM as close to zero as possible. Note the reading.

t. **CHECK** — for a deviation of 12 mV or less from the 50 kHz reference reading while varying the frequency from 250 kHz to 30 MHz.

u. Turn on the power and repeat step t.

v. Disconnect all inputs and terminators from the 1730 HD.

24. Check PIX MON OUT Return Loss

REQUIREMENT — 30 dB from 50 kHz to 5 MHz, power on only.

a. Connect the output from the Leveled Sine-Wave Generator, through a 50Ω precision cable and 50-to-75Ω minimum loss attenuator, to the input of the Return Loss Bridge. Set the Leveled Sine-Wave Generator to 50 kHz. Connect the output of the Bridge to the Test Oscilloscope and set the amplitude of the display to 500 mV p-p with the terminator removed from the Unknown arm of the Bridge. See Fig. 5-8.

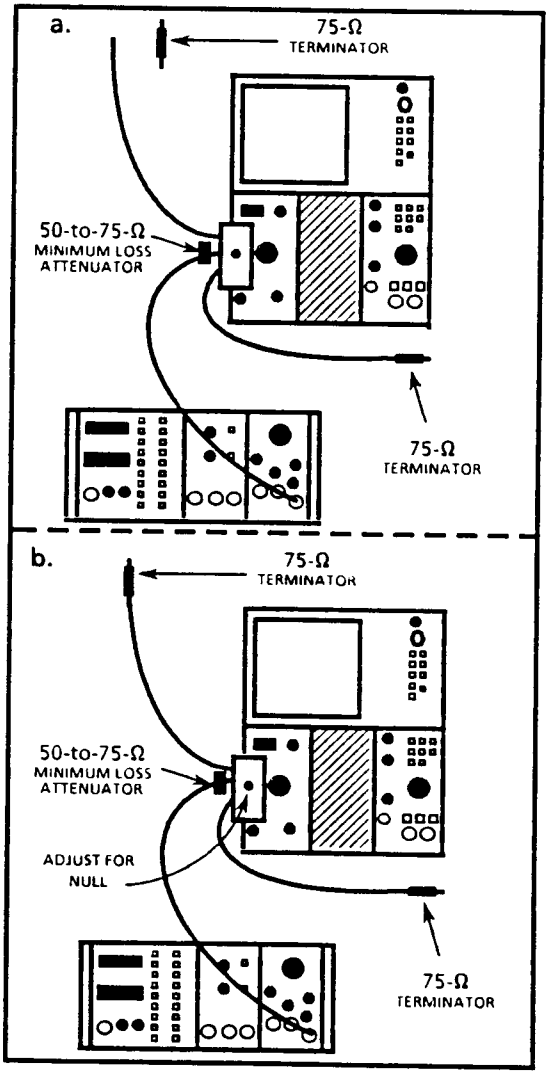

Fig. 5-8. Return-Loss Bridge Set-up: a) 500 mV amplitude. b) Null bridge.

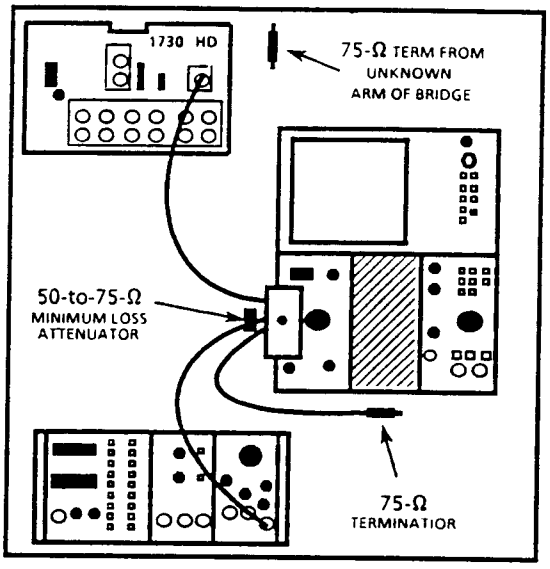

Fig. 5-9. Measuring return loss of 1730 HD PIX MON OUT.

b. Set the Test Oscilloscope as follows:

Amplitude	100 mV/Div
+ Input	DC
- Input	DC

c. Change the Leveled Sine-Wave Generator frequency to 5 MHz. Reconnect the terminator to the Unknown arm, set the Test Oscilloscope for 1 mV per division, and balance the bridge. See Fig. 5-8b. Note residual amplitude for use in a later step.

d. Remove the terminator from the Unknown arm and connect the Unknown arm to the PIX MON OUT on the 1730 HD. See Fig. 5-9.

e. Set the Test Oscilloscope to 5 mV / Div.

f. Check that the 1730 HD inputs are off (CHA and CHB led's are off).

g. **CHECK** — that the return loss of the PIX MON OUT, minus the residual noted in step c., is better than 30 dB (15.8 mV), from 250 kHz to 5 MHz. This measurement is made with instrument power on and no signal output.

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MANUAL CHANGE INFORMATION Group Code 20

Date: 07/06/89 Change Reference: M70117

Product: TSG170A Manual Part No: 070-5680-00

DESCRIPTION

Eff. S/N: B042143

TEXT and ELECTRICAL PARTS LIST CHANGES

SECTION 3 SPECIFICATIONS. Page 3-2, Table 3-1, Test Signal Generator – General Test Signal Characteristics
CHANGE Line Blanking Interval entry **TO READ:**

Line Blanking Interval	10.9 μs $\pm$0.2 μs.	Beginning at 20 IRE point of active video.

Page 3-6, Fig. 3-1. Color Bar signal components
CHANGE Fig. 3-1 **AS SHOWN:**

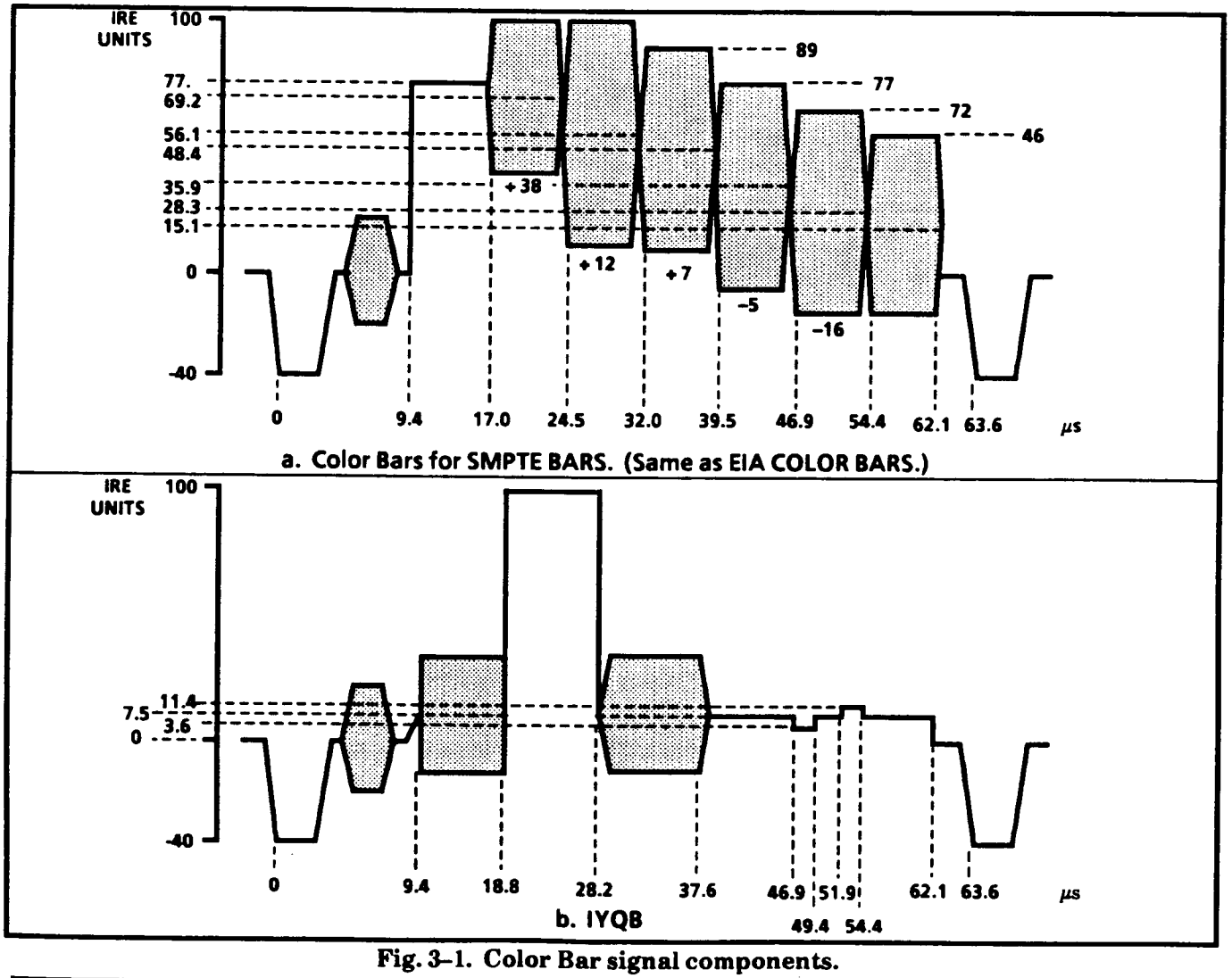
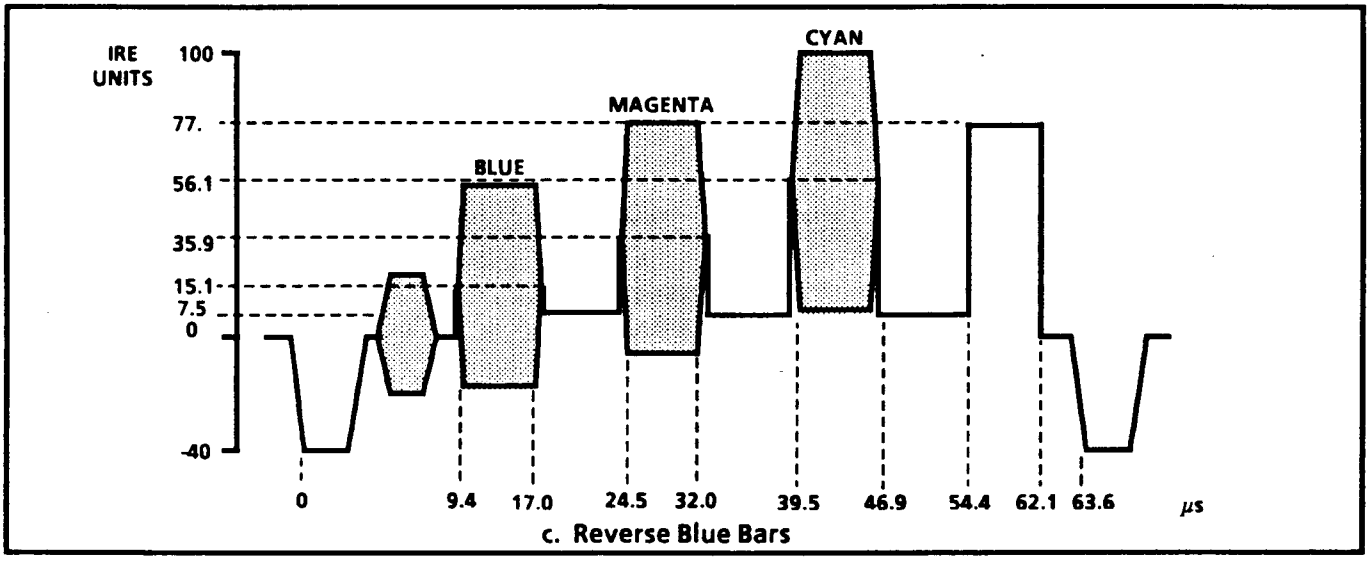


Fig. 3–1. Color Bar signal components.



c. Reverse Blue Bars

Fig. 3–1 (CONT).

Page 3–7, Fig. 3–2a. Horizontal Component of Convergence test signal.
CHANGE Fig. 3–2a **AS SHOWN:**

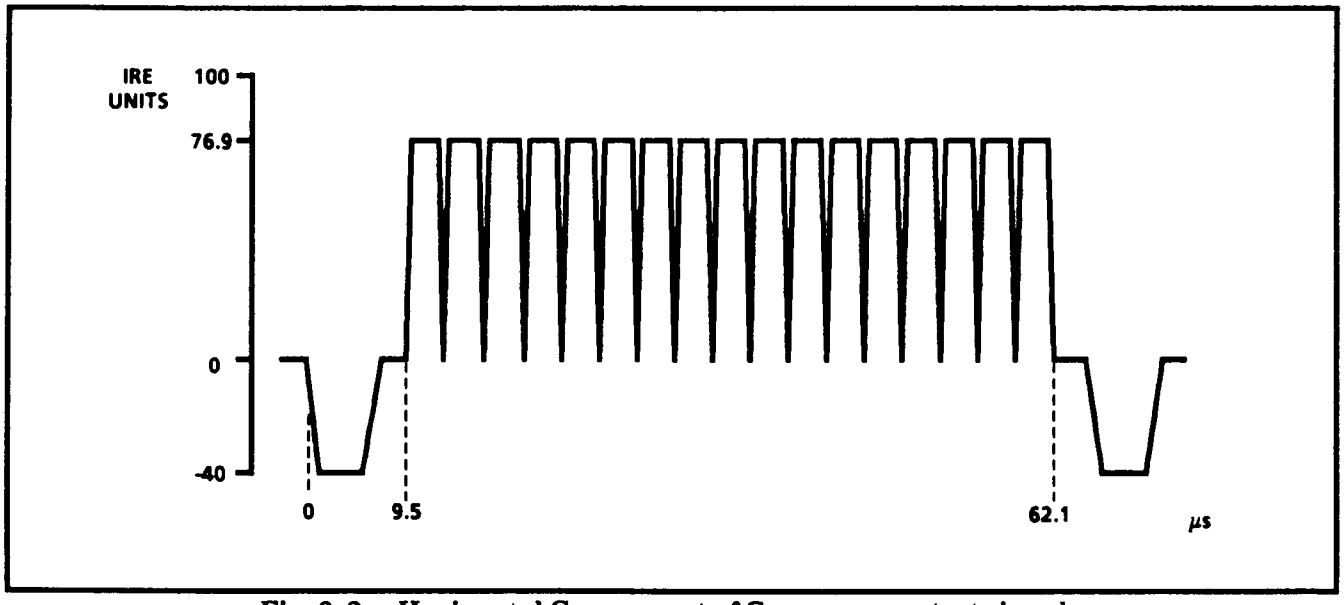


Fig. 3–2a. Horizontal Component of Convergence test signal.

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: TSG170A		Manual Part No: 070-5680-00

Page 3-8, Fig. 3-4. Multiburst
CHANGE Fig. 3-4 **AS SHOWN:**

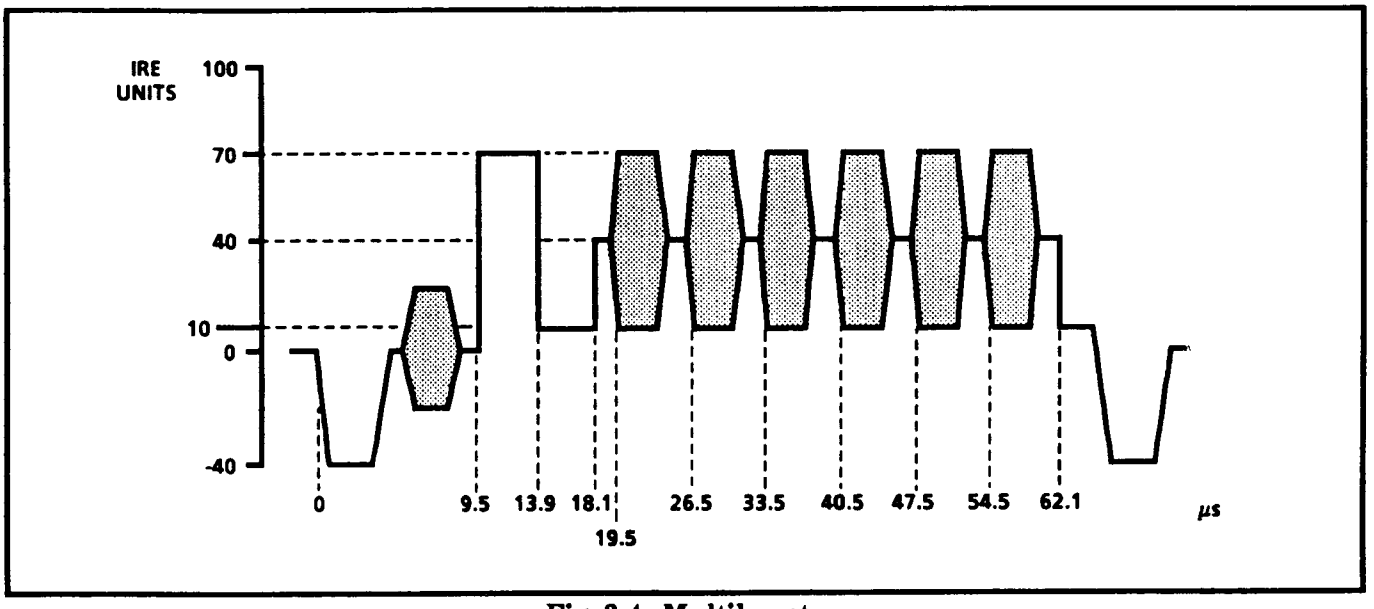


Fig. 3-4. Multiburst.

Page 3-10, Fig. 3-7. APL and Bounce
CHANGE Fig. 3-7 **AS SHOWN:**

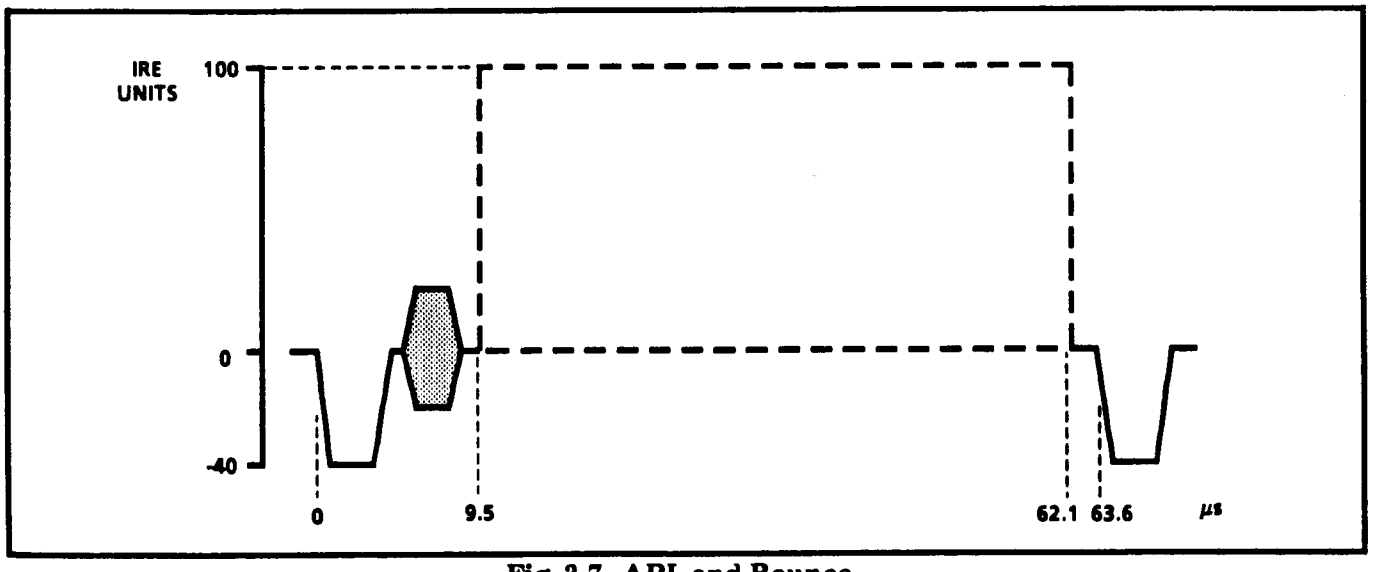


Fig. 3-7. APL and Bounce.

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: TSG170A		Manual Part No: 070-5680-00

Page 3–10, Fig. 3–8. 100/10 IRE Flat Field
CHANGE Fig. 3–8 **AS SHOWN:**

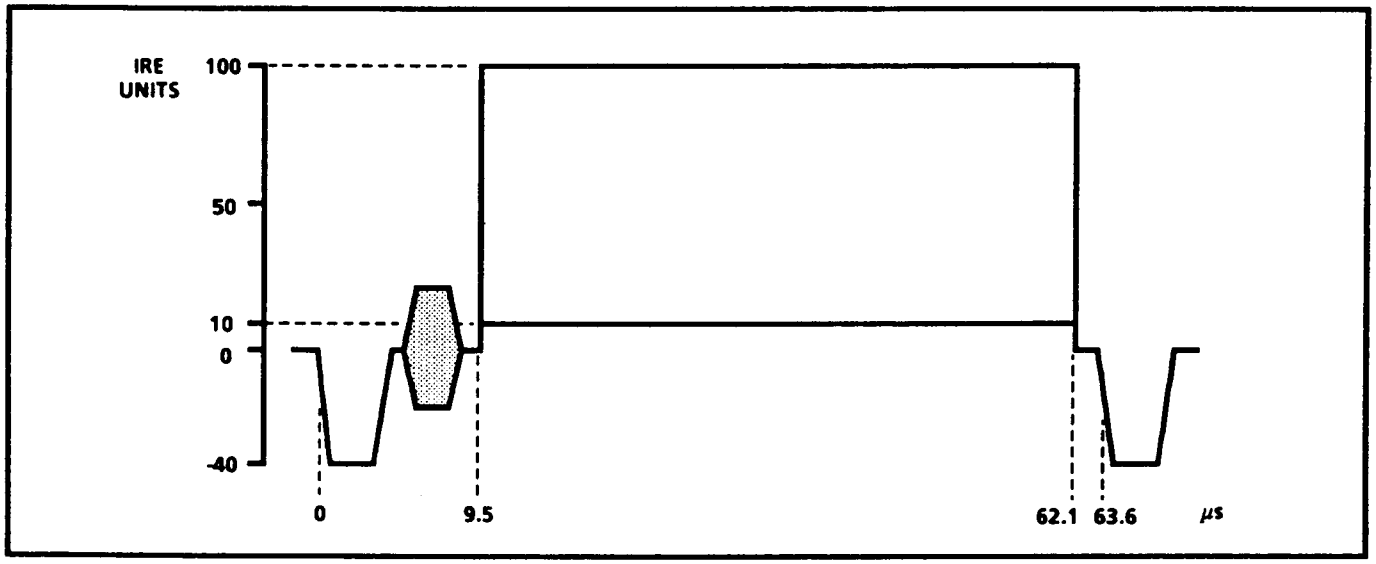


Fig. 3-8. 100/10 IRE Flat Fields.

Page 3–11, Fig. 3–9. Red Field
CHANGE Fig. 3–9 **AS SHOWN:**

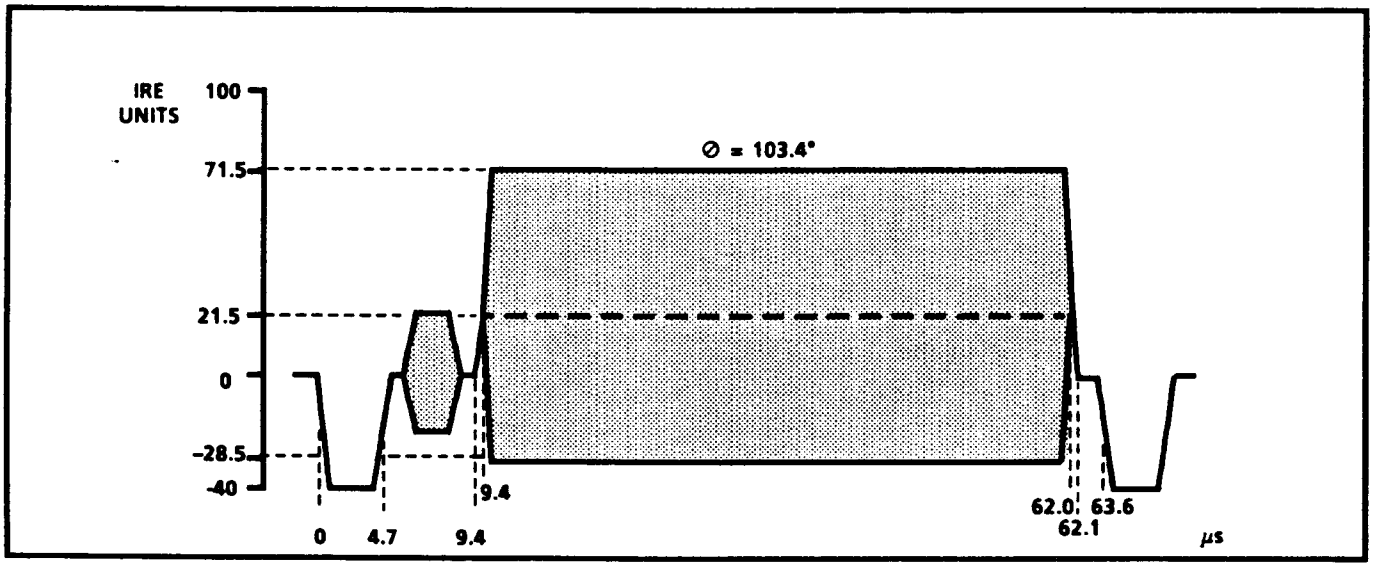


Fig. 3-9. Red Field.

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: TSG170A		Manual Part No: 070-5680-00

Page 3–11, Fig. 3–10. Multibars
CHANGE Fig. 3–10 **AS SHOWN:**

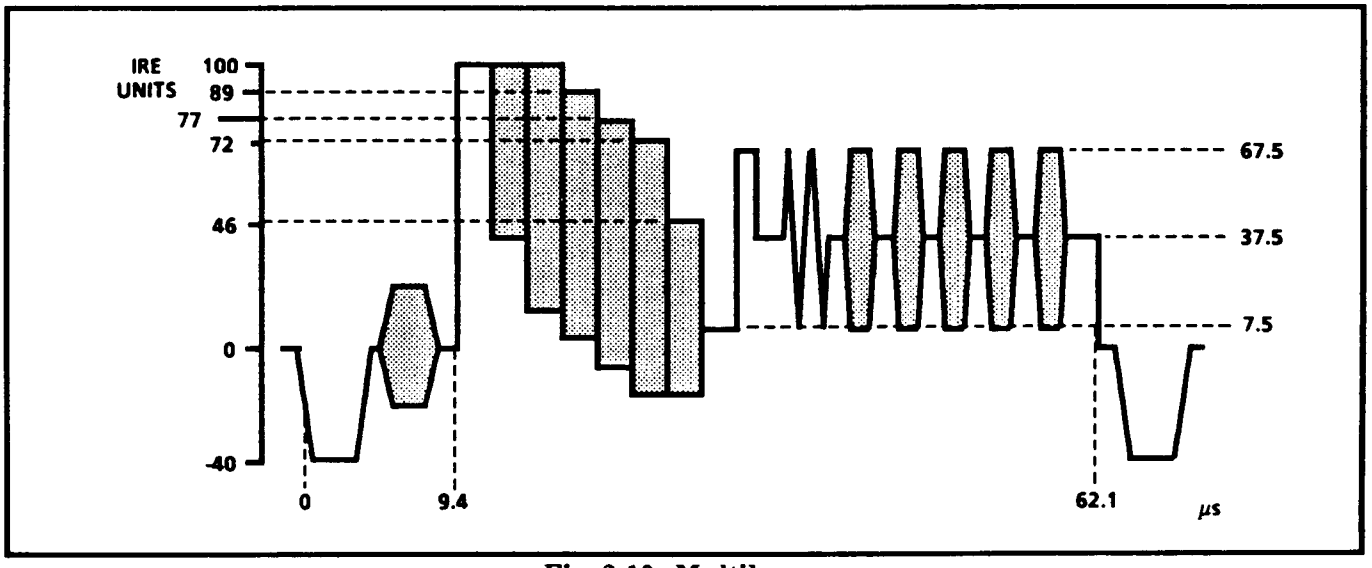


Fig. 3-10. Multibars.

Page 3–12, Fig. 3–12. Line Sweep with Markers
CHANGE Fig. 3–12 **AS SHOWN:**

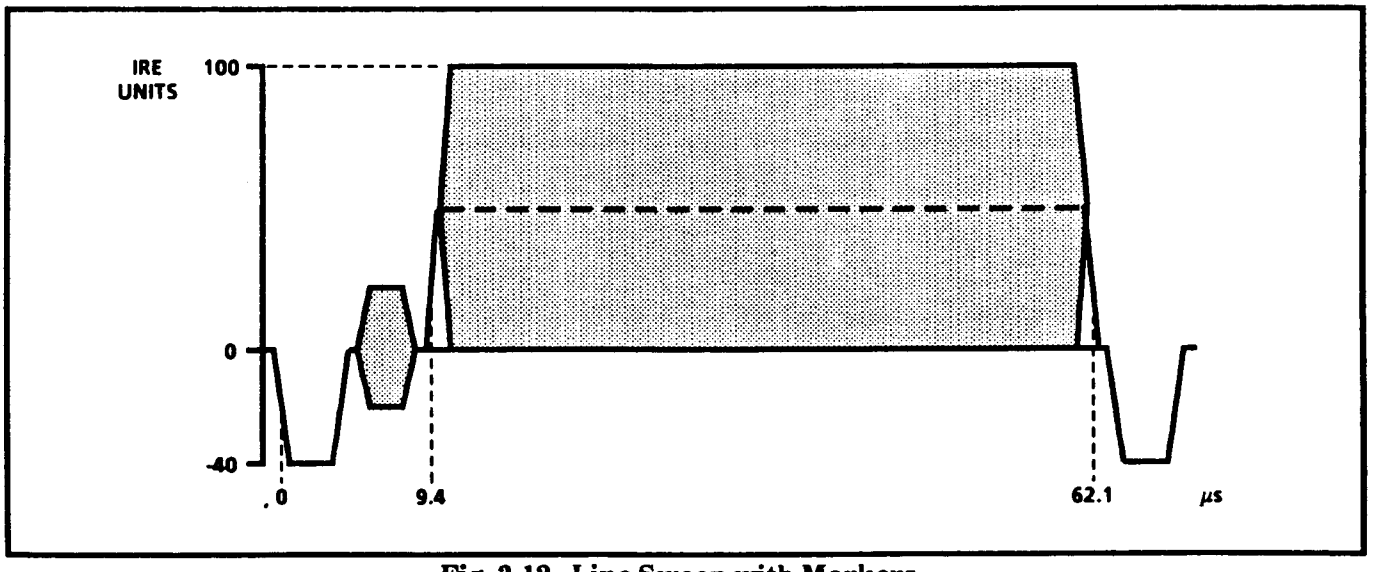


Fig. 3-12. Line Sweep with Markers.

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: TSG170A		Manual Part No: 070-5680-00

Page 3–13, Fig. 3–13. Multipulse
CHANGE Fig. 3–13 **AS SHOWN:**

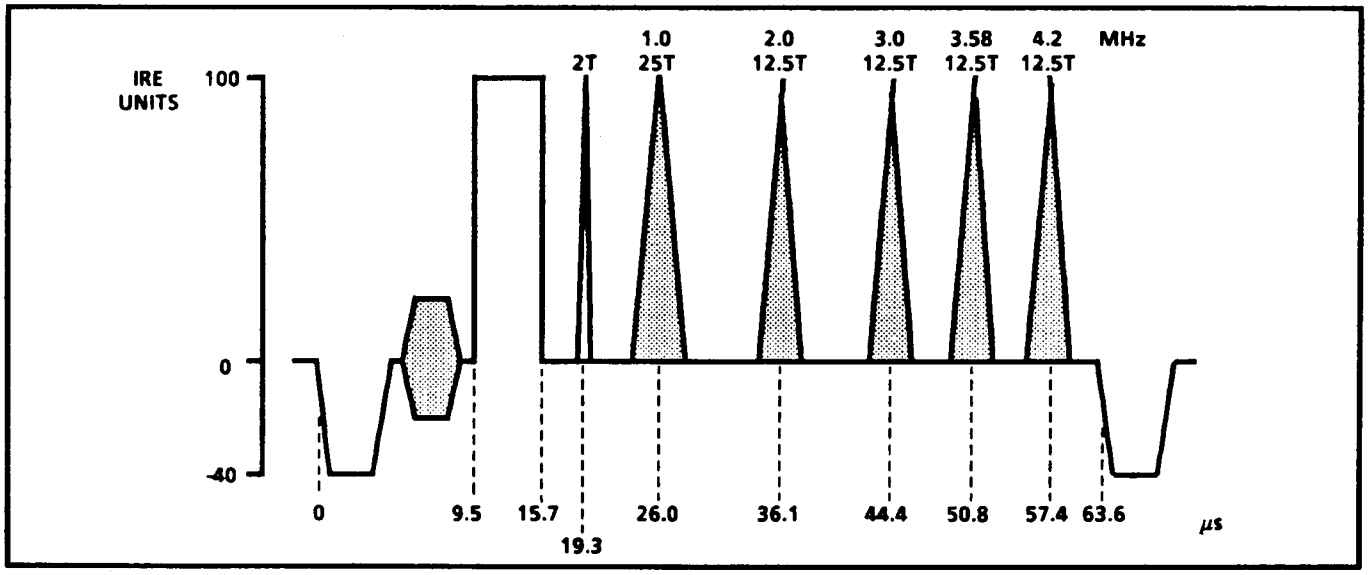


Fig. 3-13. Multipulse.

Page 3–14, Table 3–3 Test Signal Generator – Black Burst Output
CHANGE Blanking Width entry **TO READ:**

Blanking Width	10.2 μs ±0.2 μs.	

Page 3–14, Fig. 3–17. Black Burst
CHANGE Fig. 3–17 **AS SHOWN:**

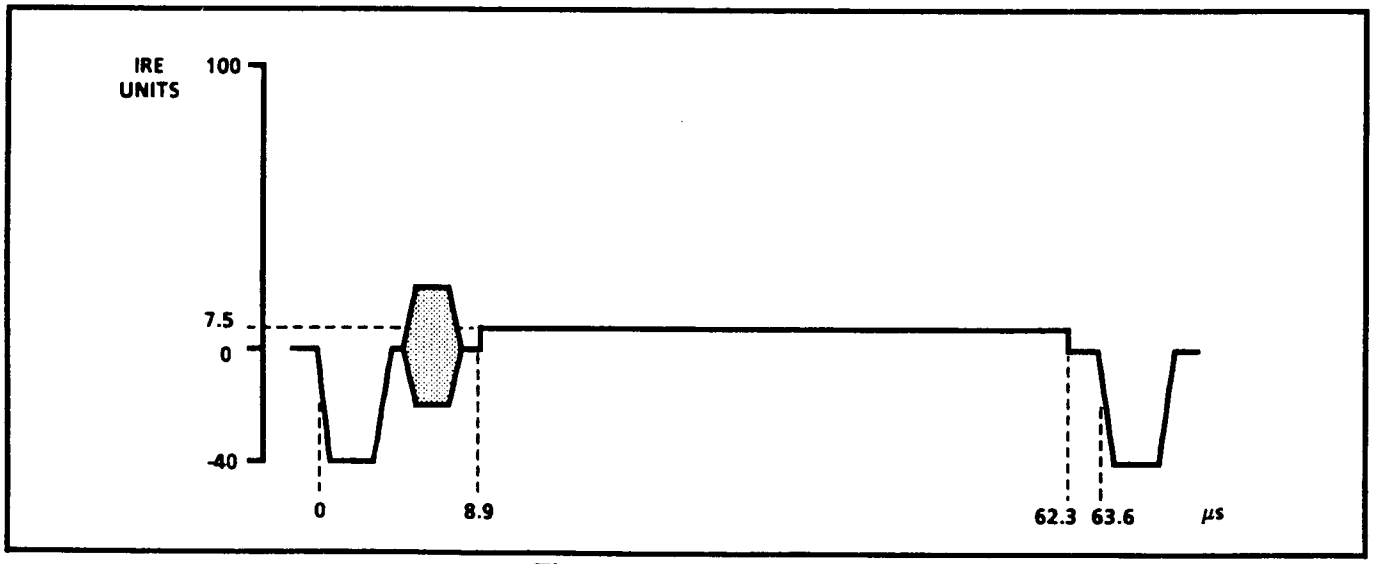


Fig. 3-17. Black Burst.

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: TSG170A		Manual Part No: 070-5680-00

SECTION 8 REPLACEABLE ELECTRICAL PARTS

CHANGE TO READ:

A2-1	670-9111-06	CKT BD ASSY:DIGITAL BD
A2-1U624	160-3563-02	IC,DGTL:NMOS,8192 X 8 EPROM,PRGM
A2-1U631	160-3564-02	IC,DGTL:NMOS,8192 X 8 EPROM,PRGM
A2-1U637	160-3565-02	IC,DGTL:NMOS,8192 X 8 EPROM,PRGM
A2-1U644	160-3566-02	IC,DGTL:NMOS,8192 X 8 EPROM,PRGM
A2-1U650	160-3567-02	IC,DGTL:NMOS,8192 X 8 EPROM,PRGM
A2-1U859	160-3570-01	IC,DGTL:CMOS,1K X 8 REGISTERED,PRGM
A5	670-9121-04	CKT BD ASSY:OPTION 1
A5U278	160-3572-01	IC,DGTL:NMOS,4096 X 8 EPROM
A5U392	160-3574-02	IC,DGTL:CMOS,1K X 8 REGISTERED,PRGM

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MANUAL CHANGE INFORMATION Group Code 20

Date: 07/06/89 Change Reference: M70117

Product: SPG170A Manual Part No: 070-5965-00

DESCRIPTION

EFF S/N:B020853

TEXT and ELECTRICAL PARTS LIST CHANGES

SECTION 4 SPECIFICATIONS. Page 4-1, Table 4-1, Black Burst Generator

CHANGE Line Blanking Interval entry **TO READ:**

Line Blanking Interval	10.9 μs $\pm$0.1 μs.	

Page 4-2, Fig. 4-1 Black Burst Line Timing

CHANGE Fig. 4-1 **AS SHOWN:**

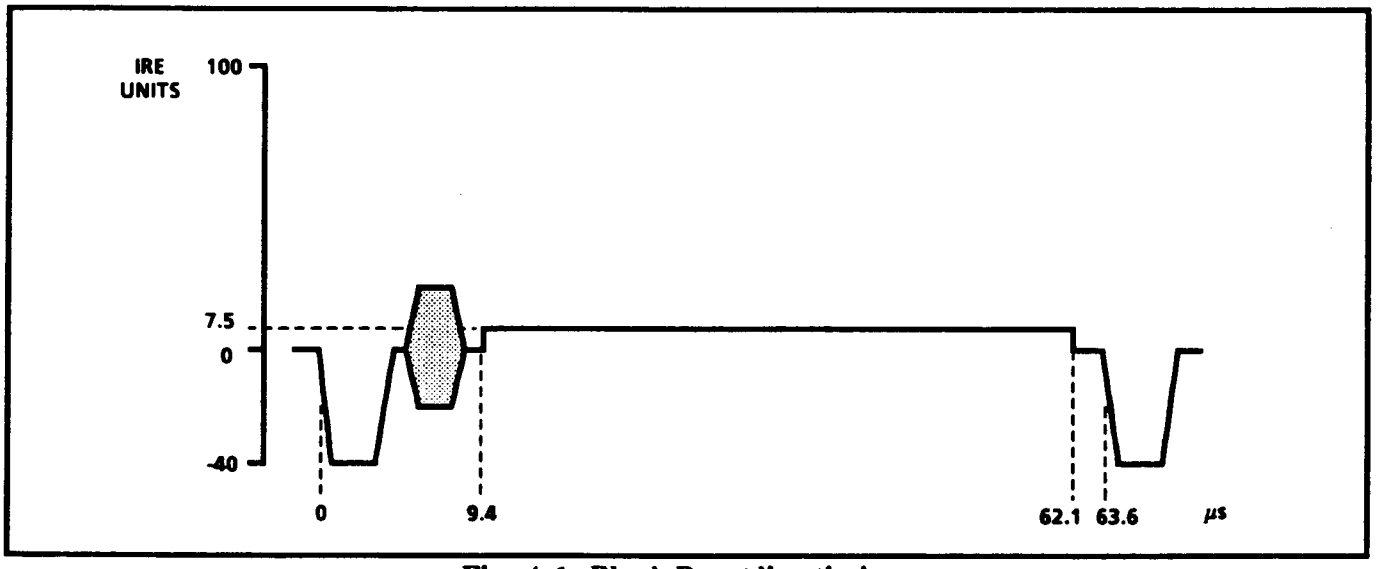

Fig. 4–1. Black Burst line timing.

Page 4-5, Table 4-6 Option 1 (Color Bars, Audio Tone, and ID)

CHANGE Color Bars Blanking Width entry **TO READ:**

Color Bars Blanking Width	10.9 μs.	

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: SPG170A		Manual Part No: 070-5965-00

Page 4-6. Fig. 4-3. SMPTE BARS detail

CHANGE Fig. 4-3 **AS SHOWN:**

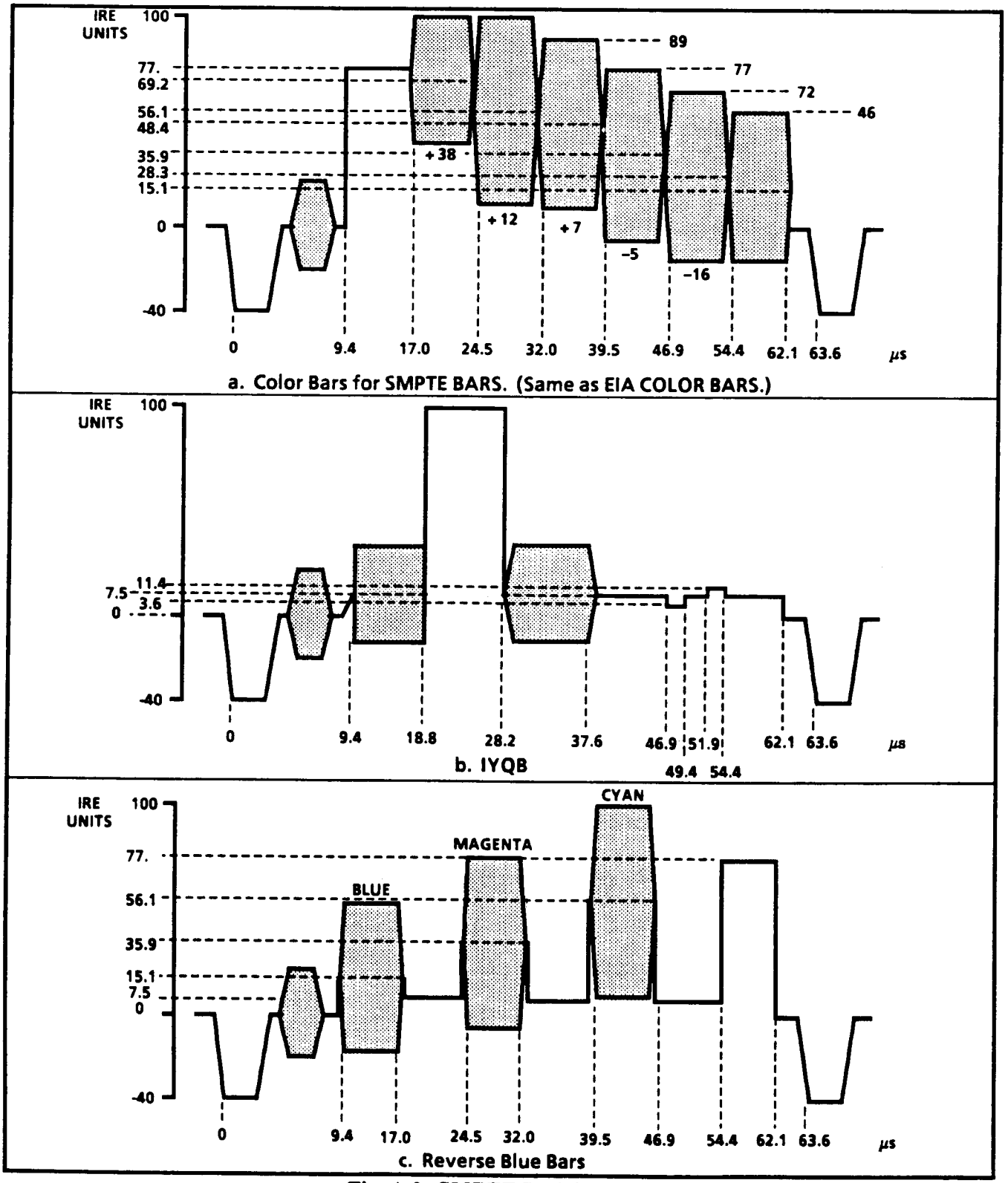

Fig. 4-3. SMPTE BARS detail.

Date: 07/06/89	Group Code 20	Change Reference: M70117
Product: SPG170A		Manual Part No: 070-5965-00

SECTION 8 REPLACEABLE ELECTRICAL PARTS

CHANGE TO READ:

A2-1	670-9523-04	CKT BD ASSY:DIGITAL
A2-1U745	160-3769-01	IC,DGTL:CMOS,1K X 8 PROM,PRGM
A2-1U756	160-3770-02	IC,DGTL:8192 X 8 EPROM,PRGM
A2-1U762	160-3570-01	IC,DGTL:CMOS,1K X 8 REGISTERED,PRGM
A5	670-9121-04	CKT BD ASSY:OPTION 1
A5U278	160-3572-01	IC,DGTL:NMOS,4096 X 8 EPROM
A5U392	160-3574-02	IC,DGTL:CMOS,1K X 8 REGISTERED,PRGM

Tektronix
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MANUAL CHANGE INFORMATION Group Code 20

Date: 06/19/89 Change Reference: M69710

Product: General Manual Part No: All TV Products

DESCRIPTION

ELECTRICAL PARTS LIST CHANGES - RESISTORS

For improved internal inventory control, Tektronix Television Division is eliminating almost all usage of a particular class of resistor. In all cases, the replacement resistor is the same value with a higher wattage rating, better tolerance, or better thermal characteristics. The following list shows the new part number for each of the replaced resistors. Make sure to use the new part numbers when ordering replacement resistors.

Old P/N	New P/N
321-0001-00	322-3001-00
321-0030-00	322-3030-00
321-0034-00	322-3034-00
321-0039-00	322-3039-00
321-0044-00	322-3044-00
321-0047-00	322-3047-00
321-0050-00	322-3050-00
321-0051-00	322-3051-00
321-0056-00	322-3056-00
321-0058-00	322-3058-00
321-0065-00	322-3065-00
321-0073-00	322-3073-00
321-0085-00	322-3085-00
321-0085-01	321-0085-07
321-0085-03	321-0085-07
321-0086-00	322-3086-00
321-0089-00	322-3089-00
321-0092-00	322-3092-00
321-0093-00	322-3093-00
321-0097-00	322-3097-00
321-0098-00	322-3098-00
321-0101-00	322-3101-00
321-0105-00	322-3105-00
321-0106-00	322-3106-00
321-0108-00	322-3108-00
321-0109-00	322-3109-00
321-0110-00	322-3110-00
321-0114-00	322-3114-00
321-0114-03	321-0114-07
321-0117-00	322-3117-00
321-0119-00	322-3119-00
321-0121-00	322-3121-00
321-0123-00	322-3123-00
321-0126-00	322-3126-00
321-0128-00	322-3128-00
321-0130-00	322-3130-00
321-0132-00	322-3132-00
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321-0138-00	322-3138-00
321-0139-00	322-3139-00
321-0141-00	322-3141-00
321-0143-00	322-3143-00
321-0143-03	321-0143-07
321-0145-00	322-3145-00
321-0146-00	322-3146-00
321-0147-00	322-3147-00

Old P/N	New P/N
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321-0152-00	322-3152-00
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321-0200-00	322-3200-00
321-0201-00	322-3201-00
321-0202-00	322-3202-00
321-0203-00	322-3203-00
321-0204-00	322-3204-00

Old P/N	New P/N
321-0205-00	322-3205-00
321-0206-00	322-3206-00
321-0207-00	322-3207-00
321-0208-00	322-3208-00
321-0210-00	322-3210-00
321-0211-00	322-3211-00
321-0213-00	322-3213-00
321-0214-00	322-3214-00
321-0215-00	322-3215-00
321-0216-00	322-3216-00
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321-0225-00	322-3225-00
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321-0246-00	322-3246-00
321-0248-00	322-3248-00
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321-0252-00	322-3252-00
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321-0255-00	322-3255-00
321-0256-00	322-3256-00
321-0256-07	322-3501-07
321-0258-00	322-3258-00
321-0259-00	322-3259-00

Old P/N	New P/N
321-0260-00	322-3260-00
321-0261-00	322-3261-00
321-0262-00	322-3262-00
321-0264-00	322-3264-00
321-0265-00	322-3265-00
321-0266-00	322-3266-00
321-0267-00	322-3267-00
321-0268-00	322-3268-00
321-0269-00	322-3269-00
321-0271-00	322-3271-00
321-0273-00	322-3273-00
321-0275-00	322-3275-00
321-0276-00	322-3276-00
321-0277-00	322-3277-00
321-0279-00	322-3279-00
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321-0281-00	322-3281-00
321-0282-00	322-3282-00
321-0284-00	322-3284-00
321-0285-00	322-3285-00
321-0286-00	322-3286-00
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321-0287-00	322-3287-00
321-0289-00	322-3289-00
321-0289-07	322-3289-07
321-0292-00	322-3292-00
321-0293-00	322-3293-00
321-0294-00	322-3294-00
321-0295-00	322-3295-00
321-0296-00	322-3296-00
321-0297-00	322-3297-00
321-0299-00	322-3299-00
321-0301-00	322-3301-00
321-0302-00	322-3302-00
321-0304-00	322-3304-00
321-0305-00	322-3305-00
321-0306-00	322-3306-00
321-0308-00	322-3308-00
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321-0314-00	322-3314-00
321-0315-00	322-3315-00
321-0318-00	322-3318-00
321-0318-03	321-0318-07
321-0322-00	322-3322-00
321-0324-00	322-3324-00
321-0325-00	322-3325-00
321-0326-00	322-3326-00

Date: 06/19/89 Group Code 20 Change Reference: M69710

Product: General Manual Part No: All TV Products

Old P/N	New P/N
321-0327-00	322-3327-00
321-0328-00	322-3328-00
321-0329-00	322-3329-00
321-0329-02	321-0329-03
321-0330-00	322-3330-00
321-0331-00	322-3331-00
321-0333-00	322-3333-00
321-0334-00	322-3334-00
321-0335-00	322-3335-00
321-0336-00	322-3336-00
321-0338-00	322-3338-00
321-0339-00	322-3339-00
321-0342-00	322-3342-00
321-0344-00	322-3344-00
321-0346-00	322-3346-00
321-0350-00	322-3350-00
321-0352-00	322-3352-00
321-0354-00	322-3354-00
321-0356-00	322-3356-00
321-0357-00	322-3357-00

Old P/N	New P/N
321-0360-00	322-3360-00
321-0363-00	322-3363-00
321-0364-00	322-3364-00
321-0367-00	322-3367-00
321-0369-00	322-3369-00
321-0371-00	322-3371-00
321-0373-00	322-3373-00
321-0374-00	322-3374-00
321-0377-00	322-3377-00
321-0378-00	322-3378-00
321-0381-00	322-3381-00
321-0383-00	322-3383-00
321-0385-00	322-3385-00
321-0385-07	322-3506-07
321-0389-00	322-3389-00
321-0392-00	322-3392-00
321-0393-00	322-3393-00
321-0394-00	322-3394-00
321-0396-00	322-3396-00
321-0402-00	322-3402-00

Old P/N	New P/N
321-0404-00	322-3404-00
321-0405-00	322-3405-00
321-0410-00	322-3410-00
321-0411-00	322-3411-00
321-0412-00	322-3412-00
321-0414-00	322-3414-00
321-0414-07	322-3504-07
321-0418-00	322-3418-00
321-0421-00	322-3421-00
321-0426-00	322-3426-00
321-0431-00	322-3431-00
321-0437-00	322-3437-00
321-0439-00	322-3439-00
321-0442-00	322-3442-00
321-0443-00	322-3443-00
321-0444-00	322-3444-00
321-0450-00	322-3450-00
321-0457-00	322-3457-00
321-0469-00	322-3469-00
321-0481-00	322-3481-00

Old P/N	New P/N
321-0603-00	321-0603-07
321-0612-00	322-3487-00
321-0612-03	321-0612-07
321-0666-00	321-0666-07
321-0674-00	321-0674-04
321-0677-00	321-0677-07
321-0793-03	321-0793-07
321-0816-03	321-0816-07
321-0928-03	321-0928-07
321-0932-03	321-0929-07
321-0962-03	321-0962-07
321-1283-03	321-1283-07
321-1289-03	321-1289-07
321-1296-03	321-1296-07
321-1614-07	322-3507-07
321-1683-07	322-3508-07
321-1684-07	322-3509-07
321-1702-03	321-1705-04
321-1727-07	322-3498-07
321-1728-07	322-3512-07

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MANUAL CHANGE INFORMATION Group Code 20

Date: 03/09/89 Change Reference: C5/389

Product: WFM300 Manual Part No: 070-6039-00

DESCRIPTION

EFF SN B010347

TEXT CHANGES

PAGE 1-9, TABLE 1-10, Transcoder, Gamut Limit (Supplemental Information)
ADD: ***NOTE: For instruments SN B010347 & Up. The bright-up display feature is enabled by pressing the UP button and disabled by pressing the DOWN button. (Operates when LIN SEL ON button is set to Off.)***

PAGE 2-4, NOTE
ADD to the NOTE: For instruments SN B010347 & Up. When LINE SEL ON button is set to OFF, the UP button enables the picture monitor Gamut Limit Intensifying Pulse. The DOWN button disables the pulse.

PAGE 2-4, UP and DOWN Buttons
CHANGE; Gamut Limit Detector to read "picture monitor Gamut Limit Intensifying Pulse.

PAGE 2-5, LINE SEL ON Button
ADD: When the button is set to the Off position, the Line Select mode is disabled. For instruments SN B010347 & Up. The Off position permits the picture monitor Gamut Limit Intensifying Pulse to be enabled or disabled by means of the UP or DOWN buttons, respectively.

PAGE 2-5, G, B, R PIX MON OUTPUTS
ADD: For instruments SN B010347 & Up. The blinking bright-up display can be turned on by pressing the UP button or turned off by pressing the DOWN button. (GAMUT indicator lights and mode of operation for the WFM-300 are not affected.)

PAGE 2-15, Step 14a
ADD: Check that the LIN SEL ON button is set to Off.

PAGE 2-18, Step 18e
CHANGE TO READ:

e. Set the generator controls to select 100% Color Bars in SMPTE Parallel Format with a Reference Level. (The reference Levels on the signal provide a method for checking the + and – Gamut trip points that turn on the LEDs and the Gamut Limit Intensifying Pulses. The pulses produce the blinking bright-up display on the picture monitor.)

f. Check that the POS and NEG GAMUT LEDs are On.

g. For instruments SN B010347 & Up. Check that the LINE SEL ON button is set to Off. Press the UP button onthe WFM-300 front panel.

h. Check that there is a blinking bright-up display on the picture monitor.

i. For instruments SN B010347 & Up. Press the DOWN button and check that the display stops blinking.

j. This concludes the Operator's Checkout Procedure.

PAGE 4-8, Gamut Limit Detector
CHANGE the last sentence in the first paragraph to read:
For instruments SN B010347 & Up. With the LINE SEL ON button set to the Off position. the picture monitor Gamut Limit Intensifying Pulse (8FIELD line) can be enabled by pressing the UP button or disabled by pressing the DOWN button.

PAGE 4-14, Dynamic Control Registers
ADD the following paragraph (after the first paragraph) –
If the GAMUT lights are blinking due to GBR signal violations, the 8FIELD line will toggle at a eight-field on-off rate. This signal causes the picture monitor display to flash brightly during the "on" time. For instruments SN B010347 & Up. When the Line Select ON button is set to Off and the UP button is pressed, the picture monitor Gamut Limit Intensifying Pulse is enabled. To turn off this feature, press the DOWN button. For more information, refer to the topic, "Gamut Limit Detector", in the VERTICAL OUTPUT DIAGRAM 2 Theory of Operation description.

PAGE 5-14, Step 17c
ADD to WFM-300 control settings: LINE SEL Off
UP (Gamut Limit Intensify Pulse) On

ADD to Step 17d: For instruments SN B010347 & Up. Check that the LINE SEL ON button is set to Off and the UP button is pressed.

PAGE 5-29, Step 30d
ADD to WFM-300 control settings: LINE SEL Off
UP (Gamut Limit Intensify Pulse) On