

SERVICETEKNOTES



SC 904
492

COVER PHOTO:

Tough and unpredictable service calls are what Tektronix portable oscilloscopes are built to handle. But in spring 1984, one of Tek's 2300 series' scopes successfully tackled its toughest service call so far--on Mount Everest, the world's highest peak.

A Tektronix 2337 oscilloscope helped medical researchers effectively study the effects of high altitude on brain function last year on an expedition up the 29,029 foot mountain. The research's aim was to establish that the symptoms of high altitude sickness can be attributed to malfunctioning of the brain.

Dr. Richard Wohns (left), director of the expedition's medical research team, and Tom Clement (right), expedition bioengineer, here are testing a climber's brain function in the Medical Research Station at Base Camp on the mountain.

In this photo, Tom is observing data on the Tektronix oscilloscope. The Nicolet Brain Monitor to the left of the oscilloscope monitors the climber's brain function, while the brain waves are displayed on the 2337 scope.

In the rugged trip from Base Camp, the Tek scope and the brain monitor were unavoidably handled very roughly. The Tek scope was undamaged, but the brain monitor had been damaged. The medical research could not continue without the Nicolet machine.

After several days, Clement repaired the brain monitor using integrated-circuit components from portions of the medical instruments not required for the research. The repair could not have been accomplished without the durable and versatile 2337 scope. Thus, the research continued at the incredible altitude of 21,300 feet.

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GMA304/4115B LINE FUSE RATING FOR 230VAC

Ref: GMA304/4115B Service Manual, P/N 070-4668-01
4115B Service Manual, Vol. 2, P/N 070-4667-00
4115/4120 Series Field Procedures Service Manual, P/N 070-5270-00

In the GMA304/4115B display documentation there is a discrepancy in the 230V fuse rating. The correct fuse rating is 6.25A, use Tek P.N. 159-0011-01.

Corrections should be made to the following manuals:

- 1) In the GMA304/4115B Service Manual, on page 7-2 under table 7-1, change F330 to F365 and change 5.00 to 6.25.
- 2) In the 4115B Service Manual, Vol. 2, on page A-13 under Display module in table A-2, change 6.25 to 8.00 and change 3 to 6.25.
- 3) In the 4115/4120 Series Field Procedures Service Manual, on page 8-1 under table 8-1, change F330 to F365 and change 5 to 6.25.

W2 Issue 15-7

M4115B DRIVE CABLE INSTALLATION

REF: 070-5101-00 4100F52 Options 01, 02, and 03 Second Disk Option Installation Procedures

It has been brought to my attention that the write-protect cable in the M4115B can be cut by Disk 1's drive belt. In one incident, Disk 1's drive belt was pulled off by the cable and one conductor of that cable was cut in half.

When connecting the write-protect cable to J499 on the Mass Storage Distribution Board, be sure to dress

the write-protect cable away from Drive 1.

Add the following step to page 14 of the 4100F52 Installation Procedures:

- 17a. Dress the write-protect cable away from Drive 1.

W2 Issue 15-3

SC503 VERTICAL ATTENUATOR KNOB BAD STOCK

REF: 366-1733-02

Some vertical attenuator knobs, PN 366-1733-02, have the numbers printed on the skirt incorrectly. This causes the numbers to not line up with the index area on the scope front panel.

All defective stock was purged from the warehouse, but some defective knobs may have been shipped before the defect was discovered. If a defective knob is discovered in local stock, a replacement knob should be re-ordered. The new knob should be correct.

W2 Issue 15-5

SC504 POWER SUPPLY IMPROVEMENT

REF: Mod 56602
All serial numbers

Some SC504's may double trigger when installed in the high power compartment of a TM504, TM506 or TM5006. This is caused by the +20volt power supply oscillating, and can be most easily seen at the 50 nS sweep speed.

The resistor R3479 on the 670-5111-XX trigger board was changed to 10K ohms, part number 315-0103-00. This change can be installed in any SC504 that has an oscillating +20volt power supply.

W2 Issue 15-3

SPG2 OPT. AA EQUALIZING PULSE ROLLOFF

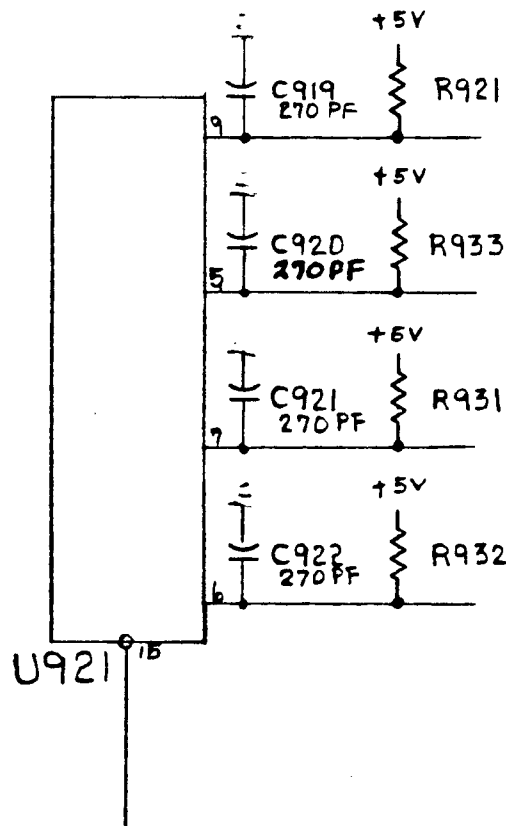
REF: SPG2 Opt. AA Instruction Manual
P/N 070-4905-00

A cable crosstalk problem has been found to cause rolloff problems in the equalizing pulses from an SPG2 Opt. AA.

The solution is as follows:

1. Locate the 10-wire ribbon cable that connects the front panel dual variable pot (R152) to the circuit board (J454/455).
2. Carefully separate this cable into two pieces along its entire length between the green and blue wires.
3. Carefully separate the blue wire from its cable half and dress away from the remainder of the ribbon cables. The separation distance is not critical. The slightest amount seems to help.

W2 Issue 15-6



Mod 55173 will change the VIRS/BLACK BURST board from P/N 670-4451-02 to 670-4451-04, and will be installed in new SPG2's starting at S/N B023191.

W2 Issue 15-4

SPG2 VIRS GLITCHES

REF: SPG1/2 Manual P/N 070-2104-00
Mod 55173

When U921 on the VIRS/BLACK BURST board is changed due to failures, there is the distinct possibility that glitches may show up in the VIRS signal.

To prevent this from occurring, Mod 55173 has added a 270 pf cap (P/N 281-0861-00) to each of the U921's output lines as illustrated below. (U921 is shown on schematic 6.)

Orders for a replacement part for U921 (P/N 156-0785-05) will be referred to a kit (P/N 050-2015-00) that will provide the parts and instructions necessary to make this change.

SPG 2/12/22 LINE TO LINE JITTER PROBLEM

REF: SPG 2 Instruction Manual
SPG 12 Instruction Manual
SPG 22 Instruction Manual
MOD 55184

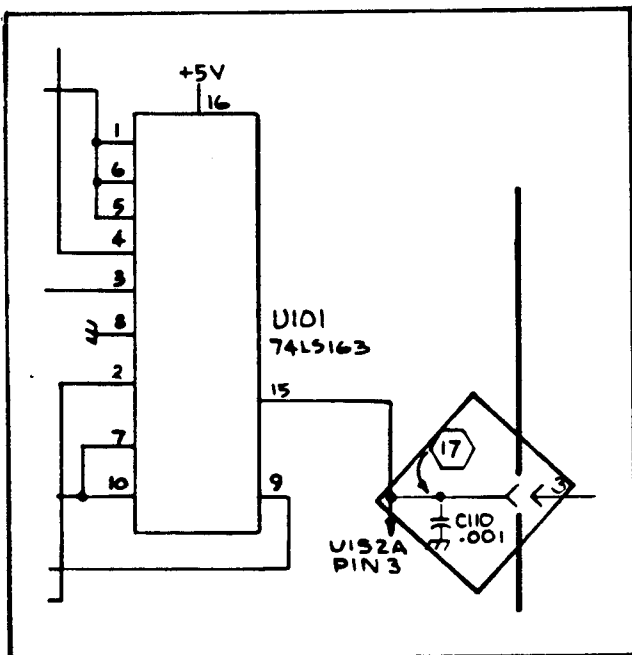
If you happen to notice a line to line jitter at one particular setting of the internal Horizontal Delay switch, an easy correction is available.

A 1000pf capacitor (P/N 281-0812-00) has been added between ground and interface pin 3 on the Sync Timing

(ARTICLE CONTINUED ON THE NEXT PAGE)

SPG 2/12/22 LINE TO LINE JITTER PROBLEM (CONT.)

board (A2) similar to the illustration below.



Mod 55184 will be installed in new instruments from the factory starting with the following serial numbers:

SPG 2	B023249
SPG 12	B022416
SPG 22	B010132

W2 Issue 15-7

SPG2/12/22 RELIABILITY/PERFORMANCE IMPROVEMENT

Ref: SPG1/2 Instruction Manual,
070-2104-00

SPG11/12 Instruction Manual,
070-2324-00

SPG22 Instruction Manual,
070-2326-00

Mod 54199

Mod 54199 provides the following benefits:

- Certain transistor locations now use parts that have a higher breakdown voltage.
- Subcarrier Phase Change with Genlock Burst Amplitude change specs are easier to achieve.

The first part of the change affects:

- Q545 and Q670 in the SPG2.
- Q526, Q536, Q545 and Q670 in the SPG12 and SPG22.

All of these transistors are changed from 151-0325-01's to 151-0188-00's. The new part number should be used to replace any one of the affected parts when a failure has occurred.

The second part of the change removes a feedback path that exists between Q665's emitter and Q715's emitter.

This change involves cutting the ground run that goes from Q665 to Q715, and is best accomplished by cutting the small portion of the run on the back of the circuit board that goes from the emitter of Q665 to the ground end of R676.

Q665's emitter ground path is then re-established by connecting a small piece of insulated hook-up wire from the emitter of Q665 to the ground end of R654.

This change should be made when Subcarrier Phase Change with Genlock Burst Amplitude Change is the specified problem.

Implementation of these two changes will change the Subcarrier Lock board as follows:

- A23, 670-4449-05 becomes 670-4449-07 in the SPG2.

(ARTICLE CONTINUED ON THE NEXT PAGE)

SPG 2/12/22 RELIABILITY/PERFORMANCE IMPROVEMENT (CONT.)

- A23-1, 670-4449-06 becomes 670-4449-08 in the SPG12.
- A23-1, 670-4449-02 becomes 670-4449-09 in the SPG22.

Mod 54199 will be installed in new instruments from the factory with the following effective serial numbers.

SPG2 - B023197
SPG12 - B022355
SPG22 - B010126

W2 Issue 15-4

SPG12 SCH PHASE CALIBRATION

REF: SPG12 Instruction Manual
P/N 070-2334-00

Mod 52605

To solve calibration difficulties that may be encountered during the adjustment of R198 and R199 on the Sync Lock Board, Mod 52605 has changed the value of R179 from 9.09K ohms to 8.25K ohms (P/N 321-0281-00).

SPG12's will have Mod 52605 installed at the factory starting with S/N B022365.

W2 Issue 15-3

S3200/1800 SERIES SYSTEMS BALANCING OF THREE PHASE SYSTEM LOADS

PHASE CURRENT MEASUREMENTS

Phase current measurements are taken to ensure that no phase of the neutral wire is drawing current in excess of the rating for the AC receptacle. If for some reason, the currents are larger than normal or too far out of balance, then corrective action is

necessary. Phase balancing and/or phase current reduction can be achieved by moving the power cords for some of the equipment housed in the system equipment racks from one phase power strip to another phase power strip. Current measurements should not be necessary during normal maintenance. But if equipment is added to or removed from the system equipment racks, the phase currents should be measured and the loads balanced, if necessary.

Required Equipment:

Multimeter, Digital: Fluke Model No. 8502A or 8505A with options 8500A-03 and 8500A-09A; or a Tektronix DM501, DM501A, DM502, or DM502A installed in an appropriate TM500/TM5000 mainframe; or an equivalent capable of measuring true-rms AC current with 1% from 40Hz to 10KHz.

Probe, Current, 1000X: Fluke Model No. Y8101, Tektronix P/N 006-6706-00, or an equivalent capable of measuring true-rms AC current with an accuracy of 2% over a bandwidth of 50Hz to 10KHz.

WARNING

This procedure requires the rear panel of the controller to be open while taking the current measurements. Dangerous electrical shock hazards are exposed with the rear panel in this position. Use extreme caution while performing the current measurements. Only qualified service personnel should make these measurements.

1. Power down the system by placing the front panel POWER switch and the circuit breakers on the rear panel of the AC Controller in the OFF position.
2. Disconnect the power cable from the receptacle on the rear panel of the AC Controller (or open the

(ARTICLE CONTINUED ON THE NEXT PAGE)

S3200/1800 SERIES SYSTEMS BALANCING OF THREE PHASE SYSTEM LOADS (CONT.)

- service drop circuit breaker that supplies service to the system).
3. Remove the necessary screws to provide access to the interior of that portion of the controller which includes the AC receptacle.
 4. Allow the rear panel to swing out and down to gain access to the interior of the controller.
 5. Connect the current probe to the digital multimeter.
 6. Select the AC ammeter mode and an appropriate range to measure up to the rated current of the AC Controller circuit breaker. If the Fluke Y8101 current probe is being used, meter readings will be multiplied by 1,000 because of the probe attenuation.
 7. Place the probe around a phase wire which connects between the AC receptacle and the AC Controller circuit breaker.
 8. Reconnect the power cable to the AC receptacle (or close the service drop circuit breaker).
 9. Power up the system by switching the Main Circuit Breakers and the front panel POWER switch to ON.
 10. Ensure all the equipment in the equipment rack is ON and running.
 11. Measure the current drawn by each phase and the neutral wire. The neutral current reading must not exceed 80% of the rating of the AC Controller circuit breaker. Reconfigure the system equipment racks if it does. If the phase readings are NOT within 20% of each other, the system needs to be reconfigured. This can be accomplished by connecting the power cords of the individual pieces of equipment to different phase power strips. Remeasure the phase currents after the equipment is reconfigured to ensure proper balance.
 12. Record the current readings on the Phase Balance label, Tektronix P/N 334-5340-00. The label should be applied to the controller rear panel near the circuit breakers or to the top of the left controller box (if the controller has two halves).
 13. Power down the system and disconnect the power cable from the AC receptacle (or open the service drop circuit breaker).
 14. Disconnect the test equipment from the controller wiring.
 15. Close the rear panel of the controller and secure the panel with the screws that were removed earlier.
 16. Reconnect the power cable to the controller (or close the service drop circuit breaker).
- W2 Issue 15-3
- ### TDC INTERMITTENT OSCILLATION
- REF: TDC Instruction Manual
P/N 070-2597-01
- An intermittent oscillation condition in the TDC's Phase Lock Loop section has been observed, and, being an intermittent, was correspondingly difficult to isolate.
- The symptom was the appearance of sideband signals about 400 kHz away from the L.O. frequency and about 20 dB down, observed at the L.O. OUT connector.
- The problem was isolated to A7U17 (P/N 156-0105-02).
- (ARTICLE CONTINUED ON THE NEXT PAGE)

TDC INTERMITTENT OSCILLATION (CONT.)

Long term solutions for this problem are being investigated, and will be documented when available. However, for the present time, with the given symptoms, U17 is one place to look. Should a similar occurrence be observed and U17 is subsequently isolated as the faulty device, please return the IC that was removed for analysis via normal channels, in or out of warranty.

W2 Issue 15-6

TSG7 BLUE CHROMA ADJUSTMENT

REF: TSG7 Instruction Manual,
070-3782-00
Mod 54997

Since the adjustment of R248 on the SMPTE Color Bar board has often been at or very near one end of the pot, Mod 54997 has changed R244 from 321-0327-00 to 321-0326-00, a 24.3K ohm part.

This change should center the range of R248, thereby making Blue Chroma in the R-Y channel easier to adjust to specs.

Mod 54997 will be shipped from the factory in new TSG7's starting with S/N B101235.

W2 Issue 15-4

TSG7/11/21 MODIFICATION

REF: TSG7 Instruction Manual
P/N 070-3782-00

TSG11 Instruction Manual
P/N 070-2328-00

TSG21 Instruction Manual
P/N 070-2322-00

Mod 44993

Mod 44993 has been implemented in the TSG Series Color Bar Generator modules to:

- 1) Correct absolute amplitude errors of the color bar signal from the TSG7, when observed at the TSP1 output.
- 2) Eliminate overshoot on the leading edge of the white bar from the TSG11 or TSG21.

Item 1 changes R407, R408, R428, R429 from 1% to 0.25% parts (321-0114-03) on the TSG7 Color Bar Output board, A33.

Item 2 changes U179 on the TSG11 and TSG21 Color Bar Logic boards to 156-0921-00. C179, which is the compensation cap for U179 is also made test selectable, with a nominal value of 470pf, and a range of selection from 0 to 1000pf. The cap is selected to eliminate any oscillations that may occur when U179 is replaced with the new part. These oscillations, should they occur, can be easily observed at TP229.

The effective serial numbers for factory installation of Mod 44993 in new instruments are:

TSG7 - B101154
TSG11 - B012145
TSG21 - B010122

W2 Issue 15-3

TSG15 MOD PULSE AMPLITUDE CALIBRATION

REF: TSG15 Instruction Manual
P/N 070-2479-00
Mod 56101

In order to allow better adjustment range for Modulated Pulse Amplitude, Mod 56101 has changed C223 on the Pulse and Bar Logic Board (A50-1) from

(ARTICLE CONTINUED ON THE NEXT PAGE)

TSG15 MOD PULSE AMPLITUDE CALIBRATION (CONT.)

a 250 pf cap to a 270 pf cap (P/N 283-0788-00).

This change may be made, if required, to achieve proper calibration.

Mod 56101 has also removed all transistor sockets from the Pulse and Bar Logic Board, which becomes P/N 670-5239-03.

Mod 56101 will be implemented in all new TSG15's starting at S/N B011318.

W2 Issue 15-4

7A16A TRANSISTOR REPLACEMENT

REF: 7A16A Manual, P/N 070-1378-01

Q820, Q840, Q860, and Q880 are a matched set of transistors that were formerly available under part number 153-0606-00. Engineering Change Number 54828 has removed the availability of these transistors under the 153-0606-00 part number. If this transistor set needs to be replaced, order 050-1941-00 for replacement parts.

W2 Issue 15-3

7A29 ATTENUATOR EXCHANGE

RE: 119-0913-00

Tek Publication 81-A-5748

The 7A29 attenuator, 119-0913-00, is now on the Repair and Return program. This program was established to provide improved service at less expense. To assure the cost advantage can be maintained, no attenuators will be accepted that are physically damaged.

W2 Issue 15-4

49X/P EXTENDER KIT UPDATED TO 006-3286-01

A circuit board extender, P/N 670-8493-00, has been added to the 49X EXTENDER KIT P/N 006-3286-00, changing the 49X EXTENDER KIT to P/N 006-3286-01.

The new circuit board extender, P/N 670-8493-00, is required for servicing the GPIB board in all current 49X/P products. Service Centers that presently own 49X EXTENDER KIT P/N 006-3286-00 can order the new circuit board extender P/N 670-8493-00 rather than ordering the new 49X EXTENDER KIT P/N 006-3286-01.

W2 Issue 15-4

49X/P IMPROVED 4.5GHz LOW PASS FILTERS

RE: M47991

A new type of 4.5GHz Low Pass Filter (P/N 119-1752-00, 119-1753-00, 119-1754-00) is now being used by FDI Manufacturing. The new parts replace FL11, FL15, (P/N 015-1027-00) and the R.F. Cables connected to these filters (W110, W160, W142, and W150) in all 49X/P products. The new filters increase product reliability and reduce filter insertion loss by reducing the total number of R.F. interconnects along the R.F. signal path.

Three field mod kits (P/N 050-1963-00, 050-1964-00, 050-1965-00) are available for replacement of FL11, FL15, or their associated R.F. Cables (W110, W160, W142, and W150). These kits may be used as follows:

492/P S/N B010100 - B055127

494/P S/N B010100 - B010445

Use 050-1963-00 to replace
FL15, W142, or W150

Use 050-1964-00 to replace
FL11, W110, or W160

(ARTICLE CONTINUED ON THE NEXT PAGE)

49X/P IMPROVED 4.5GHz LOW PASS FILTERS
(CONT.)

496/P S/N B010100 - B021075
492/P Opt. 6 S/N B610326 - B621103
Use 050-1965-00 to replace
FL11, W110, or W160

For instruments with serial numbers greater than those listed above, use P/N 119-1752-00 as a direct replacement for FL15, use P/N 119-1753-00 as a direct replacement for FL11 (492/P and 494/P only), and use P/N 119-1754-00 as a direct replacement for FL11 (496/P and 492/P Opt. 6 only).

W2 Issue 15-5

49X/P 2182MHz 2ND L.O. FREQUENCY
MEASUREMENT

REF: 492/P Service Volume 1
P/N 070-3783-01

496/P Service Volume 1
P/N 070-3481-00

494/P Service Volume 1
P/N 070-4416-00

492/P Option 6 Volume 1
P/N 070-4332-00

The frequency measurement technique presently used in all 49X/P Service Volume 1 Maintenance Adjustment Procedures for checking the 2182MHz 2nd L.O. frequency does not provide a frequency measurement that is accurate to within +/-1MHz. The 2182MHz 2nd L.O. frequency must be accurate to within +/-1MHz to ensure frequency span linearity across the 2nd L.O. tuning range. The current Maintenance Adjustment Procedure uses a 492 Spectrum Analyzer to directly measure the 2182MHz 2nd L.O. frequency.

However, because the 492 frequency accuracy is specified at +/-5MHz, this procedure cannot provide measurement results accurate to within +/-1MHz.

It is possible to directly measure the 2182MHz 2nd L.O. frequency within +/-1MHz using a Tektronix 494 Spectrum Analyzer, an HP5342A Microwave Frequency Counter, or equivalent equipment. If this equipment is not available, an alternate method has been developed which utilizes existing 49X/P test equipment to accurately verify the 2182MHz 2nd L.O. frequency to within +/-1MHz.

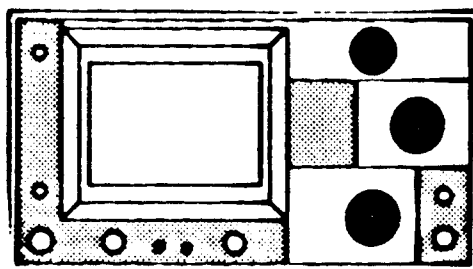
The following procedure can be used to verify the frequency accuracy of a 49X 2182MHz 2nd L.O. if a 494 spectrum analyzer or HP5342A microwave counter are not available.

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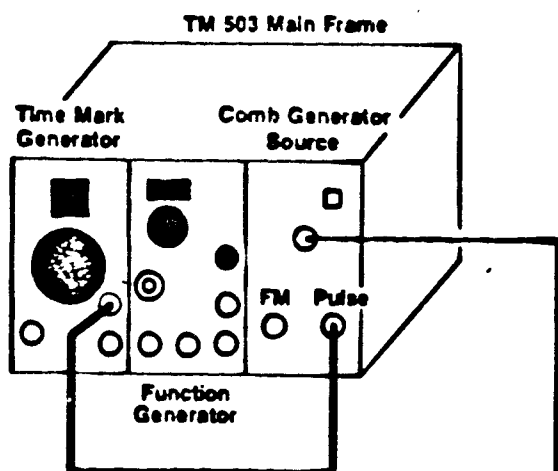
49X/P 2182MHz 2ND L.O. FREQUENCY MEASUREMENT (CONT.)

EQUIPMENT REQUIREMENTS

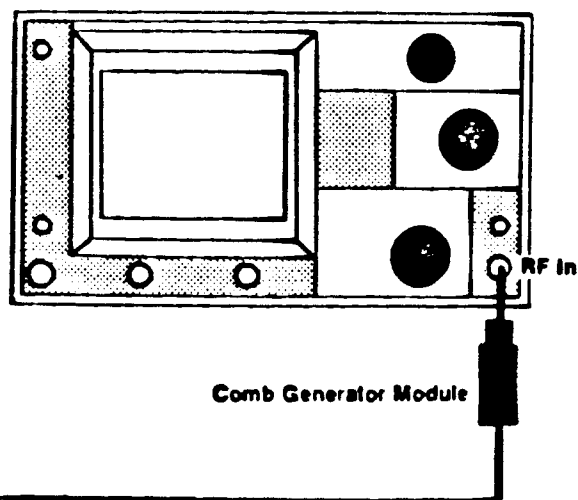
<u>Test Equipment</u>	<u>Characteristics</u>	<u>Recommended Type</u>
Spectrum Analyzer	2.5GHz, Digital Storage	492, 7L18, 7L14 Opt 39
Comb Generator	500MHz, Pulse Input	067-0885-00
Time Mark Generator	.1uS Markers, .001%	TG501



49X Under Test



Test Spectrum Analyzer



Comb Generator Module

(ARTICLE CONTINUED ON THE NEXT PAGE)

49X/P 2182MHz 2ND L.O. FREQUENCY MEASUREMENT (CONT.)

- A. Set the 49X under test to Band 1 and Max Span.
- B. Set the Test spectrum analyzer front-panel settings as follows:

Frequency 2.0Ghz
Span/Div 10Mhz
Ref. Level +20dBm
Auto Resolution On
Vertical Display 10dB/Div
Digital Storage View A/B
Time/Div Auto
Triggering Free Run
- C. Connect the comb generator output to the Test spectrum analyzer R.F. input.
- D. Press degauss, and peak the 2.0GHz signal for maximum amplitude with the peaking control, if available.
- E. Set the time mark generator for .1uS markers. Connect the Marker Output to the comb generator Pulse Input. Markers should appear on the test spectrum analyzer display, approximately one per division.
- F. Using the 2.0GHz signal as a starting point, (the 2.0GHz signal should be greater in amplitude than the 10MHz markers) begin counting 10MHz markers until the 18th marker is located. The FREQUENCY must be tuned towards 2.18GHz to locate the 18th marker. Increase the Ref. Level as necessary to view the markers.
- G. Center the 18th 10MHz marker (center frequency should be about 2.18GHz) on the test spectrum analyzer display.
- H. Reduce the test spectrum analyzer Span/Div to 1Mhz. Press degauss.
- I. Re-center the 2.18GHz marker on the test spectrum analyzer display. Activate Save A.

- J. Disconnect the comb generator output from the test spectrum analyzer R.F. Input.
- K. Set the test spectrum analyzer Ref. Level to +10dBm. Connect the 2nd L.O. Output from the 49X under test to the test spectrum analyzer R.F. Input.
- L. Check that the 2nd L.O. Output is greater than or equal to 1 major division, but less than or equal to 3 major divisions to the right of the Save A display. (Save A = 2.180GHz)
- M. Refer to maintenance adjustment procedure if calibration is required.

W2 Issue 15-3

492 (B029999 AND BELOW) FIRST L.O. DRIVER WIRING ERROR

RE: 492 (B02 and Below) Service Volume 2, P/N 070-2852-03

Some early versions of the 492 First L.O. Driver Circuit board, A44 P/N 670-5551-00 and 01, may have an incorrect run connection in the -10V reference voltage regulator circuit. This error may cause excessive first L.O. unphase-locked drift (the first L.O. fails to stabilize after the specified warm-up period of 2 hours). To check for this wiring error, complete the following procedure. Refer to the 492 (B029999 and Below) Service Volume 2, schematic 36A (First L.O. Driver 670-5551-00/02) for component locations.

1. Using a DVM, measure the DC voltage at the end of A44R1055 (487 Ohm) opposite Zener diode A44VR1055.
2. If the DC voltage measured in step 1 is -10V, the circuit board is wired correctly. If the DC voltage

(ARTICLE CONTINUED ON THE NEXT PAGE)

492 (B029999 AND BELOW) FIRST L.O.
DRIVER WIRING ERROR (CONT.)

measured in step 1 is -15V, proceed to step 3.

3. To correct this problem, cut the run on the back of the circuit board that connects A44R1055 (487 ohm) and A44R1041 (3K ohm). Connect a wire strap from the end of A44R1055 opposite A44VR1055 to the end of A44R1041 nearest the top of the circuit board.

4. Repeat steps 1 and 2 to confirm repairs are complete.

W2 Issue 15-3

492/P, 496/P, 492/P OPTION 6 FIRMWARE
VERSION 1.6

RE: M46809

Firmware version 1.6 for 492/P, 496/P, and 492/P opt. 6 implemented some mechanical changes to the 1st L.O. phase lock routine, eliminating a firmware bug that may cause the 1st L.O. phase lock circuit to intermittently drop phase lock. Firmware version 1.6 is found in 492/P S/NB042800 and above, 496/P S/NB010521 and above, and 492/P opt. 6 S/NB610521 and above. For instruments with serial numbers below those listed, please refer to the following list to install firmware version 1.6.

492 S/N B010100 - B010275
Use 050-1399-04

492 S/N B010275 - B042799
Use 670-5546-02

492P S/N B011000 - B031432
Use 050-1560-01

492P S/N B031433 - B042799
Use 670-6946-04

496 S/N B010100 - B010520
Use 670-6957-01

496P S/N B010100 - B010520
Use 670-6958-01

492 Opt. 06 S/N B610326 - B610520
Use 670-6957-01

492P Opt. 06 S/N B610326 - B610520
Use 670-6958-01

W2 Issue 15-3

494/P LOG AMP CALIBRATION
PROCEDURE CORRECTION

Before calibrating the 494/P Log Amp (A62), it is necessary to set all Log Amp Correction factors stored in the memory to zero. The existing 494/P Log Amp Calibration Procedure does not accurately describe how to cancel the Log Amp Correction factors. Please refer to the 494/P Service Volume 1 (P/N 070-4416-00) Page 5-14, Step 8, and make the following changes:

Replace Paragraph A with the following paragraph.

8a. Before calibrating the Log Amplifier, set the correction factors to zero. Set switch #3 of S1038 on the Memory board to the open (1) position. Set the Log Amp Correction factors to zero by pressing (SHIFT), 10dB, and select menu item #2, "SET RESULTS TO UNCALED". Remove Leveler Disable plug P3035 on the Video Processor board (Figure 5-15).

W2 Issue 15-3

494/P SERVICE VOLUME 2, PART NUMBER
070-4417-01; INCORRECT SCHEMATIC
DIAGRAM & PARTS LOCATION DIAGRAM FOR
A68A1 V.R. #2 MOTHER BOARD

The schematic diagram and parts location diagram for A68A1, the V.R. #2 Mother Board (P/N 670-5536-03), are

(ARTICLE CONTINUED ON THE NEXT PAGE)

494/P SERVICE VOLUME 2, PART NUMBER
070-4417-01; INCORRECT SCHEMATIC
DIAGRAM & PARTS LOCATION DIAGRAM FOR
A68A1 V.R. #2 MOTHER BOARD (CONT.)

drawn incorrectly in the most current 494/P Service Volume 2 Manual (P/N 070-4417-01). The correct schematic diagram and parts location diagram can be found in the following Service Volume 2 Manuals: 494/P, P/N 070-4417-00; 492/P, P/N 070-3784-01, Rev. March, 1984.

The gain diodes (A68A1CR3020 and A68A1CR3021) for frequency bands 2 and 3 are selectable components, and do not have mounting holes provided to install these parts as indicated by the incorrect parts location diagram in the most current 494/P Service Volume 2 Manual (P/N 070-4417-01). If A68A1CR3020 and A68A1CR3021 are needed to achieve proper band leveling for frequency bands 2 and 3, they must be added to the circuit board between pin DD and the appropriate Band Gain Adjustment pot.

W2 Issue 15-4

494/P 3rd CONVERTER EXCHANGE

The 494/P 3rd converter Assembly (A34 P/N 119-1579-01) is now available on the Module Exchange and Repair/Return programs. Calibration procedures for the 3rd Converter Assembly are located in the 494/P Service Volume 1 (P/N 070-4416-00) Maintenance Adjustments (for A34C1038) and Adjustment Procedure (for A34R1041).

W2 Issue 15-6

494/P 100Hz/30Hz VARIABLE
RESOLUTION FILTER MOD

RE: M53931, M56346

The second Filter Select Circuit board, A68A2, P/N 670-2118-01, has

been modified to increase the adjustment range of R4052, the center frequency adjustment. This allows the 100Hz/30Hz filters, FL690, P/N 119-1677-01, and A68A2FL6015, P/N 119-1676-00, to be replaced individually. The part number currently listed in the Service Manual for replacement of these two filters as a matched set, 119-1768-00, is no longer available.

The temperature compensated crystal filter A68A2FL6015, P/N 119-1676-00, has also been modified internally without changing the part number suffix. The new version crystal filter is not a direct replacement for the existing 119-1676-00, and is only available in the form of a mod kit, P/N 050-2016-00.

The following is a summary of the availability status of parts affected by these mods:

119-1768-00 (Matched Set)
Not Available

119-1676-00 (A68A2FL6015)
Use 050-2016-00

119-1677-01 (FL690)
Use 119-1677-01

670-2118-01 (A68A2)
Use 670-2118-02

These changes will be present in all 494/P Serial Numbers B010475 and above.

W2 Issue 15-3

528A RESISTOR FAILURES

REF: 528A Instruction Manual
P/N 070-3662-00

Some early failures of fixed resistors in the 528A have occurred in locations that have one particular item in

(ARTICLE CONTINUED ON THE NEXT PAGE)

528A RESISTOR FAILURES (CONT.)

common--susceptibility to high voltage switching transients.

In some of these areas, the part number specified can be either a carbon film or a carbon composition resistor since the part number group doesn't specify this parameter.

Part number groups 301, 303 and 315 are examples of such types, and in the 528A, the following circuit numbers are users of one of these group types.

A1R174	A1R322
A1R154	A1R332
A1R134	A2R532
A1R291	A2R550
A1R326	

When replacing the resistor in one of these circuit locations in the 528A's, if the part is suspected of failing due to heat stress, it is suggested that a carbon composition resistor of the correct part number be used.

Other circuit locations may or may not exhibit this type of failure mode. The key factors will be:

- evidence of heat stress (discoloration)
- close proximity, electrically, to elevated voltages (typically 50 volts or more across the part)
- the availability of a correct part number in a carbon composition style.

W2 Issue 15-4

528A WW/WX VTR DROP OUT PROBLEMS

REF: 528A Manual
P/N 070-3662-00

528A WW/WX Supplement
P/N 070-3802-00

The 528 and 528A WW/WX monitors have been returned to the Service Centers with complaints about "drop-out" or "intermittent lock to VTR", many of which were returned to the customer with no problem found.

After some investigations into the problem with AMPEX (the primary user of this model), a tentative cause/solution has been proposed.

The drop-out problem, at this time, appears to be caused by relay K380. This relay is a 24 volt device, and many VTR's are delivering only 12 to 15 volts to the relay coil.

If you have a 528AWW/WX with a drop-out or VTR lock problems which subsequently check good per the procedures in the product manuals, the steps to be taken are:

- 1) Verify that the VTR is supplying 24 volts to K380 via J370 pins 1 and 2 on the 528 rear panel.
- 2) If you do not have 24 volts at this point, refer to the VTR manufacturer for a possible solution.

W2 Issue 15-3

1420 SERIES MOD

REF: 1420 Series Instruction Manual
P/N 070-2899-00
Mod 55830

Mod 55830 has been implemented to correct the following problems--

1. Difficulties in meeting subcarrier pull-in range specs (\pm 50Hz from subcarrier); which was typically solved by selecting Y1670.
2. Difficulties in meeting phase change with reference change specs (less than 0.5 degrees), which were

(ARTICLE CONTINUED ON THE NEXT PAGE)

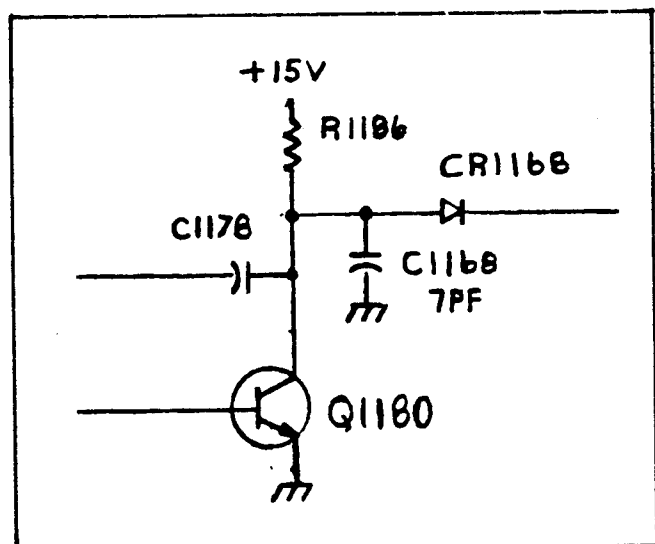
1420 SERIES MOD (CONT.)

typically addressed by selecting Q1032 and/or Q1082.

Item 1 was addressed by changing C1662 on the demodulator board from .01ufd to 87pf (283-0632-00). Kits have been set up for replacement of Y1670 or CR1663 that include the new part as follows:

CR1663	050-1993-00
Y1670	050-1994-00 (1420)
Y1670	050-1995-00 (1421)
Y1670	050-1996-00 (1422)

Item 2 was addressed adding a 7pf capacitor, C1168 (283-0157-00) between the anode of CR1168 and ground on the circuit board (see schematic change below). Kits have been set up for replacement of Q1032 or Q1082 (050-1992-00) which includes the new capacitor.



The effective serial numbers for implementation of this mod in the factory are:

1420	B065633
1421	B056550
1422	B050506

W2 Issue 15-3

1430 BOW HANDLE CHANGE

Ref: 015-0239-00 Instruction Manual, 070-1674-00

015-0240-00 Instruction Manual, 070-1674-00

015-0374-00 Instruction Manual, 070-3388-00

1430 Instruction Manual, 070-1455-00

1474 Instruction Manual, 070-2097-00

1804V Instruction Manual, 061-2867-00

Mod 55893

Due to some discoloration that has occurred because of base metal composition, the small bow handle (P/N 367-0160-00, and 01) that is used on several 1 1/2" rackmount products (ref.) has been changed.

A new base material will be used, and the new part (P/N 367-0160-02) will also be painted Smoke Tan.

Since the color of the new part is somewhat different from the old, it may be advisable to replace both handles if one must be replaced due to damage.

The new handles will be shipped on new instruments from the factory with the following effective serial numbers:

015-0239-00	B020924
015-0240-00	B020836
015-0374-00	B010282
1430	B100954
1474	B050795
1804V	B070255

W2 Issue 15-4

1450 SERIES SERVICE EQUIPMENT

REF: 1450-1 Instruction Manual
P/N 070-2200-01

In the list of Required Test Equipment for the 1450's, a Hewlett Packard Noise Meter, model 435A is specified (the current model, 435B, is a direct substitute). A power sensor, however, was not specified in the 1450 manuals. The proper power sensor for this application is an HP8482A.

For those service facilities that also do Spectrum Analyzers, the Noise Meter specified is an HP436A. This meter, coupled with an HP8482A power sensor, is not adequate for 1450 service. In order to cover the 1450's specifications adequately, if equipped with an HP436A, two power sensors must be used - an HP8482A and an HP8484A.

Consult the manufacturer's manuals for these products and the 1450 procedures. Use the correct meter/sensor combination for the application, taking into account the particular frequency and power levels being addressed in each instance.

W2 Issue 15-4

1450-3 RESISTOR VALUE CHANGES

REF: 1450-3 Instruction Manual
P/N 070-3660-00
Mod 56821

In order to allow for more consistent adjustment, the following test selectable resistors have had their nominal values changed:

A21R54 becomes 15 ohms (321-0018-00)

A26R32 becomes 47.5 ohms (321-0066-00)

Mod 56821 will be installed in new 1450-3's from the factory starting with S/N B010274.

W2 Issue 15-6

1470/1474 GENLOCK PROBLEMS

REF: 1470 Instruction Manual,
070-2096-00

1474 Instruction Manual,
070-2097-00

Mod 57050

Due to a change that occurred in a vendor's manufacturing process for CR186, MOD 57050 has made some changes to the Oscillator Frequency Control circuitry to allow more reliable genlock.

The changes are:

- R145 is changed from 910K ohms to 2.4M ohms (P/N 315-0245-00)
- C195 is changed from 65 pf. to 130 pf. (P/N 283-0638-00)
- R146, a 620K ohm part (P/N 315-0624-00), is added, "teepee" fashion, from pin 2 of U155 to ground, using the same ground point as CR186.

Note:

CR186's part number does not change as a result of this mod.

For failures of CR186, or for instruments being serviced for complaints of intermittent lock-up with change in frequency, order kit #050-2042-00.

New instruments from the factory will incorporate Mod 57050 starting with the following serial numbers:

1470 B053444
1474 B050799

W2 Issue 15-4

1750 SERIES MODS

REF: 1750 Instruction Manual
P/N 070-4472-00
Mod 55904

Mod 55904 addressed the following problems in the 1750 Series instruments:

- 1- Insufficient adjustment range of SCH subcarrier amplitude (R130)
- 2- Intermittent line selector function with noisy signals
- 3- Lock-up time of the SCH display dot (1751 only)
- 4- Intermittent phase lock on some types of signals, i.e. SMPTE Bars (1750 only)

Item 1 was addressed by changing A9R527 from 8.2K ohms to 10K ohms (P/N 315-0103-00).

Item 2 was addressed by changing A9R669 from 1K ohms to 16K ohms (P/N 315-0163-00).

Item 3 was addressed by changing A9U276 from 160-2348-00 to 160-2348-01, and A9U309 from 160-2349-00 to 160-2349-01.

Item 4 was addressed by changing A9U309 from 160-2343-00 to 160-2343-01.

Mod 55904 has been implemented in new instruments from the factory starting with serial numbers B020240 (1750) and B020134 (1751).

NOTE: Due to an oversight, Item 2 did not get implemented at the same time as the rest of the mod items. One of the symptoms of an instrument that needs this mod (other than a visual inspection) is Line Select LED's that blank briefly when a Bounce signal is applied in Line Select mode. This change may not solve the problem for

those that are viewing excessively noisy signals. For those instances, an alternate solution to try is to put P806 in the Test position.

W2 Issue 15-5

1750/51 TROUBLESHOOTING INFO

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

The following are some hints that should prove helpful for troubleshooting the SCH Logic Board.

- VC01 (Schematic 7) can be troubleshot by using VC02 as an example since they are almost identical circuits.
- P794 and P759 will disconnect VC01 and VC02 respectively from their controlling sources for test purposes. If VC02 seems to be functioning properly, you might try placing P794 in the "Test" position. This will connect the VCO to about -8 volts. You should now be able to vary the oscillator's frequency above and below 14.318MHz. The oscillator primarily consists of U592 and Y691 with controlling elements C684 and CR697. (VC01 can be used to troubleshoot VC02 in a similar fashion.)
- The signals present at U592, pins 14 and 15, are ECL levels and U493 converts these to TTL.
- The output of U493 (pin 4) is used to clock U292, U392 and U581.
- U292 should divide by 5, the resultant signal becoming a square wave (TTL levels) of about 2.86MHz. This signal can be traced through U682D and U581.
- The signals provided by U392 should be opposite polarity TTL signals

(ARTICLE CONTINUED ON THE NEXT PAGE)

1750/51 TROUBLESHOOTING INFO (CONT.)

occurring at about 14.318MHz. They are routed through U682 B+C, latched by U581, and applied to Q625 and Q628, where they are reconstructed to sinewaves. However, the gating through U392 is determined by several logic conditions from Schematic 8.

- The controlling voltage applied to VC01 at TP898 is provided by the SCH Locate 1 circuitry on Schematic 3.

This circuit works similar to SCH Locate 2, however, its timing is controlled by the SCHW1 and PDW1 signals provided by U276 via U581.

- At this point you will probably have to check the SCH Logic circuits using Signature Analysis as described on page 6-9.
- There are several paths that might determine what SCHW1 and PDW1 are doing, so you may have to look at all of them.
- The best way to approach Signature Analysis in this case is to look at the signatures that are provided by the logic devices that influence VC01 (or VC02) and work backwards until the defective device is isolated. I would suggest that you check the outputs of U276 and U422 first, and work back from there.
- Many of the logic paths on this board are routed through and affected by Programmable Logic Arrays so check your setups carefully.

W2 Issue 15-7

1751 SCH CIRCLE VARIATION

REF: 1750 Series Manual, 070-4472-00

A Technician recently inquired about a 1mm variation in the SCH Phase circle when Scale Illum was varied.

This condition is normal. The SCH Phase circle's amplitude is of secondary importance. This function is designed primarily for phase measurements only.

W2 Issue 15-3

190X SERIES PROGRAM LINE SPEC PROBLEMS

REF: 1900 Service Manual, 070-4867-00
1910 Service Manual, 070-4523-00
Mod 55891

In order to allow the 1900 and 1910 generators to meet "Program Line Out Frequency Response" specifications, especially when certain transistors are changed, the following transistors were changed from 151-0220-04 to 151-0220-03.

A6Q151	A10Q913
A6Q421	A10Q914
A6Q422	

NOTE: Since A6Q421/A6Q422 and A10Q913/A10Q914 are in circuits that may depend upon their being used as identical device types, it may be advisable to change both devices to the new part number if one of the pair has failed. They are not, however, defined as matched sets.

W2 Issue 15-3

1910 COMP SYNC AND PULSE OUTPUT
RISETIME SPECS

RE: 1910 Service Manual, 070-4523-00
Mod 55892

In order to allow the Comp Sync and Pulse outputs to more predictably match their risetime specs, Mod 55892 has changed A9C186, A9C190, A15C535, A15C555, A15C725 and A15C825 from 22pf. caps to 27pf. caps (P/N 283-0779-00).

(ARTICLE CONTINUED ON THE NEXT PAGE)

1910 COMP SYNC AND PULSE OUTPUT RISETIME SPECS (CONT.)

A9, the Sync and Memory board changes from 672-1117-01 to 672-1117-02 in the standard 1910, and from 672-1118-01 to 672-1118-02 in the 1910 Opt. 3.

A15, the Pulse Output board changes from 670-8007-00 to 670-8007-01.

Mod 55892 will be installed in new 1910's from the factory starting with S/N B010790.

W2 Issue 15-5

1910 FIRMWARE BUG

REF: 1910 Operators Manual
P/N 070-4466-00

1910 Service Manual
P/N 070-4523-00

Mod 56769

For those Technicians that may have received complaints concerning Fields 3 and 4 being reversed when the SCH Sequence function is used, a correction is available.

The problem is due to a firmware error, and the solution is to replace A12U320 with a new part, P/N 160-1940-01.

Mod 56769 will be installed in new 1910's from the factory starting with S/N B010880.

W2 Issue 15-7

1910 SPEC CHANGE, INSERTED VIT LEVEL

REF: 1910 Operators Manual
P/N 070-4466-00

1910 Service Manual
P/N 070-4523-00

Due to the difficulty of meeting External VIT Insertion Level specifications, the spec is being relaxed to $0V \pm 5mV$.

On the following two pages you will find the spec, performance, and adjustment procedures changes that will apply henceforth.

W2 Issue 15-3

1980 PROGRAMMER'S REFERENCE CARD

REF: 1980 Programmer's Reference Card
P/N 070-2924-01

The Programmer's Reference Card for the 1980 "ANSWER" has been updated to include the commands that were omitted from the original version. Order P/N 070-2924-01.

W2 Issue 15-4

2445/2465 OPTIONS - SPECIAL EDITIONS AND OPTIONS INFORMATION

The following chart shows the various options and special editions available on the 2400 Series Oscilloscope:

OPTIONS

<u>INSTR</u>	<u>OPT</u>	<u>DESCRIPTION</u>
2445/65	01	Digital Multiplier
2445/65	06	Counter/Timer/Trigger
2445/65	09	CTT with Word Recognizer
2445/65	10	GPIB Interface
2445/65	11	Probe Power
2445/65	22	2 Additional Probes

(ARTICLE CONTINUED ON THE PAGE 21)

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MANUAL CHANGE INFORMATION

Product Group 20

Date: 1/15/85Change Reference: M56655Product: 1910 SERVICEManual Part No: 070-4523-00**DESCRIPTION**

Eff. S/N: B010721

TEXT and SCHEMATIC CHANGES**SECTION 1 INSTALLATION:**Table 1-2 JUMPER CONNECTORS, Page 1-5, **CHANGE** External VITS Disable entry **TO READ:**

Name of Jumper Connectors	Jumper Positions	Factory Setting & Pins Jumpered	Circuit No.	Circuit Board Name & Assy No.
External VITS Disable	Disable-Enable	Disable 1&2	P502	External VITS Board A17

Operating Mode Description, Page 1-7, A17 External VITS Board discussion, **CHANGE TO READ:****A17 External VITS Board (see Fig. 8-8)**

P502 External VITS disable - Allows external VITS to be enabled (pins 2 & 3 connected) or disabled (pins 1 & 2 connected). P502 is factory set to the Disabled position (pins 1 & 2 connected).

SECTION 3 PERFORMANCE CHECK:SHORT-FORM PERFORMANCE CHECK, Page 3-8, **CHANGE** Step 42 Check Insertion Level **TO READ:**

42. Check Insertion Level:
0V \pm 5 mV

LONG-FORM PERFORMANCE CHECK, Page 3-36, Step 42 Check Insertion Level **CHANGE** Step 42 part e. **TO READ:**

e. **CHECK** - that lines 15 through 19 blanking levels match the back porch levels of lines 14 and 20 (or all other lines) within \pm 5 mV. (Using the 1480 graticule for the measurement, $1\frac{1}{4}$ minor divisions are equivalent to 5 mV.) Check that lines 15, 16, 17, and 18 match their back porch level within \pm 5 mV.

SECTION 8 DIAGRAMS:

CHANGE Fig. 8-8 A17 EXTERNAL VITS BOARD ADJUSTMENT, JUMPER, & CONNECTOR LOCATIONS, P502 Ext VITS Disable **TO SHOW** Pins 1&2 connected (shaded).

P502 is shown on  EXTERNAL VITS & PULSE OUTPUT.

Tektronix

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MANUAL CHANGE INFORMATION

Product Group 20

Date: 1/15/85Change Reference: M56655Product: 1910 OPERATORSManual Part No: 070-4466-00**DESCRIPTION**

Eff. S/N: B010721

TEXT CHANGES**SECTION 1 SPECIFICATION:**Table 1-3 External VITS INPUT, Page 1-6, **CHANGE** Insertion Level entry **TO READ:**

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Insertion Level	± 5 mV	Referenced to External VITS in blanking level	42

SECTION 2 INSTALLATION:Table 2-1 JUMPER CONNECTORS, Page 2-4, **CHANGE** External VITS Disable entry **TO READ:**

Name of Jumper Connectors	Jumper Positions	Factory Setting & Pins Jumpered	Circuit No.	Circuit Board Name & Assy No.
External VITS Disable	Disable-Enable	Disable 1&2	P502	External VITS Board A17

Operating Mode Description, Page 2-6, A17 External VITS Board discussion, **CHANGE TO READ:****A17 External VITS Board**

P502 External VITS disable - Allows external VITS to be enabled (pins 2 & 3 connected) or disabled (pins 1 & 2 connected). P502 is factory set to the Disabled position (pins 1 & 2 connected).

2445/2465 OPTIONS - SPECIAL EDITIONS AND OPTIONS INFORMATION (CONT.)

SPECIAL EDITIONS

<u>INSTR</u>	<u>OPT</u>	<u>DESCRIPTION</u>
2465CTS	09	Counter/Timer System
	10	
	22	
2465DMS	01	Digital Multimeter System
	09	
	10	
	22	
2465DVS	01	Digital Video System
	05	
	09	
	10	
	22	

When servicing the Special Editions, refer to the proper Option Service manuals (Option 01, 05, 06/09, 10).

The Special Editions are Option combinations utilizing the 2465 only, not the 2445.

Note: The label above the CRT and the label on the handle with the Special Edition nomenclature is not listed in any manual, but may be found below:

<u>INST</u>	<u>OPT</u>	<u>LABEL ABOVE CRT</u>	<u>LABEL ON HANDLE</u>
2445	None	334-4658-00	334-4659-01
2465	None	334-4379-00	334-4380-01
2445	10	334-5187-00	334-4659-01
2465	10	334-5180-00	334-4380-01

SPECIAL EDITONS

<u>INST</u>	<u>LABEL ABOVE CRT</u>	<u>LABEL On HANDLE</u>
2465DVS	334-6098-00	334-6097-00
2465DMS	334-6100-00	334-6099-00
2465CTS	334-6102-00	334-6101-00

Options 01, 05, 06, 09, 11, 22 and combinations thereof use the same labels as the standard instrument.

When a combination of options includes Option 10 (GPIB), use the labels for Option 10.

W2 Issue 15-3

4016/GMA125 HARDCOPY NOISE

The current version of the 4016/GMA125 CRT, 154-0807-54, incorporates the latest reliability designs in internal coatings and the floodgun system. These changes will result in greatly improved life expectancy; however, the floodgun system changes can contribute to hardcopy noise problems. The new floodgun system emits current much more efficiently than the previous version. If floodgun filament voltages are set at 44V or 48V there is enough excess current collected by CE1 during hardcopy that the CE power supply tries to go into oscillation. This oscillation is seen as noise by the TARSIG board. Therefore, it is our recommendation that when the -54 part numbered CRT is installed that the floodgun filament voltage tap be reset to 40V. **This is a change from previous suggested voltage settings.**

W2 Issue 15-6

4041 BUSS DRIVERS IMPROVED

REF: Mod 56473
SN B051139

Several of the circuit boards in 4041 serial number B051139 and above have been modified for improved operational reliability. These modifications should reduce the number of System Error 78 reports, and system crashes. The modified boards are not compatible with existing boards. While mixing new and old boards will not cause electrical damage, the 4041 will either not work at all, or be very unreliable.

(ARTICLE CONTINUED ON THE NEXT PAGE)

4041 BUSS DRIVERS IMPROVED (CONT.)

4041 Buss Improved

Board	New Board Number	Circuit	Change Part To:	
A2	670-7048-07	A2U315	156-0467-02	74LS38
A2	670-7048-07	A2R216	315-0561-00	560 ohm
A2	670-7048-07	A1R217	315-0241-00	240 ohm
A3	670-7046-05	A3U254	156-0467-02	74LS38
A3	670-7046-05	A3R104	315-0331-00	330 ohm
A3	670-7046-05	A3R105	315-0511-00	510 ohm
A9 (Opt 2)	670-7359-03	A3U205	156-0153-02	7406
A11	670-7036-04	A11U375	156-0467-02	74LS38
A11	672-1016-05	A11U375	156-0467-02	74LS38
A11	672-1034-03	A11U375	156-0467-02	74LS38
A11	672-1035-03	A11U375	156-0467-02	74LS38
A11	670-8489-01	A11U375	156-0467-02	74LS38
A11	670-8242-01	A11U375	156-0467-02	74LS38

Fortunately, it is easy to modify existing boards. Note that if any board is modified in a given 4041, all the affected boards will have to be modified. The CPU, standard I/O, memory and option 2 board each have one IC replaced. The option 1 and option 3 boards are not affected by this change. The chart above describes the new circuit boards.

These changes increase noise immunity and improve timing on several signal lines in the 4041, and can be installed in any 4041 that exhibits intermittent lock ups or crashes.

W2 Issue 15-3

4041 OPTION 30 ROM'S INCORRECT

Some of the 4041 Version 2.1 firmware update kits, PN 040-1133-10 were assembled incorrectly. The two ROM's installed in carrier #1 should have

been carrier #2, and vice versa. The left to right installation is correct.

These misassembled kits will prevent the keyboard from working, and may give "Failed: ROM PD >148" or "Failed: ROM PD 8840" displays at power up.

The ROM's are not damaged by this and may be reinstalled correctly. The proper set up is as follows:

Carrier #1	
Left	160-1246-03
Right	160-1247-03

Carrier #2	
Left	160-1335-03
Right	160-1336-03

A quick way to make the correction is to swap the silver labels on the ROM pack carriers.

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4105/4106/4107/4109/CX NVDEFINE AND NVLEARN MISCONCEPTION

Ref: 4105 Programmers Reference Manual, 070-4526-01
4105 Operators Manual, 070-4527-01
4105 Reference Guide, 070-4528-01
4106/7/9/CX Reference Guide, 070-4892-01
4106/7/9/CX Programmers Reference, 070-4893-01
CX4100 Series Operators Manual, 070-5256-00

The NVDEFINE and NVLEARN commands in the 4105, 4106/7/9/CX products have often been misunderstood. Simple use of the NVDEFINE or NVLEARN command does not ensure that the programmed key or macro has actually been stored in nonvolatile memory. In order for the macro being learned or key being defined to survive a power cycling, the NVLEARN and NVDEFINE commands must be followed by the NVSAVE command.

This misunderstanding has been primarily due to inadvertent omissions in early manuals. Later versions of the above manuals have corrected the references to the NVDEFINE and NVLEARN commands by including notes such as that found on page 5-39 of the CX version of the 4106/7/9 programmers manual, part number 070-4893-01:

Key definitions programmed with the LEARN NONVOLATILE command are saved in non-volatile memory only if you issue a SAVE NONVOLATILE PARAMETERS command before you reset or turn off the terminal or issue the FACTORY or RESET command.

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4107/4109/CX/4957 STYLUS COMPATIBILITY

REF: 4957 Service Manual, 070-4984-00
4957 User's Manual, 070-4784-00
4106/4107/CX CDT Service 070-4889-01
4109/CX Service Manual, 070-4890-01

Use caution when choosing to purchase the 119-1776-00 stylus for the 4957 tablet as it does not function with 4107/4109 terminals with Version 1 or Version 3 firmware. The new Version 7.1 firmware must be installed.

Though some applications may find the stylus more suitable for its ease of movement, the stylus is typically less stable than the crosshair cursor.

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4404 CLOCK/CALENDAR BATTERY MOD

Ref. Mod 57046

The clock/calendar Nicad battery, located on the 4404 I/O board, has been changed to correct for loss of time and date after power down. The old black encapsulated battery, made by SAFT, has been replaced at S.N. B010148 by a more reliable battery made by elpower and wrapped in white heat shrink. Stock has been purged and the 146-0052-00 part number has not changed.

If battery measures less than 3.5 volts, with the instrument turned off, replace with a new one. Install new Nicad with the plus lead (marked on heat shrink) toward the upper edge of the I/O board.

W2 Issue 15-6

4631/4632/4633AGS/4634 DEFLECTION AMP Q1010/Q1012 CONNECTORS

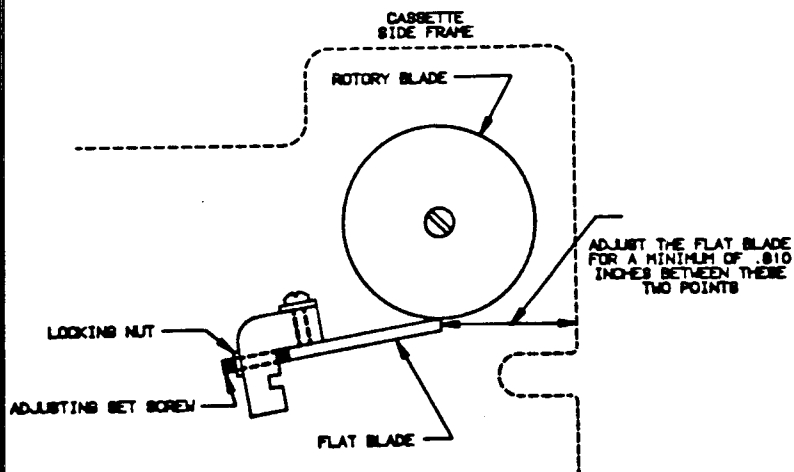
Ref: Corporate Mod #45862

The supplier for Q1010 and Q1012 is no longer gold-plating the transistor leads. The new tinned leads may create an unreliable connection which is prone to corrosion. This mod removes the molex connectors and solders the wires directly to the transistor leads.

W2 Issue 15-6

4635 CASSETTE ASSEMBLY FLAT BLADE ADJUSTMENT

The flat blade on the 4635 can be adjusted forward too far and it will make contact with the paper peeler. This contact results in the motor current limiting upon rotation of the rotary blade. The solution is to adjust the flat blade for a minimum of .81 inches between the blade and the front edge of the cassette chassis. The drawing below details the critical area.



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4695 MODIFICATIONS

Ref: 4695 Service Manual, 070-4645-00
Corporate Mods 53129, 53598,
53728, 54907, and 55403

Numerous modifications have been made to the 4695 printer since its introduction late in 1983. Many have been minor and have had no impact on service of the product. Some, however, warrant attention and this is a synopsis of those changes to date.

The very first production 4695s differed from sales demonstrator models in

many respects. First, the latches which hold the platen were changed to ease removal of the platen. All production products have the easy to use green latches.

Second, the shape of the screw heads for the ink gate valves changed. The screwdriver blade slots were made deeper to reduce the likelihood of screwdriver slippage. The screws also became color coded.

The ROMs on the control board changed to provide better positioning accuracy. In consequence, the timing fence also changed. Preproduction timing fences and control boards are not compatible with post production control boards and timing fences, respectively.

The thermal fuse, FT1 was added to production units to shut down the 300 volt supply to the control board in the event of elevated temperatures. The part number of this thermal fuse is 159-0125-00 and its circuit location is given in Figure 1 below.

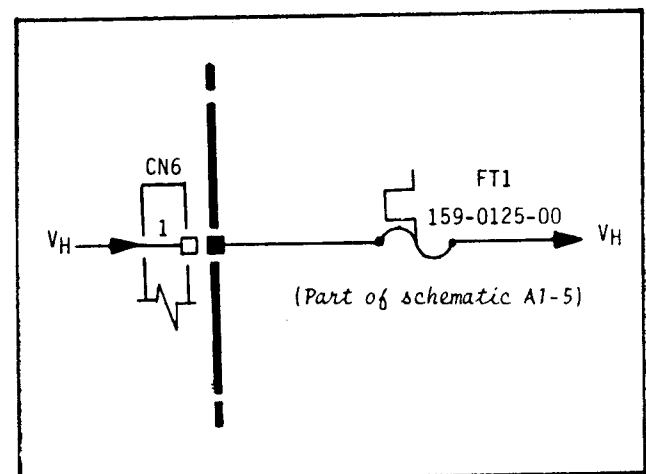


Figure 1. Location of FT1.

Finally, O-rings were added between the ink head carriage and the interconnect board around the two board mounting screws. See the detail in Figure 2 for the O-rings' locations. This was done to reduce the likelihood of ink

(ARTICLE CONTINUED ON THE NEXT PAGE)

4695 MODIFICATIONS (CONT.)

migrating along contact surfaces and finding its way onto the interconnect board. Once on this board, the conductive ink would short the runs causing a control board failure, particularly during an electronic purge.

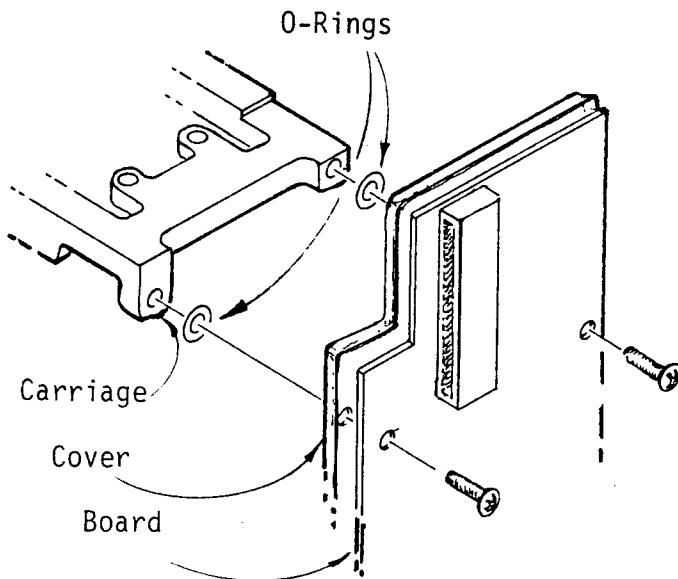


Figure 2. O-rings added.

Approximately S/N J010677, a fifth paper bail roller was added on the extreme right hand side of the paper bail.

At J011500, the thermal fuse, FT2 was added to protect the X-axis motor. This is documented as part of Engineering Change 53598, further described below. In standby mode, a current is supplied to the motor. In the event of a failure, this current can be excessive and damage the motor by overheating it. The thermal fuse (P/N 118-3830-00) monitors the current passing through the motor by monitoring the temperature of the motor's series resistor, R45. The fuse and resistor are physically bound to each other with

silicone adhesive (P/N 006-1171-00). A schematic correctly depicting the implementation of FT2 is given in the May printing of the 4695 Service Manual in pull-out A1-5.

At S/N J013200, the control board changed considerably. This is documented as Corporate Change Number 53598. As a result of that change, the level of the control board changed from 118-2940-00 to -01. The -01 version is a direct replacement for the -00 control board.

The power FET driver chips changed to incorporate some current limiting. This was done to reduce the rate of failure in the event of an ink spill induced short on the carriage interconnect board. The number of chips also dropped from four to two. The part number of the new driver chips is 118-3831-00. The circuitry surrounding the drivers changed extensively, as well. Please refer to the Service manual for more detail.

Fuse FT1 was intended to shut down the +300 volt supply in the event of a failure of the head driver chips, and subsequent overheating. The new drivers eliminated the need for FT1. FT1 was therefore removed. A few -00 control boards were shipped with both FT1 and FT2 on them.

The many changes that occurred on this board required the use of a new ROM. This ROM (P/N 118-3068-01) is not retrofittable into earlier boards.

Modification 53728 made a significant change to the X-axis motor drive circuitry. Pin 4 of P4 (TL494C) was lifted from ground and an XDRA-0 line was added between pin 4 of P4 and pin

(ARTICLE CONTINUED ON THE NEXT PAGE)

4695 MODIFICATIONS (CONT.)

13 of M4. This signal did away with the idle holding current through the carriage motor. This eliminated an occasional "buzz" that would emanate from the motor while the product was in idle. This mod was hand added to a large number of earlier boards.

Approximately J013500, the values of R70 and R90 were changed. Resistor R70 changed from 8.2K ohms to 12K ohms, and R90 changed from 1.5K ohms to 2.2K ohms. The reason for this change was to prevent the possible misadjustment of VR2 which could damage the ink jet crystals by supplying as much as 400 volts. Errors in earlier schematics have confused the issue on these two components. Please refer to a 4695 Service Manual, printed May of 1984 or later for a correct schematic representation. This change is documented as part of engineering change order 54907.

Effective J016635 through J017634, and after J018706, a .5 watt, 560 ohm resistor is added to the power supply board as R91. This part is added as shown in Figure 3 to assist in a clean "power down" of the +5 volt supply. This change is documented as the other part of engineering change order 54907.

The new part numbers of the resistors are:

Ct. No.	Old	New	Part Number
R70	8.2K	12K	315-0123-00
R90	1.5K	2.2K	315-0222-00
R91	--	560 ohms	315-0561-00

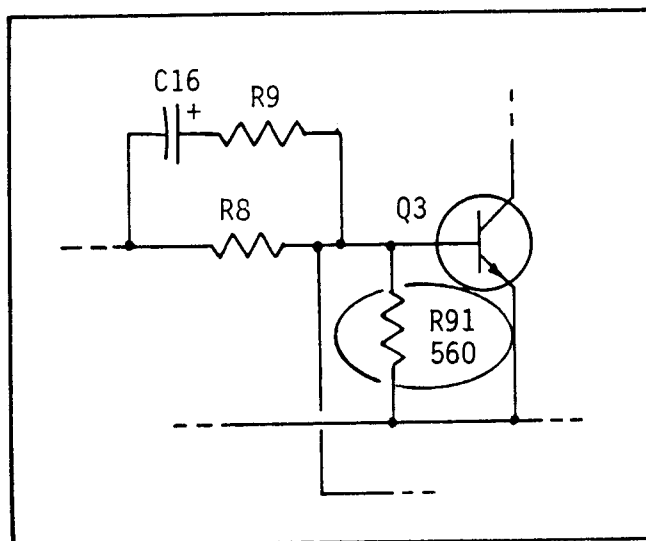


Figure 3. Addition of R91.

Product number J016635 saw the introduction of C48 onto the power supply board. Capacitor C48 is a 2200 pico-farad device, part number 283-0176-00 and should be added between pin 4 of IC4 and ground whenever IC4 is changed or oscillation problems occur on the +12 volt line. The oscillation is due to regenerative feedback from the chip's regulator output to the Vcc +12 supply. This is documented as engineering change order 55403.

The plastic standoff bushings shown in Figure 4 were originally unavailable as separate components. However, the need for their availability to repair power supplies and control boards prompted change number 53129. Each board uses three 118-3717-00 male bushings. In addition, the control board uses three 118-3719-00 female bushings and the power supply uses three 118-3718-00 female bushings.

(ARTICLE CONTINUED ON THE NEXT PAGE)

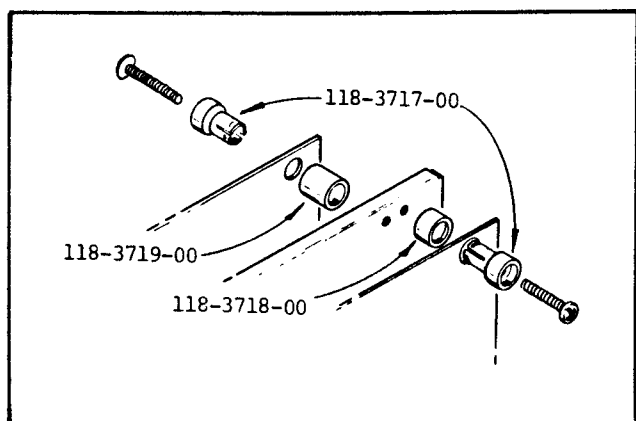
4695 MODIFICATIONS (CONT.)

Figure 4. Plastic Spacers

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4956 REPLACEMENT PARTS

REF: 4956 Graphic Tablet Service
Manual, P/N 070-2211-00

Corporate Mod #53830

The 4956 product is no longer being manufactured and has been placed on long term support. There was a deficiency in the ability to completely support this product in the field.

Solution:

To support the 4956 product during the long term support period two things have been done.

- 1) The Bill of Materials was restructured and many more parts were set up in Customer Service. The parts which were already set up are in most cases still set up. These are documented in the manual and on micro-fiche. The exceptions are those parts which are being replaced with more reliable parts. These are noted in the column headed with an R.

- 2) An 050-Kit has been set up to handle power supply replacements.

The new parts that have been set up and the ones that have been replaced with more reliable parts are listed below.

<u>TEK P/N</u>	<u>Part Name</u>	<u>R</u>
119-0874-01	Controller Box	x
118-0151-02	.Control Bd Assy	x
118-3840-00	..54MHZ Crystal Z12	
118-3842-00	..Switch SW3	x
118-3846-00	..Conn 9 pin J14	
118-3847-00	..Conn 3 pin J15	
118-0152-00	.GPB I/F Bd	
118-3845-00	..Rear Panel SW	
118-0153-01	Pwr Sup Assy	x
118-3864-00	..Transformer T1	
260-1805-00	..SW Toggle SW1	x
290-0797-00	..Cap 470uf C3	
118-4106-00	..Cap 30uf C4	
290-0334-00	..Cap 1250uf C5	
118-4107-00	..Cap 6300uf C7	
118-0155-00	.Pre-Amp Assy	
322-0097-00	..Res 100 ohm R7	
322-0289-00	..Res 10K ohm R13	
118-3835-00	.Panel, Front	
118-3836-00	.Panel, Rear (new)	x
118-3837-00	.Top & Bottom Cvr	
118-3844-00	.Button, Chrome	
119-0875-00	4 Button Cursor	
118-3849-00	.Pad, Copper Felt	
118-3446-00	.Push Button SW	
119-0876-00	Tablet, 20 x 20	
118-3838-00	.Frame w/Tek Logo	
119-0879-00	Tablet, 36 x 48	

The new 050-Kit is available for field replacement of the old style power supply (118-0153-00) with the new style power supply (118-0153-01). This replacement requires a new rear panel and power cable. These parts are included in the kit as follows:

<u>TEK P/N</u>	<u>Part Name</u>	<u>R</u>
050-1942-00	Field Kit	
118-0153-01	.Power Supply	x
118-3936-00	.Rear Panel	x
161-0066-00	.Power cord	x
006-3362-00	.Label	

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4958 DAMAGE HAZARD; REPLACEMENT OF MUX ICs ON TABLET SURFACE

Ref: 4958 Service Maintenance Information (SMI) dated March 8, 1985

Caution! The SMI does not adequately warn of the probability of circuit board damage during this procedure. The lead hole pads are very small and standard tools are **not** adequate.

Replacement of the type 4067B grid current switching multiplexers on the tablet surface requires expert technique. Do not attempt repair with less than the prescribed tools below.

- Temperature-controlled soldering iron with fine tip, such as the Weller (R) WTCPZ with tip P/N 003-1234-00.
- Fine-tip tweezers or small needle-nose pliers.
- Soldapullt (R) solder sucker and Soder-Wick (R).

Procedure:

1. Remove the MUX IC by cutting the leads as close to the body as possible, leaving maximum lead length.
2. Remove each lead with fine-tip pliers or tweezers and soldering iron. Apply heat to the lead, not to the circuit board.
3. Apply solder quickly and carefully to all holes that do not exhibit a "bead" or "dome" of solder. This actually makes the solder removal process faster and easier by providing rapid heat transfer to all solder in the hole.
4. Heat and suck the holes. Clean/tin the iron tip frequently to make heating fast and effective. If a hole is not cleared, use Soder-Wick (R) for clean up on the top side of the board. If all holes are cleared, go to step 6.

5. Remove **all** the plastic hold-down screws (some may be hidden), and bend up the board approximately 45 degrees (an assistant may be needed). Use Soder-Wick (R) for clean up on the bottom side of the board. This should clear all holes that had residual solder. **Caution:** do not flex grid wires repeatedly or they may break!
6. The new MUX IC may be soldered from top or bottom of the board, but apply heat to the IC lead, allowing solder to flow into and fill the hole. Do this quickly with a well-tinned iron and you will not damage board or IC.
7. If board damage does occur, patch the board with 30 gauge insulated wire, and dress the wire as close as possible to the original run to avoid crosstalk. A companion Service Teknotes article details the wiring information that is missing from the Service Manual.

We have discussed this issue with the tablet manufacturer and concluded that soldering in the MUX ICs is preferred. The reason is that socket intermittents are a much higher risk/frequency than IC failures. Therefore, Field Service must continue to use extreme care for the occasional MUX IC that needs replacement.

(REFER TO ILLUSTRATION ON NEXT PAGE)

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4958 MUX IC WIRING

REF: 4958 Service Manual,
070-5489-00

The schematics in the 4958 Service Manual do not include the connection information for the 4067B grid current multiplexers that are spaced along the top and left side of the tablet

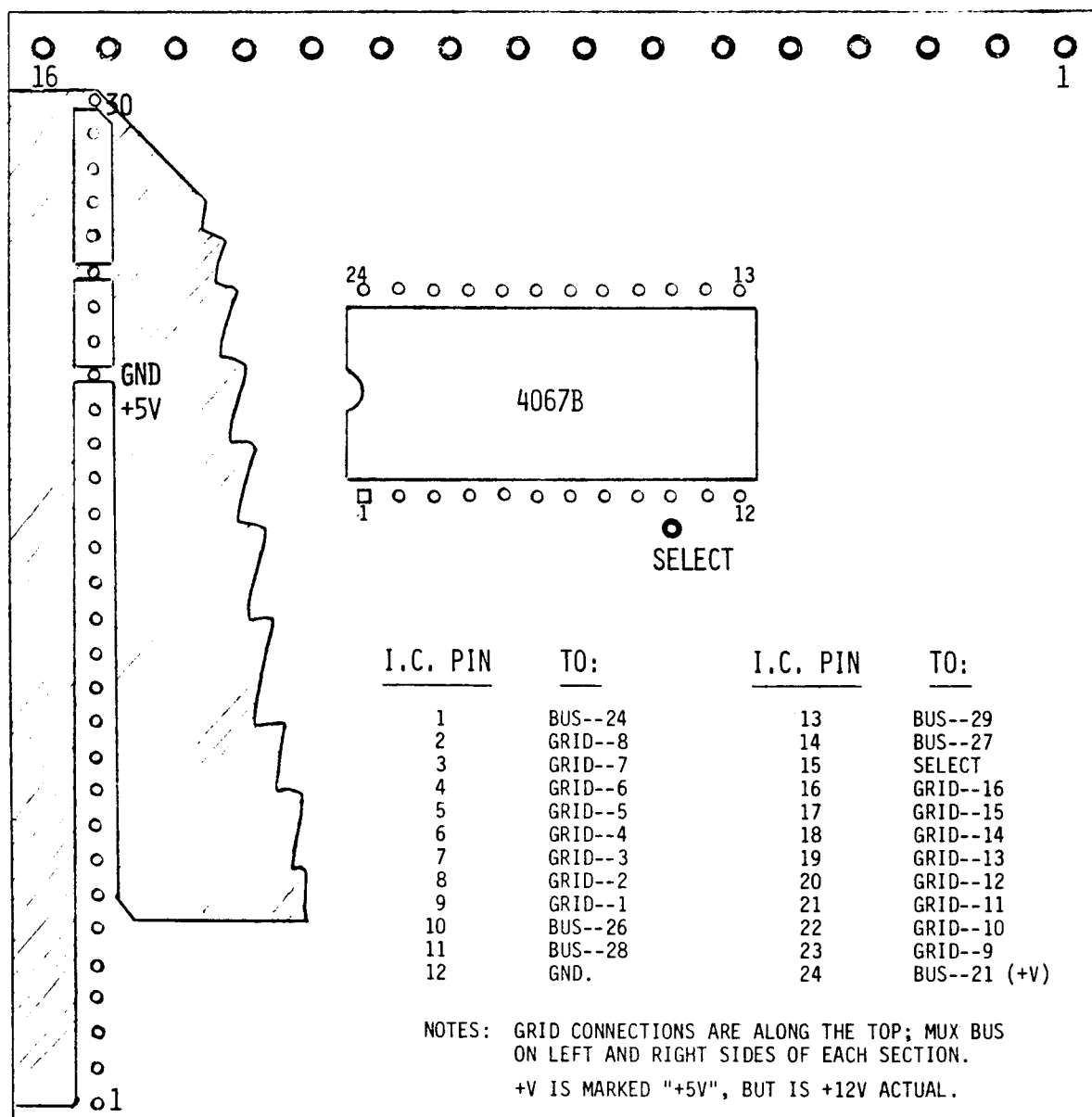
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4958 MUX IC WIRING (CONT.)

surface. The wiring information becomes essential if a pad is accidentally lifted during replacement of the IC. And, even though the connection pattern is duplicated for each IC, an ohmmeter is of little help. **ALL** of the grid wires are at DC ground.

So, if you suspect an open connection between an IC pin and a grid connection, an ohmmeter check will tell you if it is really open--and if the IC pin tests open, use the figure below and patch with 30-gauge insulated wire.

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4958 MUX Board (partial)

7000 SERIES H.F. COMPENSATION WIRE

If the high frequency compensation wire loops need to be replace, i.e. made longer etc., part number 195-8673-00 is a two inch piece of gold plated wire available for this purpose.

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Articles are submitted primarily by Corporate Service Support & Planning Personnel thoroughly familiar with the products they support. SERVICE TEKNOTES also encourages you to submit articles for publication. If you have knowledge of a technique, procedure or idea that enables you to service your Tektronix product more effectively, write it down so others may benefit from your experience.

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
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