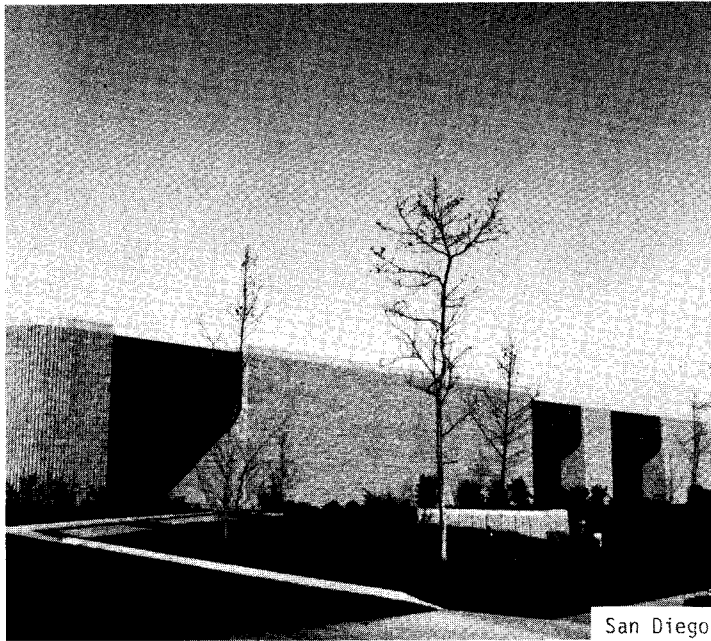


665001

# SERVICETEKNOTES



San Diego



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CG551AP/CG5001 RELEASE LATCH IMPROVED

A new release bar, P/N 105-0967-01 is now orderable. This should help eliminate the problem of broken retaining latch pieces. The new part does not allow over bending of the plug-in retaining latch, which was the major cause of breakage.

W<sup>2</sup> Issue 13-11

DAS9100 - TROUBLESHOOTING THE RS232

AFFECTED UNITS: All DAS9100s, that contain an I/O Option.

REFERENCE: DAS Service Manual Volume II, P/N 070-3836-01.

On Page 7-136 of the DAS Service Manual Volume II, there is a two line 4051 program which continuously sends data to the DAS via the RS232 port. This program, which causes the DAS to enter the "Trigger Specification" menu will work only if your DAS System contains an acquisition module (91A32, 91A08, 91A24, or 91A04).

Please be aware of this when troubleshooting the RS232.

W<sup>2</sup> Issue 13-15

PS5010 PLUS FLOATING SUPPLY DISPLAY BLANKS WHEN THE REAR INTERFACE IS USED

In the rear output configuration, each sense line is diode clamped to the output to prevent uncontrolled regulation should the sense lines be left unconnected. Remote sensing improves voltage regulation by compensating for voltage drops in the output leads. If the sense lines are unconnected, the plus Floating Supply will blank, indicating the supply is neither in constant voltage nor

constant current. The same problem applies to the minus Floating Supply. The display will not blank, but the regulation will be affected.

Supply regulation depends on the sense voltage at A14R1541 and A14R1533 (A14R1432 and A14R1540 for the minus Floating Supply). In the front panel output configuration, the sense and sense common lines are connected to the output at the connector.

When the rear output is used, the sense lines including the sensing common, must be connected at the load.

W<sup>2</sup> Issue 13-11

S3200 COMPUTER/PERIPHERALS UNIBUS CABLES

Computer and peripheral unibus cables may require replacement due to damage or inadequate length. The following cables are not orderable from Tektronix and have no Tektronix part numbers. They may be purchased from Digital Equipment Corporation.

BALLA-8 - 8' cable, unibus, flat ribbon, 60 cond.

BALLA-10 - 10' cable, unibus; flat ribbon, 60 cond.

BALLA-15 - 15' cable, unibus; flat, ribbon, 60 cond.

The above BALLA - cables are to interconnect computer and peripherals only. These cables should not be used to connect Tektronix products to the computer unibus or Tektronix to Tektronix products.

W<sup>2</sup> Issue 13-15

S3200: FRONT PANEL ACCESSABILITY  
#M45861

Reference Products:

2943 & 2944 Clock Generators

2942 Pattern Generator

1140 (All Types) Programmable  
 Power Supplies

Access to current product instruments through the front panel requires use of a screwdriver. The following information allows modification of earlier instruments to conform to UL standards.

Previously used thumbscrews and nut blocks should be replaced with screws and new nut blocks. Thumbscrews (P/N 214-0553-00) should be replaced with screws (P/N 212-0076-00). The 2943, 2944, and 1140 nut blocks (P/N 220-0465-00) are replaced by the new nut block (P/N 220-0868-00). The 2942 nut block (P/N 220-0465-02) is replaced by the new nut block (P/N 220-0868-01).

Two screws and two nut blocks are required for each instrument to be modified.

W<sup>2</sup> Issue 13-15

S3200: TERMINALS/HARD COPY UNIT CABLES

The Graphics Terminal, 50 ft. replacement cable is 012-0600-01.

The 4631 Hard Copy Unit, 50 ft. replacement cable is 012-0459-00.

W<sup>2</sup> Issue 13-11

TSG6 HARMONIC CALIBRATION

REF: TSG6 Manual, 070-2528-00

When calibrating the TSG6 with a 7L12 Spectrum Analyzer, the following hints may help you improve your times and increase your measurement accuracies.

7L12 Internal Accuracy Check

Before using the 7L12 for harmonic readings, the following steps will verify its internal calibration.  
**NOTE**--Allow 30 minute warm-up.

1. Set the 7L12 as follows:

Display mode--LOG/2dB per Div

FREQ--CENTER

RF Attenuator--Gain, CCW  
 Outer Knob, -30dBm

MODE--NORMAL

SOURCE--FREE RUN

TIME/DIV--5 mSec.

FILTER--30kHz

FREQ SPAN/DIV--3MHz/50MHz

FREQ--000

Connect CAL OUT to RF IN

2. Adjust Vertical Position knob to place base line on bottom graticule line.

3. Adjust Amplitude pot to place the first fundamental to the right of zero frequency on the top graticule line.

(ARTICLE CONTINUED ON THE NEXT PAGE)

TSG6 HARMONIC CALIBRATION (cont.)

4. Switch display mode to LOG--10dB/Div, and adjust LOG pot to place the same fundamental on the top graticule line.

5. Switch display mode to LOG -2dB/Div and repeat steps 3 and 4 respectively until the fundamental remains at the top graticule line in both display modes.

6. This completes the internal cal of the 7L12, and is generally accurate within 1dB for harmonic Attenuation readings.

Checking TSG6 Harmonics

1. Set the MAN frequencies on the 7L12 while observing the harmonics. Set the FREQ SPAN/DIV according to the fundamental frequencies involved.

<u>Frequencies</u>	<u>Freq Span/Div</u>
--------------------	----------------------

Low Range--

1-6 Mhz	300 kHz/2MHz
100kHz-1MHz	30kHz/500KHz

High Range--

1-20 Mhz	300 kHz/10MHz
330kHz-1MHz	30KHz/500KHz

2. When changing either the MAN frequencies or other 7L12 settings, reposition the fundamental frequencies to the top graticule line with the VERT POS control.

3. Note any frequencies which are in doubt with respect to harmonic attenuation specs: Generally, these frequencies will be about:

Low Range--100kHz, 300kHz, 1.1MHz, 2.5MHz, 5.0MHz, 6.0MHz

High Range--330kHz, 6.0MHz, 8.5MHz, 20MHz

4. The specs for the various frequencies are:

Low Range

100kHz - 300kHz	40dB
300kHz - 4.2MHz	43dB
4.2MHz - 6.0MHz	40dB

High Range

330kHz - 6.0MHz	38dB
6.0MHz - 20.0MHz	36dB

5. If a particular frequency has a borderline spec, use the "Exact Harmonic" procedure (below) to make an accurate determination.

Exact Harmonic Reading

This method can be used when harmonic attenuation is close to spec, but still in doubt.

1. Set MAN frequency to desired location.

2. Set 7L12 filter to 300Hz. Set 7L12 FREQ SPAN/DIV to:

Fundamentals below 1MHz = 30KHz/20KHz

Fundamentals above 1MHz = 300KHz/200KHz

**NOTE**--It will be necessary to pullout the RESOLUTION selector on the FREQ SPAN/DIV knob to achieve these settings.

3. With the COARSE and FINE frequency controls, locate the fundamental frequency which is to the right of the zero frequency reference.

(ARTICLE CONTINUED ON THE NEXT PAGE)

TSG6 HARMONIC CALIBRATION (cont.)

4. Set this frequency to the top graticule line with the VERT POS control. **NOTE**--It may be necessary to turn down the CRT intensity in order to decrease trace width.
5. Insert two 10X /50ohm attenuators in series at the input of the 7L12. Check that the fundamental is reduced exactly four major divisions (40dB).
6. If the reduction is greater than 4 divisions, adjust the LOG pot to increase the error slightly. Then remove the attenuators and reposition the fundamental to the top graticule line with the VERT POS control. Repeat steps 5 and 6 as necessary to achieve an exact reduction of 4 divisions when the attenuators are inserted.
7. Now that the 7L12 is calibrated in this manner, locate the desired harmonics with the COARSE and FINE controls. The readings obtained can be considered as very nearly exact.
8. If the 7L12 has had several hours of warm-up, this extra calibration should hold. However, a quick check can be made by inserting 40dB of attenuation at the 7L12 input and checking for exactly 4 divisions of attenuation.
9. When checking various frequencies, always set the fundamental to the top graticule line.

Some Harmonic Problem Hints

1. If the 3rd harmonic of 6.0MHz is out of spec, try readjusting

C383 (see Schematic 2 of the instruction manual) to bring it in. Then check 4.2 and 6.0 MHz LOW to see if their harmonics remain in spec. In some cases, C383 may have to be balanced between the High and Low ranges.

If the 3rd harmonic is still out of specs, R373 may require selection. The selection range is 62K to 75K ohms.

2. If the 2nd Harmonic peaking at 1-3MHz LOW cannot be reduced by replacing/exchanging Q352 or Q362, try changing U365 (see Schematic 2 of the instruction manual).

3. If there are several harmonic problems, check the harmonic content of the triangle generator. A good triangle generator will have a 2nd harmonic attenuation of about 46dB throughout the MAN range.

4. In the High range, 2nd harmonic problems of frequencies less than 6.0MHz can generally be traced to a poor axis display in the sweep mode as viewed on a 1485. In the 18-20 MHz region, 2nd harmonic problems are generally due to incorrect selection of R367.

5. In the High range, a 2nd harmonic peak at about 8-9MHz is commonly seen.

6. If harmonic problems still exist, try changing U390, preferably with a device of another date code.

W<sup>2</sup> Issue 13-15

TV MANUAL REVISIONS

The following manuals have been revised/updated during March and April 1983.

<u>Instrument</u>	<u>Manual P/N</u>
020-0967-00	070-4697-00
020-1004-00	070-4698-00
528A	070-3662-00
528AWW/528AWX	070-3802-00
650HR Series	070-2646-01
690SR	070-3821-00
1480 Series-- (Pre-B06)	070-1813-01
SPG11/SPG12	070-2324-00
SPG 22	070-2326-00
TSG 5	070-2336-00

W<sup>2</sup> Issue 13-12

TV MANUAL REVISIONS

The following instruction manuals have been revised as of May, 1983.

1480 B060000 & Up	070-2338-00
1470	070-2096-00
1420, 1421, 1422 B050000 & UP	070-2899-00
TSP11	070-2664-00
TSP1	070-2621-00

W<sup>2</sup> Issue 13-13

TV MANUAL REVISIONS

The following manuals have been revised/updated as of June, 1983.

1410 Instruction Manual  
B010135 & Up -- P/N 070-2759-00

1411 Instruction Manual  
P/N 070-2322-00

TSG16 Instruction Manual  
P/N 070-2649-00

1900 RCU Instruction Manual  
P/N 070-3388-00

1900 Operators Manual  
P/N 070-3443-00

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

1910 Service Manual  
P/N 070-4523-00

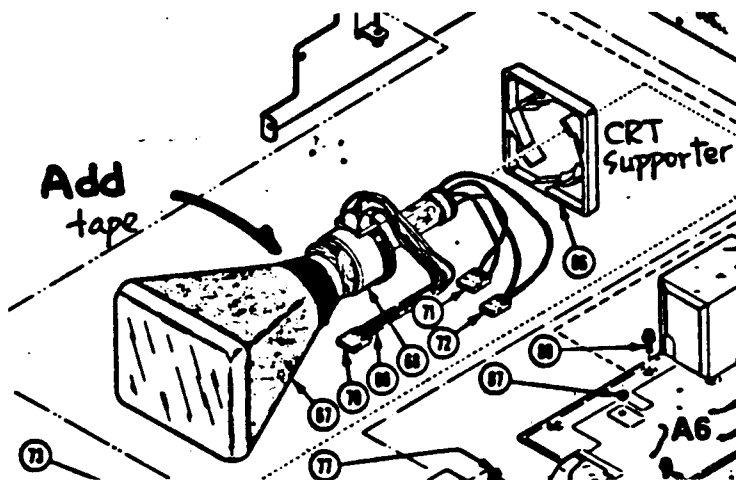
W<sup>2</sup> Issue 13-15

308 CRT TILT

Reference: 308 Instruction Manual, P/N 070-2662-00, Fig. 1 Exploded Diagram; M50959

Affected Serial Nos.: Mod was installed beginning with S/N 306179

Some CRT's rotate in the vertical axis (tilt) due to shock and vibration. To alleviate this problem a piece of adhesive tape, 10 cm x 2.5 cm, is wrapped around the CRT where it is bracketed by the CRT supporter. (See Illustration). This effectively increases the friction between the CRT and bracket, reducing rotation.



W<sup>2</sup> Issue 13-12



### 308 THRESHOLD CONTROL CIRCUIT OSCILLATIONS

Reference: 308 Instruction Manual,  
P/N 070-2662-00, Diagram 2, M50797

Affected Serial Nos.: Mod was  
installed beginning with S/N  
305429

Oscillations may occur on the  
threshold control circuit board in  
instruments with serial nos. below  
305429. The conditions exist when  
the parallel data acquisition  
probe is connected and the  
threshold level is 0 volts.

M50797 corrects this problem by  
adding a 0.01 MFD capacitor, P/N  
281-0773-00, between Pin 2 and Pin  
6 of U185 on the rear of the data  
input board, 670-5814-01.

W<sup>2</sup> Issue 13-12

### 380/381 IMPROVED DIFFERENTIAL GAIN SENSITIVITY

RE: 380 Inst. Manual 070-3421-00  
381 Inst. Manual 070-3422-00

For some applications the  
Differential Gain measurement  
resolution available from the 380  
and 381 is insufficient. The  
resolution can be significantly  
improved through the use of an  
external 75 ohm voltage step up  
termination. These terminations  
have been available for use with  
520 series vectorscopes for years  
but many people don't know they  
exist.

There are two different ones  
available, one for use with 3.58  
MHz subcarrier systems and one for  
use with 4.43 MHz subcarrier  
systems. The P/N's are:

<u>Frequency</u>	<u>P/N</u>
3.58 MHz	011-0100-01
4.43 MHz	011-0109-00

Each of these has a gain of  
approximately five at the  
subcarrier frequency and a gain of  
zero at DC. The procedure to use  
one of these is as follows:

1. Install the device in the  
video line at the 380, 381  
video input.
2. Do not terminate the signal  
line and do not use the  
internal termination.
3. Connect a sync signal to the  
program input and synchronize  
the display to the signal.
4. Select and display the video  
line that contains the  
appropriate test signal  
(modulated staircase or  
modulated ramp).
5. If the subcarrier amplitude is  
40 IRE (or 280 mv for PAL)  
push the 1.0 VFS Vertical  
Display button. If the  
subcarrier amplitude is 20 IRE  
(or 140 mv for PAL) push the  
0.5 VFS Vertical Display  
button.
6. Adjust the variable gain  
control to set the peak to  
peak amplitude of the  
chrominance to full scale  
(i.e. 0 to 10 on the right  
hand scale of the 380 or 0 to  
1.0 on the left hand scale of  
the 381).
7. Push the 0.1 VFS vertical  
display button.

Each minor division of the scale  
now represents 0.4% Diff Gain if  
the subcarrier amplitude is 40 IRE  
(or 280 mv for PAL). If the  
subcarrier amplitude is 20 IRE (or  
140 mv for PAL) each minor  
division represents 0.8% Diff  
Gain.

W<sup>2</sup> Issue 13-13

568/R568 EXTERNAL TRIGGER CABLE

The 568/R568 Instruction Manual (P/N 070-0596-00) does not contain the trigger cable from J123 (568 rear panel) to J23 (horizontal subpanel). This cable is required to allow external triggering of the 3T6 Mod 651C Horizontal Sampling Unit.

The replacement trigger cable is P/N 175-1013-00.

The 568/R568 Manual Figure 2, Item 7, illustrates a gray plastic plug (P/N 134-0067-00), Mechanical Parts List Page 8-4. This plug is replaced by the external trigger cable (P/N 175-1013-00) for 3T6 Mod 651C configurations.

The "connectors" illustration on Diamond 2 (far left) shows the J123 to J23 trigger input interconnection in the 568/R568 unit.

W<sup>2</sup> Issue 13-15

634 NEW CRT MODIFICATIONS 44159 AND 50489

A new type CRT is now being used in 634 monitors effective serial number B071317. The new tube dispenses with the lead foil around the funnel. Instead, the ceramic itself is x-ray attenuating. The new CRT is part numbered 154-0860-00. Modification #50489 incorporates this part in standard 634s.

The funnel dimensions of the new CRT are slightly smaller than those of the old. Therefore, the ground contact mounted on the yoke driver board must be bent to a sharper angle. Corporate modification 44159 changes the part number of the contact from 131-2228-00 to 131-2228-01 to reflect this change in angle. The -01 contacts are being used in 634 monitors effective B061201.

When retrofitting a new CRT into an earlier product, it is only necessary to bend the ground contact to a sharper angle. Otherwise, the new CRT is a direct retrofit.

Option 1 634 products still use the 154-0799-10 CRT and are not affected by modification 50489.

W<sup>2</sup> Issue 13-13

1410 SERIES EXTENDER BOARD

REF: 1410 Inst. Manual  
070-2759-00

The Extender Board used in the 1410 Series Generators has been upgraded to a more rugged and easier to use assembly. The primary change has been to put the bottom interconnection sockets in a molded plastic housing. Users should find this new board both easier to work with and more durable over many insertions and removals. The new part number is 670-4441-02.

W<sup>2</sup> Issue 13-13

1420 SERIES POWER SUPPLIES

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

As a troubleshooting aid, use the following values for nominal currents out of each of the 1420 Series DC power supplies:

+210 V	19.2ma
+ 15 V	515ma
- 15 V	439ma

W<sup>2</sup> Issue 13-15

1440 MOD I2R, I3B, I3C CALIBRATION

RE: 1440 MOD I2R, I3B, I3C MANUAL  
INSERT 061-1448-00

In later model 1440 Mod instruments, the power that is supplied to the RCU passes through diodes CR5691 and CR5692. In older instruments, there were fuses. The calibration procedure starting at step 18 on page 3-7 talks about removing these fuses as a part of the calibration procedure. Since the fuses have now been replaced by soldered in diodes, removal is not a clean and easy process.

In those instruments that use diodes in this application, in order to perform the calibration, the technician has two alternatives:

1. Pull P5698 and temporarily remove the wires from slots 2 and 4 on the 5-pin connector as appropriate for the calibration steps.
2. Construct a fixture as shown in Figure 1. This fixture can then be inserted in series with the connection at P5698, and will provide the ability to disable the RCU supplies.

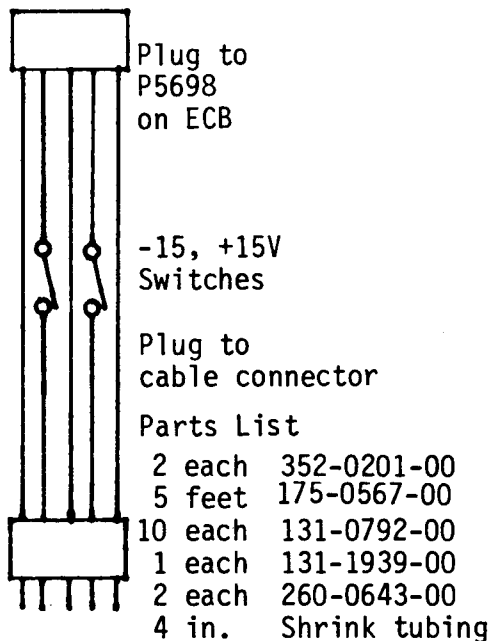


Figure 1  
RCU Power Fixture

1480 HORIZONTAL SWITCHING NOISE

REF:

1480 Instruction Manual  
070-2338-00

Horizontal switching noise in the 1480 can be somewhat difficult to isolate because of 3 or 4 circuits working into one line. The noise is apparent as a horizontal jitter, and could be caused by:

--horizontal switching matrix noise

--horizontal switching current mirror noise

--output amplifier noise

Once you have determined that your jitter problem is horizontal switching and not sync instability, isolation of some of the circuits can be achieved as follows:

1. Isolate the horizontal switching circuit (Diagram 10) from the horizontal amplifier (Diagram 11) by:
  - a) Remove Q4110
  - b) Connect a 9.53K ohm resistor (321-0287-00, or a potentiometer set for 9.53K ohms) from +15V to the A base of Q4210.

You will lose horizontal sweep, but if the noise is in the output amp, you will still see the beam fluctuating.

The horizontal magnifier amp can be further eliminated by shorting TP4420 (Diagram 11) to a circuit board ground momentarily.

(ARTICLE CONTINUED ON THE NEXT PAGE)

1480 HORIZONTAL SWITCHING NOISE (cont.)

2. If the noise disappeared, the Current Mirror Circuit (Q4020, Q4115) can be a cause, and can be eliminated by:
- a) Remove Q4020 and Q4115.
  - b) Connect a 3.92K ohm resistor (321-0250-00, or a potentiometer set for 3.92K ohms) from the junction of R4011 and C4003 to the base circuit of Q4115.

This eliminates the Current Mirror components, and if the noise goes away, the problem is in this circuit.

**NOTE:** Mod 45115 changes this circuit to eliminate the need to select Q4020 for noise problems. This mod is covered by a kit, P/N 050-1593-00.

If the noise still exists, it can now be more easily tracked to a noisy resistor, diode, or capacitor in the switching matrix.

Besides the normal problems with noisy transistors and diodes, the circuit was affected by noisy precision resistors in several locations. Of particular interest here are resistors made by Corning. These resistors are the same color and size as other vendors of precision parts.

Identifying this brand is not easy, but if this type is suspected, replace it. Some identifying features are a symmetrical green body with very good color code stripes--generally a high quality physical appearance. Corning has since resolved their problem, and new parts are working acceptably.

These parts are used as switching diode pull-downs, along with other

places in the Current Mirror and horizontal input/output amps, and once the offending circuit is isolated, it should be fairly easy to proceed to the defective component.

W<sup>2</sup> Issue 13-13

1480 SERIES Z AXIS MODULATION

REF: 070-2338-00  
SERVICE TEKNOTES Issue 28

A previous article addressed a modification that has been done to decrease Z axis modulation in 1480 Series Waveform Monitors.

The part numbers given for R6682 and C6805 were in error. The correct numbers are:

R6682 becomes 315-0221-00

C6805 becomes 285-1200-00

The remainder of the article is correct as printed.

W<sup>2</sup> Issue 13-14

1800: DATA DISTRIBUTOR,  
COMPONENTS, DUAL STATIONS #M39031

## REFERENCE:

670-2474-03 Data Distributor Circuit Board. 070-3717-00 1885 Dual Station Multiplexer Instruction Manual.

Dual Station Data Distributors, 670-2474-03, require different U40, U60, U61, and U62 components. Circuit boards modified for dual stations are also direct replacements for single station data distributors. Dual station

(ARTICLE CONTINUED ON THE NEXT PAGE)

1800: DATA DISTRIBUTOR, COMPONENTS,  
DUAL STATIONS #M39Q31 (cont.)

data distributors require the following change:

REMOVE: U40, U60, U61, and U62, 156-0255-01, MICROCKT, DGTL QUAD 2-INP NOR Gate, CHK SP380A.

INSTALL: U40, U60, U61, and U62, 156-0456-02, MICROCKT, DGTL, QUAD 2-INP NOR BUS RCVR screened, DS8836NAT or DS8836JAT.

DO NOT REMOVE: U40, U60, U61, and U62, if the following are installed: 156-0456-01, MICROCKT, DGTL QUAD 2-INP NOR BUS RCVR CHK, DS8836N or NT380A.

No 670-2474-03 P/N change is required.

W<sup>2</sup> Issue 13-15

1800 DCSS FLOATING POWER SUPPLY,  
#M43430

REFERENCE: 670-2554-04 DCSS Floating Power Supply

Switching noise on the AC line gets on the floating common of the DC subsystem and may cause F040 (T1140A.EDT) to fail.

Addition of C304 and C305 (283-0041-00) will bypass noise to ground. C304 and C305 should be installed on the back side of the Floating Power Supply Circuit Board, 670-2554-04. Installation of this change also includes changing the circuit board part number to 670-2554-05.

Insulation sleeving (162-0026-00) should be added to the capacitor leads to prevent shorting.

Add:

C304, C305, 283-0041-00, capacitor, .033uf, 5%, 500V.

.584 ft., 162-0026-00, insul., sleeving, elec., 0.059 ID, PTFE, clear 0.012 thk wall.

DIAGRAMS ON THE FOLLOWING TWO PAGES

W<sup>2</sup> Issue 13-15

1800 SERIES EXTERNAL SYNC TEST  
FIXTURE MODIFICATION, M49789

Integrated circuit, U100, P/N 156-0861-01 is being replaced on the External Sync Test Fixture P/N 067-0953-00.

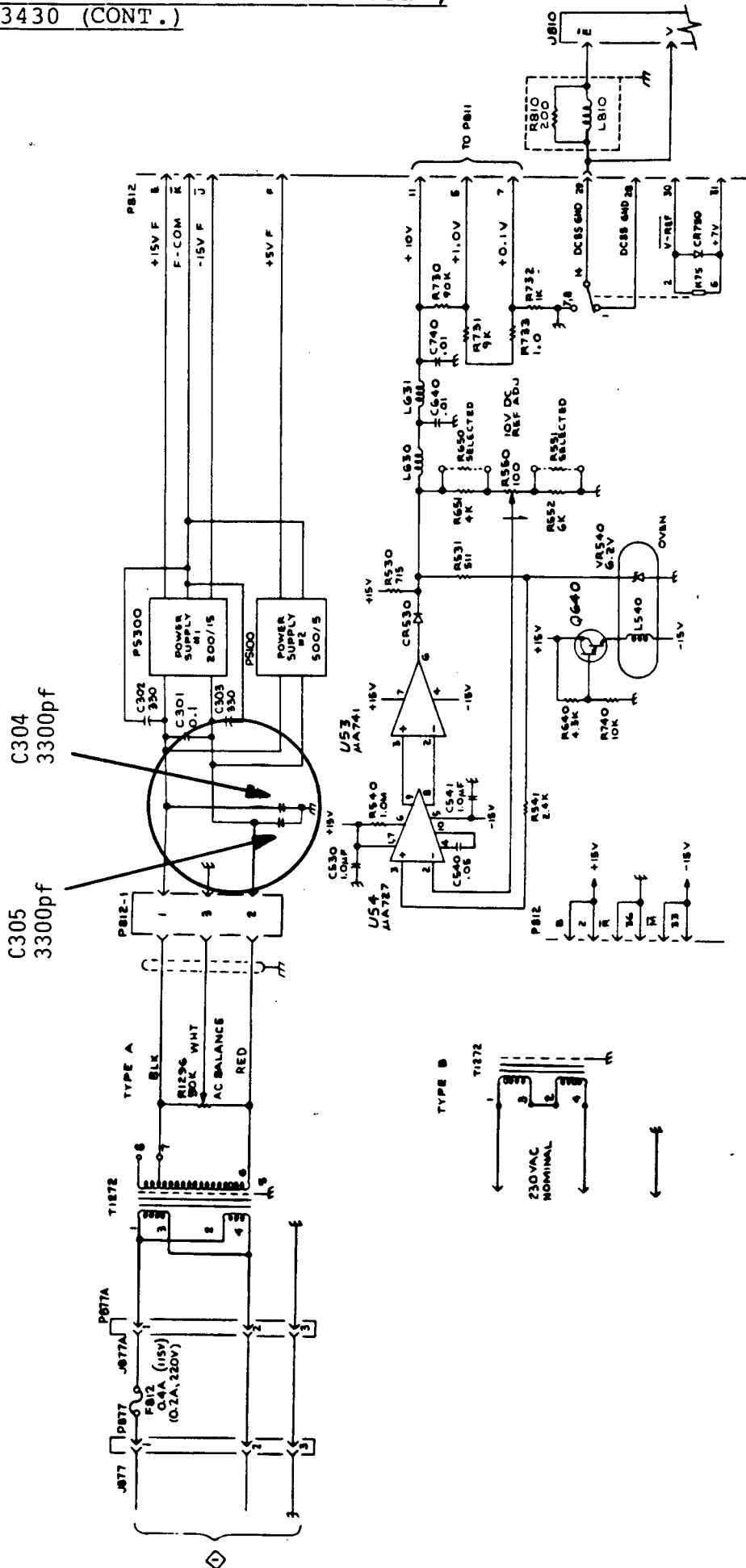
The Texas Instruments IC, a 74LS124 VCO was recently discontinued by the vendor and replaced with a part which was to be "at least as good." The new IC, a 74LS629 VCO was actually "too good" and oscillated at several hundred percent higher frequency.

This modification establishes a parts replacement kit P/N 050-1751-00. Included in the kit are the new IC and two frequency-of-oscillation determining capacitors, C101 and C111.

The External Sync Test Fixture is now P/N 067-0953-01. The subassembly 670-6485-00 should be changed to 670-6485-01.

W<sup>2</sup> Issue 13-12

1800 DCSS FLOATING POWER SUPPLY,  
#M43430 (CONT.)



C304  
3300pf

C305  
3300pf

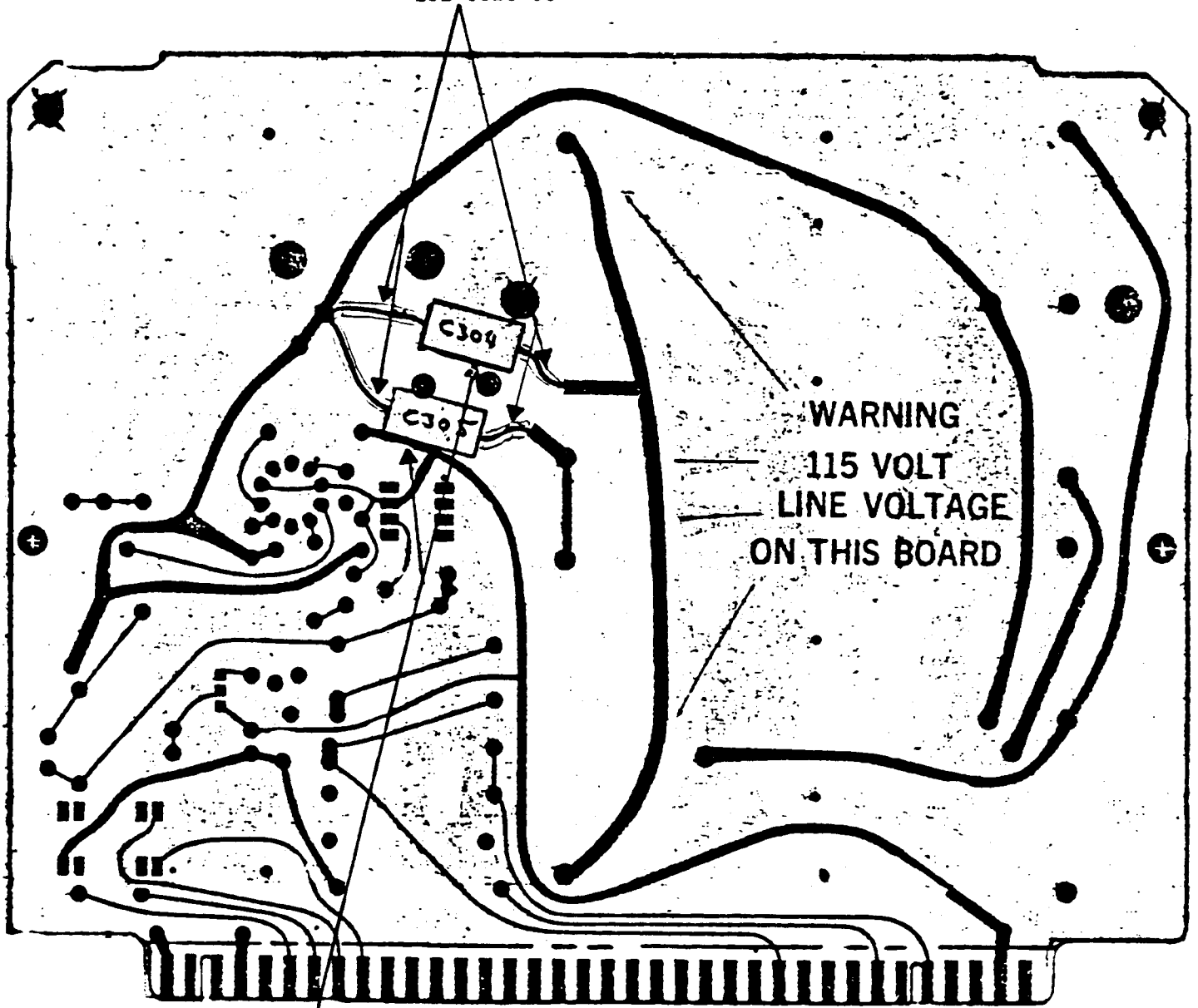
PS 812 DC SUBSYSTEM  
FLOATING POWER SUPPLY CARD  
New:  
670-2554-05

MOD M43430 adds two  
.0033uf capacitors  
(C304 and C305) as  
shown above.

1800 DCSS FLOATING POWER SUPPLY,  
#M43430 (CONT.)

M43430

Insulation, Sleeving  
162-0026-00



**WARNING**  
115 VOLT  
LINE VOLTAGE  
ON THIS BOARD

BACK SIDE OF FLOATING POWER SUPPLY  
ASS'Y, 670-2554-05

C304 & C305  
283-0041-00  
.0033uF, 5%, 500V

AFTER MOD 43430

1900/1910 R.C.U.

RE: 1900 Service Manual,  
061-2281-01  
1910 Service Manual,  
070-4523-00

The cable connector parts for the 1900/1910 Remote Control Unit interconnection cables are as follows:

Cable 012-0108-00 (72 inch)  
Connector Plug 131-0325-00  
Cable Collar 343-0087-00

Cable 012-0251-00 (192 inch)  
Connector Plug 131-0325-00  
Cable Collar 343-0166-00

Connector Plug 131-0325-00 includes the connector and a housing.

A similar connector, P/N 131-2180-00, is specified in the manuals (ref.) for calibration and performance checks.

This connector is a plastic body device without a housing. It is quite satisfactory for use as a shorting plug (as specified in the manuals), but is not to be used for repairing the interconnect cables.

W<sup>2</sup> Issue 13-13

1980 POWER SUPPLY FAILURES

REF: 1980 Service Manual Vol. 1  
070-2921-00, Mod 50871

Several inputs from the field have indicated that the 1980 power supply had an occasional tendency to blow the line fuse upon turn-on, or during a line transient. This has been a particular problem in the 620-0286-01 supply when used in a 240 volt 50 cycle environment.

A recent mod (#50871) has been implemented to solve this problem. The result of the mod is that some fuse value changes and transient protecting devices are now being installed in the power supply module (620-0286-01) in the manufacturing area. In addition, a field mod kit has been set up to allow field service technicians and self service customers to implement the correction. The field mod kit is P/N 050-1783-00, and upon installation, the 620-0286-01 becomes a 620-0286-02.

Since this assembly is on the Exchange and Repair and Return programs, the Module Exchange Center and the European Board Exchange Center have also been requested to install the kit whenever this module is in for service.

NOTE--This modification does not apply to power supply assembly P/N 620-0286-00, which is used mainly in 110 Volt 60 cycle application, and, to date, has not exhibited this failure mode.

MANUAL CHANGE INFORMATION ON THE FOLLOWING PAGE.

W<sup>2</sup> Issue 13-15



Date: 4-18-83 Change Reference: M50871

Product: 1980 Service Volume 1 Manual Part No.: 070-2921-00

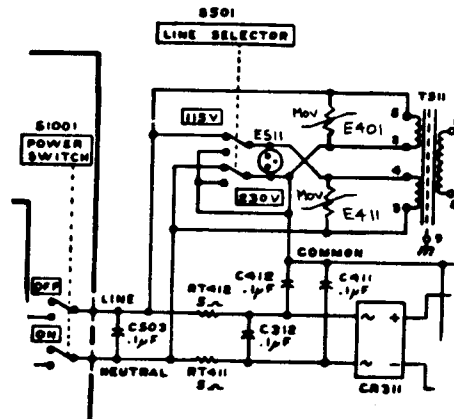
**DESCRIPTION**

EFF SN B030268 ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

A60	620-0286-02	CKT BOARD ASSY:POWER SUPPLY (OPTION 02 & OPTION 05 ONLY)
A60A1	670-6046-02	CKT BOARD ASSY:INVERTER (USED WITH 620-0286-02 ONLY)
A60A1E401	307-0449-00	RES., VAR, SENSITIVE:1900PF, 100A, 340V
A60A1E411	307-0449-00	RES., VAR, SENSITIVE:1900PF, 100A, 340V
A60A1E511*	119-0181-00	ARSR, ELEC SURGE:230, GAS FILLED
A60A4	670-7444-01	CKT BOARD ASSY:LINE FILTER (USED WITH 620-0286-02 ONLY)
A60A4F1	159-0211-00	FUSE, CARTRIDGE:3AG, 5A, 250V SLOW BLOW (FOR 115V OPERATION)
A60A4F1	159-0217-00	FUSE, CARTRIDGE:3AG, 2.5A, 250V SLOW BLOW (FOR 230V OPERATION)

The above added part, E511, is located on the A60A1 INVERTER BOARD and shown on diagram 11a - Partial



\*Denotes added part

### 4010, 4010-1 HIGH VOLTAGE CAPACITORS FAIL

Reference: 4010, 4010-1 Computer Display Terminal Maintenance Manual, 070-1183-02.

Corporate Mod #48507.

Seven capacitors on the 4010, 4010-1 High Voltage board have been failing at a very high rate. Corporate Mod #48507 has been completed to implement changing to a different capacitor for all seven circuit numbers.

The seven circuit numbers are C39, C62, C72, C73, C74, C91 and C93. The old capacitor part number was 283-0101-00. The new capacitor part number is 285-0507-01. With this change the High Voltage board, 670-1731-03 will roll to a -04.

W<sup>2</sup> Issue 13-14

### 4016-1 AC POWER SWITCH MOD #47785

The power switch on the 4016-1 terminals in some instances cannot handle the power on or off current loads. This can result in the switch's contacts welding together preventing the terminal from being turned off.

A modification to this circuitry corrects the problem by supplementing the power switch with a solid state relay. To accomplish this in the field, an 050 kit has been set up. This parts replacement kit consists of a new power switch, the solid state relay, a metal chassis for the relay, a plastic cover for the chassis-relay assembly, two new wire assemblies and miscellaneous mounting hardware. All these parts are set up in kit part number 050-1715-00 along with installation instructions.

W<sup>2</sup> Issue 13-14

### 4016-1 GMA125 LVPS STRAP SETTINGS CAN EXTEND CRT LIFE

REF: 4016-1 Service Manual, 070-2661-00  
GMA125 Service Manual, 070-2618-00

One possible cause of premature failure of replacement CRTs in 4016 terminals and GMA125 monitors are flood gun heater straps that are not set for optimal performance. When a CRT is replaced, the flood gun heater straps, J44 and J34 on the secondary LVPS board, should be placed in the 44V settings. Leaving the straps in the 48V settings may severely curtail the life of the CRT. The 48V setting is used to extend the life of an old CRT. The 40V setting is not recommended because it may cause early CRT failures. To strap J44 and J45 to the 44V setting, it requires that one be strapped to 20V and the other to 24V. They are strapped to 48V when both J44 and J45 are in the 24V position.

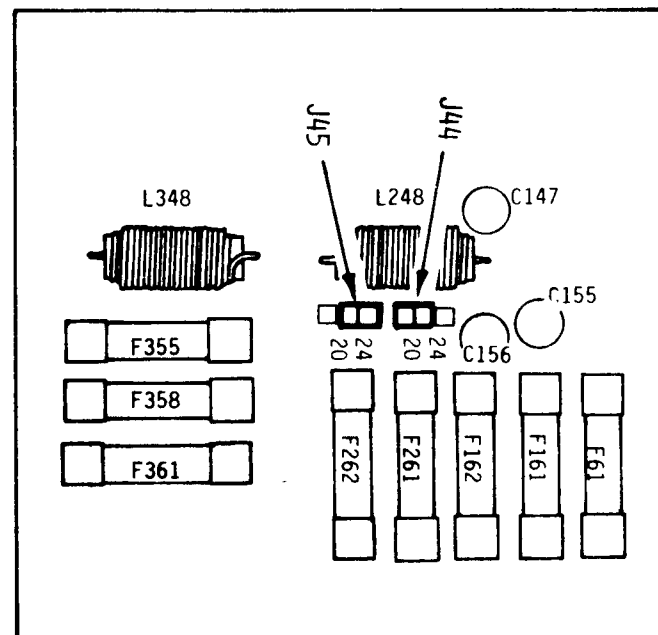


Figure 1.

W<sup>2</sup> Issue 13-15

4016/4116A/GMA 125/618DM CRT  
MODULE THREADS OBSTRUCTED

A number of calls have been received expressing a difficulty in installing replacement CRT modules in the 4016, GMA125 and 618DM products. The 1/4" X 20 thread holes in the module's frame were the source of complaints. Reports of wrong thread, incomplete tapping and obstructions in thread holes were made.

Manufacturing has investigated and found paint runs obstructing the threaded holes in the CRT frame. A Q.A. procedure has been implemented to prevent future problems with the mounting holes.

A locally purchased 1/4" X 20 tap is recommended to clean out any mounting holes that are found to have the above symptoms.

W<sup>2</sup> Issue 13-15

4052/4052A/4054/4054A AND 4050E01  
RESTART CIRCUIT MOD

REF: 070-2829-01 4052 and 4052A Graph-  
ic Computing System,  
Parts and Schematics  
Service Manual.

070-2839-03 4054 and 4054A Graph-  
ic Computing System,  
Parts and Schematics  
Service Manual.

070-3833-00 4050E01 ROM Expander  
Instruction Manual.

Corporate Mod #M48904.

Identical power up restart circuits on the 4052/4052A power supply, 4054/4054A I/O boards and the 4050E01 power supply have a design defect which can cause the restart signal to pulse several

times. This can cause the system to hang or for the 4050E01 to power up in the opposite mode than the product to which it is connected. The malfunction can also show up on the 4050E01 as intermittently changing modes.

Corporate Mod #M48904 fixes this restart malfunction with a design change. The change is as follows:

Note: In the following paragraph, the circuit numbers are applicable to the schematic in this article only. Actual circuit numbers are listed by product following the schematic diagram.

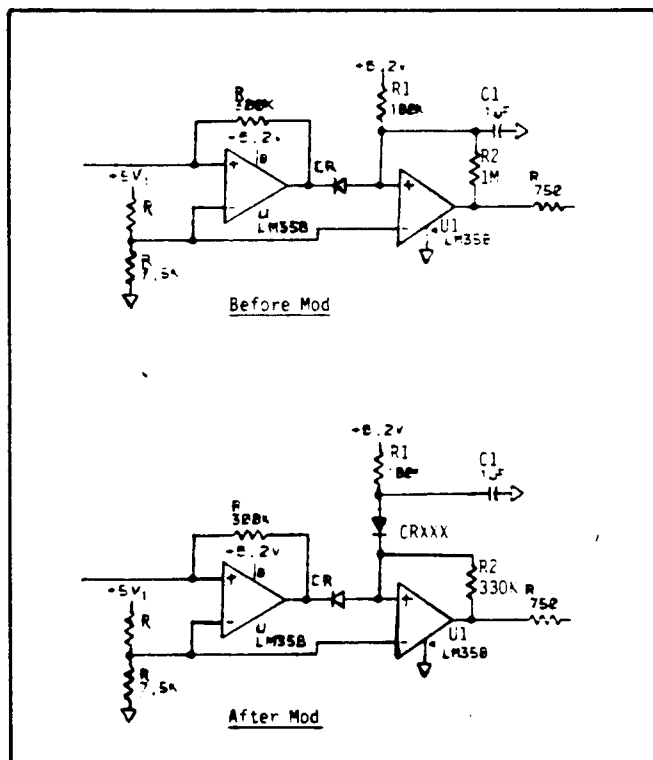
One end of both a 1 uf cap (C1) and a 180K  $\Omega$  resistor (R1) are connected to the plus input of the OP AMP (U1) in the circuit involved. Lift this end of both components and "teepee" together. Insert and solder in the cathode end of a 1N4152 diode (CRXXX) into the hole from which the end of the "teepeed" resistor (R1) was removed. Connect the other end of the diode to the "teepeed" resistor and capacitor (R1, C1) and solder together. Last, replace the 1M  $\Omega$  resistor (R2) with a 330K  $\Omega$  resistor. Below are part numbers for CRXXX and R2.

Diode CRXXX	152-0141-02	1N4152
Resistor R2	315-0334-00	330K

(ARTICLE CONTINUED ON THE NEXT PAGE)

4052/4052A/4054/4054A AND 4050E01  
RESTART CIRCUIT MOD (CONT.)

Schematic Changes



4054A

Board Name - Input/Output Board  
Board P.N. - 670-7630-01 rolls to -02  
Ckt. Involved - U265B (+ input = pin 5)  
Lift - R265 and C267  
Add - CR265  
Change - R266

4050E01

Board Name - Power Supply Ckt. Bd.  
Board P.N. - 670-7210-01 rolls to -02  
Ckt. Involved - U205A (+ input = pin 3)  
Lift - R202 and C202  
Add - CR203  
Change - R201

Serial Number Breaks

Products started shipping with this modification installed at the following serial numbers:

4052A	B044963
4052F39	B010368
4054A	B033024
4054F39	B010290
4050E01	B010398

There will not be an 040 or 050 kit set up for this modification. The mod should be installed on an as needed basis only.

By Product Circuit Number and Other Information:

4052/4052A

Board Name - Regulator Circuit Board  
Assy. P.N. - 620-0278-00 rolls to -02  
Bd Assy P.N. - 672-0833-01 rolls to -03  
Ckt. Involved - U271A (+ input = pin 3)  
Lift - R272 and C271  
Add - CR272  
Change - R263

4054

Board Name - Input/Output Board  
Board P.N. - 670-5666-02 rolls to -03  
Ckt. Involved - U270B (+ input = pin 5)  
Lift - R260 and C262  
Add - CR261  
Change - R261

W<sup>2</sup> Issue 13-15

### 4052/4052A/4054/4054A FIRMWARE INFORMATION

The following information is a list of all the CRC's for the 4052/4052A/4054/4054A system firmware and current level firmware of each 4052/4052A/4054/4054A ROMpack.

#### 4052/4054 CRC's

IC	PART NUMBER	V2.1			V3.1			V3.2			V4.1		
		P/N LEVEL	WITH PATCH	WITHOUT PATCH	P/N LEVEL	WITH PATCH	WITHOUT PATCH	P/N LEVEL	WITH PATCH	WITHOUT PATCH	P/N LEVEL	WITH PATCH	WITHOUT PATCH
U810	160-0260	01	BB83	BB83	01	4A4E	BB83	01	4A4E	BB83	02	5B67	267D
U820A	160-0261	01	E396	E396	01	E396	E396	01	E396	E396	02	3EAB	3EAB
U820B	160-0261	01	8C00	D684	01	E306	D684	01	E306	D684	02	E7CB	9BBE
U825	160-0262	01	AD91	1AF1	01	0468	1AF1	01	0468	1AF1	02	D098	8BA8
U835	160-0263	01	75A8	00DE	02	E810	D515	02	E810	D515	03	OCA2	9254
U870A	160-0264	01	C1FA	C1FA	01	C1FA	C1FA	01	C1FA	C1FA	02	7132	7132
U870B	160-0264	01	EC8B	4383	01	C5D9	4383	01	C5D9	4383	02	04C8	43B3
U880	160-0265	01	876A	9E7B	01	92BB	9E7B	01	92BB	9E7B	02	E7F0	AF39
U885	160-0266	01	641A	030C	02	1344	593F	02	1344	593F	03	2E15	7369
U893	160-0267	01	FABF	FABF	01	0613	FABF	01	0613	FABF	02	CB18	CB18
U805A	160-0340	00	1E52	XXXX	01	5DD7	XXXX	03	B9D1	XXXX	02	9407	XXXX
U805B	160-0340	00	XXXX	XXXX	01	XXXX	XXXX	03	XXXX	XXXX	02	XXXX	XXXX
U897A	160-0341	00	97F7	XXXX	01	B742	XXXX	01	B742	XXXX	02	F0B0	XXXX
U897B	160-0341	00	XXXX	XXXX	01	XXXX	XXXX	01	XXXX	XXXX	02	XXXX	XXXX
U845	160-0379	00	XXXX	XXXX	01	XXXX	XXXX	01	XXXX	XXXX	02	XXXX	XXXX
U863	160-0380	00	XXXX	XXXX	01	XXXX	XXXX	01	XXXX	XXXX	02	XXXX	XXXX

#### 4052/4054 CRC's

IC	PART NUMBER	V4.2			V4.3			V4.4			V5.1		
		P/N LEVEL	WITH PATCH	WITHOUT PATCH	P/N LEVEL	WITH PATCH	WITHOUT PATCH	P/N LEVEL	WITH PATCH	WITHOUT PATCH	P/N LEVEL	WITH PATCH	WITHOUT PATCH
U810	160-0260	02	5B67	267D	02	5B67	267D	02	5B67	267D	03		2057
U820A	160-0261	02	3EAB	3EAB	02	3EAB	3EAB	02	3EAB	3EAB	03		0066
U820B	160-0261	02	12A0	9BBE	02	00F1	9BBE	02	00F1	9BBE	03		494F
U825	160-0262	02	D098	8BA8	02	7403	8BA8	02	7403	8BA8	03		8C30
U835	160-0263	03	27B0	9254	03	241B	9254	03	08AF	9252	04		6389
U870A	160-0264	02	7132	7132	02	7132	7132	02	7132	7132	03		46C9
U870B	160-0264	02	026A	43B3	02	95BC	43B3	02	95BC	43B3	03		67B6
U880	160-0265	02	E7F0	AF39	02	3FE5	AF39	02	3FE5	AF39	03		AF97
U885	160-0266	03	97C6	7369	03	026F	7369	03	186B	7369	04		38E2
U893	160-0267	02	1F38	CB18	02	1F38	CB18	02	1F38	CB18	03		93A4
U805A	160-0340	04	98AC	XXXX	05	68D3	XXXX	06	AEED	XXXX	U805A/U820C		8D82
U805B	160-0340	04	XXXX	XXXX	05	XXXX	XXXX	06	XXXX	XXXX	U805B/U820D		D064
U897A	160-0341	03	C7CD	XXXX	04	4A20	XXXX	05	A7E3	XXXX	U897A/U870C		C27E
U897B	160-0341	03	XXXX	XXXX	04	XXXX	XXXX	05	XXXX	XXXX	U897B/U870D		71C4
U845	160-0379	03	XXXX	XXXX	04	XXXX	XXXX	05	XXXX	XXXX			
U863	160-0380	03	XXXX	XXXX	04	XXXX	XXXX	05	XXXX	XXXX			

4052/4052A/4054/4054A FIRMWARE INFORMATION (CONT.)

4052A/4054A CRC's

IC	PART NUMBER	V1.3		V1.4	
		P/N LEVEL	CRC	P/N LEVEL	CRC
U810	160-1698	00	68DF	00	68DF
U820A	160-1699	00	E525	00	E525
U820B	160-1699	00	4869	00	4869
U825	160-1700	00	7DDF	00	7DDF
U835	160-1701	00	E98D	01	EC6E
U870A	160-1684	00	6487	00	6487
U870B	160-1684	00	4F31	00	4F31
U880	160-1683	00	59EE	00	59EE
U885	160-1691	00	83F8	01	43DF
U893	160-1682	00	7F39	00	7F39
* U805A U820C	160-1699	00	0B9D	00	0B9D
* U805B U820D	160-1699	00	348D	00	348D
* U897A U870C	160-1684	00	C9F8	00	C9F8
* U897B U870D	160-1684	00	F93E	00	F93E

\*When using the 4052/4054 Diagnostic ROMpack to read CRC's of a 4052A/4054A or a 4052/4054 V5.1 firmware, the ROMpack will list CRC's for U805A, U805B, U897A and U897B. U805 and U897 do not exist in the "A" or "V5.1" models of the 4052/4054, but these CRC's are valid extensions of U820 and U870. Therefore, as shown in the chart, the ROMpack prints the CRC for U805A the actual CRC value corresponds to U820C, U805B corresponds to U820D, U897A corresponds to U870C, and U897B corresponds to U870D.

4052/4052A/4054/4054A ROMpack CRC's:

Editor ROMpack 4052/4054 R06 Level 2.0

U1           160-1414-00       ----  
 U11          160-1415-00       2D58           (1 CRC for both)

SPS ROMpack #1 4052/4054 R07 Level 2.0

U1           160-1416-00       B6B3

SPS ROMpack #2 4052/4054 R08 Level 2.0

U1           160-1417-00       ---  
 U11          160-1418-00       FF43           (1 CRC for both)

Real Time ROMpack 4052/4054 R09 Level 3.0

U21          160-0762-02       673E

(ARTICLE CONTINUED ON THE NEXT PAGE)

4052/4052A/4054/4054A FIRMWARE INFORMATION (CONT.)

4909 Advanced File Manager ROMpack 4052/4054 R10 Level 1

U1	160-1337-00	----	
U11	160-1338-00	5C8C	(1 CRC for both)

Character & Symbol ROMpack 4052/4054 R11 Level 1

U1	160-1313-00	----	
U11	160-1314-00	5AA8	(1 CRC for both)
U13	160-1315-00	----	
U15	160-1316-00	6051	(1 CRC for both)

Graphics Enhancement ROMpack R12 Level 1.0

U1	160-2039-00	37D2	
U11	160-2040-00	6FDC	
U13	160-2041-00	98B2	

GPIB Enhancement ROMpack 4052/4054 R14 Level 1.0

U1	160-1638-00	----	
U11	160-1639-00	B50F	(1 CRC for both)

GPIB Enhancement ROMpack 4052A/4054A R14 Opt. 1A Level 1.0

U1	160-2026-00	----	
U11	160-2027-00	8756	(1 CRC for both)
U13	160-2043-00	B399	

4907 Opt. 40 File Manager ROMpack 020-0476-01 Level 3.0

U1	160-1419-01	----	
U11	160-1420-01	994F	(1 CRC for both)
U13	160-1703-00	608A	

4052 DTSEND Rompack 020-0614-00 Level 2.0

U1	160-1421-00	72FF	
----	-------------	------	--

4052A Option 10 Printer Interface Level 1.0

U100	160-0342-01	1ECA	
------	-------------	------	--

4052/4052A/4054/4054A GPIB Test ROMpack 067-1113-99 Level 1.0

U1	160-1835-00	----	
U2	160-1836-00	D1EE	

067-0900-01 4052A Diagnostic ROMpack V1.5

U101	160-0381-02	----	
U111	160-0382-02	7580	(1 CRC for both)

### 4110 MOD CD AND 4110A COMPATIBILITY WITH CD-2000 SOFTWARE V1.4 & V1.45

4110 Mod CD custom mod incorporates into the firmware the ability to have many small segments without using alot of user memory. This firmware change was also incorporated into Version 3 firmware in the 4110A series products.

Another addition to mod CD firmware is the ASCII control character 'RS' being sent to the terminal allowing the previous segment to be selected. This command is not implemented in the 4110A series because it is a duplicate command. The 'RS' control character is only a shortened method. Both mod CD firmware and Version 3 firmware support an ESC command that does the same thing (longer method).

CD-2000 software was written by Control Data Corporation for the 4110 mod CD products. It used the 'RS' control character command. When using CD-2000 software (V1.4) with a 4110A or a 4110 upgraded with Version 3 firmware, segments on the display will not be written correctly. To correct for this, the CD-2000 software needs to be upgraded to Version 1.45 or higher. This is because the 4110A eliminated the 'RS' command. The CD-2000 software was changed to correct for the incompatibilities. The new Version 1.45 CD-2000 software operates with both the 4110 mod CD and 4110A products. The customer should contact CDC for the new software.

W<sup>2</sup> Issue 13-12

### 4110/4110A SERIES TERMINAL OPTIONS

One of the major differences between a 4110 and a 4110A is the firmware. An instrument with mixed 4110 and 4110A firmware installed will fail to operate at power-up. Any EPROM from Version 2 and lower cannot be used in the same instrument that has Version 3 or higher installed.

Field Upgrade Kits for options are available only with 4110A firmware. 4110 firmware is no longer available on upgrades. See Marketing Sales Release (IDD MSR. No. 93-11, December 17, 1982). As indicated by this Marketing Sales Release, a customer that wishes to add an option to his 4110 will need to:

1. Upgrade the 4110 to a 4110A equivalent with a 4112F60 kit, or 4113F60 kit, or a 4114F60 kit.
2. Order a 4110A option.

When ordering the upgrade F60 kit, be sure to list all options that are installed in the instrument. The kit will then include at no extra charge the firmware to upgrade each option. If the order does not list these options, no optional firmware will be included in the F60 kit. This will then require a separate purchase of optional firmware.

W<sup>2</sup> Issue 13-13

### 4114/4116 ADJUSTING GAIN FOR HARD COPY

Reference: 4114A/4116A Service Manual, p.n. 070-4513-00.

Characters displayed in size 11 thru 16 in the first line of the display extend above the top line of the hard copy pattern in adjustment/self test. This may cause the tops of character size 11 thru 16 to be cut off on the hard copy, if you use the hard copy pattern to adjust the hard copy gain. Characters displayed on line one in character size 16 are approximately 1/8 inch above the hard copy pattern.

When using the built-in hard copy pattern, increase the scan line gain 3/8 of an inch past the top of the pattern. This will compensate for the 1/8 inch error and the origin shift that normally occurs to increase CRT life.

W<sup>2</sup> Issue 13-11



4907 INDEX/SECTOR ADJUSTMENTS ADDITION

Ref: 070-2405-00 4907 File Manager Service Manual, pages 5-25 thru 5-27.

It has been brought to my attention that after completing the Sector to Data Alignment adjustment, it may be necessary to go back and readjust the Index Pulse. Normally the tolerance of the specification for the Index Pulse will allow a large change to the Sector to Data adjustment. However, if either one was previously out of tolerance, the two adjustments could interact with each other. It is, therefore, necessary to always recheck the Index Pulse after the Sector to Data adjustment is made.

W<sup>2</sup> Issue 13-15

4909 SERVICE MANUAL CORRECTIONS --  
VERIFICATION TAPE

REF: 070-3998-00, 4909 Multi-User File Management System Service Manual

In the new issue of the 4909 Service Manual, the System Verification Tape documentation (page 4-58 through 4-65) does not show the correct sequence number for each test of the disk interface (pages 4-62 and 4-63). The correct sequence is 1 through 9, A, C, E, F, H and L. The test labeled "Read Disk Track [A]" should actually be "...[9]".

W<sup>2</sup> Issue 13-15

4909 SYSTEM SOFTWARE RELEASE 2

Ref: 070-3998-00 4909 Multi-User File Management System Service Manual

070-3994-00 4909 Multi-User File Management System Operators Manual

Corporate Mod Number M49339

The System Software for the 4909 has been modified to remove the Offset Error Recovery test from the Power-up Self Test procedures. Engineering has determined that it was not a valid check of the drives' data recovery procedure.

System Software changes were made to tape I of the 2 tape package. This changed the System Software Package part number to 062-5867-01 and the version level to 2.

4909's running version 1 may experience intermittent failures during the Power-up Self Test which will not allow the drive to reach an operational state. The symptoms seen may be a fault indicator on the drive and/or the controller and the Two Character Display on the front panel of the controller may indicate [U] [X], X being the drive unit number which failed.

W<sup>2</sup> Issue 13-15

7854, MAIN INTERFACE PLUG-IN  
CONTACTS

RE: 7854 Instruction Manual P/N 070-2874-01

It has been brought to our attention that the P/N in the manual, in the Replaceable Mechanical Parts List, for figure 5 items 134 and 144 are not for individual contacts. When needing individual contacts use the following P/N's. For straight contact order 131-0726-00. For the offset contact order 131-0727-00.

W<sup>2</sup> Issue 13-11

067-0625-00 CALIBRATION ERROR

Errors have been detected in the calibration procedure used by the manufacturing area for the 067-0625-00 Peak-to-Peak Detectors. All new detectors calibrated from approximately January 1983 to May 1983 (identification numbers 960-1279) may have erroneous calibration graphs.

Detectors that have erroneous calibration graphs may be identified as follows:

1. The detector is supplied with two (2) graphs instead of the customary one (1).
2. The graphs are labeled section + for one, and section - for the other.
3. The word frequency is misspelled as frequincey.
4. The y axis of each supplied graph is labeled 99 (or 98) % to 101 (or 102) %, rather than the usual  $\pm 1$  to 2%.
5. The X axis (frequency) is a logarithmic scale rather than the usual linear scale.

**All detectors identified as having received an invalid calibration should be returned to the local Field Office/Service Center for no cost recalibration.**

W<sup>2</sup> Issue 13-13

067-1115-00 SERVICE MAINTENANCE INFORMATION

REF: 067-1115-00 Manual 070-4508-00  
1980 Service Manual Vol. 1  
070-2921-00  
1980 Service Manual Vol. 2  
070-4494-00

The Tektronix 1980 Service Kit, 067-1115-00, is a set of assemblies and parts that provides a number of tools required for servicing the 1980 "ANSWER" Video Measurement set to the component level. The kit contains the following items:

067-1115-00 Manual	070-4508-00
1980 Service Manual	
Vol. 1	070-2921-00
1980 Service Manual	
Vol. 2	070-4494-00
Diagnostic Board, A94	672-0836-00
BASIC Test Program Board	672-1084-00
3 Filter VDC Boards	670-5956-00
Extender Board	670-5703-00
VDC Test Clip	670-8056-00
CPU Test PROM Subkit	020-0091-00
1980 VDC Test PROM	
Subkit	020-0882-00

AND, several Interconnecting cables, test leads, and jumpers.

Detailed descriptions of the above items are contained within the service kit documentation.

The kit provides the following functions for the user:

- a) Bus Monitoring
  - Illegal opcodes
  - Faulty RAM control lines
  - Memory access timing errors
  - Data timing errors
  - Intermittent power failures
- b) Functional Test Firmware
  - Check sum
  - Parity
  - Address and pattern tests
  - Real-Time Clock tests
  - Interval Comparator
  - RS-232C + RS-366 tests
- c) Signature Analysis Firmware
- d) High speed digital Ramp 8 bit, 20MHz
- e) Video Data Converter Calibration
  - BASIC routines
  - User Prompts
  - Graphic display
  - Auxiliary equipment drive

(ARTICLE CONTINUED ON THE NEXT PAGE)

067-1115-00 SERVICE MAINTENANCE  
INFORMATION (cont.)

- f) All necessary cables to extend, access, probe, and monitor the appropriate circuit activity.

The 067-1115-00 manual, 070-4508-00, provides the parts lists for the three major circuit boards, a mechanical explosion of the kit subparts, and the component location diagrams and schematics for the Diagnostic board.

The 1980 Service Manual Vol. 1, 070-2921-00, contains specifications, circuit descriptions, block diagrams, EPL's, MPL's, schematics, maintenance hints and troubleshooting hints for all of the assemblies that make up a 1980, including options.

The 1980 Service Manual Vol. 2, 070-4494-00, contains the information required to set up and use the 067-1115-00 Service Kit including:

Diagnostic Troubleshooting (General)  
Faulty Board Identification  
Diagnostic Board Operation  
Signature Analysis Operation  
CPU Test Procedures  
1980 Performance Check Procedures  
1980 Adjustment Procedures  
and Appendices containing:

Diagnostic Test Prescriptions  
Troubleshooting Flowcharts  
Software Maps  
Device Identification Maps  
End Node Signature Tables  
General Node Signature Tables  
1980 Test Configurations  
Assembly Code list for the CPU Test PROM  
Modification procedures for the 1900 Digital Generators  
FDC Troubleshooting Aid  
Glossary

The three manuals are detailed, and provide the user ample information to allow effective location of a problem to the component level in a minimum amount of time. These manuals should be thoroughly studied for their layout and content.

A class was held in January 1983 for those personnel that will be servicing the 1980 to the component level. Future requests for classes of this type should be coordinated through Tektronix Maintenance Training. Contact Dick Hornicak, Delivery Station 54/077, 642-8843, or your training coordinator for further information.

The two major circuit boards containing circuitry (672-1084-00 and 672-1084-00) can be repaired to the component level by the user.

The 672-1084-00 board is similar to other ROM/PROM boards used in the 1980, and should be troubleshot in the same manner.

The 672-0836-00 board can be troubleshot using a scope, DVM, logic analyzer, etc. However, the normal method of repair/support for this assembly will be at the factory via the Module Exchange Center. A list of troubleshooting hints for this board is provided as an appendix to this article.

The 672-1084-00 and 672-0836-00 will be set up on R & R through the Module Exchange Center. Before and After Cal Data does not apply to this product.

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## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

APPENDIX A

## 1. DEFAULT SETTINGS

## 1.1 Link Positions

Set the links on the Diagnostic board as follows:

P260: 2 --> 3  
 P273: 2 --> 3  
 P275 through P282: 2 --> 3  
 P326: 2 --> 3  
 P619: 1 --> 2  
 P365: 2 --> 3  
 P605: OPEN

Layout of different pin configurations:



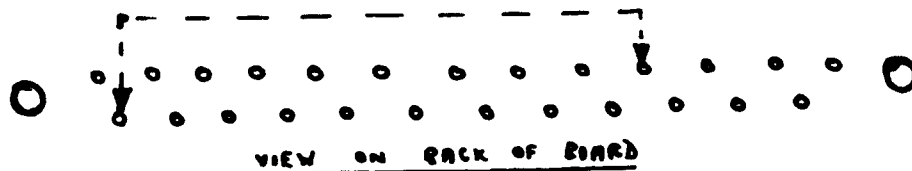
## 1.2 Switch Settings

Set the switches on the Diagnostic board as follows:

S382: ALL OPEN  
 S373: 50 ns position CLOSED; all others OPEN

## 2. MINOR MOD CHECK

Check that a wire strap is present between pins 10 and 15 on P099 (RS-232 connector) on the back of the Diagnostic board:



## 3. FUNCTIONAL TESTS

## 3.1 Preliminary

Select a fully-functional 1980 incorporating the AUTO-CALL Option 12, the 670-5694-01 Memory Controller, and 670-5692-01 Acquisition Memory. Set the I/O board links for PORT 0 as MASTER PORT and BAUD RATE of 4800. Remove any

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

Applications Program ROM boards. Plug the Diagnostic board onto a 1980 Extender board, 670-5703-00, and plug the combination into slot 8. Ensure that slots 9 and 10 are empty to allow for easy access to the Extender board switches. Turn the 1980 front-panel key to the RESET ENABLE position.

Connect a 4006 or 4010-series terminal to PORT 0 and set the terminal for 4800 baud.

### 3.2 Diagnostic Boot-Up Text

Turn on the 1980. The following prompt should appear:

```
DIAG V1.0
```

```
$
```

#### Troubleshooting:

- (1) If the prompt does not appear, try pressing RESET. If it still does not appear, the EPROMs U452, 462, 472, 652, 662, and 672 may be faulty. The data and address buffers associated with them may be faulty or wrongly positioned or the board decoder, U525, may be wrongly programmed.

Try switching P282 link to 1 --> 2 and press RESET. If the 1980 self-test is printed out, check that no FIRM errors are output. Type SYSTEST FIRM (cr) after READY. Check that the text of Section 3.4 is part of the output listing. After locating fault, restore P282 to 2 --> 3 position.

- (2) If the 1980 goes directly to its power-up self-test, then the Diagnostic board may not be fully inserted in the Extender, or the Extender may have one or more of its series switches open. If the condition of the Extender board is normal and good contact is being made, but the 1980 self-test appears instead of the \$ prompt, then check that link P282 (next to P282 nomenclature) is in the 2 --> 3 position. If so, then a possible fault exists in the CRU circuitry U287, U327, or in the U525 board decoder. Before searching for this fault, check that a SYSTEST FIRM after the 1980 displays:

```
READY
```

```
*
```

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

gives the text of Section 3.4 -- exactly as shown -- as part of the output listing. If not, rectify the problem and run 3.1 again.

### 3.3 Light Latching Tests

- (a) Press the LIGHT button (S163) on the Diagnostic board. All lights, except READY and HOLD, in the group nearest the edge of the board should come on. READY and HOLD should remain OFF.

Press CLEAR button (S170). This should turn OFF all the lights in the group near the edge.

- (b) Press LIGHT again and observe the inner row of lights. One or more lights may be illuminated.

Press RESET on the 1980 front panel.

Type 1G(CR) on terminal [(cr) = carriage return].

The 1980 self-test sequence should follow. Observe the inner row of lights while running the self-tests. These lights should remain in the state set by the LIGHT button and should not flicker. Look for 1980 self-test errors.

#### Troubleshooting:

A flickering display indicates a problem associated with the latch U435 on the Diagnostic board.

If errors appear on the FIRM test between blocks E0 and E4, a fault is present in one or more of the EPROMs in the Zero-Insertion-force sockets on the Diagnostic board. See 3.4 below for more details. If any other errors occur, turn off the 1980 and remove the Diagnostic board. Turn on the 1980 and press RESET to run the self-test again to confirm that the errors were caused by the Diagnostic board.

- (c) Press RESET again.

Type 1G(CR)

While the 1980 self-test is running, observe the inner row of lights on the Diagnostic board. Press the CLEAR button and release. All the inner lights should change from a static 'ON' or 'OFF' condition to a flickering

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

condition with varying intensities.

### Troubleshooting:

Failure of the CLEAR button (while self-test is running) to produce a flickering display on all the inner lights indicates a problem with the latch U435 or buffer U335 or perhaps one of the eight LEDs DS230.

### 3.4 Diagnostic Firmware Test

With the 1980 displaying:

READY

\*

Type: SYSTEST FIRM(CR)

Check that the following appears in exact form and order as part of the SYSTEST FIRM listing.

DIAGOS	1.0	E0	OK
DIASUP	1.0	E1	OK
SIGDRV	1.0	E2	OK
SIGROM	1.0	E3	OK
DIAGOP	1.0	E4	OK

Also, check that the above names are not duplicated and/or associated with other block numbers.

### 3.5 Link Decoder Test

Put link P282 (next to the P282 nomenclature on the board) in 1 --> 2 position. Press RESET. The 1980 should run its self-test sequence without any terminal input.

### Troubleshooting:

Failure to run the self-test indicates a problem in CRUIN circuitry on the Diagnostic board. Check U287, U327A, or U525 board decoder.

### 3.6 Individual "Fault Light" Tests

Check that link P282 is in 1 --> 2 position. Press the CLEAR button, then press RESET and allow the 1980 to power-up to:

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

READY

\*

- (a) The RESET light should be ON. Press CLEAR to extinguish.
- (b) Momentarily short P605 (near top edge of board). The MEMEN light should come ON. Press CLEAR to extinguish.
- (c) Check that P365 is in the 2 --> 3 position. Close P382 100 ns switch. Open P373 50 ns switch. Press CLEAR to clear all lights.

Type SYSTEST VID: (CR)

At some time while typing or during the self-tests, the DATA light should come ON.

Close P373 50 ns switch. Open P382 100 ns switch. Press CLEAR to clear all lights.

- (d) With the 1980 at READY, momentarily short pin 23 on U799 (28-pin device) to the adjacent GND pin. The OPCODE light should turn ON. (The DATA light may also turn ON.) Press CLEAR.
- (e) With the 1980 at READY, open switch contact S335-56 on the Extender board. Connect PO10-56 on the Extender board to GND via a 470-ohm resistor. Press CLEAR button on Diagnostic board. The REF light should come ON after releasing the button.

Remove the 470-ohm resistor connection to GND. Press RESET on the 1980. Press CLEAR. While the 1980 is running self-test, the CAS light should come ON.

Close S335-56.

- (f) Open S335-57 (S335-56 closed and 1980 at READY). Press CLEAR. Both RAS 1 and RAS 2 lights should come ON after releasing CLEAR.

Open S335-56, leaving S335-57 still open. Connect PO10-56 to GND via a 470-ohm resistor. Press CLEAR. RAS 1 and REF lights should come ON. RAS 2 light should remain off.

Disconnect resistor and close S335-56 and S335-57. Press CLEAR.

- (g) Momentarily connect pin 3, U315, to GND via a 470-ohm



## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

resistor. The PWR light should turn ON. Press CLEAR.

- (h) Open S335-60 and S340-61 on the Extender board. Connect P010-60 on the Extender board to GND via a 470-ohm resistor. The READY lights should turn ON. Disconnect resistor. The READY light should turn OFF. Connect P010-61 to GND via a 470-ohm resistor. The HOLD light should turn ON. Disconnect resistor. The HOLD light should turn OFF.

Close S335-60 and S335-61.

- (i) Restore the link P282 to the 2 --> 3 position. Press RESET and check that the prompt:

DIAG V1.0

\*

is obtained.

### 3.7 RS-232 Port Tests

- (a) Check that the wire-strap is present between pins 10 and 15 on the back of the RS-232 connector on the Diagnostic board. Connect the Diagnostic board RS-232 I/O port to PORT 1 on the 1980 via a RS-232 Extender cable, 012-0815-00. With the Diagnostics \* prompt present, type:

Type: #1(CR)

The terminal should respond:

DONE

#### Troubleshooting:

This test assumes that the 1980 I/O ports are fully operational. If errors appear, change connection to PORT 3 and type:

#3(CR)

If the pattern of errors is the same as PORT 1, try changing the UART (U229) on the Diagnostic board. If this does not rectify the problem, use the Diagnostic L (Load CRU) and R (Read CRU) commands in conjunction with the tables of Fig. 3-7 (pages 3-46 through 3-48) in the 1980 Service Manual, Vol. 2, to track the faulty line(s).

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

- (b) Disconnect the RS-232 Extender cable from PORT 1 and connect to the AUTO-CALL port.

With the \$ prompt on screen, type:

#A(CR)

The terminal should respond:

DONE

Troubleshooting:

Use the table of Fig. 3-7(c) in the 1980 Service Manual, Vol. 2, together with the Diagnostic L and R commands to track the faulty line.

- (c) Remove the RS-232 extender cable and connect one end of the special RS-232 male-male I/O adapter cable, 012-0929-00, to the Diagnostic board RS-232 I/O port. Connect the other end to PORT 2 on the 1980.

With the \$ prompt on screen, type:

#2(CR)

The terminal should respond:

DONE

Troubleshooting:

If errors occur, check that the same pattern of errors are present when the cable is transferred to PORT 4 and #4 is typed. If so, use table of Fig. 3-7(a) in the 1980 Service Manual, Vol. 2, together with the Diagnostic L and R commands to track the error.

- (d) Disconnect the RS-232 cables from the Diagnostic board.

### 3.8 High-Speed Interface Tests

- (a) ?Link pins 2 and 3 on P260 and P273. Use an oscilloscope with a X10 probe to monitor pin 6 of U260. Check for a square wave of approximately 0.75 V p-p amplitude about a mean level of -1.25 Vdc and a period of 50 ns.

Turn off the 1980 and plug in the 672-1084-00 BASIC TEST PROGRAM board from the 1980 Service kit.

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

Turn on the 1980. After the Diagnostic prompt \$, type 1G and run the self-test sequence to READY. Check that no FIRM or VID: errors are present. Disconnect the 34-way cable connecting the front edges of the VDC and Memory Controller boards. Connect the 34-way extender cable, 175-2934-00, from the Service kit between the front edges of the Memory Controller and Diagnostic boards.

Type: OLD "RAMP", 1<CR>

Check that the graphic display is exactly as Fig. 3-4 on page 3-33 of the 1980 Service Manual, Vol. 2.

### Troubleshooting:

A "FATAL P24" strongly indicates that U245 and U239 are not counting. Check that the links P260 and P273 are in the 2 --> 3 position. If it is okay, probe pin 5, U245, and check for GND potential. Probe pin 13 U245, for 20 MHz ECL clock.

If the problem is not a "FATAL P-24" but seems to be associated with the Diagnostic board (i.e., an alternate Diagnostic board works), then check for stuck or missing bits at the outputs of U139, U145, and U152. If the problem does not seem to be associated with the Diagnostic board, try replacing the Acquisition Memory and Memory Controller with alternate 670-xxxx-01 versions. Also, if an alternate 34-way cable is available, try replacing it.

### 3.9 Signature Interface Test

#### (a) Equipment Set-Up

Turn off the 1980 and remove the Digital Feedback board (DF).

Identify the following signal points on the CPU board front edge and connect to the Signature Analyzer control port as shown:

<u>CPU Board#</u>	<u>Signature Analyzer Pod</u>
START	START
STOP	STOP
2	CLOCK
GND	GND

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

Set Signature Analyzer to:

+ or ↑ on START  
+ or ↑ on STOP  
- or ↓ on CLOCK

Connect the 34-way cable between the Diagnostic and Memory Controller boards. Ignore REF, RAS 1, RAS 2, or CAS Error lights during Signature Analysis.

Set P260 and P273 on the Diagnostic board to position 1 --> 2.

Turn on the 1980. After the \$ Diagnostic prompt, type:

S (space) MC (space) 2(CR)

The 1980 should respond:

..SIG MC 2

(To exit from the Signature Program, type: <CNTRL-X>).

Probe P010-80 (+5 V) on Extender board with Signature Analyzer data probe. Signature should be:

U1HP

Probe U041, pin 4 on the Memory Controller board. (U041 is the IC directly behind the gap between the front connectors.) Signature should be:

F2U8

Probe U031, pin 13 on the Memory Controller board  
Signature should be:

AU4A

The functional tests on the Diagnostic board are complete. Restore P260, P273 to the 2 --> 3 position and check that all other links and switches are set as in Sections 1 and 2 of this procedure.

Replace the Digital Feedback board and restore the 1980 to its normal state. Run the power-up self-test and SYSTEST FIRM to check that the instrument operates normally and that all the correct firmware has been reinstalled.

## CALIBRATION NOTES ON 670-6413-00 1980 DIAGNOSTIC BOARD

Troubleshooting

If the Signatures are unstable, first check that P260 and P273 are in the 1 --> 2 position. If so, then probe pin 5, U245, for ECL-level negative-going pulses with a repetition period of approximately 90 ms. Probe pin 13, U245, for negative-going ECL pulses with a repetition period of approximately 350 ns.