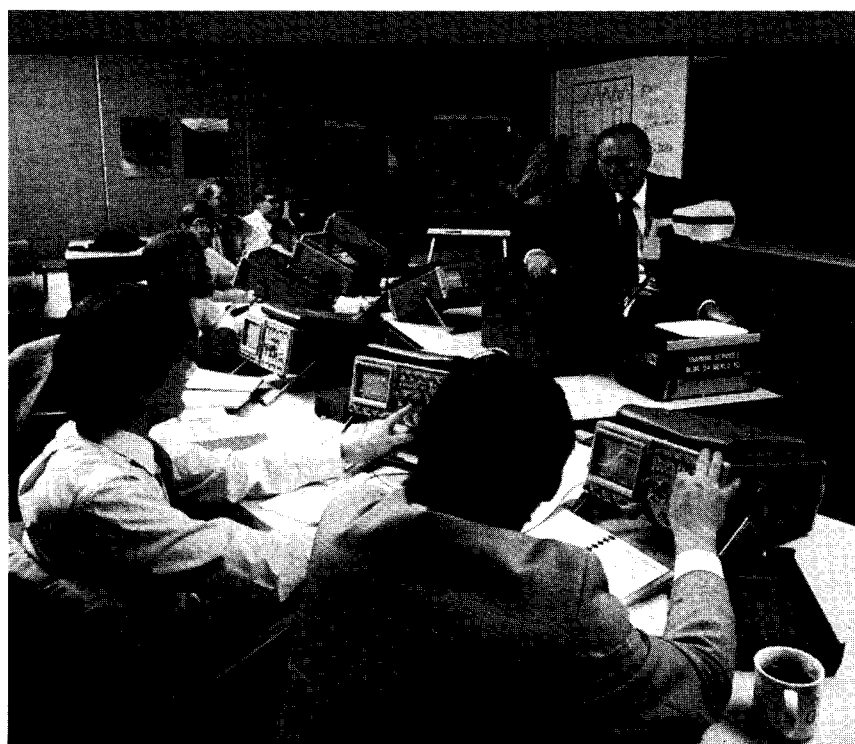


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*66 5001
DM 501
SC 503
TM 5006
492/496P
520A/521A
650HR.*

A WEEK OF TEKTRONIX TRAINING IS WORTH YEARS AT THE BENCH! (See article on page 1a)

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Operating the 2236	068-9199-22	115
Operating the 2245/2246A	068-9200-22	115
Operating the 2210	068-9203-22	115
Operating the 2220	068-9204-22	115
Operating the 2221	068-9205-22	115
Operating the 2230	068-9206-22	115
Fundamentals of Analog Scopes	068-9195-22	115
Fundamentals of Probes	068-9201-22	115
Fundamentals of Digital Scopes	068-9202-22	115
Using the PC as a Controller	068-0225-22	145
11301/11302 Measurement and Analysis	086-0232022	125
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Apr 26-27, 1988 Chicago, IL

11301/11302 MEASUREMENTS AND ANALYSIS

Mar 24, 1988 Irvine, CA
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CG551AP/CG5001 EDGE OUTPUT SIGNAL
WILL NOT SUPPLY 10 mA WHEN
PROGRAMMED FOR 16 V @ 100 kHz

S/N: B064228
MOD: #M63791

When the CGXXXX is programmed for Edge Mode, 16 V @ 100 kHz, it may not supply the required 10 mA of current.

To correct this, change A7R1414 to Tek P/N 315-0330-00, A7R1525 to Tek P/N 315-0513-00, and on the back side of the A7 board add R1517, Tek P/N 315-0512-00 from A4Q1517 collector to ground.

X All instruments below S/N B064228 with the exception of the following, may display this discrepancy:

B064200
B064212
B064216
B064217
B064222
B064224
B064225

W2 Issue: 18-1

DM501A INCORRECT OHMS READING
CAUSED BY HIGH INDUCTANCE
RESISTORS

S/N: B056076
MOD: #64048
MANUAL: 070-2749-00

In some instances when a high inductance resistor is being tested for ohms value, incorrect readings may be displayed.

To correct this, add capacitor A10C1516, Tek P/N 281-0812-00 (1000 pF) between the input to ohms converter A10U1515-P3 and floating ground #2. To accomplish this, solder this cap across A10CR1518 on the component side of the board.

W2 Issue: 18-1

ECO170A 60 MHz OSCILLATION ON
H DRIVE

REF: ECO170A INSTRUCTION MANUAL
P/N 070-6113-00

Mod #65263

In order to eliminate a small 60 MHz oscillation that may be seen on the H DRIVE output, A2C691 was changed from 12.8 pF to 8.2 pF, P/N 281-0645-00 by Mod #65263.

Install this change as required.

Mod #65263 is being installed in new instruments starting with S/N B010149.

W2 Issue: 18-1

FG5010 NEW CPU BOARD INFORMATION

REF: 070-3467-01

S/N: B052043

The CPU circuit board has been redesigned. The changes that resulted affect the Theory of Operations, Parts, and Schematics. These changes are provided via pullout "A". Remove this information and add to your FG5010 Instruction Manual.

W2 Issue: 17-24

GMA30X/4109/4111/4115B/412X SERIES
DEGAUSS MOD - CORRECTION

Ref: Corporate Mod #63543
Corporate Mod #65153

GMA301 Service Manual, 070-5122-00

GMA302 Service Manual, 070-5215-00

GMA303 Service Manual, 070-5260-00

GMA304 Service Manual, 070-4668-01

The original article contained an incorrect value for the new thermistors. The correct value is 52 ohms, not 45 ohms. The additional GMA-302/N/4111 part number, which required a separate corporate mod proposal (#65153), has also been added.

On the GMA30X series displays, when operated at 240 Vac, 50 Hertz, both "power-up" and "on-demand" degauss circuitry do not completely degauss the screen of the CRT. When these displays are operated at 115 Vac, 60 Hertz and 100 Vac, 60 Hertz, the degauss circuitry works correctly.

To correct this, existing thermistors on the Low Voltage Power Supply (L.V.P.S.) have been replaced with two thermistors wired in parallel. The part number to these new thermistors is 307-1389-00 (1ea., 52 ohm).

The following kits have been created to modify the existing L.V.P.S.

For GMA301/2/3 displays: 040-1241-00 consists of:

- 1 assembly consisting of 2 ea.
 - 52 ohm thermistors,
P/N 307-1389-00
- 1 ea. - 20 ohm, 5%, 5 W resistor,
P/N 308-0123-00
- 0.5 ft - wire, P/N 175-0525-00
- 1 ea. - label, P/N 006-3362-00
- Instructions to install parts

For GMA 304 displays: 040-1240-00 consists of:

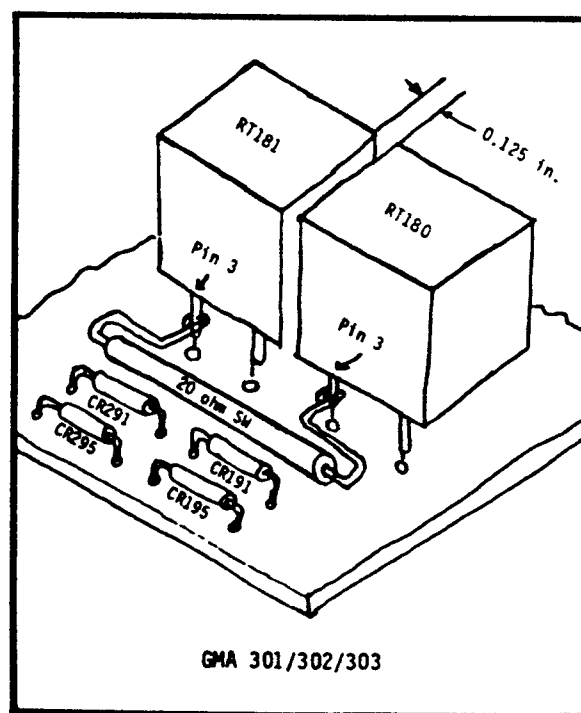
- 2 assemblies consisting of 4 ea.
 - 52 ohm thermistors, P/N 307-1389-00
- 1 ea. - label, P/N 006-3362-00
- Instructions to install the parts

Note: The following circuit board part numbers contain this modification:

- 670-7685-08 (GMA301)
- 670-8464-04 (GMA302)
- 670-8613-06 (GMA303)
- 670-7655-02 (GMA304)
- 620-0308-05 (GMA304 L.V.P.S. assembly)

To modify the GMA301/2/3:

1. Remove the power supply from the display.
2. Remove RT180 and RT181.
3. Connect a 20 ohm resistor from kit between pin 3 of RT180 and pin 3 of RT181.
 - a. Solder resistor leads close to the body of RT180 and RT181. Refer to figure below.



(Article continued)

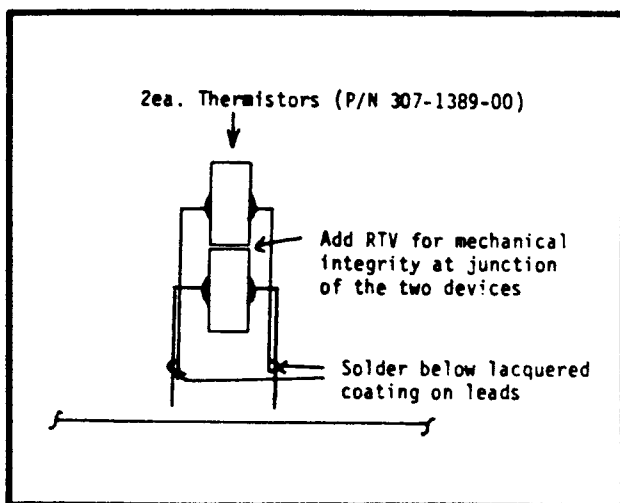
GMA30X/4109/4111/4115B/412X SERIES
DEGAUSS MOD - CORRECTION
(.....Continued)

4. Cut circuit run on component side of L.V.P.S., between J7 pin 2 and RT181, next to RT181. Also cut circuit run between RT181 and RT180.
5. Using approximately two inches of wire from kit, on the solder side of the circuit board, solder one end to J7 pin 2 and solder the other end to RT180 pin 3.
6. Insert RT180, RT181, and resistor assembly at the same location from which they were previously removed, and solder into place.
 - a. On component side of board, ascertain there is ample space between resistor body/wire leads and diodes CR191 and CR291. If necessary, gently bend resistor closer to RT180/181.
7. Remove RT170 and replace, using the thermistors supplied from kit (paralleled one on top of the other one) and solder into place.
 - a. If the thermistors are not from the 040 kit, obtain two thermistors, solder one in parallel with the other one, and then RTV (ie. Silicone Seal, P/N 006-1171-00) should be applied to the paralleled thermistors. Refer to figure below.

To modify the GMA304:

1. Remove L.V.P.S. from display.
2. Locate and remove RT85 and RT180 from the power supply primary board (P/N 670-7655-0X).
3. Install thermistors from kit at RT85 and RT180 positions and solder into place.
 - a. If the thermistors are not from the 040 kit, obtain four thermistors and prepare by referring to step 7a, above.
 - b. It may be necessary to slant RT185 and RT187 at a forty-five (45) degree angle towards switch S280 to allow installation of parallel paired thermistors.

W2 Issue: 18-1



R520A/R521A/R522A RESISTOR
OVER-DISSIPATING

REF: R520A INSTRUCTION MANUAL
P/N 070-1709-00

R521A INSTRUCTION MANUAL
P/N 070-1794-00

R522A INSTRUCTION MANUAL
P/N 070-1874-00

Mod #64482

After a number of years, Resistor A14R1522 has shown signs of degrading due to long term heat dissipation.

Mod #64482 changes A14R1522 to a higher wattage resistor, P/N 324-0369-00.

Install the new resistor on an as required basis.

NOTE: This resistor is part of a "part combo." When A14R1522 is replaced, a new capacitor, A14C1524 (P/N 283-0659-00) will need to be added to the resistor before the resistor is soldered into the board. Otherwise, the capacitor is not affected by this mod.

Mod #64482 is being installed in new instruments from the factory starting with S/N B541086 (R520A), B335053 (R521A) and B260542 (R522A).

W2 Issue: 18-1

R520A/R521A/R522A TRANSISTOR
BREAKDOWN CAUSING BURST
DISTORTION

REF: R520A INSTRUCTION MANUAL
P/N 070-1709-00

R521A INSTRUCTION MANUAL
P/N 070-1794-00

R522A INSTRUCTION MANUAL
P/N 070-1874-00

Mod #65645

Transistor A2Q2110, the burst detector and intensifier, has shown an occasional tendency to breakdown, causing distortion of the displayed burst signal.

Mod #65645 changes A2Q2110 from P/N 151-0325-00 to P/N 151-0188-00.

Install this change on an "as fails" basis.

Mod #65645 is being installed in new instruments from the factory starting with S/N B541081 (R520A), B335046 (R521A) and B260542 (R522A).

W2 Issue: 18-1

SC502 -20 V POTENTIOMETER CHANGE

MOD: M64705

The -20 V potentiometer is occasionally brushed when removing and installing the protector side cover. This will cause the -20 volts to change in value, nullifying calibration.

To correct this, change A3R947 to a close case pot, Tek P/N 311-1248-00, which is a direct replacement.

W2 Issue: 17-24

SC503 Z AXIS MODULATION

When Z Axis Modulation occurs, the following areas should be checked:

- Resistors on HV Board (A80)
- A10Q7031. May need to select one with low beta. After selecting, check -135 V output. This part may affect this and if it does then selecting C6031 will correct this.

W2 Issue: 17-24

SG503 BAND SWITCH CIRCUIT BOARD
REPLACEMENT MOD KIT NOW
AVAILABLE

S/N: B090100
MOD: M58343
MANUAL: 070-6770-00

When replacing Band Switch Circuit Boards, Tek part numbers 672-0447-00 and 672-0447-01 use mod kit Tek part number 050-2325-00.

This mod kit will consist of Tek part numbers 672-0232-00, Band SW Circuit Board, and 671-0339-00 Display Circuit Board.

W2 Issue: 18-1

SG503 DISPLAY DRIVERS (TEKTRONIX
P/N 156-0379-XX) REPLACEMENT MOD KIT
NOW AVAILABLE

S/N: B090100

MOD: #M58343

MOD KIT: #050-2324-00

When replacing the BCD to 7-Segment display driver IC's, A1U510, A1U520, and A1U530, use mod kit Tektronix P/N 050-2324-00.

The reason is the 156-0379-XX parts are no longer available.

W2 Issue: 17-23

S3295 PHANTOM CYCLE
DOCUMENTATION CHANGE

REF: Manual, TEKTEST V, Version 1,
P/N 061-2854-00, page 4-14, 4-15.

TEKTEST V, Version 2, 3,
P/N 070-5545-00, page 12-13, 12-14.

Replace the existing entry regarding PHANTOM. Delete footnote #1.

Refer to Pullout "B" for PHANTOM Documentation change.

W2 Issue: 18-1

TM5006 REAR PANEL SCREWS
STRIPPING-OUT

REF: TM5006 Instruction Manual

MOD: M64833

In some instances the self-tapping screws, illustrated in exploded view Figure 2, index #'s 66 and 68, will strip-out.

To prevent this, replace the existing Tek part numbered screws, 212-0023-00 and 213-0801-00, with Tek part number 213-0906-00 for both locations.

W2 Issue: 17-24

TSG170A +5 VOLT OVERCURRENT INDICATIONSREF: TSG170A Instruction Manual,
P/N 070-5680-00

To date, there have been at least three occurrences where the +5 volt overcurrent protection circuitry was actuated without an overcurrent condition existing. In each case, VR233, a 5.6 V Zener diode had failed.

Checking VR233 and VR120 before you proceed may save a lot of time. 5.6 Volts can be measured across the diodes in normal operations (no overload).

W2 Issue: 18-1

TSG170A/SPG170A/TSG271/TSG300/ECO170
A DIODE BRIDGE EXCESSIVE FAILURESREF: TSG170A Instruction Manual,
P/N 070-5680-00
SPG170A Instruction Manual,
P/N 070-5965-00
TSG271 Instruction Manual,
P/N 061-3457-00
TSG300 Instruction Manual,
P/N 061-3302-00
ECO170A Instruction Manual,
P/N 070-6113-00
MOD 65185

Diode Bridge CR360, on the power supply board, is being changed to an improved part, to improve overall power supply reliability.

On any of the listed instruments that are returned for service, replace CR360 with new part number 152-0905-00.

Mod 65185 is being installed in new instruments from the factory starting with the following serial numbers.

TSG170A	B031077
SPG170A	B010384
TSG271	B020177
TSG300	B020541
ECO170A	B010189

W2 Issue: 17-24

TSG170A/TSG300/SPG170A FAN WIRES
NEED ADDITIONAL INSULATION

REF: TSG170A INSTRUCTION MANUAL
P/N 070-5680-00

TSG300 INSTRUCTION MANUAL
P/N 061-3302-00

SPG170A INSTRUCTION MANUAL
P/N 070-5965-00

MOD 64742

In order to insure continued regulatory agency compliance, a 7.5 inch length of insulated sleeving has been added to the fan wires that run under the power supply board.

Add a 7.5 inch length of P/N 162-0013-00 to the fan wires whenever the fan is replaced or whenever the power supply board is removed from the instrument for servicing.

Mod 64742 is being installed in new instruments from the factory starting with S/N B030985 (TSG170A), B020510 (TSG300), and B010350 (SPG170A).

W2 Issue: 17-23

TSG170A, SPG170A, TSG300 POWER
SUPPLY NOT GENERATING PROPER RESET
PULSE

REF: TSG170A, INSTRUCTION MANUAL
P/N 070-5680-00

SPG170A, INSTRUCTION MANUAL
P/N 070-5965-00

TSG300, INSTRUCTION MANUAL
P/N 061-3302-00

MOD 61785

Under certain conditions the 5 volt power supply line could drop below required values with causing a power supply reset pulse to be sent to the microprocessor. This would cause the microprocessor to randomly lock-up.

Mod 61785 adds some +5 under-voltage detection circuitry to the power supply boards.

Since this change involved a relay-out of the circuit board artwork, it is not recommended for piece-by-piece field installation.

For symptoms associated with microprocessor lock-up, where other causes cannot be determined, give strong consideration to ordering a new power supply board, P/N 670-9113-02.

Mod 61785 is being installed in new instruments from the factory starting with S/N B030889 (TSG170A), B010305 (SPG170A), and B010473 (TSG300).

W2 Issue: 17 - 21 & 22

TSG300 IMPROVEMENTS IN LINE SWEEP
FLATNESS AND 625/50 BETA CTDM
AMPLITUDES

REF: TSG300 INSTRUCTION MANUAL
P/N 061-3302-00

Mod #65394

Mod #65394 has been implemented in the TSG300 to insure that the Line Sweep waveform is flat to 5.5 MHz, and to correct some amplitudes of 625/50 BETA CTDM signals.

The modification changes software in U335, U340, U345, U351, U535, U540, U545, U551, (all of which change to the -02 versions of their respective part numbers), and U635, U640, U645, U651, U835, U840, U845, and U851 (which change to the -01 versions of their part numbers).

Since the signal generation code is spread throughout many devices, they are not individually upgradable.

Install this change on an "as required" basis using kit 020-1584-02.

Mod #65394 is being installed in new instruments from the factory starting with S/N B020541.

W2 Issue: 18-1

TSG300 TEST SIGNAL ERRORS
CORRECTED

REF: TSG300 INSTRUCTION MANUAL
P/N 061-3302-00

Mod #65524

Mod #65524 has been implemented in the TSG300 to correct the following Test Signal discrepancies:

50 Hz and 60 Hz MII 2-wire format signals had some incorrect levels and timing.

The 2, 4, 8T Pulse and Bar was lacking 4T and 8T Pulses using the negative excursion from baseline.

Since the test signals are matrixed into several IC's any necessary or requested changes should be accomplished by installing Kit P/N 020-1584-02.

The following is a list of IC's that are affected (all of these are on the Digital Board A2-1).

U335	U535	U635	U835
U340	U540	U640	U840
U345	U545	U645	U845
U351	U551	U651	U851

Mod 65524 is being installed in new TSG300's from the factory starting with S/N B020548.

W2 Issue: 18-1

TSG300 TIMING ERROR ON PULSE AND BAR SIGNAL

REF: TSG300 INTERIM MANUAL
P/N 061-3302-00
MOD 64680

A previous mod (64075) added 2T, 4T, and 8T signals to the TSG300, along with other major changes. These changes were also available via a kit, P/N 020-1584-00.

Due to a small timing error that was found in the new 2T, 4T, and 8T Pulse and Bar signals, the signal PROM's that carry this test signal have been changed as follows:

U335 Changes from P/N 160-4871-00 to P/N 160-4871-01.

U340 Changes from P/N 160-4872-00 to P/N 160-4872-01.

U345 Changes from P/N 160-4873-00 to P/N 160-4873-01.

U351 Changes from P/N 160-4874-00 to P/N 160-4874-01.

U535 Changes from P/N 160-4875-00 to P/N 160-4875-01.

U540 Changes from P/N 160-4876-00 to P/N 160-4876-01.

U545 Changes from P/N 160-4877-00 to P/N 160-4877-01.

U551 Changes from P/N 160-4878-00 to P/N 160-4878-01.

NOTE: None of the new IC's are a direct replacement for its previous version. If one must be changed due to failure, they all must be changed. This will be accomplished by ordering a new kit, P/N 020-1584-01.

Install 020-1584-01, as required, to address failures in the listed IC's or complaints from customers specific to the timing problem.

NOTE: Kit 020-1584-01 will also contain the instructions and any other necessary parts to do the "M to MII" conversion that was announced by Mod 64075.

Mod 64680 is being installed in new TSG300's from the factory starting with S/N B020490.

W2 Issue: 17-23

TSI8150 COMPATIBILITY KITS NOW AVAILABLE

S/N's Affected: Below B020100

TSI8150 Mainframes prior to S/N B020100 are not compatible with the TSD42 and TSX8140 until the appropriate below indicated mod kit is installed. All S/N's above B020100 will have the required mods incorporated.

The mod kits should be used as follows:

020-1598-00 - This kit extends the TSI8150 compatibility to the TSX8140, TSD42, and future product line additions. It provides firmware for operating the TSX8140, TSD42, and other future products, plus diagnostic firmware to enhance TSI8150 reliability.

Note: It is recommended that installation of this kit be installed by Tek Service Representatives only.

020-1599-00 - This kit extends TSI8150 compatibility to the TSD42 only, not the TSX8140, or any future TSI8150 products that may be incompatible. It includes operating firmware for the TSD42, but no new diagnostic firmware.

Note: This kit is recommended for customer installation, requiring only standard hand tools, a soldering iron, and minimal disassembly/assembly.

W2 Issue: 17 - 21 & 22

TV ANALOG COMPONENT LITERATURE
AVAILABLE

TV Marketing has written an information pamphlet titled "Solving the Component Puzzle".

This pamphlet gives an excellent overview of the surrounding technological and application areas that are unique to the Analog Component Video world.

Copies of this pamphlet are available by contacting your TV Sales Engineer, or by writing to:

Tektronix, Inc.,
Television Division, M/S 58:699
P.O. Box 500
Beaverton, OR 97077

ATTN: Literature Coordinator

This pamphlet will also be reproduced in the next update of the "TV General" section of the microfiche.

W² Issue: 17-23

WFM300 INVALID NEGATIVE GAMUT LED
WITH 50 HZ SYSTEMS

REF: WFM INSTRUCTION MANUAL
P/N 070-6039-00

MOD 64988

To address a tendency for the Negative Gamut LED to turn on when a valid 50 Hz Test Signal is applied, Mod 64988 changes some software in A4U343.

Install a new U343, P/N 160-4203-03, as required, for this type of complaint.

Mod 64988 will be installed in new instruments from the factory starting with S/N B010571.

W² Issue: 17 - 21 & 22

WFM300 PERFORMANCE CHECK
PROCEDURE CHANGE

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

Enclosed as pull-out "C", are changes to the Performance Check Procedure for the WFM300 Waveform Monitor/Vectorscope.

W² Issue: 17-24

7A29P INTERMITTENT QUERY
RESPONSES

REF: MOD #M65347
S/N B010172

Some 7A29P's may occasionally give garbled or incomplete responses to a query via GPIB. These erroneous responses will be random and very intermittent.

If a 7A29P exhibits this symptom, replace the EPROM A20U4020, Tek P/N 160-4841-00 with a new EPROM, Tek P/N 160-4841-01. The -01 version EPROM has a revised code to improve handshaking capability to the GPIB bus.

The revised EPROM is being installed at the factory in all 7A29P's of S/N B010172 and higher.

W² Issue: 18-1

015-0311-01 ABERRATIONS EXCEED SPECIFICATIONS

S/N: B011290
MOD: M64049

In some instances long term roll-off on the front corner of the waveform will cause the aberrations to exceed specifications. When this occurs, test select capacitors A20C1004 and A20C1013 from 47 pF to 100 pF. The part numbers are as follows:

281-0763-00	Cap.	Fxd.	Cer.	47 pF	100 V
281-0799-00	Cap.	Fxd.	Cer.	62 pF	100 V
281-0764-00	Cap.	Fxd.	Cer.	82 pF	100 V
281-0765-00	Cap.	Fxd.	Cer.	100 pF	100 V

W2 Issue: 17-23

110S DEMODULATOR IC GAIN VARIANCES

REF: 110S SERVICE MANUAL
P/N 070-4423-01

MOD 60938

To accommodate a batch-to-batch variation of the output gain of a Demodulator IC (P/N 156-1401-00), some supporting circuit values have been changed.

On the standard 110S Board, 670-7741-XX,
- R544 was changed to 6.98K ohms,
P/N 321-0274-00
- R753 was changed to 56K ohms,
P/N 315-0563-00

On the 110S Opt. 20 ADC Board, 672-0153-XX,
- R542 was changed to 6.98K ohms,
P/N 321-0274-00
- R748 was changed to 56K ohms,
P/N 315-0563-00

On the 110S Opt. 20 Processor Board, 670-8607-XX,
- R452 was changed to 205 ohms,
P/N 321-0127-00
- R453 was changed to 316 ohms,
P/N 321-0145-00

The new resistor values will be provided as part of 050-2188-00 when a new demodulator IC is ordered.

Install these changes on an "as fails" basis.

Mod 60938 is being installed in new instruments from the factory starting with S/N B020825 (110S), B030844 (110S Opt. 20), and B010171 (110F01).

W2 Issue: 17 - 21 & 22

110S OPT. 20 ACCURATE DETECTION OF
SIGNALS FROM NEW VTR'S FOR TBC
OPERATION

REF: 110S SERVICE MANUAL

P/N 070-4423-01

MOD 62204

With the introduction of new VTR models whose circuitry improvements have improved signal-to-noise ratio and signal stability, it has become increasingly difficult for the 110S Time Base Corrector to determine whether or not it is connected to a VTR versus a generated signal, and to process the signal accordingly.

To improve the VTR detection capability, Mod 62204 makes substantial changes to the non-direct color detection circuits. Other changes made will stabilize the operation of the TBC Processor Phase Lock Loop, and will improve adjustment consistency.

The changes occur, for the most part, on the TBC Write Logic Board, 670-8682-XX, and on the TBC Processor Board, 670-8607-XX.

670-8682-01 becomes 670-8682-02
670-8607-04 becomes 670-8607-05

Since the changes to these boards are quite extensive, service center upgrades will not be possible. Those customers that require the increased TBC accuracy should be contacting their Sales Engineer, if they already haven't.

Once either one of the affected boards becomes unrepairable, a new board or an 050 kit will be required. The actual part number to order will depend upon the level of circuit board being replaced. Consult your Replaceable Parts

Record or request the assistance of your Tektronix Customer Service Representative.

One part of this mod enhances the adjustment consistency, and is recommended for installation on any 110S Opt. 20 TBC/ADC assembly being serviced. Two resistors are changed on the ADC sub-assembly, P/N 670-8656-XX. R509 is changed to P/N 321-0147-00, a 332 ohm 1% resistor, and R547 is changed to P/N 315-0102-00, a 1K ohm 5% resistor.

Mod 62204 is being installed in new instruments from the factory starting with S/N B031042 (110S Opt. 20) and B030176 (110F01).

W² Issue: 17 - 21 & 22

110S OPT. 20 FREEZING
DURING VTR SHUTTLE MODE

REF: 110S SERVICE MANUAL

P/N 070-4423-01

MOD 60285

To address a tendency for the 110S Opt. 20 to freeze when fed a signal from a shuttling VTR, substantial changes were made to the TBC Processor Board and the TBC Write Logic Board.

Due to the extent of the changes involved, these circuit boards cannot be updated by simply swapping out some components. The components that existed before this mod will continue to be available.

For those customers that are experiencing the noted symptoms, or have TBC Processor (670-8607-91) or

(Article continued on next page)

110S OPT. 20 FREEZING DURING
VTR SHUTTLE MODE (Continued)

TBC Write Logic (670-8682-00) Boards that are otherwise beyond repair, this upgrade can be obtained by ordering P/N 050-2171-02.

For those customers that have a TBC ADC assembly (672-0154-02 or earlier) that is not repairable, the upgrade can be obtained by ordering 050-2175-03.

New user reference cards (P/N 062-7743-01) will be appropriate also.

The details of this change will be documented in a new Service Manual. Expected completion date for this new manual is approximately November, 1987.

Mod 60285 is being installed in new 110S Opt. 20's from the factory starting with S/N B030826. Also, new 110S TBC installation kits (110F01) will have these changes starting at S/N B010171.

W² Issue: 17 - 21 & 22

110S OPT. 20 IMPROPER LOOP
RESPONSE OF IC OSCILLATOR

REF: 110S OPT. 20 SERVICE MANUAL
P/N 070-4423-01

MOD 61647

Within the TBC Processor Board (P/N 670-8607-XX) is an IC-based oscillator circuit whose control voltage exhibits undesirable instability. To overcome this problem, A1A3R979 has been made Test Selectable, with a nominal value of 3.32K ohms (P/N 321-0243-00).

The range of selection is about 2.5K to 3.9K. The selection criteria procedure is to put J670 on Pins 1 and 2. R979 is then selected for a frequency of 10-12 MHz. (Decreasing by 230 ohms raises the frequency by about 1 MHz). Once J670 is put back to pins 2 and 3, check to see if the frequency drops to about 7.5 MHz.

Make these changes on an "as required" basis.

Mod 61647 is being installed in new instruments from the factory starting with S/N B030847.

W² Issue: 17 - 21 & 22

110S OPT. 20 SERVICE MANUAL
AVAILABLE

REF: Mod #65523

A new service manual containing the Option 20 information for the 110S is now available.

Order P/N 070-5380-00.

W² Issue: 18-1

110S/TSG170A/SPG170A/TSGF01/
TSG300 IC SOCKET TYPE CHANGED

REF: 110S SERVICE MANUAL
P/N 070-4423-01

TSG170A INSTRUCTION MANUAL
P/N 070-5680-00

SPG170A INSTRUCTION MANUAL
P/N 070-5965-00

TSGF01 INSTRUCTION SHEET
P/N 062-9126-00

TSG300 INTERIM MANUAL
P/N 061-3302-00

MOD 62969

Mod 62969 replaces all applications of 24 pin 0.300" wide IC sockets in the listed instruments for increased long-term reliability.

Replace P/N 136-0790-00 with 136-0925-00 on an "as fails" basis.

Mod 62969 will be installed in new instruments from the factory starting with the following serial numbers.

110S	B021042
110S Opt. 20	B031042
TSG170A	B030927
SPG170A	B010322
TSG300	B010487
TVGF01	B010107

W2 Issue: 17 - 21 & 22

118AS CHANNEL DELAYS BECOMING
MISMATCHED

REF: 118AS INSTRUCTION MANUAL

P/N 062-8495-00

MOD 64803 & 64825

In multichannel 118AS's, channel-to-channel delay could become mismatched if manual delay was changed one channel at a time, or if auto delay was engaged one channel at a time.

Also, an internal delay constant was 174 msec. in error.

To address these problems, Mod 64803 changed A2U743 to P/N 160-2672-03.

NOTE: This change affected all A2U743's that might be installed in a given instrument. There can be one, two, or three.

Mod 64803 became effective in new instruments from the factory starting with S/N B030269 (118AS) and B020228 (118F01).

During the implementation of Mod 64803, another software error was discovered that may cause the delay changes to occur suddenly when auto delay was disabled. The desired effect is to have delays change smoothly to preserve audio quality.

This change also affects A2U743, on all A2 Digital Boards installed in a given instrument.

Mod 64825 was implemented at S/N B030278 (118AS) and B020430 (118F01) to address this new problem.

A2U743 should be inspected for, and changed to P/N 160-2672-04, to address either type of complaint on an "as required" basis.

W2 Issue: 17 - 21 & 22

118AS NOISE CAUSING SPURIOUS
VERTICAL SYNC SIGNALS

REF: 18AS INSTRUCTION MANUAL
P/N 061-3076-00
MOD 64230

Mod 64230 has been implemented in the 118AS to address two problems:

1. The presence of noise caused occasional spurious vertical sync signals that last into sample intervals.
2. Delays were being miscalculated.

The first problem has been addressed by changing the following parts on the A9 Video Interface Board, 670-8895-01, which becomes 670-8895-02.

- A9C470 and A9C381 are changed from 0.1 ufd capacitors to 0.22 ufd capacitors, P/N 283-0339-00.
- A9R470 and A9R382 are changed from 68K ohm resistors to 47K ohm resistors, P/N 315-0473-00.
- A9R228 and A9R229 are changed from 510K ohm resistors to 100K ohm resistors, P/N 315-0104-00.

Problem number two has been addressed by changing the software in A9U854, which is now P/N 160-4564-01.

Install these changes as required to address the listed failure symptoms.

Mod 64230 is being installed in new instruments from the factory starting with S/N B030220 (118AS) and B010100 (118F02).

W² Issue: 17 - 21 & 22

118AS UNRELIABLE SYNC
STRIPPER OUTPUT

REF: 118AS INSTRUCTION MANUAL
P/N 062-8495-00

MOD 63473

Two capacitors used in the vertical sync stripper circuitry have caused unreliable operation of the following circuitry due to slow rise-times.

Mod 63473 addresses this condition by removing A9C424 and A9C434.

Remove A9C424 and A9C434 on any instrument being serviced.

Mod 63473 is being installed in new units from the factory starting with S/N B030246 (118AS) and B010110 (118F02).

W² Issue: 17 - 21 & 22

492/P, 496/P: SPECIFICATION CHANGE

The Gain Variation Between Resolution Bandwidth specification has been revised. Effective immediately, use the following specification:

Characteristic

Gain Variation Between Resolution Bandwidths

Performance Requirement

≤ 0.8 dB

Supplemental Information

Measured at -20 dBm, MIN DISTORTION mode, at 25°C.

Prior to this change, the performance requirement was
 ≤ 0.5 dB.

W² Issue: 17 - 21 & 22

520A/521A TEST SELECTABLE RESISTOR

REF: 520A INSTRUCTION MANUAL
P/N 070-1709-00

521A INSTRUCTION MANUAL
P/N 070-1794-00

In the Luminance Clamp Generator circuit R694 is designated as "test selectable".

The recommended range of selection for R694 should not exceed 6.99K ohms.

If you must exceed 6.99K ohms in order to make the circuit function properly, one place to look for a solution may be the output diodes. These diodes, CR697/CR698 and VR695/VR696, must be fairly close to their normal tolerances. Try swapping or replacing CR697 and CR698. Then try swapping or replacing VR695 and VR696. This may save you the trouble of replacing the transformer, T695.

W² Issue: 17 - 21 & 22

650HR SERIES CENTERING THE DISPLAY IN THE RASTER

REF: 650HR SERIES INSTRUCTION
MANUAL, P/N 070-2646-02

In order to provide the best possible centering, horizontally, of the display in the raster, R1529 is test selectable.

The 650 Manufacturing Technicians suggest a decade box for ease of finding the best value.

In 650HR Series instruments being produced today, the nominal value for R1529 is about 25K ohms, with a range of selection running from about 25K ohms to 35K ohms.

W² Issue: 17 - 21 & 22

690SR CHASSIS SLIDE PART NUMBER

REF: 690SR INSTRUCTION MANUALS
070-3821-00, 070-2870-00

To attach the chassis slides (P/N 351-0395-00) to the 690SR chassis, an additional slide part is necessary. This is the slide section that screws directly to the 690SR.

Its part number is 351-0377-00.

W² Issue: 17 - 21 & 22

- 17 -

833 KERNAL ROM REPLACEMENT (.....Continued)

- 2) Move the jumper connecting pins E and F to pins A and F.
- 3) Add a jumper (P/N 131-0993-00) to connect pins B and C.

NOTE: Once the run between pins C and D has been cut, pins C and D must be jumpered to install a 2532 IC, as well as pins E and F.

W2 Issue: 18-1

1405 OPTION 03: 2710 COMPATIBILITY

REF: MSR #73-26

The 1405 TV Sideband Adapter is now available with Option 03, which provides compatibility with the 2710 Spectrum Analyzer. Option 03 involves calibration of the 1405's Transmitter Frequency Readout Dial so that it matches the 2710's Center/Marker Frequency Readout.

The dial tape is mechanically adjusted for a 0 MHz readout when the A30 RF Oscillator output frequency matches the 2710's 2110 MHz First I.F. frequency.

A manual insert providing Option 03 Transmitter Frequency Dial Readout calibration instructions has been generated for the 1405 Service manual (P/N 070-2078-00). See Pullout "D" for a copy of this insert.

W2 Issue: 17 - 21 & 22

1450 SERIES SYNC SEPARATOR PERFORMANCE IMPROVEMENT

REF: 1450-1 INSTRUCTION MANUAL
P/N 070-5568-00
1450-2 INSTRUCTION MANUAL
P/N 070-2998-00
1450-3 INSTRUCTION MANUAL
P/N 070-3660-00
MOD 64233

In order to accommodate a wider vendor tolerance in sync stripper IC's, R15 and C25 on the AGC Control Board are changed as follows:

R25 was 68 K Ω , and becomes 47 K Ω , P/N 315-0473-00.

C25 was 0.1 μ F, and becomes 0.22 μ F, P/N 283-0339-00.

This change is recommended whenever U24 (P/N 155-0144-00) is changed due to failure.

Mod 64233 has also changed U45 on board A60 to take advantage of a better slew rate specification in the new component. Replace U45 with P/N 156-1272-00 upon failure.

Mod 64233 is being installed in new instruments from the factory starting with S/N B020555 (1450-1), B020218 (1450-02), and B010283 (1450-3).

W2 Issue: 17-23

1480 SERIES WIRE HARNESS CHANGES

REF: 1480 SERIES INSTRUCTION MANUAL
P/N 070-2338-00

MOD 62143

To accommodate a vendor change in some of the Front Panel controls, several wire harnesses required lengthening.

The following changes reflect an increase in cable lengths of about 3/4".

179-2106-00 became -02
179-2108-01 became -04
179-2449-01 became -02
179-2495-00 became -01
179-2496-00 became -01

Change these cables on an "as fails" basis.

Mod 62143 is being installed in new instruments from the factory starting with S/N B094416 (1480C Series) and B105674 (1480R Series).

W² Issue: 17 - 21 & 22

1480 SERIES/WFM300/AVC20/1705/
1710B SERIES/1720 SERIES/1730
SERIES/1740 SERIES/1750 SERIES
IC PART NUMBER

REF:

1480 SERIES INSTRUCTION MANUAL
P/N 070-2338-00

WFM300 INSTRUCTION MANUAL
P/N 070-6039-00

AVC20 INSTRUCTION MANUAL
P/N 070-5979-00

1705 INSTRUCTION MANUAL
P/N 070-6355-00

1710B SERIES INSTRUCTION MANUAL
P/N 070-5522-00

1720 SERIES INSTRUCTION MANUAL
P/N 070-5846-00

1730 SERIES INSTRUCTION MANUAL
P/N 070-4474-02

1740 SERIES INSTRUCTION MANUAL
P/N 070-4473-00

1750 SERIES INSTRUCTION MANUAL
P/N 070-5664-00

MOD 63542

Due to increased reliability of parts received from vendors, the following part number changes have been made.

Use the following new numbers for replacement parts on an "as fails" basis.

1480 Series

A9U6474, 156-0048-02 becomes
156-0048-00.

A16U8116, 156-0382-02 becomes
156-0382-00.

WFM300

A4U422 & A4U533, 156-0382-02
becomes 156-0382-00.

A4U352, 156-0384-02 becomes
156-0384-00.

AVC20

A1U280, 156-0048-02 becomes
156-0048-00.

A1U229, 156-0388-03 becomes
156-0388-00.

1705

A3U434, 156-0048-02 becomes
156-0048-00.

(Article continued on next page)

1480 SERIES/WFM300/AVC20/1705/
1710B SERIES/1720 SERIES/1730
SERIES/1740 SERIES/1750 SERIES
IC PART NUMBER (CONTINUED)

Mod 63542 is being installed in new instruments from the factory with the following starting serial numbers.

1710B Series

A3U429 & A3U724, 156-0382-02 becomes 156-0382-00.
A3U748 & A3U875, 156-0388-03 becomes 156-0388-00.
A3U491, 156-0515-02 becomes 156-0515-00.

1720 Series

A3U184, A3U383 & A3U440, 156-0048-02 becomes 156-0048-00.
A3U876, 156-0382-02 becomes 156-0382-00.
A3U774, 156-0388-03 becomes 156-0388-00.

1730 Series

A3U252, A3U564, A3U795 & A3U978, 156-0048-02 becomes 156-0048-00.

1740 Series

A1U564, 156-0048-02 becomes 156-0048-00.
A3U613, 156-0382-02 becomes 156-0382-00.
A4U467, A4U545, A4U589 & A4U667, 156-0382-02 becomes 156-0382-00.
A4U627, 156-0388-03 becomes 156-0388-00.

1750 Series

A1U564, 156-0048-02 becomes 156-0048-00.
A3U613, 156-0382-02 becomes 156-0382-00.
A9U343, A9U653 & A9U682, 156-0382-02 becomes 156-0382-00.
A9U461, 156-0384-02 becomes 156-0384-00.
A12U1, 156-0384-02 becomes 156-0384-00.
A5U534, 156-0388-03 becomes 156-0388-00.

1480 Series	B015949
1480 OPT. 6	B015939
WFM300	B010411
AVC 20	B010175
1705	B010209
1710B	B021228
1711B/PM	B020266
1720	B012066
1721/PM	B010721
1730/BT	B022520
1731/PM/BT	B020734
1735/BT	B010135
1740	B014163
1741	B011519
1742	B010171
1750	B031918
1751	B031008

W2 Issue: 17 - 21 & 22

1500 TDR BATTERY PACK CHANGE

REF: Corporate Mod #65270

Serial Number 1st affected:
1502 R118365
1503 R097969

Instruction Manuals:
1502 P/N 070-1792-02
1503 P/N 070-1865-01

A 1800 mA hour battery pack P/N 016-0595-01 used with the 1500 Series TDR's has been replaced with a 2000 mA hour battery pack P/N 016-0813-00. The 016-0813-00 is the pack being used in the new 1500B TDR's. The 016-0595-01 consists of 9, 1.2 V, 150 mA C cells. The 016-0813-00 consists of 9, 1.2 V, 200 mA D cells.

The 016-0595-01 battery pack and 146-0018-01 battery cells will no longer be available for customer service. The new 146-0065-00 is not a direct replacement for the 146-0018-01.

P/N 050-2345-00 has been set up for replacement of the 146-0018-01. The 050-2345-00 consists of a 146-0065-00 and 2 each 343-0349-01.

The new style battery sets are slightly larger in diameter. To accommodate this increase, the clearance holes on the side panel retaining clamps were enlarged from a diameter of 0.197 to a diameter of 0.312 inches. The revision to the retaining clamp was done in February of 1987 with no serial number break given. This means that there are 016-0595-01 battery packs in the Field with 146-0018-01 battery sets that already have the retaining clamps with the larger diameter holes. For these battery packs, the 146-0065-00 is a direct replacement, but there is no good way of identifying these packs other than measuring the holes. If in doubt, use 050-2345-00 when replacing 146-0018-01 battery sets.

W2 Issue: 18-2

1502 FUSE CHANGEREF: P/N 070-1792-02
Mod M62672 & M65403

Affected Serial Numbers:
R117576 and Above

The above referenced mod changed the fuse-holders and front panel fuses. This was done to improve the watertightness of the fuseholder. Following is a list of the affected components.

PAGE 9-9**Item 31 --**

352-0362-00 B010100 - R117575
352-0766-00 R117576

Item 32 --

210-1245-00 B010100 - R116634
210-1419-00 R116635 - R117575
Deleted R117576

PAGE 7-25**F0401 --**

159-0032-00 B010100 - R117575
0.5A, Slow Blow, 0.25" x 1.25"
159-0282-00 R117576 - R118372
0.5A, Slow Blow, 5MM x 20MM
*159-0182-00 R118373

** 159-0282-00 and 159-0182-00 are identical parts. Mod #M65403 removed 159-0282-00 because of part number duplication.*

F0491 --

159-0029-01 B010100 - R117575
0.3A, Slow Blow, 0.25" x 1.25"
159-0281-00 R117576
0.25A, Slow Blow, 5MM x 20MM

This data is provided for information only.

W2 Issue: 18-2

1502 MANUAL CHANGE INFORMATION

Please see Pullout "E" for manual change information on the 1502.

W2 Issue: 18-1

Figure #1-3; 124-0043-00; 2 EA;
Strip, Trim: 15.9L

Figure #1-4; 124-0421-00; 2 EA;
Strip, Trim: 15.0L

Figure #1-5; 348-0617-01; 4 EA;
Foot, Cabinet, TV Gray

Figure #1-6; 348-0596-00; 4 EA;
Pad, Cab. Foot

Figure #1-7; 348-0618-01; 2 EA;
Flip-Stand, Cab.

Figure #1-8; 361-1259-00; 4 EA;
Post, Latch

Figure #1-9; 211-0541-00; 4 EA;
Screw, Machine, 6-32 x 0.25

Figure #1-10; 367-0247-03; 1 EA;
Handle, Carrying: TV Gray

Figure #1-11; 200-2191-01; 2 EA;
Cap, Retainer, TV Gray

Figure #1-12; 211-0541-00, 2 EA;
Screw, Machine, 6-32 x 0.25

Figure #1-13; 437-0312-00, 1 EA;
Cabinet, Scope

1503 MANUAL CHANGE INFORMATION

Please see Pullout "F" for manual change information on the 1503.

W2 Issue: 18-1

1700F02, 1700F03 CABINET REDESIGN, CABINET DELETED

REF: MOD 60091

Mod 60091 implements a redesign of the 1700F02 instrument cabinet to accommodate the BP1 Battery Pack, and deletes the 1700F03 instrument cabinet.

These cabinets were used with various Television products depending upon customer needs. Some usages were 528A, 1420, 1710B, 1720, 1730, 1740, 1750, 760 and WFM300.

1700F03 Deletion Details

A data sheet was never developed for the 1700F03 cabinet. Therefore, the following parts list and Figure 1 should be kept available as parts support documentation.

Figure #1-1; 348-0544-02; 4 EA;
RTNR, CAB. COVER: CORNER, TV GRAY

Figure #1-2; 211-0511-00, 4 EA;
Screw, Machine: 6-32 x 0.500

NOTE: The changes made to the 1700F02 cabinet were meant primarily to provide the ability to attach the BP1. Therefore, a new 1700F02 is a direct replacement for an old or unrepairable 1700F03. Also, P/N 437-0312-00, listed above for reference, will no longer be available. 1700F02 will be the replacement. Finally, P/N 361-1259-00, listed above, has been replaced by P/N 361-1259-01. The new part is slightly larger, so 4 new parts should be used to insure fit and function.

(Article continued on next page)

1700F02, 1700F03 CABINET REDESIGN, CABINET DELETED (CONTINUED)

For replacement of P/N 437-0312-00, Tek Service Centers can order P/N 390-0018-06. This will also be the part number to use for replacing a 1700F02 that is damaged beyond repair.

1700F02 Redesign, Details

A data sheet for the 1700F02 is still pending. Until the data sheet has been published, Figure 2 and the following parts list should be kept available as parts support documentation.

NOTE: Figure 2 is an example of the 1700F02 Cabinet as it was before Mod 54630. The picture is representative of 1700F02's between Mod 54630 and Mod 60091, with exceptions noted below.

Figure #2-1; 390-0018-01; 1 EA;
Cabinet, Scope

Figure #2-2; 105-0074-00; 1 EA;
Strike, Catch

Figure #2-3; 210-0457-00; 2 EA;
Nut, Plain, 6-32

Figure #2-4; 348-0187-00; 4 EA;
Foot, Cabinet

Figure #2-5; 211-0503-00; 4 EA;
Screw, Machine, 6-32 x 0.188

Figure #2-6; 212-0033-00; 2 EA;
Screw, Machine, 8-32 X 0.75

Figure #2-7; 344-0098-00; 2 EA;
Clip, Decorative, Carrying-Handle

Figure #2-8; 213-0155-00; 2 EA;
Screw, Machine, 10-32 x 0.40

Figure #2-9; 367-0037-00; 1 EA;
Carrying

Mod 54630 made the following changes that affected the above parts list.

- 390-0018-01 became 390-0018-05
Color changed to TV Gray

- 105-0074-00 was deleted from the cabinet.

- 367-0037-00 became 367-0037-03
Color changed to TV Gray

Today's mod (60091) makes substantial changes to the 1700F02, and is illustrated in Figure 3. Parts used on this cabinet before Mod 60091 are still orderable.

The only exception will be P/N 390-0018-05 which became 390-0018-06. The new part is a direct replacement.

The following is a parts list detailing Figure 3.

Figure #3-1; 390-0018-06; 1 EA;
Cabinet, Carrying Case

Figure #3-2; 344-0098-00; 2 EA;
Clip Decorative, Carrying Handle

Figure #3-3; 212-0628-00; 2 EA;
Screw, Shoulder, 10-32 x 0.40

Figure #3-4; 367-0037-03; 1 EA;
Handle, Carrying, TV Gray

Figure #3-5; 348-0074-00; 2 EA;
Hinge Block

Figure #3-6; 212-0559-00; 4 EA;
Screw, Machine, 10-32 x 0.625

Figure #3-7; 348-0207-00; 2 EA;
Foot, Cabinet

Figure #3-8; 361-1259-01; 4 EA;
Post, Latch

(Article continued on next page)

1700F02, 1700F03 CABINET REDESIGN,
CABINET DELETED (CONTINUED)

Figure #3-9; 211-0711-00; 4 EA;
Screw, Machine, 6-32 x 0.25

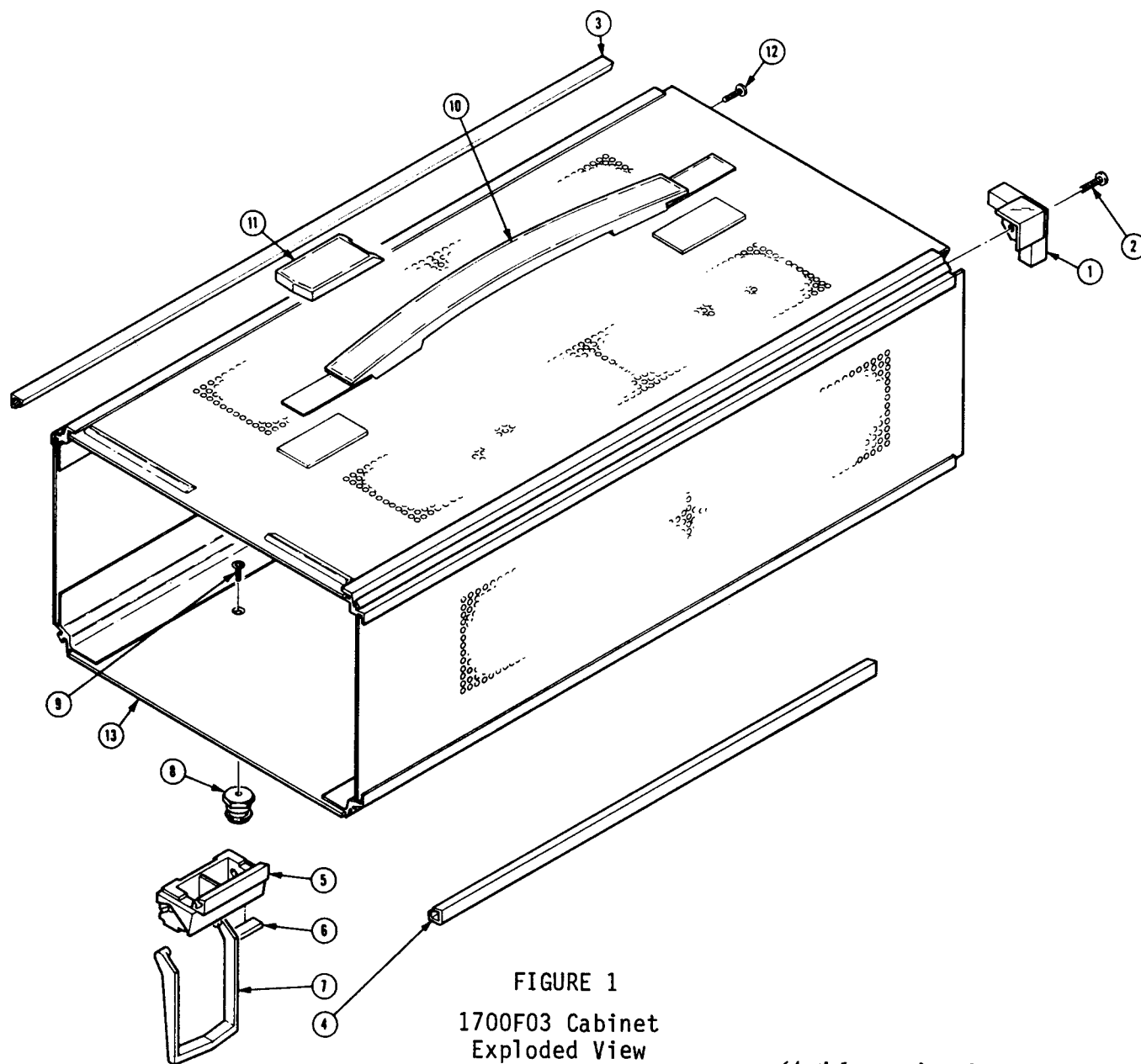
Figure #3-10; 348-0073-00; 2 EA;
Hinge Block

Figure #3-11; 212-0559-00; 4 EA;
Screw, Machine, 10-32 x 0.625

Figure #3-12; 348-0208-00; 2 EA;
Foot, Cabinet

Figure #3-13; 348-0960-00; 1 EA;
Cabinet Flipstand

Mod 60091 becomes effective in
1700F02 starting with S/N B020101.



(Article continued on next page)

1700F02, 1700F03 CABINET REDESIGN,
CABINET DELETED (CONTINUED)

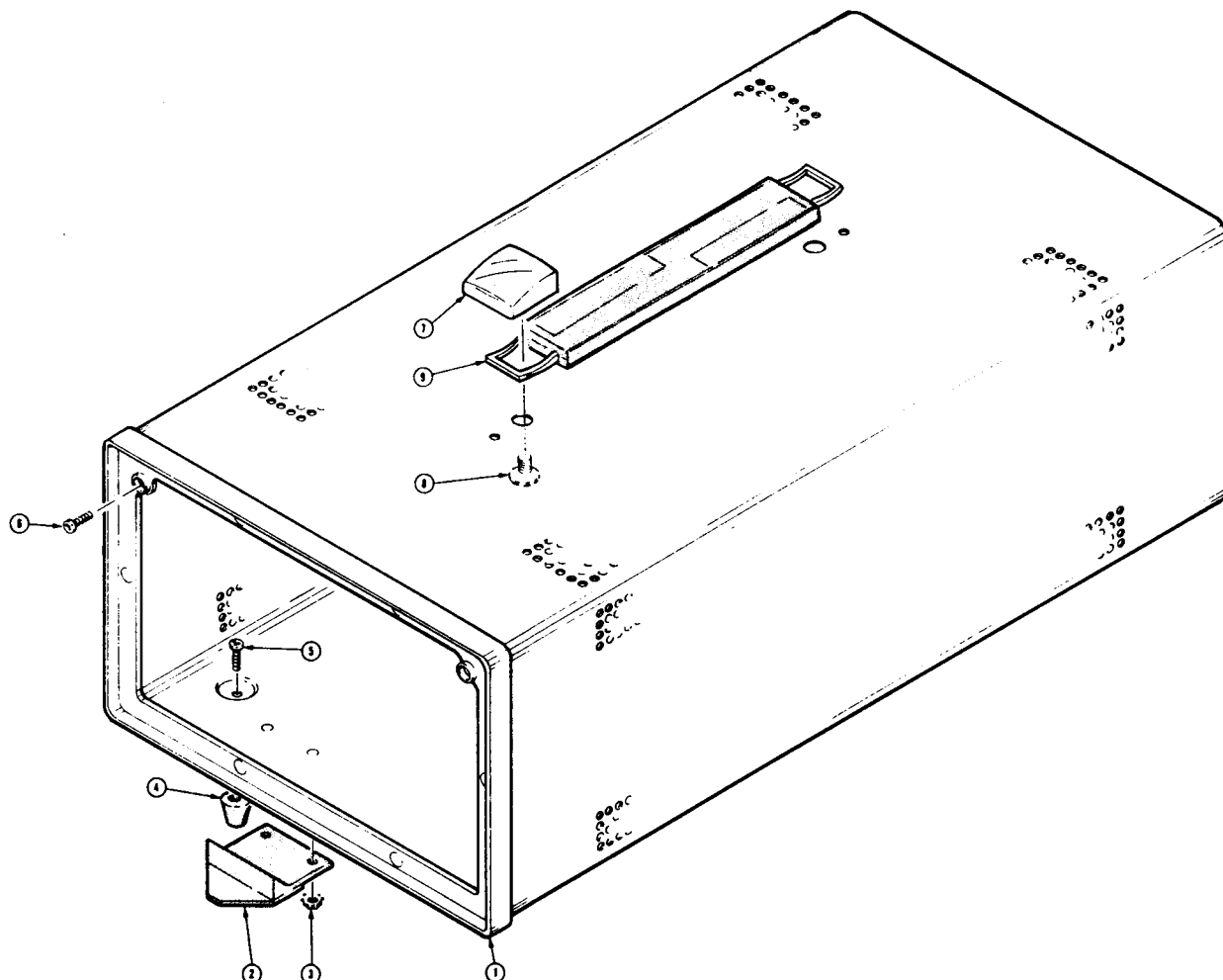


FIGURE 2

1700F02 Cabinet
Before MOD #54630

(Article continued on next page)

1700F02, 1700F03 CABINET REDESIGN,
CABINET DELETED (CONTINUED)

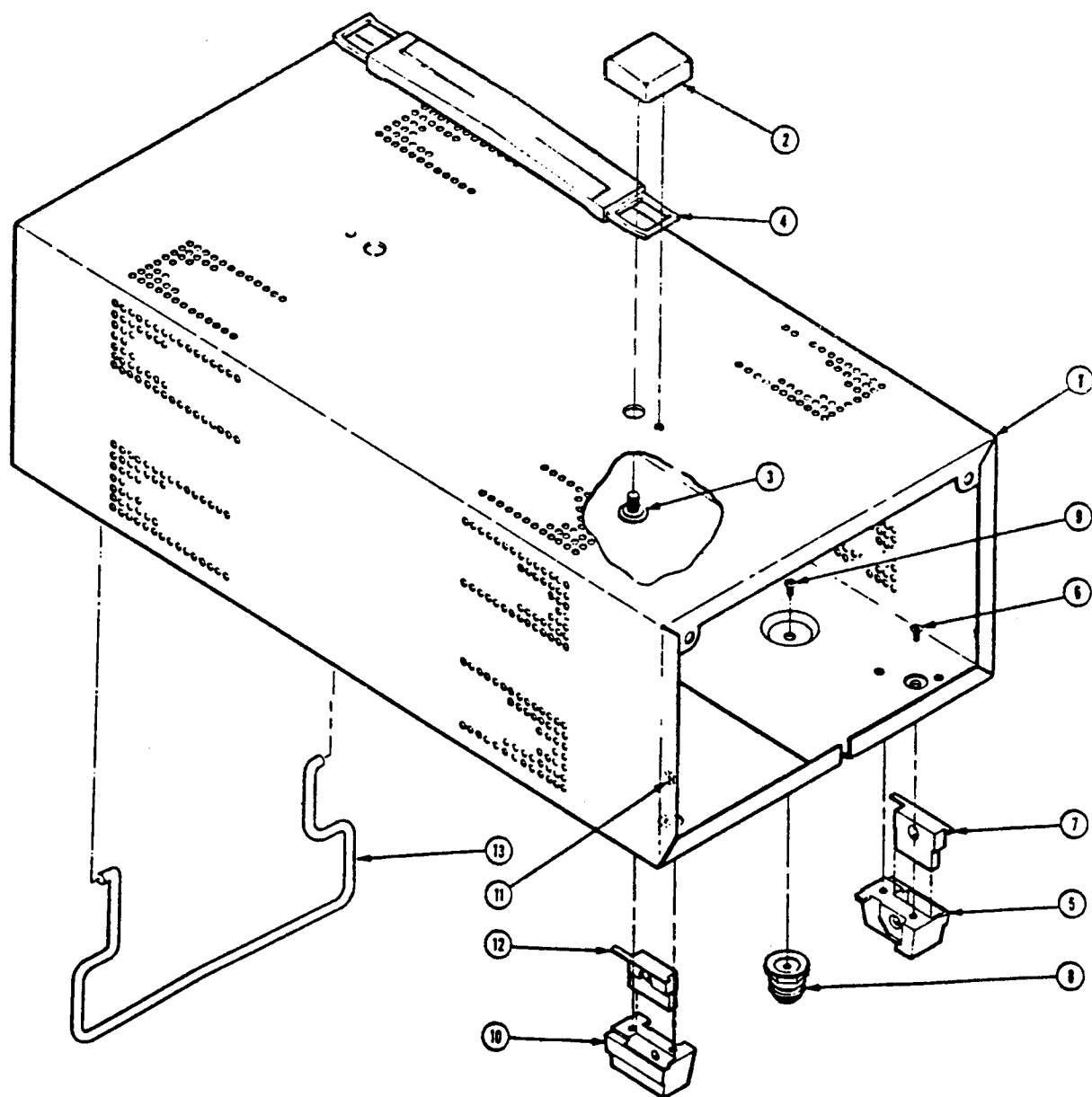


FIGURE 3

1700F02 Cabinet
Post - Mod 60091

Used with: 528A, 1420, 1710B, 1711B, 1720/21, 1730/31, 1740, 1750.

W² Issue: 17 - 21 & 22

1700F05 MODIFIED TO VARY FRONT
PANEL DEPTH

REF: 1700F05 DATA SHEET
062-1119-04

MOD 63657

Mod 63657 changes the 1700F05 Dual Side-by-Side instrument cabinet such that 1700 Series instruments will be able to have their front panels set at one of two depths. This will allow the user to match 528A style or 1480 style depths.

In addition, two new handles will be provided.

Mod 63657 is being implemented in new 1700F05 cabinets starting with S/N B017999.

W2 Issue: 17-23

1705 COMPONENTS DESIGNATED AS
TEST SELECTABLE

REF: 1705 INSTRUCTION MANUAL
P/N 070-6355-00

Mod #65316

Mod #65316 changes three components within the 1705 to "Test Selectable" in order to ease adjustment difficulties.

A3R830 will be selected to extend the adjustment range of A3R928 (Magnifier Range) when necessary. The nominal value for A3R830 will be 121 K ohms, and it will be test selectable upwards for a value not to exceed 128 K ohms.

A3R631 (5.6 K ohms), A3R637 (3.9 K ohms) and A3R736 (22 K ohms) have also been made test selectable. These can be selected to alter the adjustment range of the L-Band wave shaping network in order to assist in correcting some non-linearities in the L-Band tuners. The nominal values for these resistors are as stated above, and the range of selection will be approximately ± 3 K ohms.

Mod #65316 should be installed on an "as required" basis, and will be installed in new 1705's from the factory starting with S/N B020316.

W2 Issue: 18-1

1705 VERTICAL SENSITIVITY MOD

REF: 1705 INSTRUCTION MANUAL
P/N 070-6355-00

MOD 64806

In response to customer requests, the 1705 has been modified to provide a 2 dB per division vertical sensitivity mode.

This change will be available to 1705 owners via a kit, P/N 040-1244-00, and will be installed in new instruments from the factory starting with S/N B020235.

Enclosed as Pull-out "G" are the details of the change and the new cal procedures that are a result of these changes.

This kit should be installed on an "as requested" basis. For out of warranty (billable) installations, time and material applies. During the warranty period, normal warranty accounting applies.

W² Issue: 17 - 21 & 22

1710B SERIES CRT CHANGE

REF: 1710B SERIES INSTRUCTION
MANUAL, P/N 070-5522-00

Mod #64645

Mod 64645 has been implemented in the 1710B and 1711B to use common CRT mechanical designs seen in other TV products.

The new part numbers are:

1710B CRT 154-0903-00
1711B CRT 154-0904-01

Use the new part number for replacement upon failure.

Mod #64645 is being installed in new instruments starting with S/N B021459 (1710B) and B020301 (1711B).

W² Issue: 18-1

1710B SERIES, 1730 SERIES, 1740 SERIES,
1750 SERIES, WFM300 IC PART NUMBER
CHANGE

REF: 1710B SERIES INSTRUCTION
MANUAL, P/N 070-5522-00

1730 SERIES INSTRUCTION
MANUAL P/N 070-4474-02

1740 SERIES INSTRUCTION
MANUAL P/N 070-4473-00

1750 SERIES INSTRUCTION
MANUAL P/N 070-5664-00

WFM300 INSTRUCTION MANUAL
P/N 070-6039-00

MOD 63144

Due to increased reliability from the vendor, all usage of P/N 156-1191-01 in the listed instruments is being replaced with 156-1191-00.

Use 156-1191-00 as the replacement part on an "as fails" basis.

W² Issue: 17 - 21 & 22

1720 SERIES INSUFFICIENT CRYSTAL
LOCK-UP RANGE

REF: 1720 SERIES INSTRUCTION
MANUAL
P/N 070-5846-00

MOD 64774

Due to crystal parameters that are varying farther than the 1720's lock-up circuit can accommodate, Mod 64774 has changed A3C235 to an adjustable capacitor, 9-45 pf, P/N 281-0167-00.

This mod should be installed on an "as required" basis whenever lock-up problems are the initial symptom.

Enclosed as Pull-out "H" are changes to the 1720 adjustment procedure to accommodate this mod.

Mod 64774 is being installed in new instruments from the factory starting with S/N B012751 (1720) and B010932 (1721).

W² Issue: 17 - 21 & 22

1721 VECTOR GAIN LOSS AT SOME
POSITIONS OF PHASE SHIFTER

REF: 1720 SERIES INSTRUCTION
MANUAL, P/N 070-5846-00
MOD 65146

On occasion, replacement phase shifter assemblies have exhibited a loss of Vector gain at some positions of rotation.

To correct this problem, A3R233 has been changed from 5.6 K Ω to 2 K Ω (P/N 315-0202-00) in the 1721 instrument.

Install this change whenever a phase shifter is replaced due to failure.

Mod 65146 is being installed in new 1721's beginning with S/N B011012.

W² Issue: 17-23

1730BT/1731BT/1735BT FRONT
PORCH BLANKING IMPROVED

REF: 1730 SERIES MOD BT
INSTRUCTION MANUAL
P/N 070-6514-00

Mod #64402

Mod #64402 has been implemented in the 1730 Series Mod BT to unblank the CRT during Front Porch and all of active video.

A4R105 has been changed from 48.7 K ohms to 56.2 K ohms, P/N 321-0361-00.

Make this change on an "as required" basis.

Mod #64402 will be installed in new instruments from the factory starting with S/N B023816 (1730BT), B021200 (1731BT) and B010182 (1735BT).

W² Issue: 18-1

1730 SERIES OSCILLATION INDUCED
HORIZONTAL SWEEP DISTORTION

REF: 1730 SERIES INSTRUCTION
MANUAL
P/N 070-4474-02

MOD 64780

In order to prevent oscillations that cause horizontal sweep distortion when a Motorola part is used for A3U564 (P/N 156-0048-00), Mod 64780 changes the values of A3R564 and A3R664.

Install P/N 315-0511-00, a 510 ohm resistor, at circuit locations A3R564 and A3R664 to address the listed symptom on an "as required" basis.

Mod 64780 is being installed in new instruments from the factory starting with S/N B023134 (1730), B021000 (1731), and B010153 (1735).

W² Issue: 17 - 21 & 22

1740 SERIES FRONT PANEL INTERCONNECT CABLE

REF: MOD 61980
WIZARDS' WORKSHOP ISSUE 17-15

Front Panel Interconnect cable, P/N 175-9773-01, is only a direct replacement in 1740's produced after S/N B013795 (1740), B011352 (1742) and B010162 (1742).

Before these serial numbers, the correct replacement part number for Figure 3-104 is 175-4545-00. The only way that the new P/N cable would properly fit would be to remove the 34 pins from the main board and solder in the cable. This is not recommended at this time.

W2 Issue: 17 - 21 & 22

1740 SERIES ORDERING OPTION CHANGES

REF: 1740 Series Instruction
Manual, P/N 070-4473-00
MOD 64937

Mod 64937 has been implemented in the 1740 Series, in order to more closely align instrument ordering options with current ordering trends.

A summary of the changes are:

- Options 1, 2, 6, 11, and 15 will be deleted.
- Options 5 and 7 will be the only ordering options for the 1740 Series.

This does not mean that any particular features go away, only that the names have been changed. An order for a 174X will ship an instrument without a cabinet, and with a dual (Waveform and Vector) internal graticule of the appropriate standard. (The 1742 will continue to have an Internal/ External graticule as standard.) To get a

cabinet, the customer will have the choice of 1700F00, 1700F02 or 1700F05.

Option 5, for those who want to match previous instrument installations, will deliver an Internal/External graticule combination for the 1740 or 1741.

Option 7 will equip the 1740 with the DC power supply option for operation on an external 12 VDC source.

Option 15 will be included in all standard configurations.

For more information, contact your Sales Engineer.

Mod 64937 will be installed in all new instruments from the factory, starting with S/N B024700 (1740), B021800 (1741) and B020500 (1742).

W2 Issue: 17-24

1750 SERIES FRONT PANEL TRANSISTOR PART NUMBERS

REF: 1750 SERIES INSTRUCTION
MANUAL, P/N 070-5664-00

For those of you that have asked, the part number for the small transistors on the back of the Front Panel board (A8) is 151-0706-00.

This will be added to the next manual update.

W2 Issue: 17-23

1750 SERIES MODIFICATION TO IMPROVE HEAT DISSIPATION

REF: SERIES INSTRUCTION MANUAL
P/N 070-5664-00

(S/N B03 and Newer)
Mod 64401

In order to improve heat dissipation in the 1750 Series Low Volt Power Supply, Mod 64401 adds a shield/heat sink to the LVPS board. This board will mechanically connect the power supply shield to a modified chassis side rail, providing a heat sink path and enlarging the sink area. In addition, three parts (CR345, R345 and R346) will be raised off the board for improved air flow.

The changes will be accommodated by a kit (P/N 040-1245-00) containing the necessary parts and instructions for installation.

This kit is recommended for installation on an "as required" basis.

For those instances where a Low Volts power supply board (670-8129-00 through -04) must be replaced, a similar kit (P/N 050-2320-00) will be required.

Mod 64401 is being installed in new instruments from the factory starting with S/N B032091 (1750) and B031094 (1751).

Thanks to Janet Miller and Ralph Clure of NBC for bringing this to our attention.

For in-house 1750 repairs, this change will be accomplished using kit P/N 045-0146-00. Time and material, for this portion of the repair only, is to be charged to Activity Code 18.

This mod is classified as an "as required" service update. A mandatory customer re-call is not required. Reference should be made to the published 1750 Service Update Program.

(Article continued)

Since material availability may be tight for the initial 1-2 months, it is recommended that no service job be held up awaiting parts unless the Low Volts circuit board has been destroyed. Circuit board discoloration in the area near the raised components is not necessarily adequate criteria alone for board replacement. However, if the board has been subject to enough heat in this area to cause circuit board traces to separate from the board, or to cause board delamination, replacement of the board under Activity Code 18 will be acceptable. In this case, 050-2320-00 will deliver the necessary board and other parts.

Your discretion on board replacement is necessary to keep program costs to a minimum, and is appreciated.

W2 Issue: 18-2

1910 SHIELD ADDED TO PREVENT WIRE DAMAGE

REF: 1910 SERVICE MANUAL
P/N 070-4523-00

Mod 63812

The cables immediately behind the front panel have, over time, shown an occasional tendency to short to the soldered leads protruding through the front panel board.

To prevent this, a plastic shield has been added to the rear side of the front panel board on the end where the IC leads protrude through.

Add this shield, P/N 337-3455-00, to the front panel whenever the 1910 is serviced because of a cable problem in this area. It may also be advisable to add the shield whenever the front panel board is removed for service.

Mod 63812 is being installed in new 1910's from the factory starting with S/N B021572.

W2 Issue: 18-1

2220/2221/2230 INTERMITTENT GAIN, POSITION, OR DISPLAY IN STORE MODE

Capacitors installed in the following component locations may be defective.

1. A10C9210, C9220
2. A10C2104, C2114
3. A1C133

It was found that these capacitors, Tek P/N 281-0814-00, which are black in color with a plastic body, may break down over time. Following are the symptoms keyed to the locations listed above.

1. Intermittent display in store.
2. Intermittent gain or position in store.
3. Vertical channel switching incorrect.

We are now using parts which are yellow in color or clear glass with markings.

W² Issue: 17 - 21 & 22

2710: MATCHED MIXER DIODES

REF: PICN #34

The 2710 Manufacturing Line is currently test selecting P/N 152-0723-00 1st Mixer diodes (A16CR120, CR125, CR220, and CR225), and installing them as a matched set. The diodes are matched to minimize the 0 Spur's Amplitude and Phase Noise levels.

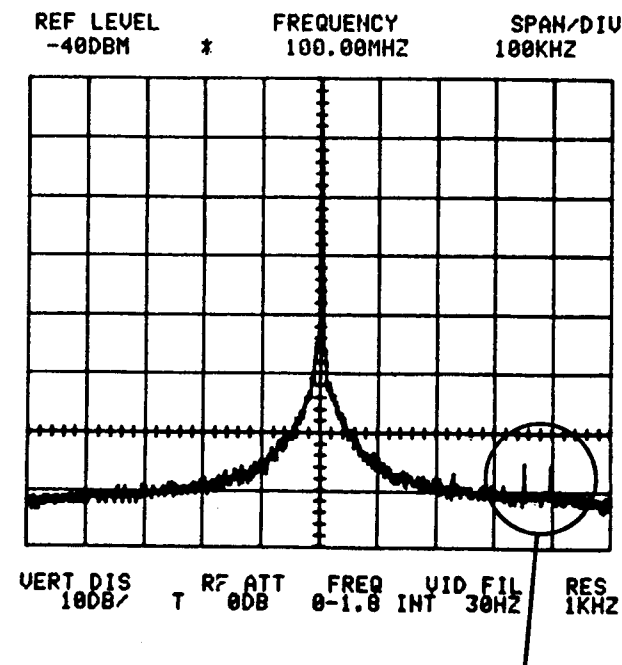
A part number (P/N 153-0080-00) has been set up to provide a matched set of 4 1st Mixer diodes for Field use. Install P/N 153-0080-00 whenever the diodes must be replaced.

W² Issue: 17 - 21 & 22

275X/P, 49X/P: CROSS-OVER SPURS

REF: M63618, M64879

Cross-over spurs have been observed on the 275X/P and 49X/P 2182 MHz 2nd L.O. signal. These spurs are low-level, narrow bandwidth signal pairs located in the 2nd L.O.'s noise skirts. They cause two small spurs to appear on one side of a displayed signal, about 350 KHz away (see figure). The cross-over spurs may appear on either side (right or left) of a displayed signal, but not on both sides simultaneously.



Cross-over Spurs

If spurs are present on a displayed signal, they can be observed by entering a (1 KHz) RES BW, 100 KHz Span/Div, and PEAK Digital Storage Mode. Their narrow bandwidth and low amplitude cause them to disappear in the instrument's noise floor when wider RES BW settings or Digital Storage Averaging are employed.

(Article continued on next page)

275X/P, 49X/P: CROSS-OVER SPURS
(Continued.....)

The following modifications have been implemented to eliminate these spurs.

M63618

The screws used to secure boards in the A22 Phase Locked 2nd L.O.'s RF section (A22A2) were changed from P/N 211-0162-01 to P/N 211-0162-00. The associated washers were also changed from P/N 210-1008-00 to P/N 210-0001-01.

A nylon substance (lock tite) on the 01 version screws' threads is shaved off as the screws are installed. These particles can work their way between the circuit boards' ground planes and the assembly housing. The resulting RF leakage generates cross-over spurs. Spurs caused in this manner can be eliminated as follows:

- Remove the A22A2 boards from the assembly housing.
- Remove all particles from the housing.
- Polish the housing and circuit board ground plane surfaces to remove any remaining nylon particles.

M64879

Harmonics of the 16-20 MHz VCO may feed into the A22A2A3 2200 MHz Reference Mixer circuit, resulting in cross-over spurs. This problem was resolved by adding a 293 nH inductor (L1060, P/N 108-0182-00) in series with the 2200 MHz Reference Mixer's output to the A22A1 Phase Lock board.

L1060 is installed between feedthrough capacitor C2204 and A22A1C1046 (C1040 in the 492/P) on the Phase Lock board. It replaces a small length of wire previously used to make this connection.

Install these mods on an 'as required' basis.

W² Issue: 17-23

2754/P, 2755/P, 2756P, 492A/P, AND 494A/P:
SPECIFICATION CHANGE

The Frequency Band 5 Sensitivity specification has been revised for instruments with Preselector Filters. This includes all 494A/P's and 2756P's, and Option 1 versions of the 492A/P, 2754/P, and 2755/P. Effective immediately, use the following specification:

Characteristic

Sensitivity, 15 GHz - 21 GHz Frequency Range

Performance Requirement

Equivalent Input Noise Vs. Res. BW.

3 MHz:	-54 dBm
1 MHz:	-59 dBm
300 KHz:	-64 dBm
100 KHz:	-69 dBm
10 KHz:	-79 dBm
1 KHz:	-89 dBm
100 Hz:	-99 dBm
10 Hz:	-106 dBm

This change relaxes the Band 5 Sensitivity specification by 1 dB for each of the Resolution Band-width Filters.

W² Issue: 17 - 21 & 22

4120 OPTION 3F/4100F3F U-BRACKET'S FILTER MOD TO THE BUSY-0 CIRCUITRY

Ref: Corporate Mod #65443

070-5290-02 DMA Interface
Service Manual

070-5270-02 4115/4120 Field
Procedures Manual

670-9679-00/01 Opt. 3F DMA
Handshake Boards

Engineering reports that in some 4120 series terminals using the Option 3F DMA Interface, the DMA Handshake board (with P/N 670-9679-01 and below) would receive double characters, missing characters, and in a few instances locked the terminal up. The cause of these anomalies is voltage undershoot on the Busy-0 line as the active signal reaches the host control port input buffer (U26) on the Handshake board. Not all buffer I.C.'s can clamp the undershoot to an acceptable level. When a buffer can't clamp the undershoot, then it causes the output of this buffer to change state, triggering the Data Request line of the I/O processor too early. When the voltage on the input of the buffer rises to ground, the output of the buffer returns to its proper low level active state. At the end of the Busy-0 pulse, the signal rises and causes another data request. The result is that the I/O processor reads the same data again. The byte count on the terminal is now out of step with the host, so either the host or the terminal can lock-up.

This modification reduces the undershoot of the Busy-0 signal to a level that any buffer I.C. can handle.

The following parts are needed for this modification:

1 each 220 Ω , 1/4 watt
resistor, P/N 315-0221-00

1 each 270 pF, 50 Vdc capacitor,
P/N 281-0861-00

To modify, first remove the handshake board with P/N 670-9679-01/00 from the U-bracket.

Locate the Etched Circuit Board (ECB) run (on the solder side of the board) from U26, pin 6 to a feedthru hole. Cut the run that goes to the feedthru hole.

On the component side of the board, solder one end of the 220 ohm resistor to pin 6 (U26) and solder the other end to the feedthru hole identified in the previous step.

Solder one end of the capacitor to pin 6 of U26 and solder the other end to ground (for a ground location, locate C122 just above U122; J292 side of C122 is ground).

After this modification, the suffix level of the Handshake board then rolls to -02.

W2 Issue: 18-1

4120 OPTION 30/4100F30 DISPLAY WHITE BALANCE PROCEDURE CORRECTION

Ref: 070-5270-02 4115/4120 Field Procedures
Manual

On page 6-20 (White Balance adjustment section) in the 4115/4120 Field Procedures Manual, step C should not be performed using a voltmeter. Using a voltmeter on some displays show the voltage to be -60 volts (2 volts out of tolerance). Changing the video board did not have any effect on this -60 volt measurement.

The correct procedure is to use an oscilloscope connected to TP1 (G-1) on the "C" board and verify that both a waveform is present and the d.c. level of this G-1 waveform is at -45 volts (+/- 2 volt tolerance). For reference, a figure of the G-1 waveform (referred to as GIR Level) is already shown on the same page.

If the waveform is not present, or the d.c. level is out of tolerance (<-43 volts), then the Video ("A" board), Deflection ("D" board), EMI Filter ("B" board), or the Power Supply ("G" Board) may be at fault.

W2 Issue: 18-2

4120 OPTION
30/4100F30/4220/4230/4320/4330 SERIES 16"
DISPLAY H-STAT WIRES REVERSED

REF: 070-6512-00 Display Service Manual

070-6646-00 4220/4320 Field Service
Manual

070-6647-00 4230/4330 Field Service
Manual

070-5270-02 4115/4120 Field
Procedures Manual

Engineering reports that they've discovered a convergence drift anomaly in the 16-inch displays, which is caused by corrosion due to ionization between the slider metal and the resistor material within the H-stat potentiometer.

To prevent the corrosion from developing, the wires leading to the H-stat potentiometer must be reversed.

The correct wiring to the H-stat potentiometer can be identified by verifying that the Black wire (from the CRT socket board) is connected to the bottom left connector of the H-stat pot, and the White wire is connected to the bottom right connector (positioned in the front of the display, looking toward the back).

These connectors are push-on type, non-locking. Therefore, to remove the wires, grasp and squeeze the insulator boot against the connector and push down towards the bottom of the display.

W2 Issue: 18-1

DESCRIPTION

Product Group 76

This insert affects instruments bearing serial number B052043 and above.

The following text replaces the CPU Section of the Theory of Operation on pages 4-48 thru 4-61 for instruments with serial number B052043 and above:

CPU SECTION

These pages of text on the FG 5010 CPU Section describe a revised CPU Board and are to be used, instead of the preceding CPU Board description, for instrument serial numbers B052043 and higher. The revisions on the board involve a different microprocessor and an increased level of circuit integration. These changes reduce the number of board schematic diagrams from five to two and also reduce significantly the amount of descriptive text.

The Processor Board contains the Microprocessor and its associated Clock circuit, the instrument RAM and ROM storage facilities, and the various input/output and bus circuits that communicate with external instruments and with other FG 5010 circuit groups. The CPU Block Diagram shows the relationships of the Processor Board circuits and is included in the diagrams section of this manual. The schematics for these circuits are shown on Diagrams 5A and 6A, which are also included in the diagrams section of this manual. Refer to the block diagram for support of the following brief description.

At the center of FG 5010 functions is the Microprocessor, which controls all program-influenced operations. It is an 8-bit integrated-circuit processor device. An associated 4 MHz Oscillator provides the clock signal for the Processor Board circuits.

Memory circuits include 2 kilobytes of Random-Access Memory (RAM) and 32 kilobytes of Read-Only Memory (ROM), with each type contained in one IC. Communications of data between the Microprocessor and these memory circuits is via the Bidirectional Data Buffer and the on-board 8-bit parallel data bus. (The memory address lines are not buffered.)

Communications between the Microprocessor and other Processor board circuits is also via the on-board parallel data bus; selection of the memory and input/output circuits is via a 16-bit parallel address bus. Input/output circuits include the GPIB Interface, the Keyboard/Display Interface, and the Peripheral Interface.

The GPIB Interface logic provides the interface between the Processor Board data bus and the external IEEE-488 data bus that allows communications between the FG 5010 and other instruments and controllers. Also, the GPIB Interface logic handles the required handshake and bus management signals. Relieving the Microprocessor of these functions allows it to decode more efficiently the device-dependent communications and set up the interface logic to appropriately handle its semi-autonomous functions.

The Keyboard-Display Interface logic accepts data and commands from the Keyboard and, under control of the Microprocessor, generates the signals required to control the Front Panel indicators. Each individual indicator segment can be lighted or not. Communications between these interface circuits and the Microprocessor is through the Bidirectional Data Buffer of the on-board data bus.

Part of the Keyboard-Display Interface is the Indicator Control logic. This logic controls lighting the ERROR, TRIG'D (triggered), and NOT ENTERED Indicators. Additional circuits and inputs from the Peripheral Interface logic allow the indicators to blink.

The Peripheral Interface logic performs conversions of data (both parallel-to-serial and serial-to-parallel) for transmission between the Processor Board data bus and the FG 5010 Output Amplifier, Loop 1, Loop 2, and Sine Shaper circuit groups; and between the Loop 2 circuit group and the Processor Board data bus. The circuits also produce the strobe signals to those circuit groups to effect such transfers. Part of the Peripheral Interface logic also generates, under control of the Microprocessor, the trigger/gate signals to control the FG 5010 output.

The instrument Address Switch circuits allow the user to select (by switches) the GPIB address and terminator, and buffer those switch settings onto the board bus, thus allowing Microprocessor access to the settings. A jumper on the board allows service personnel to select normal, calibration, or signature analysis mode. The jumper setting is also applied to the board bus through the buffer.

DESCRIPTION

MICROPROCESSOR/BUFFER/CLOCK/ ADDRESS DECODER/READ-WRITE CONDITIONING/ROM/RAM

Introduction

Processor board Diagram 5A contains the Microprocessor, Data Buffer, 4 MHz Clock, Address Decoder, Read/Write conditioning, and the board ROM and RAM logic.

Microprocessor and Bidirectional Data Buffer

The Microprocessor (U1111) provides the detailed control for all automatic and programmable functions performed by the FG 5010. The Bidirectional Data Buffer (U1201) isolates the Microprocessor device from other board logic.

Microprocessor U1111 is a standard 6808 8-bit device with an 8-bit data bus and a 16-bit address bus, and is similar to the 6802 device used previously, except that it does not include RAM control logic. Since U1111 is a standard 6808 device, and a detailed description is provided in the various manufacturer's documents, refer to those documents for more information. The following paragraphs describe only the inputs and outputs.

Bidirectional data bus lines D0 through D7 are connected through Bidirectional Data Buffer U1201, a 74LS245 device. Control for the direction of data transmission is provided by the R/\overline{W} (read/write) signal from the Microprocessor. When the R/\overline{W} signal is high, data are being read into the Microprocessor from the selected memory or I/O circuit; when the signal is low, data are being written from the Microprocessor to the selected memory or I/O circuit.

The eight 10-kilohm resistors (R1211 through R1218) between the Bidirectional Data Buffer and the Microprocessor provide a No-Operation code (NOP) for operation in Forced Instruction Mode (FIM). This forces the Microprocessor to cycle through each of the memory locations, allowing testing of the address lines and address decoding circuitry. Jumper J1201 allows the user to set the Processor Board for either FIM or RUN (normal) operation. The on-board parallel data bus connects Bidirectional Data Buffer U1201 to the various peripheral circuits.

Address lines A0 through A14 are routed to appropriate peripheral circuits on the Processor board. Most of these lines are used exclusively by the ROM and RAM devices;

only the lowest-order bits are used to select registers within the board peripheral logic. In addition, address lines A11 through A15 and VMA are routed to the Address Decoder (U1221). Address lines A15 and VMA are also used as the chip-enable to select the ROM when the Microprocessor is accessing the top half of the memory space.

The \overline{IRQ} (Interrupt ReQuest) line is used to allow the peripheral devices to request service from the Microprocessor. In general, this is done when the Microprocessor has requested that it be informed when an external event has occurred. \overline{IRQ} may be asserted by either the Versatile Interface Adapter (VIA, U1401 on Diagram 6A) in the Peripheral Interface logic, or the GPIB Interface Controller (U1001, also on Diagram 6A).

The Microprocessor is reset by the signal from the Reset Generator on Diagram 4. This signal is buffered on the Processor Board so as to supply both a positive-true and a negative-true reset signal for use by the board circuits. These signals are LRESET and \overline{LRESET} , respectively.

Clock

The 4 MHz clock signal is generated by hybrid Oscillator Y1031. The Oscillator output is applied directly to the Microprocessor (U1111) and the GPIB Interface Controller (U1001 on Diagram 6A) and buffered to the other boards in the FG 5010. Inverters U1131D and U1131E isolate the Oscillator and the Microprocessor/GPIB Interface clock inputs from the other circuits; resistors R1231 and R1232 and capacitor C1331 act as a filter to reduce the potential for noise in the instrument caused by the clock signal.

Address Decoder

The Address Decoder logic decodes most of the addresses for the peripheral circuits and generates the chip-select signals for those circuits. The logic consists of decoder IC U1221 and associated gates, and produces the enable signals for the ROM, RAM, Address Switch, Display-Keybaord Interface, GPIB Interface, and Peripheral Interface logic from the addresses supplied by the Microprocessor.

The outputs of Address Decoder U1221 are enabled when VMA is high and address lines A14 and A15 are low. When these conditions are met, the outputs of U1221 define 2-kilobyte boundaries within the \$0000 through \$3FFF range. When both VMA and address line A15 are high, gate U1322A produces the \overline{ROMCE} signal to indicate to the ROM that the upper half of memory is being accessed. Table 4-4 shows the FG 5010 memory map.

DESCRIPTION

Table 4-4
INSTRUMENT MEMORY MAP

Address	Peripheral	Comments
0000-07FF	RAM (2k X 8)	Filled block, read/write
0800-0FFF	8279 (2 X 8)	1024 images of display controller, read/write
1000-17FF	6522 (16 X 8)	128 images of VIA, read/write
1800-1FFF	Shift Enable FF (1 X 1)	2048 images, write only
2000-27FF	Address Switch (1 X 8)	2048 images, read only
2800-2FFF	9914 (8 X 8)	256 images of GPIB Controller, read/write
3000-7FFF	None	Empty
8000-FFFF	ROM (32k X 8)	Filled block, read only

Associated with the address decoder is the Serial Transfer flip-flop, which consists of gates U1331A and U1331B. This flip-flop produces the SHIFT ENABLE signal that enables the transfer of serial data to other circuits in the FG 5010.

Also associated with the address decoder is gate U1321B, which uses the inverted E (enable) output pulse from the Microprocessor as a gate for the GPIB Interface enable to ensure that the chip select signal is not longer than the E pulse, even though the GPIB enable signal from the address decoder might be. This is done to make certain that the data lines from the GPIB Interface controller (U1001), which are active whenever the chip select is asserted, will not be active for a greater duration than that of the E pulse.

Read/Write Conditioning

Conditioning gates U1321A and U1321C and the associated circuitry transform the Microprocessor R/W (read/write) signal into the RD (read) and WR (write) pulses required by peripheral logic that uses non-6800-series devices. Such logic includes the RAM, the Keyboard-Display Interface, and the GPIB Interface.

Read-Only Memory

The ROM device (U1301) is a 32k X 8 Erasable Programmable Read-Only memory (EPROM) IC that stores the program used by the Microprocessor in controlling FG 5010 operations. Selection of the ROM for a read operation is controlled by the ROMCE (ROM chip enable) signal from U1331C in the Address Decoder logic. Since this signal is a combination of the VMA and A15 outputs from the Microprocessor, ROM access is allowed only in the upper half of the memory space.

The ROM is check-summed and tested internally during the power-up sequence. (Because of the simplicity of the address decoding, verifying operation of the ROM is also very simple in an instance of instrument malfunction. Assuming that power supplies are correct, checking for proper states of the E pulse, VMA, and address line A15 assures that the ROM is accessible by the Microprocessor.) Since program fetch is the most active bus state, it can be assumed that the ROM will be active most of the time.

Random-Access Memory

The RAM device (U1311) is a 2k X 8 IO that stores the buffer register contents and the variables used by the Microprocessor in controlling FG 5010 operations. This includes handling the GPIB traffic, decoding the Front Panel control settings, and storing those settings. Power-on diagnostics detect and report any RAM failure with no requirement that the RAM be active.

Selection of the RAM for either a read or a write operation is controlled by the RAMCS (RAM chip select) signal from Address Decoder U1221. Data direction control is provided by the WR signal from the Read/Write Conditioning logic. When the WR signal is low, data are written into the RAM; when WR is high, data are read from the RAM. The WR signal ends within 20 ns after the end of the Microprocessor E (enable) pulse so that data will still be valid at the end of WR. This prevents possible problems where delayed cutoff of the E pulse could allow writing erroneous data.

Power Connections

Power is supplied to the Processor Board through edge connector P1010 pins 1A, 1B, and 2A; ground is connected through pins 3A, 3B, 4A, 4B, 5A, and 5B. Parallel lines are

DESCRIPTION

used for power connections to reduce voltage drops across the connectors. Capacitors C1501, C1601, and C1201 and inductor L1501 act as a filter to attenuate noise applied from the Processor Board to other FG 5010 board through the +5 V bus. In addition to the filter capacitors, distributed capacitance throughout the Processor Board is used as the return path for the high-frequency noise currents generated by the board logic elements.

KEYBOARD-DISPLAY INTERFACE/PERIPHERAL INTERFACE/GPIB ADDRESS SWITCH/GPIB INTERFACE

Introduction

Processor Board Diagram 6A contains the Keyboard-Display Interface, Peripheral Interface, GPIB Address Switch, and GPIB Interface logic.

Keyboard-Display Interface

The Keyboard-Display Interface logic consists of the interface controller (U1431), Indicator Control Programmable Array Logic (PAL) device (U1521), and associated circuits.

Keyboard/Display Interface Controller U1431 accepts data from and sends data to the Bidirectional Data Buffer (U1201 on Diagram 5A), accepts data from the Keyboard (see Diagram 2), accepts control signals from the Peripheral Interface logic, and supplies the signals required to control the Front Panel indicators (see Diagram 2). It is accessible in the range of 0800 through 0FFF. Address line 0 from the Microprocessor is the only one used directly by U1431; the addresses are ordinarily 1400 and 1401. The \overline{RD} and \overline{RW} signals from the Read/Write conditioning logic (on diagram 5A) are both used. The device is selected by the DISPCS (display chip select) signal which is from the Address Decoder (U1221 on Diagram 5A) and does not include the ENABLE signal from the Microprocessor. Instead, the ENABLE signal is used by the Interface Controller as its clock.

Data input is from the on-board parallel data bus and the Keyboard; data output is to the board data bus. Indicator control outputs consist of the indicator segment lines SEG1 through SEG8 and indicator select lines SL0 through SL3, all of which are supplied to the Display Driver Board segment circuits (on Diagram 3).

Interface controller output segment select signals SL0 and SL1 and blank display signal BD are also applied to Indicator Control PAL U1521, as are the PA0, PA1, PA2, and PA3 signals from the Versatile Interface Adapter (VIA,

U1401) in the Peripheral Interface logic. From these inputs, the PAI determines the states of the TRIG'D, ERROR, and NOT ENTERED Front Panel indicators, and controls those states by its output signals to the Display Driver Board and Front Panel Board. These signals are the BD (blank display), TRIG'D (triggered), ERR (error), and NE (not entered).

Note that the \overline{LRESET} signal (developed from the \overline{RESET} signal supplied by the Reset Generator on Diagram 4) is also applied to Keyboard/Display Interface Controller U1431, which causes U1431 to supply the \overline{BD} (blank display) signal to PAL U1521. When this signal is active, the PAL produces the BD signal to ensure that the indicators will not light during reset operations.

NOTE

The TRIG'D indicator operates in any of three states: on, blinking, and off. When the trigger input is above the threshold (positive slope), the indicator is on; when the input is below the threshold (positive slope), the indicator is off; and when the trigger is making the transition, the indicator blinks. For negative slopes, the indicator is on when the trigger input is below the threshold and off when the input is above the threshold. The ERROR and NOT ENTERED indicators both blink when the on conditions are met, but are never on continuously.

The states of the indicators are determined by the Indicator Control PAL, which is controlled in this instance by the PA0, PA1, PA2, and PA3 signals from the VIA.

Signals PA3 and PA2 control the state of the TRIG'D output from the PAL. PA2 determines whether the signal will be supplied constantly, or will be on and off alternately (blinking). If PA2 is high, the output is on and off; if PA2 is low, the output is constant. PA3 functions as a gate to control the output as determined by PA2. Thus, PA3 controls whether the TRIG'D indicator will be on or off, and PA2 controls whether it will blink or light steadily.

Signal PA1 controls the state of the ERR output from the PAL. If PA1 is high, the output is on and off alternately, causing the ERROR indicator to blink; if PA1 is low, the signal is off, causing the indicator to be off.

Signal PA0 controls the state of the NE output from the PAL. If PA0 is high, the output is on and off alternately, causing the NOT ENTERED indicator to blink; if PA0 is low, the signal is off, causing the indicator to be off.

DESCRIPTION

The Indicator Control PAL also supplies the clock input to Counter IC U1621. Resistor R1521 and capacitor C1621 act as a filter to eliminate the effects of the positive-going spike that exists on the BD line between 80 and 100 ns after the start of the blanking time (while the Interface Controller internal data are changing). Resistor R1522 acts as a pull-up to ensure that the clock input to the Counter is within specifications. Counter U1621 outputs Q5, Q6, and Q7 are applied back to the PAL to provide a duty cycle of 5/8 at the PAL outputs for a flashing cycle that is pleasant to the eye. The PAL then applies this as the blinking component to the display for the three indicators.

Peripheral Interface

The Peripheral Interface logic consists of the Versatile Interface Adapter (VIA, U1401), the Serial Data/Trigger Programmable Array Logic (PAL) device (U1511), a flip-flop IC (U1501), and associated circuits.

The VIA (U1401) transforms the data from the on-board parallel data bus to a serial data stream and strobes the data into the Loop 1, Loop 2, or Sine Shaper circuits of the FG 5010. The VIA also transforms the serial return stream from Loop 2 to parallel data and places those data onto the on-board parallel data bus for transfer to the Microprocessor. Address lines A0 through A3 select the VIA, which is enabled by the 6522CS (6522 chip select) signal from the Address Decoder (U1001 on Diagram 5A).

Strobe and control outputs from the VIA include the PA0 through PA7 and PB0 through PB7 signals. As described previously, the PA0 through PA3 signals are used in the Keyboard-Display Interface logic. The other signals are used as follows:

Signal PA7 from the VIA drives the Mag Latch Strobe Generator circuit (see Diagram 4). It is called the MAGLATCH TRIG signal and must be held low by the VIA for the duration of the mag latch strobe output of the strobe generator. If the signal is allowed to become high before the strobe ends, the strobe will be terminated at that time. For this reason, the signal is held until a return is received from the strobe generator. The return is the END OF STROBE signal to the VIA.

Signals PB0 through PB5 are the strobe output lines to the various FG 5010 boards. PB0 is the Output Amplifier strobe and is called STROBE A (see Diagram 25). PB1 is the Loop 1 strobe and is called STROBE L1 (see Diagram 10). PB2 and PB3 are the Loop 2 strobes and are called STROBE 2L2 (see Diagram 17) and STROBE 1L2 (see Diagram 19), respectively. PB4 is the Sine Shaper strobe and is called STROBE SS (see Diagram 20). Each of these strobes causes data that have been serially shifted to the respective board to be loaded into latches on that board.

Signal PB5 is the Loop 2 status strobe and is called STROBE L2 STATUS (see Diagram 19). This strobe causes status data for Loop 2 to be loaded into the shift register on the Loop 2 Board and then shifted in serial form to the VIA.

Signals CB2, CB1, and PB6 effect and control the bidirectional transfer of serial data between the VIA and the other circuits of the FG 5010. CB2 is the data input and output line. CB1 is the shift clock that synchronizes the transfers. The direction of transfer is controlled by the PB6 signal through the Serial Data/Trigger PAL (U1511).

When PB6 is high, CB2 is used for data output. The output line is buffered and includes a pull-up resistor (R1612) to ensure proper logic levels. When PB6 is low, the data on the LOOP 2 STATUS input line to PAL U1511 are applied through Serial Data flip-flop U1501B, and through PAL U1511 again, to the CB2 line, which is then used for input.

Within the PAL, there is a half-clock-cycle delay of the input signal. This is done because the VIA shifts data on the positive-going edge, and, dependent upon set-up times and internal-delay times, may not accept the first input data bit if it is not delayed. The half-cycle delay in the PAL thus causes the data at CB2 to remain stable during the positive-going transition of CB1 and prevents data loss.

Serial Data/Trigger PAL U1511 and associated Trig/Gate flip-flop U1501A, under control of signals from the VIA, also produce the TRIG/GATE output signal that is supplied to the Loop 2 Trigger/Gate Input Amplifier circuit on the Loop 2 board (see Diagram 15). Outputs PA4, PA5, PA6, and CA2 from the VIA provide the control.

Signal PA4 is applied through PAL U1511 to enable flip-flop U1501A. Signal CA2 clocks the flip-flop, if gated by the combination of PA5 and the TRIG input from GPIB Interface Controller U1001. (PA5 determines whether the TRIG signal will gate the clock to the flip-flop.)

Signal PA6 from the VIA controls whether a trigger signal or a gate signal will be supplied to the Loop 2 circuits. If PA6 is high, Trig/Gate flip-flop U1501A is held reset. Its Q output is held low and the CA2 signal from U1401 is gated through PAL U1511 to the Loop 2 trigger circuit.

If VIA U1401 output PA5 is low, the TRIG input from the GPIB Interface, which pulses high on a Group Execute Trigger, is disabled. The CA2 pulse is then applied from PAL U1511 to the Loop 2 trigger circuits. Thus, if the user presses the front panel trigger switch to put the FG 5010 in trigger mode, and then presses the Front Panel manual trigger switch, the Microprocessor will cause a negative-going

DESCRIPTION

pulse from CA2 to become a positive-going output trigger/gate pulse.

When the DT TRIG command is received by the FG 5010, the Microprocessor causes PA5 to be set high. This enables the TRIG output from GPIB Interface controller U1001. The TRIG output becomes high when a Group Execute Trigger is received, and remains high during the time that the Group Execute Trigger is actually present on the bus. Thus, from the time that data are declared valid on a Group Execute Trigger, plus 4 or 5 internal clock cycles for the GPIB Interface Controller, there will be a signal present on the TRIG input line.

If PA5 is high, that positive-going trigger, in combination with a high CA2 output, also from VIA U1401, produces a positive-going trigger pulse to the Loop 2 trigger circuit.

When a gate is required rather than a trigger, the U1401 PA6 output is set low. This removes the reset from Trig/Gate flip-flop U1501A and causes PAL U1511 to invert whatever signal is at the Q output of that flip-flop. When a manual gate is required, the U1401 PA5 output is set low. With PA5 low, CA2 is inverted by PAL U1511. Setting PA4 high and clocking flip-flop U1501A by pulsing CA2 low causes the high on PA4 to be loaded into the flip-flop. The flip-flop Q output is thus driven high and supplies to the Loop 2 trigger circuit, remaining high until PA4 is changed to a low and CA2 is pulsed low again. That low is clocked into the flip-flop, resulting in a high at the Q output. The output is then applied as the trigger/gate output to the Loop 2 trigger circuit.

NOTE

Regarding the TRIG signal in the following paragraph, the pulse is generated during the time that Data Valid is true on the Group Execute Trigger multiline signal. The leading edge of the signal becomes high between 1 and 1 1/4 μ s after Data Valid; that is, 4 to 5 clock cycles after Data Valid is asserted in the Group Execute Trigger byte.

When the DT GATE command is received by the FG 5010, output PA5 from VIA U1401 is set high. When this occurs, a TRIG pulse from the GPIB Interface Controller causes PAL U1511 to reset Trig/Gate flip-flop U1501A (the U1401 CA2 output will be in its normal high state, and the positive-going clock edge will have clocked flip-flop U1501A). Thus, when the Group Execute Trigger occurs, it causes the trigger/gate output to the Loop 2 trigger circuit to be high.

The Microprocessor then determines what caused the Group Execute Trigger interrupt, and sets the VIA (U1401) PA4 output back to the low state. Thus, the next time that the Group Execute Trigger is received, the output gate will be turned off (set low).

The output gate can be toggled by consecutive Group Execute Triggers because, each time the Microprocessor receives a Group Execute Trigger, it examines the signal that is applied back as PB7 to determine whether the PA4 signal was accepted. If it was, the output is set to turn the gate on (or off), and the PA4 signal is inverted. By these operations, the hardware actually causes the FG 5010 output to be turned on or off with timing that varies approximately 1 μ s from that of the Group Execute Trigger on the bus, while the software is still in control of actual operation.

GPIB Address Switch

The Address Switch logic (S1020 and U1020 and associated components) allows the user to assign manually the instrument GPIB address and terminator for reading by the Microprocessor, and to select normal, calibrate, or signature analysis mode. (The address/terminator bits are set by switch S1020; the mode is set by jumper J1121.)

The address switch circuits consist of six manually operated switches (accessible through a cutout in the instrument read panel) that allow the user to assign the IEEE-488 bus address and terminator for the FG 5010. All six switches are contained in switch module S1020 and are assigned binary weights with section 1 being the least significant. Pull-up resistors R1030 through R1035 are connected to switch lines 1 through 6, respectively, to provide the proper high logic levels.

At instrument power-on, the Microprocessor causes Switch Buffer U1020 to be enabled by the ADDSWCS (address switch chip select) signal from the Address Decoder (U1221 on Diagram 5A). This places the switch contents, plus the jumper position information, on the Processor Board data bus.

GPIB Interface

The GPIB Interface logic (U1001, U1000, U1010, and associated components) transfers data between the IEEE-488 bus and the Microprocessor; and also handles the required GPIB protocols for handshaking, device selection, and polling; and thus relieves the Microprocessor of these tasks. GPIB Interface Controller U1001 is the actual bus controller; GPIB Data Buffer IC U1000 senses and drives the GPIB

DESCRIPTION

lines; and Handshake Buffer IC U1010 handles handshake and bus management tasks. The GPIB Interface Controller communicates with the Microprocessor via the on-board parallel data bus. Data transfer is under the control of commands from the IEEE-488 bus and control signals from various FG 5010 circuits.

GPIB Interface Controller U1001 is accessible in the address range of 2800 through 2FFF. However, the specific normal addresses for the GPIB Interface Controller are 1C00 through 1C07; these eight register addresses being defined by the three register select lines (RS0, RS1, and RS2.)

Controller U1001 requires that the address lines be stable before it is enabled. Thus, a delay is provided by a combination, in the Address Decoder logic, of the Y5 output from Address Decoder IC U1221 and the E (enable) pulse from the Microprocessor. (Incorporating the E pulse allows the address time to stabilize.) These signals produce the 9914CS (9914 chip select) signal that is used as the U1001 enable signal.

Data transfer on the U1001 external bus side is to and from the GPIB through GPIB Data Buffer U1000. External inputs/outputs consist of D101 through D108, on pins 38, 37, 36, 35, 34, 33, 32, and 31, respectively. Data transfer on the board side is to and from Bidirectional Data Buffer U1201 on Diagram 5A via the on-board parallel data bus. Internal inputs/outputs consist of D0 through D7, on pins 10 through 17, respectively.

Controller U1001 receives its clock signal from the 4 MHz Clock circuit on Diagram 5A. IC U1001 does not require synchronization with this clock signal however, because synchronization is accomplished by the WR (write) signal from the Read/Write conditioning logic and the 9914CS (9914 chip select) signal from the Address Decoder logic (both on Diagram 5A). These signals are applied to U1001 pins 4 and 3, respectively. The R/W (read/write) signal from the Microprocessor is connected to the U1001DBIN input to control the direction of data flow through the IC.

In addition to the signals for data and protocols, GPIB Interface Controller U1001 produces the IRQ (Interrupt Request) and TRIG (Trigger) signals. IRQ is applied directly to the Microprocessor (U1111 on Diagram 5A) as the GPIB interrupt; TRIG is applied directly to the Serial Data/Trigger PAL (U1511) in the Peripheral Interface logic to produce the TRIG/GATE signal that is supplied off the board to the Loop 2 Trigger/Gate circuits (see Diagram 15).

Connected between the GPIB Interface Controller and the IEEE-488 bus, GPIB Data Buffer U1000 is enabled in two states. The PE (pull-up enable) signal applied to pin 11 is supplied by associated logic circuits U1321D and U1512B to prevent the data buffer (U1000) from loading the bus during a parallel poll operation. (However, parallel polling is not implemented in the FG 5010.) Inputs to U1321D are the ATN (attention) and EOI (end of instruction) commands from the IEEE-488 bus via Handshake Buffer U1010. Thus, the only time that the pull-up enable signal is low is when ATN and EOI are low at the same time, which occurs only during a parallel poll. Buffer U1000 operates open-collector at that time and tri-state at all other times.

Also connected between the GPIB Interface Controller and the IEEE-488 bus, Handshake Buffer U1010 provides for communication of handshake and bus management signals. These include: SRQ, EOI, DAV, NRFD, NDAC, IFC, and REN. Since the CONT signal from Controller U1001 is high continuously, U1010 is configured as a talker/listener rather than a controller. (The effect of the continuously high CONT signal is to divert the ATN, REN, and IFC signals toward the GPIB Interface Controller and the SRQ line out toward the IEEE-488 bus. For a controller, the conditions would be opposite).

Transistor Q1100 inverts the TE (talk enable) signal from the GPIB Interface Controller to produce the TE signal to enable an active data buffer (if one is used) in the main frame. Note that the TE signal is also applied to both the GPIB Data Buffer (U1000) and Handshake Buffer (U1010) to enable driving the IEEE-488 bus lines.

DESCRIPTION

Please make the following changes to the Replaceable Electrical Parts list:

R E M O V E / A D D

CKT. NO	QTY	PART NO.	DESCRIPTION
REMOVE:			
A30	1EA	670-6907-01	MICROPROCESSOR CIRCUIT BOARD

ADD:			
A30	1EA	*671-0418-00	MICROPROCESSOR CIRCUIT BOARD

THE NEW *671-0418-00 MICROPROCESSOR CIRCUIT BOARD ASSEMBLY WILL CONSIST OF
ADD:

L1501	1EA	108-0574-00	COIL TORROID
Y1031	1EA	119-1555-00	OSCILLATOR RF
	2EA	131-0993-00	BUS CONDUCTOR
U1301	1EA	136-0755-00	MICROCKT 28 DIP
U1111	1EA	136-0757-00	MICROCKT 40 DIP
Q1111	1EA	151-0190-00	TRANSISTOR 2N3904
U1111	1EA	156-1342-01	MICROCKT DIGITAL 6808 40 DIP
U1001	1EA	156-1444-01	MICROCKT DIGITAL TMS9914A
U1431	1EA	156-1535-00	MICROCKT DIGITAL 8279-5,40 DIP
U1401	1EA	156-1539-00	MICROCKT DIGITAL 6522 40 DIP
U1311	1EA	156-1632-00	MICROCKT DIGITAL 24 PIN DIP
U1301	1EA	160-4971-00	EPROM PRGM
S1020	1EA	260-2064-00	SWITCH, ROCKER 125MA, 30VDC
J1121	17EA	131-0608-00	TERMINAL PIN GOLD
J1201 TP1 thru TP10			
U1322			
U1331			
U1512			
	1EA	156-0382-00	MICROCKT DIGITAL 74LS00
	1EA	156-0383-00	MICROCKT DIGITAL 74LS02
	1EA	156-0385-00	MICROCKT DIGITAL 74LS04

DESCRIPTION

REMOVE / ADD

CKT.NO	QTY	PART NO.	DESCRIPTION
ADD CONT:			
U1501	1EA	156-0388-00	MICROCKT DIGITAL 74LS74
U1221	1EA	156-0469-00	MICROCKT DIGITAL 74LS138
U1621	1EA	156-0523-00	MICROCKT DIGITAL 4024, CMOS
U1131	1EA	156-0645-00	MICROCKT DIGITAL 74LS14
U1201	1EA	156-1111-00	MICROCKT DIGITAL 74LS245
U1020	1EA	156-1277-00	MICROCKT DIGITAL 81LS95 20 DIP
U1000	1EA	156-1414-00	MICROCKT DIGITAL 75160A
U1321	1EA	156-0479-00	MICROCKT DIGITAL 74LS32
U1010	1EA	156-1415-00	MICROCKT DIGITAL 75161A,MI
U1521	1EA	160-4972-00	EPROM PRGM 12L6
U1511	1EA	160-4970-00	EPROM 16L8A-2DIP
	1EA	388-9525-01	CPU CKT BOARD
C1621	1EA	281-0772-00	4700 PF, 10% CAP
C1000 C1001 C1201 C1031 C1111 C1232 C1301 C1302 C1401 C1421 C1511 C1521 C1622 C1623	14EA	281-0773-00	10%, 100V CAP
C1331	1EA	281-0788-00	470 PF, 10% CAP
C1501	1EA	281-0815-00	0.027UF, 20% CAP
C1020	1EA	290-0755-00	100 UF, +5%-10% CAP
C1601	1EA	290-0759-00	290UF, +75-10% CAP
R1611 R1612	2EA	315-0102-00	1K OHM, 5%, 0.25W RES

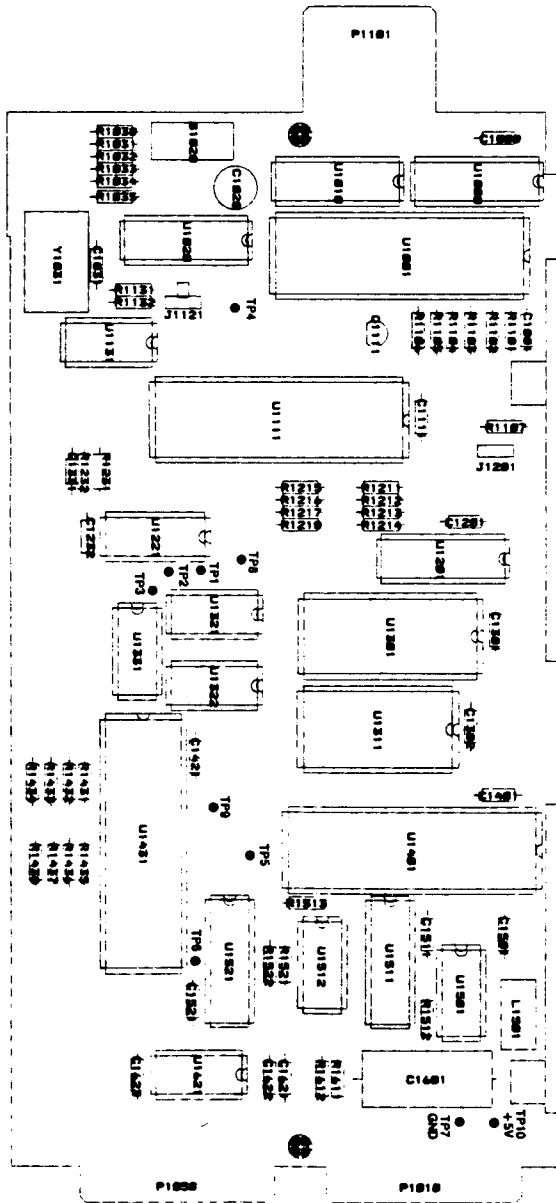
DESCRIPTION

REMOVE / ADD

CKT.NO	QTY	PART NO.	DESCRIPTION
ADD CONT:			
R1030			
R1031			
R1032			
R1033			
R1034			
R1035			
R1102			
R1103			
R1105			
R1106	30EA	315-0103-00	10K OHM 5%,0.25W
R1131			RESISTOR
R1132			
R1211			
R1212			
R1213			
R1214			
R1215			
R1216			
R1217			
R1218			
R1431			
R1432			
R1433			
R1434			
R1435			
R1436			
R1437			
R1438			
R1521			
R1522			
R1101			
R1104			
R1107	5EA	315-0472-00	4.7K OHM,5%
R1512			0.25W RESISTOR
R1513			
R1231			
R1232	2EA	315-0621-00	620 OHM 5%,0.25W
			RESISTOR
U1511	1EA	*160-4970-00	MICROCKT DIGITAL
U1301	1EA	*160-4971-00	MICROCKT DIGITAL
U1521	1EA	*160-4972-00	MICROCKT DIGITAL
	1EA		LABEL, IDENT.

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A B C D E F G H I J



A30-Microprocessor circuit board assembly.

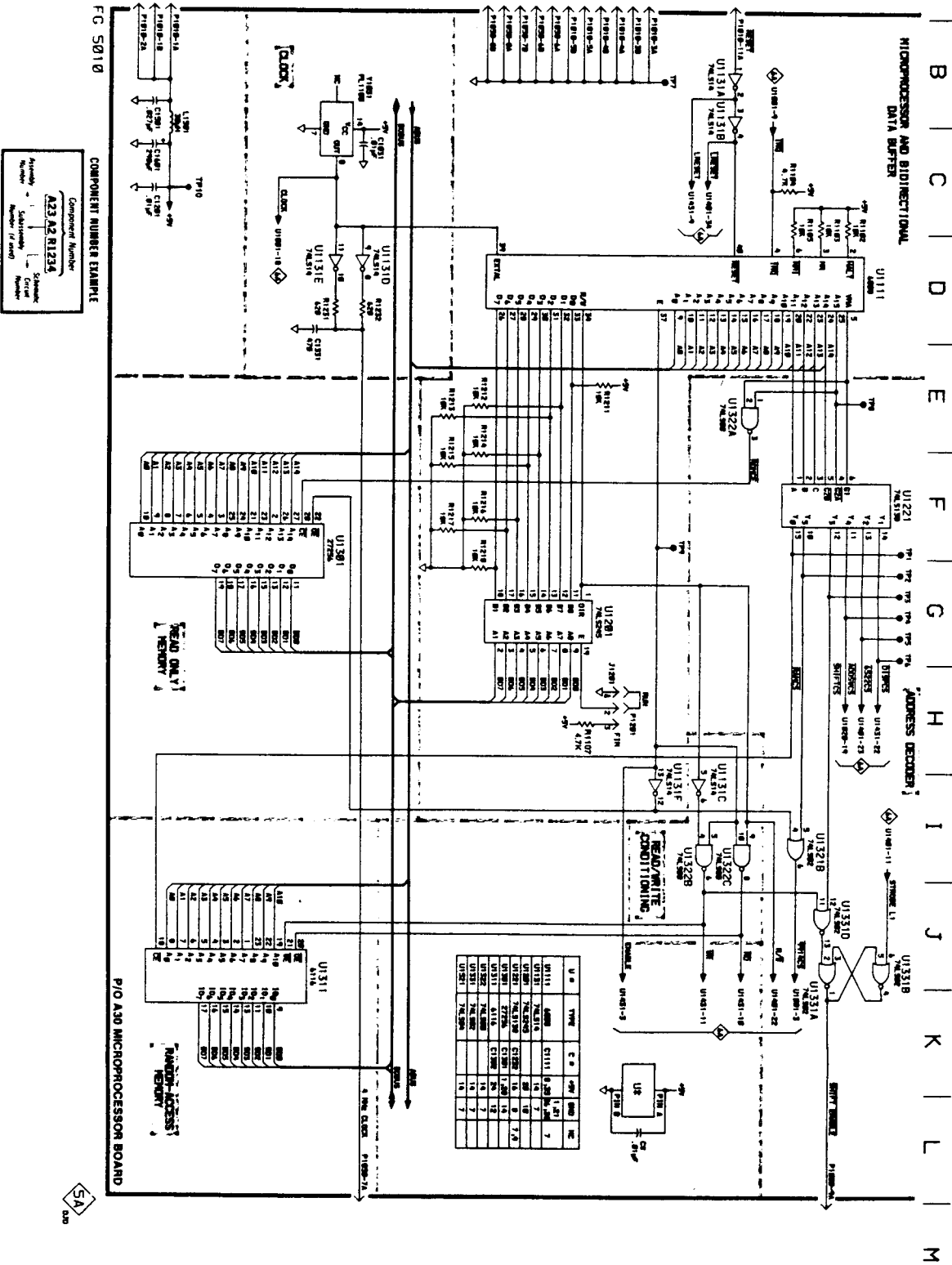
This board replaces Fig. 10-11, CPU Board for Instruments serial number B052043 and above.

The following schematics (5A & 6A) replace diagrams 5 thru 9 for Instruments with serial number B052043 and above.

**COMPONENT LOCATOR TABLE
FOR DIAGRAM 5A**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1031	C6	C4	R1218	F5	E3
C1111	K4	D2	R1231	D6	D4
C1201	C8	E1	R1232	D6	D4
C1232	K4	E4			
C1301	K4	F1	TP1	F1	E4
C1302	K4	F1	TP2	G1	E4
C1331	E6	D5	TP3	G1	E4
C1501	B8	H1	TP4	G1	C3
C1601	C8	I2	TP5	G1	G3
			TP6	G1	H4
J1201	H3	D1	TP7	B3	I1
			TP8	E1	E3
L1501	B7	I1	TP9	F3	G3
P1010	B2	J2	U1111	D1	D3
P1010	B8	J2	U1131A	B2	C4
P1050	B4	J4	U1131B	B2	C4
P1050	L1	J4	U1131C	I2	C4
P1050	L6	J4	U1131D	D6	C4
P1201	H3	D1	U1131E	D6	C4
			U1131F	I3	C4
R1102	C1	C1	U1201	G4	E1
R1103	C1	C1	U1221	F1	E4
R1104	C2	C1	U1301	F6	F2
R1105	C2	C1	U1311	J6	F2
R1107	H4	D1	U1321B	I2	E3
R1211	E3	D2	U1322A	E2	F3
R1212	E5	D2	U1322B	I3	F3
R1213	E5	E2	U1322C	I3	F3
R1214	E5	E2	U1331A	K2	F4
R1215	E5	D3	U1331B	J1	F4
R1216	F5	D3	U1331D	J1	F4
R1217	F5	E3			
			Y1031	B6	C5

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F
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K
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M



**COMPONENT LOCATOR TABLE
FOR DIAGRAM 6A**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1000	B10	B1	R1433	F4	G5
C1001	B10	C1	R1434	F3	G5
C1020	D9	B3	R1435	E4	G4
C1401	B10	G1	R1436	E5	G4
C1421	B10	G3	R1437	E5	G5
C1511	D10	H2	R1438	E5	G5
C1521	D10	I3	R1512	G7	I2
C1621	I5	I3	R1513	D6	H3
C1622	D10	I3	R1521	I5	H3
C1623	D10	I4	R1522	I5	H3
			R1611	J9	I2
			R1612	J8	I2
P1010	B6	J2			
P1010	N2	J2	S1020	B2	B3
P1050	B3	J4			
P1050	N2	J4	U1000	M6	B1
P1101	N5	A2	U1001	J5	C2
P1121	D1	C4	U1010	C9	B2
Q1111	N6	C2	U1010	M8	B2
			U1020	E1	B4
R1030	B1	A4	U1321D	L6	F3
R1031	C2	B4	U1401	E6	G2
R1032	C1	B4	U1431	G1	G4
R1033	C2	B4	U1501A	H7	H1
R1034	C1	B4	U1501B	H7	H1
R1035	D2	B4	U1511	G7	H2
R1101	J8	C1	U1512A	I8	H2
R1106	M6	C2	U1512C	F9	H2
R1131	D1	C4	U1512D	I9	H2
R1132	D2	C4	U1512F	I8	H2
R1431	F3	G4	U1521	H4	H3
R1432	F3	G4	U1621	J5	I3

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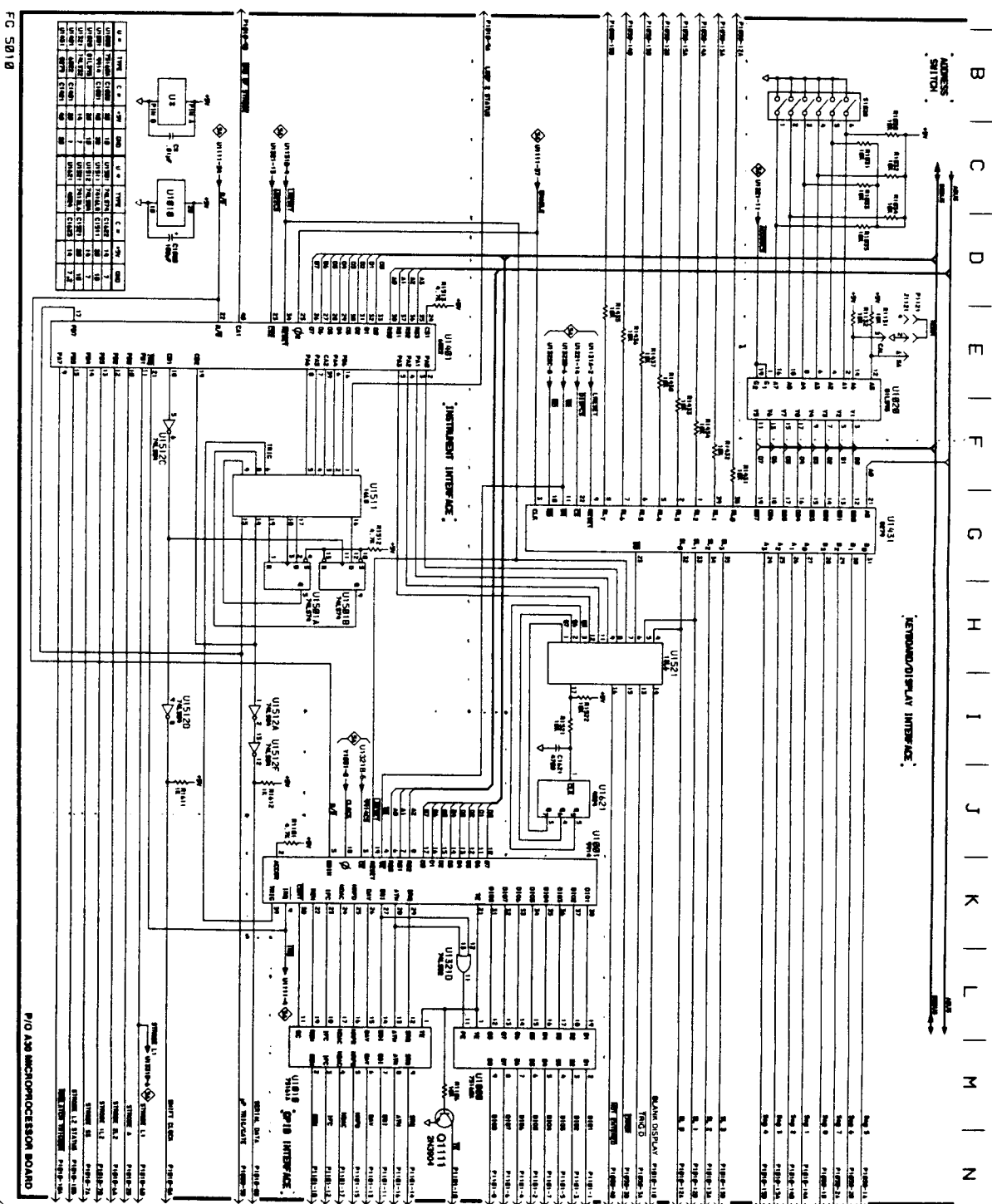


FIG 5018

COMPONENT NUMBER EXAMPL

Part Number: 100-100000-0000

Revision: 1

Quantity: 1

Unit: 1

Notes: See Assembly Drawing

PHANTOM -- This keyword is a clause to identify the statement as a Phantom statement. A Phantom statement allows housekeeping or set-up operations (as specified by the other clauses of the statement) without affecting the test vector applied at the test pins. Phantom statements are commonly used at the beginning of a program segment preceding the executable statements but they may also be embedded within a program. When a Phantom statement is used within a program, the cycle time of the prior-to-previous executable statement must be of sufficient length to allow the Pattern Processor to perform the operation.

The time required to perform the operation of a single statement, including Phantom, is typically 48 ns when the FAST range of the Clock Generator is used. Therefore, when one Phantom statement is used, the cycle time of the prior-to-previous executable statement must be equal to or greater than the time required to process the statement plus the time for the one Phantom statement, or 96 ns. More than one Phantom statement can be used consecutively as long as the cycle time in question is equal to or exceeds the sum of the processing times of all the Phantom statements plus 48 ns. For example, the minimum cycle time when three consecutive Phantom statements are used is $3 \times 48 \text{ ns} + 48 \text{ ns}$ for a total of 192 ns.

If the Clock Generator SLOW range is used, the time for each operation will be 2.048 us instead of 48 ns.

When Phantom is used with SHIFT, it suppresses one shift pulse unless the SHIFT statement is included in the Phantom statement. The example below will generate 4 shift pulses because the Phantom statement will suppress one of them:

```

...
...
SHIFT,ALTERNATE;
SHIFT,ALTERNATE;
SHIFT,ALTERNATE,PHANTOM;
SHIFT,ALTERNATE;
SHIFT,ALTERNATE;
...
...
```

The minimum cycle time is dependent on the number of consecutive Phantom Cycles used in the Pattern Program. Example:

Number of consecutive Phantoms	Minimum Cycle Time (Fast Range)
1	96 ns
2	144 ns
3	192 ns
.	...
n	$48 \text{ ns} \times n + 48 \text{ ns}$

Date: 11-11-87 Change Reference: C4/1187

Product: WFM300

Manual Part No: 070-6039-00

DESCRIPTION

SPECIFICATIONS CHANGES

ADD:

Sec. 1, Page 1-7

To Table 1-7, Vector Mode

CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	Perf. Ck. Step No.
Horizontal Variable Gain	± 3 dB	A 700 mV signal can be decreased to 6.4 major div. or less. A 500 mV signal can be increased to 9 major div. or more.	14

CHECKS AND ADJUSTMENTS CHANGES

CHANGE TO READ:

Sec. 5, Page 5-11

Step 14. CHECK VECTOR MODE GAIN & ELECTRONIC GRATICULE

Change Step	i.	to	m.		o.	to	s.
	j.	to	n.		p.	to	t.
	k.	to	o.		q.	to	u.
	l.	to	p.		r.	to	v.
	m.	to	q.		s.	to	w.
	n.	to	r.		t.	to	x.

ADD:

Sec. 5, Page 5-11

To Step 14. CHECK VECTOR MODE GAIN & ELECTRONIC GRATICULE

- Set the H GAIN control fully counter clockwise. Check that the display amplitude is equal to or less than 6.4 major divisions.
- Move the H GAIN control to the just out of detent position.
- Set the VAC to 500 mV.
- CHECK — that the display amplitude is equal to or more than 9 major divisions.

DESCRIPTION**TEXT CHANGES**

Section 2, OPERATION, 2.5.2 Frequency Readout Dial Calibration on page 2-5.

CHANGE TO:**2.5.2 Frequency Readout Dial Calibration**

The 1405 frequency readout can be calibrated to any compatible Tektronix spectrum analyzer by offsetting the dial to compensate for the difference in 1st LO frequencies between the 7L12/7L13/7L14 and the other spectrum analyzers.

1. Remove the bottom panel from the 1405 to expose the frequency drive shaft and couplers between the oscillator assembly and the tuning control mechanism. Center the FINE tune potentiometer (5 turns from either extreme position).
2. Connect the 1405 to the spectrum analyzer as directed for the 7L12, 7L13, or 7L14 and as shown in Fig. 2-2.
3. Tune the spectrum analyzer frequency to center the transmitter visual carrier on the display and note its frequency.
4. Tune the 1405 FREQUENCY such that the center of the display coincides with the transmitter frequency.
5. Loosen the set-screw in the coupler, between the tuning shaft and the oscillator assembly, then, while holding the oscillator tuning shaft with one hand, adjust the FREQUENCY control until the dial reads the same as the transmitter frequency. Re-tighten the set-screw.
6. Replace the 1405 bottom panel.

Section 4, OPTIONS, 4.2 OPTION 02 on page 4-2.

CHANGE TO:**4.2 OPTION 02 AND OPTION 03****4.2.1 Description**

Option 02 provides the correct frequencies at the TV channel marks on the mechanical dial tape for use with Tektronix 49X and 27X spectrum analyzers.

Option 03 provides the correct frequencies at the TV channel marks on the mechanical dial tape for use with Tektronix 271X spectrum analyzers.

A procedure for calibrating the Frequency Readout Dial for either Option 02 or Option 03 is included in Section 2, Operation in this manual.

Customers who have used this procedure should notify their service center when they bring in the 1405 for repair in order to have their instrument returned ready for use with their spectrum analyzer.

Tektronix Manuals Change Information
Product Group 22

Date: January 20, 1987
Product: 1502 MTDR
Manual Part Number: 070-1792-02 Service
Change Reference: M62284

DESCRIPTION

Effective S/N:R117916

Page:9-14

Fig 3-69,70 QTY.
Remove:3-69 (10) 358-0329-00 Bushing
3-70 (10) 131-0513-00 Pin
Add:3-69 (10) 358-0699-00 Bushing, Fuseholder

Tektronix Manuals Change Information
Product Group 22

Date: January 26, 1987
Product: 1502 Time Domain Reflectometer
Manual Part Number:070-1792-02
Change Reference: M61690

DESCRIPTION

Effective S/N:R117428

Page 7-10 Electrical Parts

670-3008-09 Main Board(Standard Instr)
670-4338-04 Main Board(Option 5 Metric)

Remove:A1R1540 315-0563-00 Res,56K,5%,1/4W
Add:A1R1540 321-0361-00 Res,56.2K,1%,1/8W

Tektronix Manuals Change Information
Product Group 22

Date: January 20, 1987
Product: 1503 MTDR
Manual Part Number: 070-1865-01 Service
Change Reference: M62284

DESCRIPTION

Effective S/N: R097327

Page: 9-13

Fig 3-87,88 QTY.
Remove: 3-87 (10) 358-0329-00 Bushing
3-88 (10) 131-0513-00 Pin

Add: 3-87 (10) 358-0699-00 Bushing, Fuseholder

Date: July 7, 1987
Product: 1503 Metallic Time Domain Reflectometer
Manual Part Number: 070-1865-01 Service
Change Reference: M62672

DESCRIPTION

Effective Serial Number: R097520
Page: 9-5

Remove: Fig. 2-26 (2) 352-0362-00 Fuseholder
(2) 220-0859-00 Nut, Plain
2-27 (2) 210-1246-00 Washer, Flat
2-28 (2) 210-1242-00 Washer, Flat

Add: Fig. 2-26 (2) 352-0766-00 Fuseholder, Watertight
Page: 7-21

Remove: F0401 159-0029-01 Fuse
F0491 159-0032-00 Fuse

Add: F0401 159-0281-00 Fuse: 0.25A, 5 X 20MM
F0491 159-0282-00 Fuse: 0.5A, 5 X 20MM

Page: Accessories

Remove: Index -8 159-0029-01 Fuse
159-0032-00 Fuse

Add: Index -8 159-0281-00 Fuse: 0.25A, 5 X 20MM
159-0282-00 Fuse: 0.5A, 5 X 20MM

DATE: 10-8-87

CHANGE REFERENCE: M64806

PRODUCT: 1705

MANUAL PART NO: 070-6355-00

EFF SN B020000

ELECTRICAL PARTS LIST CHANGES

CHANGE TO READ:

A3U718 160-4524-03

MICROCKT,DGTL:CHMOS,64K ERASABLE PROM

ADD:

A6 671-0544-00
A6R100 313-1202-00
A6R102 313-1123-00
A6R103 311-2238-00
A6R104 313-1472-00
A6U100 156-0515-00
A6W100 174-1153-00

CKT BD ASSY:2 dB GAIN SWITCH
RES,FXD,FILM:2K OHM,5%,0.25W
RES,FXD,FILM:12K OHM,5%,0.25W
RES,VAR,NONWW:TRMR 50K OHM,20%,0.5W
RES,FXD,FILM:4.7K OHM,5%,0.25W
MICROCKT,DGTL:CMOS,3 CHAN MUX
CA ASSY,SP,ELEC:6,26 AWG,10.500 L,RIBBON

ELECTRICAL SPECIFICATIONS CHANGES

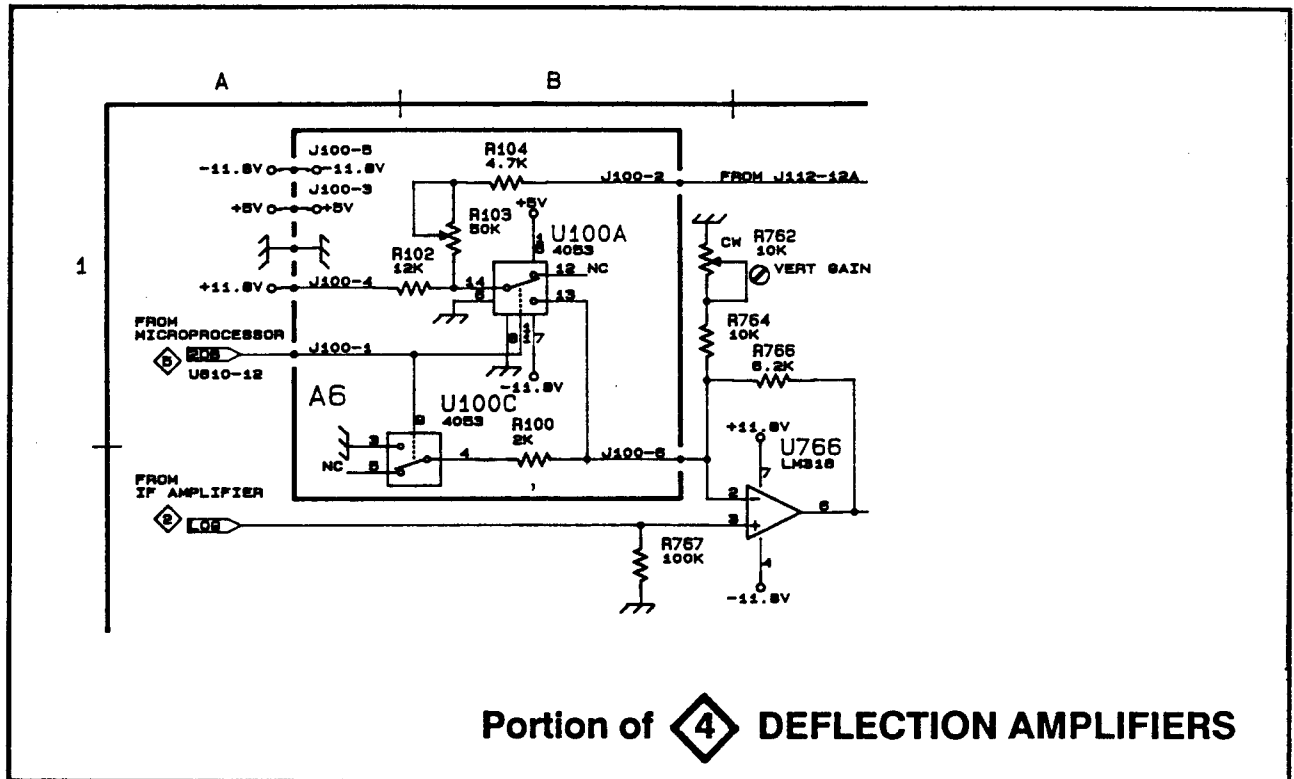
ADD:

Sect. 1, Page 1-4, Table 1-1

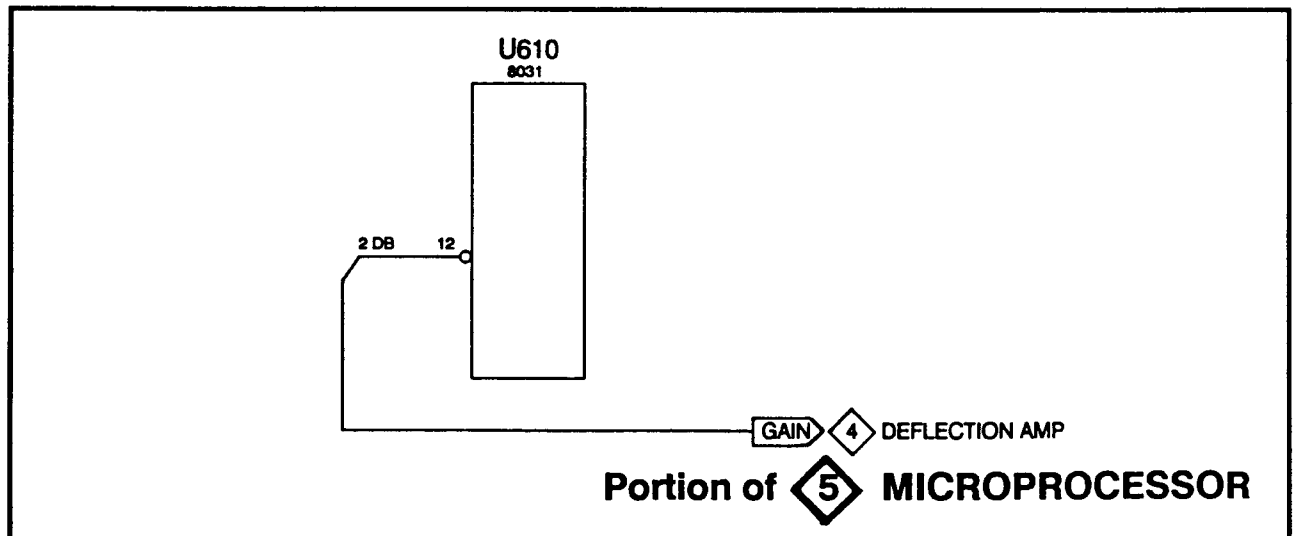
CHARACTERISTIC	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION	CHECK STEP
2 dB Gain Accuracy	\approx 2 dB/division.	< 3 dB/division at -50 dBm.	14

ADD:**To Schematic 4 - VERTICAL DEFLECTION AMPLIFIERS:**

New Circuitry Shown Below

**ADD:****To Schematic 5 - MICROPROCESSOR:**

New connection shown below



ADD: Sect. 2, Page 2-3, Fig. 2-1A

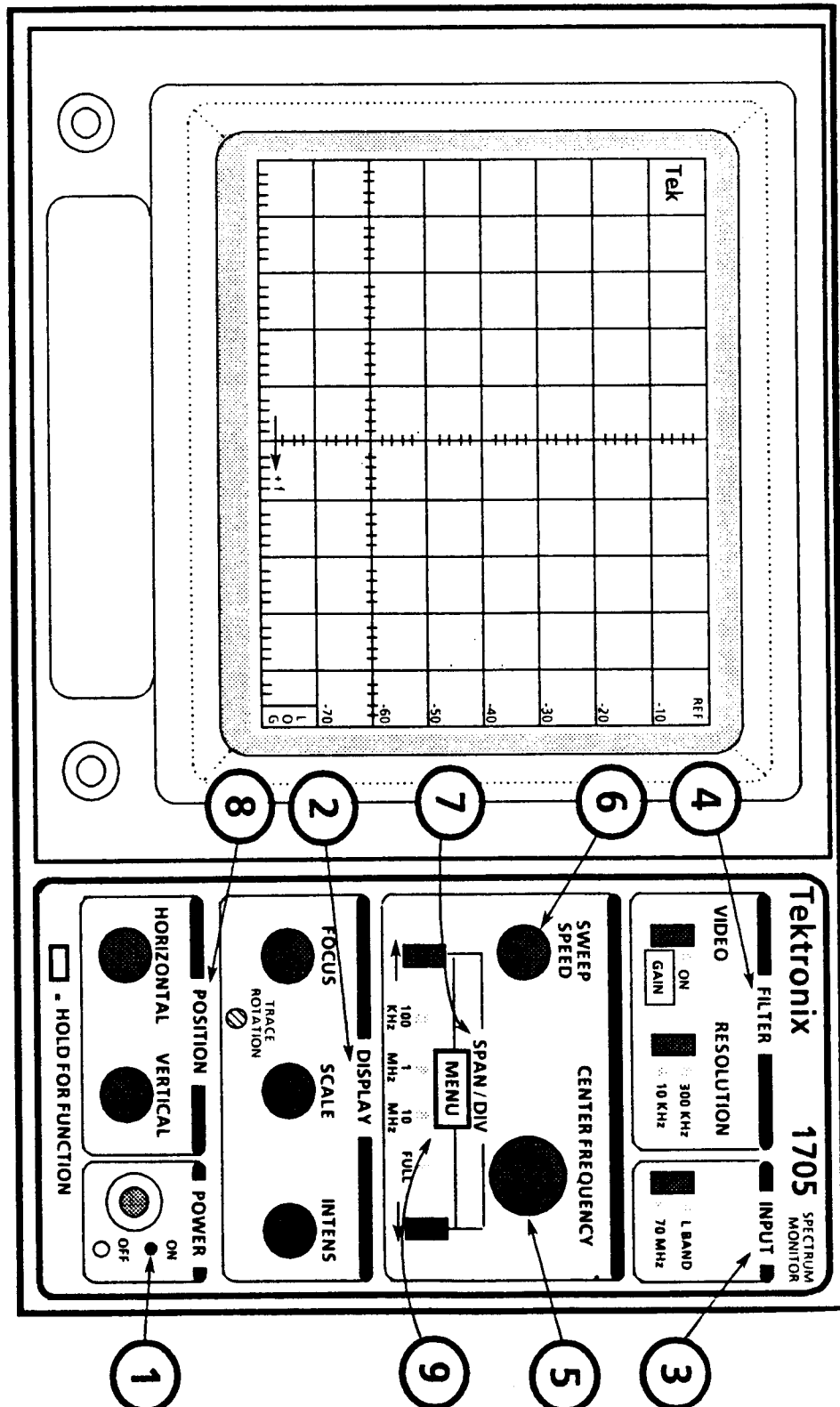


Fig. 2-1A. 1705 front panel for SN B020000 and Up, showing the location of controls. Circled numerals relate to the accompanying control function descriptions.

TEXT CHANGES

CHANGE TO READ:

Sect. 2, Page 2-1

FRONT-PANEL CONTROLS AND INDICATORS

The front-panel controls and indicators consist of momentary contact push-button switches, with backlit switch selections, and variable controls. For front panel control and indicator locations, see Fig. 2-1. (See Fig. 2-1A for SN B020000 and Up). For 1705 instruments with SN B020000 & Up, there are also functions that are accessed by holding the switch down for approximately 1 second. These functions are identified by a blue box surrounding the front-panel label.

④ VIDEO

Turns on or off the Video Filter, which reduces the post detection bandwidth (video), to reduce the high frequency components for display noise averaging. A front panel LED indicator lights when the Video Filter is on. For 1705 instruments with Gain Selection (SN B020000 & Up), holding the Video switch activates the High Gain mode. An on-screen readout indicates 2 dB/div. To exit this mode, hold the switch again, and the on-screen readout returns to 10 dB/div. Gain selection will not affect the momentary touch VIDEO On/Off selection.

ADD:

Sect. 2, Page 2-2

To follow POSITION:

⑨ MENU

Two push-button switches that, when pushed simultaneously, bring the Main Menu selection to the crt readout. To exit the Menu, push either one of the MENU switches again.

Sect. 2, Page 2-5

Vertical Scales

The vertical scale is 8 divisions in height. The center vertical scale is broken into 5 equal minor divisions per major division. Note that the 0 dB reference is at the top of the graticule and that 80 dB (maximum division) is at the bottom of the graticule. For instruments with SN B020000 and below, major divisions are 10 dB, which makes each minor division 2 dB. For instruments with SN B020000 and Up, there are two gain selections: normal gain (10 dB/DIV) and high gain (2 dB/DIV). In normal gain mode, major divisions are 10 dB, which makes each minor division 2 dB. When the GAIN front-panel push button is held, high gain is selected, and major divisions are 2 dB, which makes minor divisions 0.4 dB each.

ADD:**Sect. 4, Page 4-7 , DEFLECTION AMPLIFIERS DIAGRAM 4**

To follow the first paragraph under BUFFERS:

For instruments with SN B020000 & Up only:

U766 is a switchable gain amplifier. When high gain (2 dB/div) is selected with the front-panel push button, the signal at pin 12 of the Microprocessor (U610) goes high, and the switch in U100C grounds R100 through pins 3 and 4. This increases the gain of U766 by approximately a factor of five. U100A also switches, connecting pins 13 and 14, putting a portion of the Vertical Position control into the summing junction of U766 (pin 2). The Vertical Position control is attenuated by resistors R104 and R103 (2 dB POS RANGE). This positions the Video signal at pin 6 of U766, providing greater positioning range while in high gain mode.

CHECKS AND ADJUSTMENTS CHANGES

ADD:**Sect. 5, Page 5-3**

This step is to be performed only for instruments with 2 dB Gain selection (SN B020000 and Up).

Step 14. CHECK 2 dB/DIV GAIN

- e. CHECK -- for more than 1 division of amplitude change.
- f. CHECK -- that the noise floor can be positioned on screen.

Sect. 5, Page 5-9

This step is to be performed only for instruments with 2 dB Gain selection (SN B020000 and Up).

Step 14. CHECK 2 dB/DIV GAIN

REQUIREMENT -- Greater than 1 division of amplitude change while changing from -50 dBm to -53 dBm.

- a. Change high frequency signal generator to -40 dBm.
- b. Hold the VIDEO push button until 2 dB/div appears on the CRT readout.
- c. Check that the marker tip can be positioned on screen.

GROUP CODE 24

DATE: 10-8-87

CHANGE REFERENCE: M64806

PRODUCT: 1705

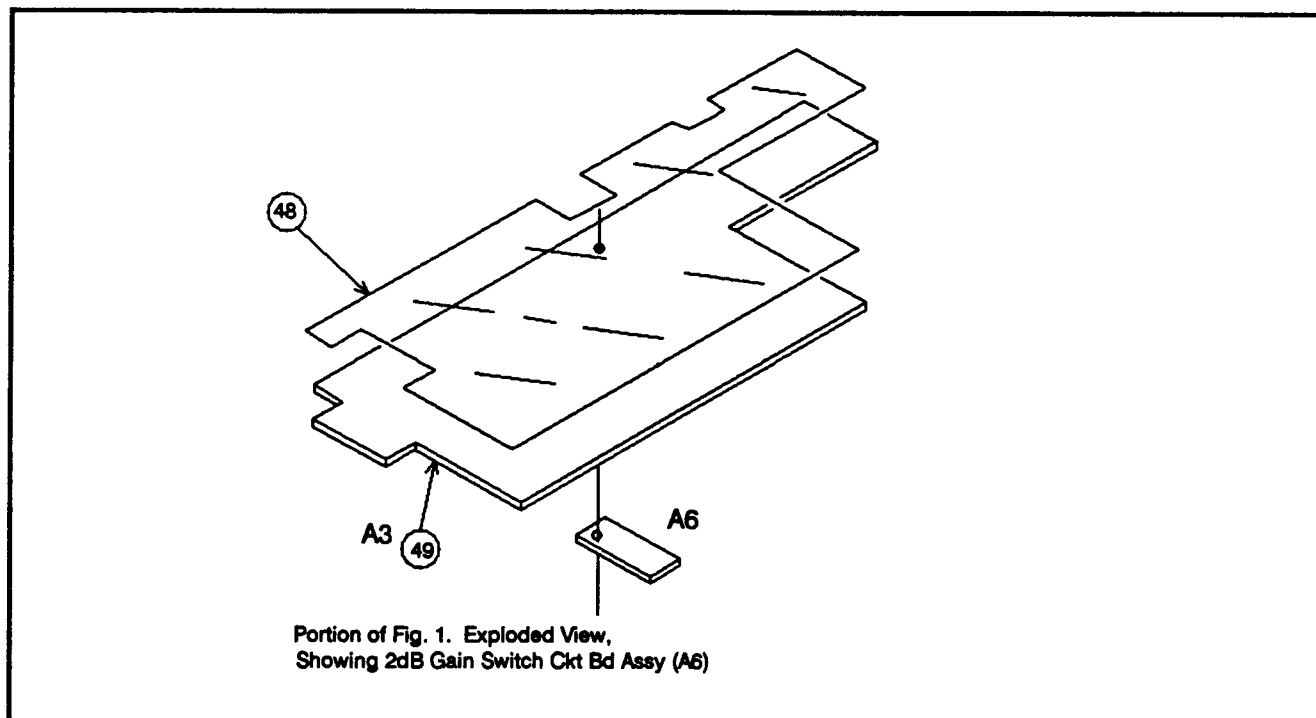
MANUAL PART NO: 070-6355-00

SCHEMATICS CHANGES

ADD:

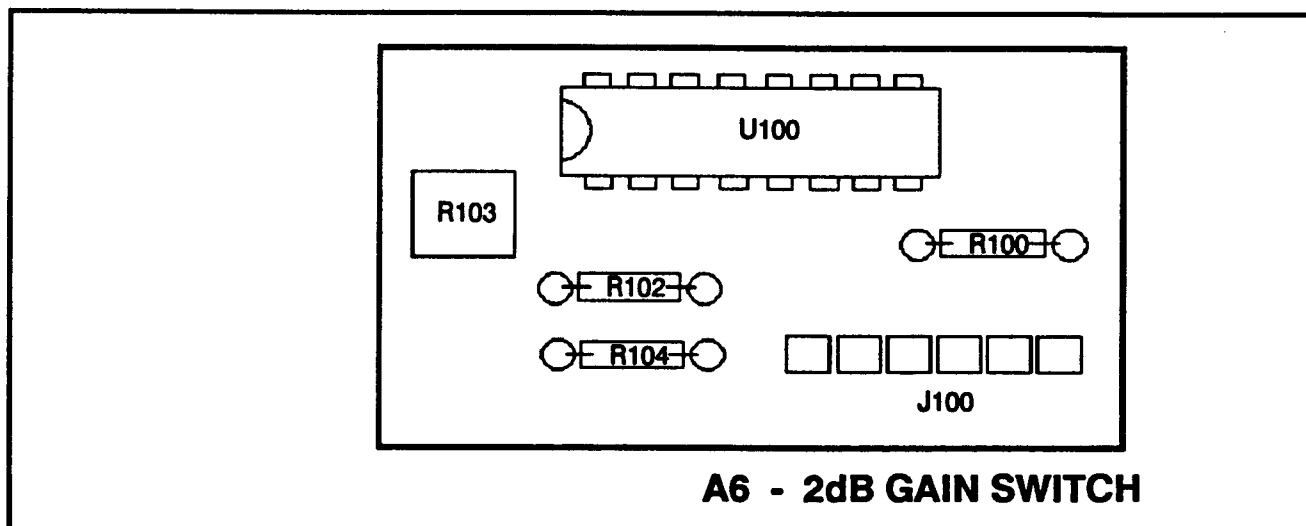
To Fig. 1. Exploded View:

New Circuit Board (A6) Shown Below



ADD:

New Circuit Board Illustration Shown Below



- d. Turn the 1705 SWEEP SPEED control fully counter-clockwise.
- e. CHECK -- for more than 1 division of amplitude change while switching the high frequency signal generator between -50 dBm and -53 dBm.
- f. CHECK -- that the noise floor can be positioned on screen.

ADD:**Sect. 5, Page 5-10**

This step is to be performed only for instruments with 2 dB Gain selection (SN B020000 and Up).

Step 20. ADJUST 2 dB/DIV POSITION(R103)

Sect. 5, Page 5-17

This step is to be performed only for instruments with 2 dB Gain selection (SN B020000 and Up).

Step 20. ADJUST 2 dB/DIV POSITION

- a. Disconnect signal from L-Band input.
- b. Set VERTICAL POSITION control fully clockwise.
- c. Hold VIDEO push-button down until 2 dB/div appears on the CRT readout.
- d. ADJUST -- R103 to position the noise floor to center screen.

Date: 9-17-87 Change Reference: M64774Product: 1720-SERIESManual Part No: 070-5846-00**DESCRIPTION**

EFF SN B012751

1720

EFF SN B010932

1721 / 1721 PAL-M

ELECTRICAL PARTS LIST AND SCHEMATICS CHANGES**CHANGE TO READ:**

A3C235

281-0167-00

CAP,VAR,CER DI:9-45 PF,200V

DIAG. LOC

2

ADJUSTMENT PROCEDURE CHANGES**Sect 5, Page 5-12, Short-Form Procedure****CHANGE TO READ:**

Step 6 to Step 7

Step 7 to Step 8

Step 8 to Step 9

Step 9 to Step 10

Step 10 to Step 11

Step 11 to Step 12

Step 12 to Step 13

Step 13 to Step 14

Step 14 to Step 15

Step 15 to Step 16

ADD NEW STEP:

6. ADJUST LOCK-IN RANGE (C235)

Sect 5, Page 5-14, Long-Form Adjustment Procedure**CHANGE TO READ:**

Step 6 to Step 7

Step 7 to Step 8

Step 8 to Step 9

Step 9 to Step 10

Step 10 to Step 11

Step 11 to Step 12

Step 12 to Step 13

Step 13 to Step 14

Step 14 to Step 15

Step 15 to Step 16

ADD NEW STEP:

6. ADJUST LOCK-IN RANGE

- a. Set the 1720-Series INPUT to CH-B, MODE to VECTOR, and REF to INT.
- b. Change the Television Signal Generator's subcarrier frequency by -50 Hz for NTSC and PAL-M (-10 Hz for PAL).
- c. Connect the voltmeter ground lead to one of the rear-panel ground lugs, and the active lead to pin 1 of U734.
- d. Adjust C235 for a locked display and a voltmeter reading of .5V for NTSC and PAL-M (1V PAL).
- e. Change the generator's subcarrier frequency by +50 Hz for NTSC and PAL-M (+10 Hz for PAL) and check for a locked display.
- f. Return generator to subcarrier frequency.