



# product modification

Scan by Zenith

050-2180-06

M60858, M60968  
M61358, M61386, M61554  
M61814, M62939, M63776

## U2160 OR U2260 REPLACEMENT

For the following TEKTRONIX<sup>®</sup> instruments:

2445A	Serial Numbers B010100 - B011858
2455A	Serial Numbers 100001 - 10XXXX
2465A	Serial Numbers B010100 - B014330
2467	Serial Numbers B010100 - B011011

Microcircuits, pn 160-3302-08 and pn 160-3303-08, replace U2160 and U2260 (earlier versions are no longer available). Both microcircuits must be replaced simultaneously. R362 must be removed and R669 must be replaced.

### NOTE

If the instrument serial number is greater than those listed above or if this kit has been installed, disregard the instructions and use the enclosed microcircuits as direct replacements.

**CAUTION****STATIC SENSITIVE DEVICES**

Static discharge can damage any semiconductor component in this instrument. Static voltages of 1kV to 30kV are common in unprotected environments.

**TO AVOID DAMAGE, OBSERVE THE FOLLOWING:**

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist-strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work-surface covering capable of retaining a static-charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only approved, anti-static type, desoldering tools.

## KIT PARTS LIST:

Ckt. Number	Quantity	Part Number	Description
U2160	1 ea	160-3302-08	Microcircuit, dgtl, 32768 x 8, EPROM
U2260	1 ea	160-3303-08	Microcircuit, dgtl, 65536 x 8, EPROM
R669	1 ea	321-0995-00	Resistor, film, 549k $\Omega$ , 1%, 0.125W
	1 ea	-----	Label, 050-kit

## INSTRUCTIONS:

**WARNING**

*Before proceeding, ensure the mainframe power switch is in the off position, then disconnect the instrument from the power source.*

- ( ) 1. Remove the instrument cabinet.
- ( ) 2. For 2467's only, on the Main circuit board, remove R362 (26.1k $\Omega$ ) if present. R362, when present, is located piggy-back fashion parallel with R361.
- ( ) 3. For 2467's only, replace R669 with the 549 $\Omega$  resistor included in the kit. Some instruments may already have this change; if so, ignore this step.
- ( ) 4. Replace U2160 with the pn 160-3302-XX microcircuit included in the kit.
- ( ) 5. Replace U2260 with the pn 160-3303-XX microcircuit included in the kit.
- ( ) 6. Check instrument performance and recalibrate as necessary.
- ( ) 7. Re-install the instrument cabinet.
- ( ) 8. Correct the electrical parts list in the Instruction Manual with the information included in the kit instructions.
- ( ) 9. Remove the protective backing from the 050-kit label (included in the kit) and place it on a clean, dry area of the rear panel.

RH:rh

## FIRMWARE IMPROVED AND MAIN BOARD MODIFIED

Effective SN: B010180

To correct numerous software bugs, the programming in firmware microcircuits U2160 and U2260 was changed. Replacement of either of the old firmware microcircuits requires replacement of both. Also, use of the new microcircuits required the following changes on the 2467 Main circuit board:

1. R362, a 26.1k $\Omega$  resistor, was removed. This resistor was mounted in parallel with R361 in tepee-fashion; the resistor was no longer needed with the new firmware.
2. R669, a 165k $\Omega$  resistor, was replaced with a 549k $\Omega$  resistor.

Parts Replacement Kit, "U2160 OR U2260 REPLACEMENT", pn 050-2180-XX, is available with parts and instructions for replacement of the microcircuits in pre-modified instruments.

For further information, refer to the Remove/Add list below.

## PARTS REMOVED:

A1	1 ea	670-9268-03	Circuit board, Main, 2467
U2160	1 ea	160-3302-00	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-00	Microcircuit, dgtl, 65536 X 8, EPROM

## PARTS ADDED:

A1	1 ea	670-9268-04	Circuit board, Main, 2467
U2160	1 ea	160-3302-01	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-01	Microcircuit, dgtl, 65536 X 8, EPROM

The new Main circuit board, pn 670-9268-04, is the same as the old Main circuit board, pn 670-9268-03, except for the following:

## PARTS REMOVED:

R362	1 ea	321-0329-00	Resistor, film, 26.1k $\Omega$ , 1%, 0.125W
R669	1 ea	321-0406-00	Resistor, film, 26.1k $\Omega$ , 1%, 0.125W

## PARTS ADDED:

R669	1 ea	321-0995-00	Resistor, film, 549k $\Omega$ , 1%, 0.125W
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M60968

2467

## FIRMWARE IMPROVED

Effective SN: B010180

The programming contained in firmware microcircuits, U2160 and U2260, was changed as follows to correct software problems and add features:

1. A scrolling diagnostics feature was added. If the operator holds down on the trigger mode switches, the diagnostic monitor scrolls through all the TESTs, EXERs, and CALs.
2. LED coding was added during ALL.TEST so the operator can see that the instrument is functioning properly as it performs its ALL.TEST at power up.
3. Corrected the way the INIT@50% switch works with CTT independent B triggers and Menu Function Active states.
4. Corrected problem CTT has with changes to the timing knob in the diagnostic monitor or with power off. If knobs were unlocked at these times, the CTT failed to put up its delay display when the normal mode was entered.
5. Corrected the problem of EXER 09 exiting on the second trigger coupling up switch.
6. Added new intensity control code for compatibility with future products.

For further information, refer to the Remove/Add list below.

## PARTS REMOVED:

U2160	1 ea	160-3302-01	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-01	Microcircuit, dgtl, 32768 X 8, EPROM

## PARTS ADDED:

U2160	1 ea	160-3302-02	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-02	Microcircuit, dgtl, 32768 X 8, EPROM

## FIRMWARE UPDATED

Effective SN: B010124

Changes were made to the programming contained in U2160 and U2260 to correct the following software-related problems:

1. Corrected problem of lost trigger levels when recalling a setup while in the autolevel mode.
2. Corrected problem of readout intensity being set wrong after an AUTO SETUP.
3. Corrected problem of trace intensity being too high when intensity control is fully on.
4. Corrected problem with random CTT TEST 82 and TEST 83 failures.
5. Removed extra switch change that occurred at the end of an AUTO SETUP.

For further information, refer to the Remove/Add list below.

## PARTS REMOVED:

U2160	1 ea	160-3302-03	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-03	Microcircuit, dgtl, 32768 X 8, EPROM

## PARTS ADDED:

U2160	1 ea	160-3302-04	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-04	Microcircuit, dgtl, 32768 X 8, EPROM

## IMPROVEMENTS MADE TO FIRMWARE

Effective 2465A SN: B010891

Effective 2467 SN: B010492

The programming contained in firmware microcircuits, U2160 and U2260, was changed to correct the following problems:

1. The diagnostics monitor was modified to allow TEST 04 to loop. This was the only diagnostics routine not allowed to loop.
2. The diagnostics monitor was modified to update the bottom line of readout and the LEDs to reflect the test in progress during ALL TEST (if in the loop mode). Previously, the readout and LEDs were not updated after the first time ALL TEST was executed.
3. Modified SET.MISC.REGISTER to turn off the Scale Illumination only if in single sequence and normal operation. This allows scale illumination during diagnostics and prevents the scale illumination from flashing on and off during power-up.
4. The programming was changed to correct erroneous indications of TEST 04 failure.
5. The programming was changed to correct a problem of switching between UP key and DOWN keys in scrolling diagnostics mode (switch change would be ignored and the diagnostics would scroll at a faster rate).

## PARTS REMOVED:

U2160	1 ea	160-3302-04	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-04	Microcircuit, dgtl, 32768 X 8, EPROM

## PARTS ADDED:

U2160	1 ea	160-3302-05	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-05	Microcircuit, dgtl, 32768 X 8, EPROM

M61814

2465A

2467

## FIRMWARE BUGS CORRECTED

Effective 2465A SN: B011450

Effective 2467 SN: B010607

The following changes were made to the programming contained in firmware microcircuits U2160 and U2260:

1. Corrected the problem of CAL 06 causing a limit failure if the transient response voltage was set exactly at the limit.
2. Corrected problem of random TEST 02 failures in CYCLE mode.
3. Corrected the problem of the parity not being set correctly if the CAL 04 is not executed properly.
4. Updated the ROM default setup to accommodate the 2465A/2467 new information section of the LLSET command.
5. Modified the power-up routine to keep from corrupting the power-down setup if the power is turned off during the power-up initialization or soon after exiting diagnostics.
6. Improved graticule illumination for single shot photographs by increasing the time the scale illumination is active after the completion of a single shot sequence.
7. Corrected the problem of the MAXIMUM GRID DRIVE setting being reset to 40V whenever the instrument performs its initialization routine.
8. Corrected the problem of multiple triggers occurring because of high frequency noise on the LINE trigger pickoff of the low voltage power supply.
9. Modified the default setting for the high frequency transient response voltages to be 2.5 divisions right of center screen in CAL 06 instead of at the center.
10. Modified the EXE TIMELOG to only blank bottom line of readout if executing the CAL TIMELOG subroutine. This leaves the EXER 05 on the bottom line when executing this routine.
11. Corrected the problem of the INIT@50% feature not always finding the correct trigger level.
12. Corrected the problem of the GPIB bus being hung after an INIT, BALANCE or NORM command.



For further information, refer to the Remove/Add list below.

**PARTS REMOVED:**

U2160	1 ea	160-3302-05	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-05	Microcircuit, dgtl, 32768 X 8, EPROM

**PARTS ADDED:**

U2160	1 ea	160-3302-06	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-06	Microcircuit, dgtl, 32768 X 8, EPROM

## FIRMWARE PROBLEMS CORRECTED

Effective 2465A SN: B014331

Effective 2467 SN: B011012

The following changes were made to the programming contained in firmware microcircuits U2160 and U2260:

1. Corrected a problem that caused INIT@50% feature to fail if used while in composite trigger mode in a standard (non-option) instrument.
2. The Timelog routine was modified to check for out of range values at power up instead of when executing EXER 05 or CAL 05.
3. Corrected numerous timeout errors on the MPTS GPIB bus.
4. Corrected the GPIB/Main Box Save/Recall/Autotsetup interface when in remote or remote with local lockout states.
5. Added a new CYCLE test to check the microprocessor reset circuitry.
6. Modified CAL 08 to run in 2445A/2455A/2465A instruments. Also, modified this CAL substantially to be able to perform a CRT setup procedure.
7. Corrected the problem of the readout shutting down approximately 90 seconds prior to MCP shutdown in the 2467 instruments.
8. Corrected GPIB interface to EXER 01.
9. Corrected the problem of AUTOSETUP not setting the horizontal and vertical correctly if in 50 OHMS or with channel input in the variable mode.
10. Corrected the problem of instruments with invalid trigger level causing the background to be sluggish. This caused a slow cursor symptom. When switching between Delta Volts and Delta Time cursors, up to 1 second of lag time between the switch change and the display being updated could occur.
11. Modified the starting cursor position for the SAVE/RECALL sequence definition menu so if the wrong delay pot is turned the label is not the information that is corrupted.
12. Corrected the problem of AUTOSETUP not recognizing the state of the SEC/DIV switch if activated following a RECALL state conflicting with the state of the SEC/DIV switch.
13. Corrected the problem of the vertical gain for CH1 and CH2 being over-compensated when not in the BW LIMIT mode.

For further information, refer to the Remove/Add list below.

PARTS REMOVED:

U2160	1 ea	160-3302-06	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-06	Microcircuit, dgtl, 32768 X 8, EPROM

PARTS ADDED:

U2160	1 ea	160-3302-07	Microcircuit, dgtl, 32768 X 8, EPROM
U2260	1 ea	160-3303-07	Microcircuit, dgtl, 32768 X 8, EPROM

## FIRMWARE PROBLEMS CORRECTED

2465A Effective SN: B016276

2467 Effective SN: B011246

The following changes were made to the programming contained in firmware microcircuits U2160 and U2260:

1. Corrected a problem intermittent failure of AUTO SETUP.
2. Corrected problem of CH 1 and CH 2 variable range being greater than a 3:1 ratio.
3. To correct numerous trigger and vertical MPTS failures, the vertical and trigger calibration get. peaks routines were modified to ensure the auto level function finds the correct peak values.
4. To reduce cursor-to-signal mismatch error, the cal. cursors subroutine was modified.
5. Modified the CRT calibration (CAL 08) routine to eliminate an invalid setup for the high drive focus step (in 2467 instruments).
6. Corrected the problem of CAL 06 and CAL 08 routines not setting the cursor correctly if entered immediately after power-up.
7. Corrected the problem of the trace intensity data being corrupted during the cycle mode.
8. Modified the cycle routine output <0000> error code in case of RAM failure and changed the reset circuitry error code to be <0003>.
9. Increased the readout intensity level in the cycle mode for the 2465A/2467/2465A instruments.
10. Corrected the problem of the CT CAL 81 failing offset calibration step if it was run after executing CAL 01 without turning off power or exiting diagnostics first.
11. Added a new calibration step to adjust the Z-Axis Transient Responses potentiometer for the 2467 instruments and added a message for the step to adjust dynamic centering for the 2465A instruments in the CRT CAL (CAL 08).
12. Modified CAL 02 to ensure cursors are cleared if DVSF (cursor cal) section of CAL 02 limits and is repeated by pressing down on the trigger coupling switch.

For further information, refer to the Remove/Add list below.

## PARTS REMOVED:

U2160	1 ea	160-3302-07	Microcircuit, dgtl, 32768 X 8 EPROM
U2260	1 ea	160-3303-07	Microcircuit, dgtl, 65536 X 8 EPROM

## PARTS ADDED:

U2160	1 ea	160-3302-08	Microcircuit, dgtl, 32768 X 8 EPROM
U2260	1 ea	160-3303-08	Microcircuit, dgtl, 65536 X 8 EPROM