

1S2 Cal Procedure Outline

File in
152
Tech File

Connect the Type 1S2 to the main frame of a 530, 540, or 550-series scope using Extender Cable 012-0038-00. You can eliminate the wide trace by modifying the extender cable to have a shielded lead between pins 16. Connect the HORIZ OUTPUT of the 1S2 to the external horizontal input of the main frame via a patch cord, set the horizontal display for a horizontal input, and turn on the power.

Set up the 1S2 front-panel switches and controls as follows:

OFFSET control -- dots straight up

RESOLUTION -- Normal

DISPLAY MODE -- Normal

VERTICAL UNITS/DIV -- .5

VERTICAL UNITS/DIV VARIABLE -- in the CAL position

Vertical Units -- Rho

HORIZONTAL UNITS/DIV -- Time

POSITION -- 000

position RANGE -- 1 μ s

DIELECTRIC -- Air

MAGNIFIER -- X1

MAGNIFIER VARIABLE -- in the CAL position

MODE -- External trigger

Plug in a GR 50-ohm termination to the upper vertical input connector.

1. Free run the sampler by turning the TRIGGER SENS knob fully clockwise. Set 1S2 offset controls, and main-frame horizontal positioning, for a trace on-screen. If no trace appears under these conditions, it may be that Memory Balance (R247), Control TD Bias (R544), Offset Range (R396), or Comparator Level (R677) are misadjusted.

J. MULVEY
MAR 1968



2. Set the horizontal input variable, on the scope main frame, for precisely one volt/div by temporarily disconnecting the patch cord at the 1S2, and connecting the patch cord to a 5 or 10-volt calibrator signal from a Standard Amplitude Calibrator, 067-0502-00, and observing correct limits to the horizontal deflection. Reconnect the 1S2 patch cord, and for the remainder of the procedure be careful not to bump the setting of the horizontal input variable control on the scope main frame.
3. Rotate the MODE SWITCH to the .25-volt INT PULSE position. Do not patch the pulse to a vertical input yet. Position the trace on-screen, and adjust Memory Balance (R247) to minimize trace shift when switching the RESOLUTION switch between HIGH and NORMAL. Leave the switch in the NORMAL position. Several minutes warm-up will be required with the plug-in installed before this adjustment can be optimized. You should check it again after the plug-in is inserted, and readjust if necessary. It should be possible to keep the shift to less than 1 division.
4. Check, or adjust, the sampling bridge back-bias voltage for an indication of between 4.0 and 4.2 volts across the Bridge Volts control (R367) using the 60-volt scale of a Triplet 630 MA Meter. (A lower scale may cause too much loading.)
5. Adjust the front-panel OFFSET Control(s) to minimize trace shift when switching between .5 units per division and .005 units per division. The trace probably won't be centered. Leave the VERTICAL UNITS/DIV switch set at .5 units per division. Disconnect the patch cord at the HORIZ OUTPUT of the 1S2, and alternately connect and disconnect it to the X1 OFFSET OUTPUT of the 1S2 while observing horizontal shift in position of the beam. Adjust the OFFSET control(s) while continuing to connect and disconnect the patch cord to

eliminate the shift in horizontal position of the beam. Reconnect the patch cord to the HORIZ OUTPUT and adjust the Bridge Balance control (R360) to minimize vertical trace shift while rotating the VERTICAL UNITS/DIV switch between .5 units per division and .005 units per division. Leave set at .5 units per division.

6. Adjust Variable Balance (R388) so that the trace doesn't shift vertically while rotating the VARIABLE UNITS/DIV control. If the trace goes off-screen go to the next step temporarily, then back to this step.
7. Adjust Offset Range (R396) to center the trace vertically. If the main frame amplifier is not balanced, this control may need to be adjusted when a customer plugs it in.
8. Connect the .25-volt, 50-ps output step to the lower vertical-input connector via two GR elbows. Change the Range switch to .1 μ s, and observe the step on-screen. If there is no step, the 100 mA TD Bias (R411), .25-volt Pulser Bias (R433) or Pulse Position (R621) may be out of adjustment.

Change the MAGNIFIER one step at a time while keeping the step on-screen using the POSITION control, until the MAGNIFIER is at X100. If the step can't be made to remain on-screen, Pulse Position (R621) can usually be pre-adjusted so it does. Leave the MAGNIFIER set at X100.

Adjust Avalanche Volts (R131) and Snap-off Current (R140) for the shortest risetime with a stable trace. Overshoot and ringing are maximum when risetime is shortest. Don't bother to measure risetime yet, because the time base may not be accurate. It is normal for the trace to move up and down



as these adjustments are made, and normal for the position of the pulse to vary radically.

9. Repeat Step 5.
10. Disconnect the 50- Ω GR terminator from the top input connector, and plug it into the lower input connector. Switch the MODE switch to the 1.0-volt pulse position, and connect that pulse output to the upper vertical-input connector via the two GR elbows. Change VERTICAL UNITS/DIV to .2 units per division. Change the RANGE switch to 10 μ s, and the MAGNIFIER to X1, and position the step on-screen with the OFFSET control(s). Adjust the Memory Gate Width (R204) for maximum loop gain by observing the separation between the baseline ahead of the step and the first dot on the rise. Loop gain will be maximum when the separation is greatest.
11. Change the RANGE to 1 μ s, the VERTICAL UNITS/DIV to .05, and rotate the OFFSET control(s) to position the top of the step to approximately center-screen. Adjust Transient Response (R129 and C128) for the flattest, most horizontal top.
*USE 1 μ s/div + ADJ.
CHECK AT 10, 14, 1 μ s*
12. Disconnect the INT PULSE by removing the GR elbows, switch the MODE to EXT TRIG, the RANGE to 10 μ s, and VERTICAL UNITS/DIV to .2. Apply a 1.2-volt signal from a 50- Ω Amplitude Calibrator (067-0502-00) to the upper vertical input of the 1S2. Trigger the 1S2 for a stable display after applying a trigger signal from the 50- Ω Amplitude Calibrator to the EXT TRIG input on the 1S2. The Amplitude Calibrator must have a rep rate of approximately 50 kHz. Early models may be modified to produce a square wave of this frequency. Center the step using the POSITION and OFFSET controls, and monitor the VERT OUT jack on the 1S2 with a 10X probe on a test scope. The accuracy of the test scope at 1 volt per division, including the 10X probe should be



determined with a signal from a Standard Amplitude Calibrator (067-0502-00) to be within about $\pm 1\%$.

Adjust Volts Cal (R356) for precisely 6-volt, 6-division square waves on the test scope.

13. Adjust the VERTICAL GAIN control on the front panel of the 1S2 for precisely 6 cm of displayed amplitude on the scope the 1S2 is operating into. (If either scope has only 4 cm of deflection, change the input signal to .6 volts, and adjust for 3 cm.)
14. Disconnect both inputs from the 50- Ω Amplitude Calibrator, and switch the MODE switch to the internal 1-volt pulse. Connect the two GR elbows between the top two front-panel GR connectors, and set the position control fully clockwise. Adjust 1-Volt Rho (R351) for precisely 5 cm of amplitude. (If the scope has only 4 cm of deflection, change the UNITS/DIV control to .5, and adjust for precisely 2 cm of deflection.)
15. Rotate the MODE switch to the .25-volt position, connect the 50-ohm termination to the top vertical input connector, and connect the .25-volt pulse to the bottom input connector, using the two GR elbows. Adjust .25-volt pulse to the bottom input connector, using the two GR elbows. Adjust .25-Volts Rho (R353) for precisely 5 cm of amplitude. (If the scope deflection is limited to 4 cm, switch UNITS/DIV to .5, and set the amplitude for 2 cm.)

Pulse Generator and Triggering Adjustments:

16. Remove the GR terminator and elbows, and connect GR elbows between upper vertical INPUT and EXT TRIG input. Connect the 50- Ω GR terminator to the lower INPUT. Set VERTICAL UNITS/DIV to .2. Set RANGE to .1 μ s, and MAG to X1.

...with a
to be

... ..
... ..



... ..
... ..

... ..
... ..

... ..
... ..

... ..
... ..



... ..
... ..

... ..
... ..

... ..
... ..



... ..
... ..

Rotate the MODE switch to the EXT TRIG position. Position TRIG SENS fully clockwise. Pre-adjust the Internal Trigger Level Pot (R523) fully counterclockwise. Rotate the Control TD Bias Pot (R544) clockwise until trace appears, and back up about 20 degrees. Advance the Internal Trigger Level pot (R523) clockwise until the trace reappears, and continue clockwise about another 10°. This is a preliminary setting of R523 only. Final adjustment is made in a later step.

POSITION MUST BE AT 0.00 Replace GR elbows. .02 V/DIV.

17. Rotate the MODE switch to UHF SYNC position, and set the front panel UHF SYNC fully counterclockwise. Pre-adjust UHF Sync Sens (R481, on the Pulse Generator board) control fully counterclockwise, then rotate slowly clockwise until the last of several kick-out pulses near the left edge of the screen disappears to the left. Some lower amplitude unmoving kickout signal will remain. Check that rotating UHF SYNC clockwise makes the moving kickout pulses reappear.
18. Rotate the MODE switch to 1.0 V PULSE position, the RANGE switch to the 1 μ s position, and the MAG switch to X10. Adjust 100 mA TD Bias (R411) clockwise to the point where the step disappears, then rotate slowly counterclockwise until the bottom corner of the step has a small bump. Then rotate clockwise until the bump barely disappears.
19. Rotate the MAGNIFIER to X100, and advance the Internal Trigger Level Pot (R523) very slowly clockwise while noting several positions where there are exceptionally large amounts of leading-edge time jitter and instability. Set the Internal Trigger Level pot in the middle of the most stable region.
20. Pull the GR elbows out, set the VERTICAL UNITS/DIV to .005, and center the trace. Reinsert the elbows, and adjust the 1.0-volt Pulse DC Output Level Pot

...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...



...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...



...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...



(R443) so that the baseline level ahead of the step is approximately the same as the trace level when the inputs are disconnected.

21. Disconnect the elbows and the 50- Ω termination, and reinsert the termination at the top, and elbows between the two bottom connectors. Change the MODE switch to the .25-volt pulse position, and the VERTICAL UNITS/DIV to .5. Adjust .25-Volt Pulser Bias (R433) so the .25-volt step is in the center of the range between disappearing to the left and disappearing to the right.
22. Disconnect the elbows, set the VERTICAL UNITS/DIV to .005, and center the free-running trace. Then reinsert the elbows, and adjust the .25-volt Pulser DC Output Level (R439) so the baseline ahead of the step is at approximately the same level as a free-running trace with no input connected.

The 1S2 should now be removed from the extender cable, plugged into the plug-in compartment, and allowed to warm up again for about 10 minutes.

Step 3 should be repeated.

(1) we have the following results:

as the first level, we have:

Since the first level is the same as the second level, we have:

So the first level is the same as the second level.

On the other hand, we have:

Since the first level is the same as the second level, we have:



Since the first level is the same as the second level, we have:

Since the first level is the same as the second level, we have:

Since the first level is the same as the second level, we have:

Since the first level is the same as the second level, we have:

Since the first level is the same as the second level, we have:

Since the first level is the same as the second level, we have:



Since the first level is the same as the second level, we have:

