

RUWB372

ZG-22JAN92UD
GWW-08SEP89CD

Operation of the GN300WB 2090 Digital Oscilloscope

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I. GENERAL

The 2090 Digital Oscilloscope, or Fast Digitizer, is used when faster digitization rates are needed to attain larger sweep widths. The maximum sweep width is ± 1 MHz compared to $\pm 71,428.5$ kHz possible with the normal set up.

When in use, the 2090 Oscilloscope digitizes the real and imaginary FID's and then transfers them to the GN300WB's 1280 computer. Signal averaging occurs within the 1280 computer so that the 2090 Oscilloscope display actually shows each individual scan as it is acquired.

There are some disadvantages in using the fast digitizer. You can only collect up to a 4K spectrum (CB = 4K), which would be a problem when trying to observe narrow linewidths. Also, the receiver input filters have a maximum bandwidth of about 102 kHz. This limits their use to sweep widths less than about ± 100 kHz or dwell times greater than 5 usec. You must turn the filters off (IF = -1) when using sweep widths larger than this. The input filters increase S/N by reducing high frequency noise.

When tuning the probe (XP command), you must revert back to the normal set up. The automatic receiver gain scaling (SG command) does not work with the fast digitizer, either, and you must set it with the GN command.

II. 2090 OSCILLOSCOPE SETTINGS

Note: Tune the probe (XP command) before hooking up the oscilloscope cables to the rear of the GN300WB console. The 1280 computer cannot use the fast digitizer in the tuning mode.

1. On the rear of the GN300WB console (behind the oscilloscope), unplug the cables labeled A2 and B9 from J50 Channel A and J51 Channel B, respectively. These cables are used for the normal set up. The cables are removed by pushing in on the tab while pulling out on the plug. Do not use excessive force.

2. Plug Fast Digitizer Channel A into the J50 Channel. Make sure that the slot inside the plug is on top before inserting it. Plug Fast Digitizer Channel B into the J51 Channel. Again, check the position of the slot before insertion.

3. Turn on the 2090 Oscilloscope and verify the following settings:

- a) Retain Reference: OFF
- b) Storage Control: Push "Hold Last"; the red light will be on.
- c) Channel A: ON, Channel B: ON
- d) Time Per Point: set to desired dwell time, DW.
- e) DC Level: do not adjust.
- f) Range: X1 ON (push in) - both channels.
 ± 10 V (push in) - both channels.
 SIG \pm /GND - flip up to SIG, all four switches.
- g) Trigger Threshold: near zero (i.e., at 9 o'clock).
- h) Trigger mode: NORM
- i) Trigger slope: - AC
- j) Trigger source: EXT
- k) Expansion: Vertical - OFF
 Horizontal - OFF
 Auto Center - OFF
 X/T or Y/T - Y/T
- l) Function: SUB
- m) Memory: ALL (for CB = 4K)

III. GN300WB SOFTWARE SETTINGS

Note: Tune the probe (XP command) using "GEM" before setting up to use the fast digitizer. You cannot tune while the digitizer is connected.

1. Type "MO".
2. In monitor mode and in solids subdirectory, type "TREE" to check, type "GEMXN" to use the fast digitizer rather than "GEM". Remember, you must run "GEM" for probe tuning.

3. Type "C^F". Enter 970 for the configuration number (the configuration number for the normal set up is 968). Do not change the ^1H or clock frequencies. Answer "N" to the "Smart Air Controller?" question. Check the parameters SF, F2 and EX.
4. For ^2H wideline spectra, set LK=off, LT=off and TC=off.
5. Enter CB = 4K.
6. Set DW equal to the desired dwell time. This value must be the same as the time per point setting on the 2090 oscilloscope. The relationship between the dwell time and the \pm sweep width is: $DW = 1/(2 \pm SW)$. In GEMXN, the SW command merely reports the \pm sweep width and does not allow changes to be made.
7. Use the IF command and set the attenuation to -1 to turn off the receiver input filters. You only need to do this for dwell times less than 5 usec (sweep widths greater than ± 100 kHz).
8. Set the display screen scale to VS = 12.
9. By taking single scans, adjust the receiver gain using the GN command so that the FID height at VS = 12 is less than about 1". Type "T" before entering a new gain value. Note: The SG (scale receiver gain) command does not work with the fast digitizer set up.
10. If the FID's on the computer display have random "spikes" in them. it will be necessary to reduce the receiver gain and/or adjust the DC Levels on the 2090 oscilloscope.
The Real and Imaginary FID's on the scope display actually overlap (one on top of the other) and should be centered along the line indicated on the display by switching on and off the autocenter toggle switch. The FID's must not extend beyond the upper and lower limits indicated on the scope display. Adjust the DC Levels and/or the receiver gain (GN command), accordingly.
Another problem which can occur when using the oscilloscope is that the FID's actually have uniformly spaced "zeroed" spots in them. These gaps are more easily seen on the oscilloscope display since it has better resolution than the computer monitor (if you zoom in on the computer display, they are easily seen). On consecutive scans, the gaps change positions in the scope FID's and, as a result, are averaged out in the computer FID's yielding "normal" looking FID's.
This strange behavior occurs when the x-nucleus decoupler is not in heteronuclear mode. To correct: type "XC", turn it on, enter level 1 = 0, level 2 = 0, heteronuclear mode on, CW, and then "XF" to turn the x-nucleus decoupler off.
11. Once you have the dwell time, receiver gain and DC Levels set correctly, set NA to the desired number of scans and begin acquiring your spectrum.
12. Remember, in order to retune the probe for another sample, you must reconnect the cables labeled A2 and B9 into J50 Channel A and J51 Channel B, respectively, on the rear of the console and run "GEM".

IV. SWITCHING BACK TO NORMAL OPERATION

1. Turn off the 2090 oscilloscope.
2. At the rear of the console, disconnect the fast digitizer cables labeled "Fast Digitizer Channel A" and "Fast Digitizer Channel B" from J50 Channel A and J51 Channel B, respectively, and lay them on top of the 2090 oscilloscope.

3. Connect the normal cables labeled "A2" and "B9" into J50 Channel A and J51 Channel B, respectively. Make sure that the slots inside the plugs are on top before inserting them.
4. Type "C^F" and set the configuration number back to 968. Do not change the ¹H or clock frequencies. Answer "N" to the "Smart Air Controller?" question.
5. Set LK, LT and TC as appropriate.
6. Type "IF" to turn on the receiver input filters and enter an attenuation of 3.
7. Type "MO".
8. Type "GEM".