

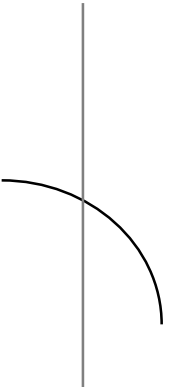
Handshaking with Windows

- Serial port on Windows has some 'interesting' properties
 - 1: Loses occasional characters at 19.2 kbaud.
 - 2: Driver sometimes inserts binary 00h into received data stream.
- Decision to use hexadecimal ASCII to transfer results between units. Slower than Binary, allows use of non-hex characters to synchronize control.
- From D93WE to DSP-93:
 - 'P' starts a parameter block of hex characters, each field is 4 characters. Number of parameters is application-dependent.
 - 'R' instructs DSP-93 to reset itself.
- From DSP-93 to D93WE:
 - blocks of 4-digit parameters are returned.
 - 'Q' is suffixed after all data blocks, D93WE looks for 'Q' to terminate stream, since a lost character is otherwise undetected.
- Positive control: D93WE requests a block of data, DSP-93 sends one block, then waits for next request.
 - Simplest protocol, minimizes buffer size problems.

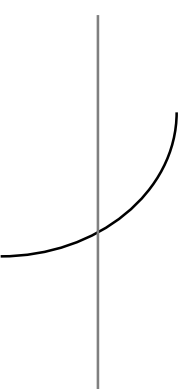
Digital Oscilloscope

- Configured to sample at 62.5 ksps.
- Software selectively discards samples to lower effective sampling rate.
- Display is 512 points, 64 points per horizontal division.
- Triggering
 - Auto trigger prevents lock up on no input signal meeting criteria.
 - Can select slope and level.
- Persistence can be on or off. Can be used for eye pattern in 'ON' mode.

Positive slope



Negative slope



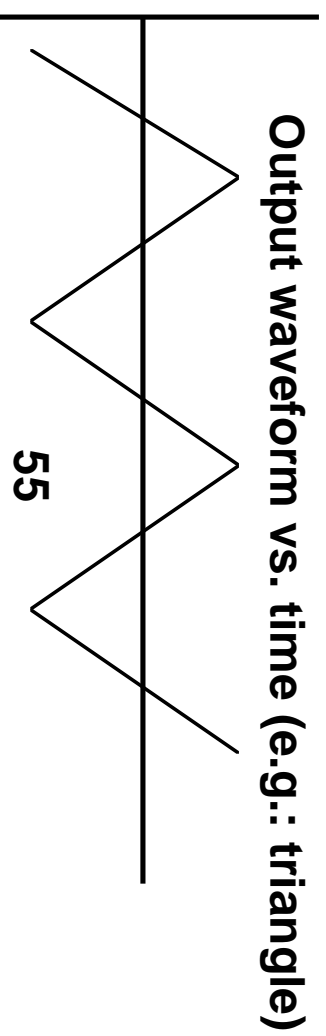
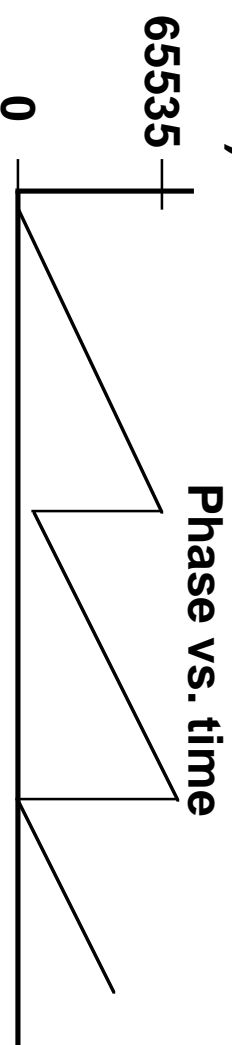
Manual trigger will wait forever until the signal crosses threshold or RESET is hit on DSP-93.

Spectrum Analyzer

- Operates much like digital oscilloscope:
 - Fixed threshold and positive slope.
 - Sampled at 62.5 ksps, software selectively discards samples to alter net effective sampling rate.
- Once a data buffer has been captured, a Discrete Fourier Transform (DFT) is computed on the buffer.
- The REAL, MAG sample pairs are sent from DSP-93 to the Windows program.
 - The Windows software computes the magnitude from the two samples in each frequency bin.
 - Could display phase or group delay by altering the Windows program.
- Persistence modes are selectable:
 - None.
 - Max-hold.
 - Integrate (exponential integrator).

Function Generator

- Based on a numerically controlled oscillator, 16-bits in size.
- Each sample time, some more phase is added. The larger the added phase, the higher the output frequency.
- Phase rolls over at $2\text{-}\pi$ radians.
- An output table converts phase to sine-, triangle- square- and sawtooth-waves as selected.
- Output amplitude is multiplied by level adjust to give final output.
- Small size of output conversion table leads to distortion (not so noticeable with sine wave).



Function Generator - 2

- **Beat-frequency between sampling rate and actual output frequency causes severe distortion for square and sawtooth waves at high frequency.**
- **Output reconstruction filters in D/A cause levels to be frequency dependent.**
- **Output filters in D/A limit maximum usable frequency , especially for square, triangle, and sawtooth waves.**
- **AC-coupling capacitor on DSP-93 limits low-frequency response. Test points are available to bypass the coupling capacitor:**
 - **Use a small value resistor to offer some current limiting protection.**
- **Larger output table would give better looking output waveforms, but would take much longer to download.**

D93WE Directory Structure

IDSP93
IDSP93\ASMI released .asm files
IDSP93\TASMI TASM30.EXE, TASM3225.TBL - TMS320 assembler
IDSP93\WIN31 **D93WE.EXE** - windows executable program
D93WE.HLP - help file for D93WE
D93FUNC.G.OBJ - TMS320 object for Function Generator
D93SPEC.OBJ - TMS320 object for Spectrum Analyzer
D93SCOPE.OBJ - TMS320 object for Oscilloscope
MEMTEST.OBJ - TMS320 object for Memory Test utility

D93WE .INI initialization file

```
[ .INI file for D93WE program ]

CommPort=COM1
BaudRate=19200
BitsPerWord=8
Parity=0           ;0=NoParity 1=Odd 2=Even 3=Mark 4=Space
NumberStopBits=0 ;0=OneStopBit 1=1.5StopBits 2=TwoStopBits
Assembler=\dsp93\asm\tasm.exe      ;filename of TMS320 assembler
Linker=
Simulator=
Editor=c:\windows\write.exe        ;file of windows editor
InstrumentPath=\dsp93\win31         ;place where TMS code for instruments is

[ user installed applications, delete any you don't want ]

App1File=File1.obj
App1Title=Set_a_title_for_1
App2File=File2.obj
App2Title=Set_a_title_for_2
;App3File=File3.obj      ; commenting out a line removes it from the menu
;App3Title=Set_a_title_for_3 ; remember to comment out both lines in a pair
App4File=File5.obj
App4Title=Set_a_title_for_5
App5File=File6.obj
App5Title=Set_a_title_for_6
```

Using DSP93 Debugger

```
; Version Date      Author      Reason
; 0.0.1  10-27-94  TCMcDermott  Original
; 1.0.0  11-19-94  TCMcDermott  Full release version for monitor code
;                                     Adds mode control for single, passcount,
;                                     and stop modes.
;
; ----- debugger routine -----
; Assumes that data page pointer = 8, to find DEBUGPC, DEBUGML, 61
; DEBUGPC contains the passcount/mode:
;   = 0      : causes the debug to trap always
;   = n      : value gets decremented by one each call, it stops
;             decrementing at zero and causes debug trap
;   = 0FFFFh : causes the debug to trap always, then waits for
;             keyboard input (any key) to continue.
;
; DEBUGML points to a memory location in DATA RAM that will be printed
; to screen.
;
; DEBUGML and DEBUGPC are defined in MONITOR.INC
;
; Prints: Program_Counter, Accum, the ARn registers, P, T, ST0, ST1,
;         and 8 memory locations starting at DEBUGML
;
; AR7 gets destroyed (used as context-save pointer)
;
; Location 61 in page 8 (0461h) gets over59ritten
```


The Challenge

- **Improve on existing Code when possible.**
 - **Study programs supplied with DSP-93.**
 - **Seek out other DSP code and translate it to the DSP-93**
 - » **Document the task of translating from one DSP mfg. to another.**
 - » **Port some of the BBS code to the DSP-93**
- **Contribute to an operations manual.**
- **Develop a new application for the DSP-93**
 - **Hearing Test program.**
 - **Frequency Shift of Audio to a preferred range.**
 - **Sound buster or Anti Sound device.**
 - **Improved speech processor for HF**
 - **Touch Tone Encode and Decoder**
- **Share your experiences on the Internet**
- **Document your radio interface if you feel it has not been documented.**

Information Sources

- **DSP-93 on the Internet**
 - Send email to listserv@tapr.org with following in the message text:
subscribe dsp-93 <your email address>
 - Ask about a bibliography on dsp-93.
- **TMS320C2x Users's Guide By Texas Instruments**
 - Book Number SPRU014C
 -
- **Linear Circuits Data Book Volume 2**
 - Book Number SL YD004A
 -
- **TI Customer Response 800-232-3200**