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You should have the following materials at hand:

- A WD-900 uEngine-based system with 8" floppies,
- A Terminal which supports RS-232 at 9,600 baud or faster,
- RS-232 cable making kit ("DB-25"s, cable, soldering iron),
- Documentation for the serial port connection of the terminal,
- "On Cabling a WD-900 for VS Software", a VS tech note,
- "WD-900 Baud Rate Switches", a VS tech note,
- The VS systems disk for the uEngine WD-900 SBC. This is labeled as SYS_3na (where n = (0-synch, 1-asynch), and "a" identifies the current release), and

We also recommend:

- Reading the Doc file(s) on the Sys diskette, when you have a system up;
- A WD-90 Pascal MicroEngine(tm) Reference Manual is available from WD; however better documentation is available for the systems software from Advanced Digital Design, San Diego;
- If you speak hardware, the schematics and some diagnostics are also available from WD; and
- DGN_Wna (where "na" is release and version labeling). This is the VS diagnostics disk for the WD-900. It is nice to have, but is optional, as the two mandatory diagnostic programs are on the SYS diskette. The diagnostics are documented separately.

The basic steps to get on the air are:

- 0 - Add a wire to the back of the board so software can control disk density,
- 1 - Connect the terminal as the system console,
- 2 - Set the baud rate switches for port "a",
- 3 - Set the system configuration switches for the disk shape and density,
- 4 - Set the boot density selection switch, and
- 5 - Boot and copy the system diskette.

BOARD ORIENTATION and TERMINOLOGY

When a location on the board is referenced, such as "upper right", a standard view of the board is assumed; that is, you are facing the component side of the board (as opposed to solder) and the edge connector (those 100 gold fingers) are "down". This implies that the connectors for cabling are "up" and the memory array is in the "lower left".

DIP switches, there are three sets of them on the board, are said to be "up", "down", "right", or "left", denoting which end of the switch's paddle is pushed in toward the surface of the board.

STEP 0 - Add a wire to the back of the board

This step is optional, and is only necessary if you wish to operate your system in dual density mode; that is, with mode selectable under the automatic control of the system software.

WD software and hardware demands that your system be either single or double density, but neither the twain shall meet. In the upper right section of the board there is a two switch DIP of which the upper, switch-1, controls the density; right being double and left being single. VS software supports your adding a wire to the back of this switch so that software can dynamically control the density selection.

Unfortunately, WD-900 microcode boots from track one, not track zero! As track one is recorded in either single or double density, depending on the mode of the rest of the diskette, the density select switch must be set accordingly to boot

a diskette. Furthermore, the density selection switch ties the density line to ground when in double density mode, and to a pull-up resistor when in single mode. This implies that software can only control the situation when the switch is in the single mode (to the left). Thus the "normal" way of using the density feature is:

- Boot double and run that way normally.
- When you wish to see a single density disk, then, while running in double density, throw the switch and system software will take over.

Alternatively, you may choose to boot and run in single density mode, which will automatically allow mixed use of double density without manual intervention.

The jumper wire which must be added should go

FROM : A25-10. This is the LS174 two chips to the left of the red Erie crystal or alternatively, the second chip down from the left edge of the floppy cable connector. Pin 10 is one pin up from the bottom right of the chip. This is an otherwise unused output of the drive selection latch!

TO : Switch L9-8. This is the upper right pin of the density select switch. Note that the board was set up for a four switch DIP, therefore the upper right pin is called pin-8.

STEP 1 - Connect the terminal as the system console

The system expects the CONSOLE: (units #1: and #2:) to be connected to serial port "A". Furthermore, VS software demands that the connection supply the full modem hardware ready signals (CTS, DSR, CxD). Please read "On Cabling a WD-900 for VS Software" for a detailed discussion of these considerations.

Here is a cable for simplest of connections. Note that there may be some signals which must be conditioned for the terminal to operate, therefore the terminal's documentation should be studied.

uE		Terminal	Notes
TxD	2 ---/ /-----	n RxD	n and m are almost always pins 2/3 or 3/2
RxD	3 ---/ /-----	m TxD	just make sure that cable routes T-R and R-D
Cnd	7 ---/ /-----	7 Cnd	this is signal ground. do not connect pin 1
RTS	4 --		supplies the hot for the "hotwire"
CTS	5 --		so uE's UART will transmit at all
DSR	6 --		so VS software will xmit
CxD	8 --		so VS software will xmit

Proper operation of this connection can be verified, after your system is up, with the diagnostic SerDiag (see diagnostics diskette and documentation).

STEP 2 - Set the baud rate switches for port "A"

The baud rate for serial port "A" is set via the horizontal DIP switch which is three quarters of the way up the left edge of the board (X16). The rightmost four switches (5-8) control port "A". For a baud rate of 19,200 the switches should be set all down. For 9,600 turn only switch 8 Up.

See the tech note "WD-900 Baud Rate Switches" for more detail.

VS software assumes: 8 data bits, 1 stop bit, no parity; and your terminal should be set accordingly. In fact, hadn't you best check out all of the switches on the terminal too, in case it has peculiar requirements?

STEP 3 - Set the system configuration switches for the disk shape and density

Whereas the Density Selection Switch (Step 4) tells the hardware the disk configuration, the software will have to be told separately. The switch X14, the vertically oriented 8-position DIP just to the left of the center of the

board, readable under software control, is used for this purpose. The standard release WD I/O Drivers as of 10-Nov-79 did not use the switches (although they do use three positions on the latch corresponding to switches 5 through 7).

sw2	sw1	Meaning
R	R	Seek at 3ms per Step
R	L	Seek at 6ms per Step
L	R	Seek at 10ms per Step
L	L	Seek at 15ms per Step
sw3 (used only at boot)		
R		Single density boot volume
L		Double density boot volume
sw4 (used only at boot)		
R		Single Sided system
L		Double Sided system
sw5 - sw7 Reserved by WD, must be to Right		
sw8		
R		Printer on Serial Port E
L		Printer on Parallel Port B with "Centronics" interface

The seek rate of Shugart SA-800 disk drives is specified at 8ms per track, but most can operate comfortably at 6ms. We suggest starting at 10ms, and when all is working satisfactorily (try Disk Terror Diagnostic/Exercise), then try using 6ms. If all remains proper, you have a 40% faster seek; if not take consolation in the probability that the latency of floppies is of more serious effect.

Remex drives are specified at 3ms seek, and seem to do quite well. The fast seek rate makes them appealing despite their noise.

The disk shape and density selection controls the initial value which will be assigned to all units. The density may be dynamically modified by the system after boot if and only if the modification in Step 0 has been made. If you intend to operate in only one mode, then merely set the hardware selection switch (Step 4) and this software configuration switch to the appropriate setting as described above.

STEP 4 - Set the boot density selection switch

The hardware controlling the floppy has its basic clocking determined by switch L9, a two switch DIP in the upper right of the board immediately to the right of the FDC piggyback board. The upper switch controls the density, and the lower selects between 5" and 8" drives.

The upper switch, labeled 1, selects double density to the right and single density to the left. When the modification described in Step 0 has been applied, the software may dynamically change the density iff this switch is in the single density mode. Most users set this switch to the right and run double density normally and only throw it on occasions when they wish to "see" a single density disk in one drive or the other.

We know of no one who has 5" drives working with a WD-900, so please throw the bottom switch (2) to the left.

Note, the program Mapper must be run to "see" a DEC/UCSD standard disk; although AdaptableSystem/FDQ format diskettes may be read and written on-the-fly by using a keyboard command sequence described in the Doc file on the SYS diskette.

STEP 5 - Boot and copy the system diskette

You should now be ready to turn the system on and attempt to boot the SYS_3na
diskette, AFTER DOING A COMPLETE VISUAL CHECK OF ALL CABLING, CONNECTIONS,
POWER, AND OTHER COMPONENTS!!!

Note that the WD-900 has some difficulties booting, and patience is rewarded.
Before you call VE support, please note how far the boot has progressed by
observing the disk arm movement.

Please remember to read the "Doc" files on the system diskette.

Happy computing.

!xjmsvllnx!f8!ejB!