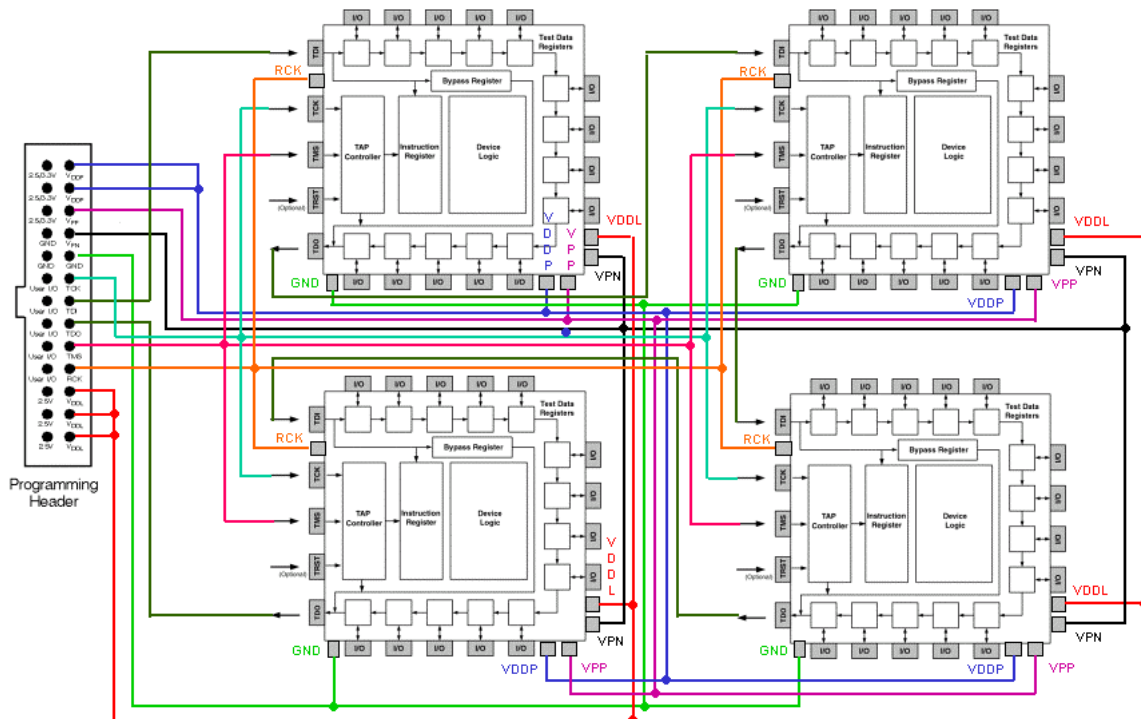


## ProASIC Daisy-Chain Programming

In order to allow customers to program several, possibly different, ProASIC devices using a single header, a new daisy-chaining feature has been implemented in the latest version of the Sculptor Programming Software ( [http://www.actel.com/support/updates/updates\\_programming.html](http://www.actel.com/support/updates/updates_programming.html) ). This version of the daisy-chain solution programs one device at a time using the JTAG chain.

The various ProASIC devices on the board are tied together, with a single header, by connecting the TDO port of the first device to the TDI of the following part, all other JTAG signals, i.e. TCK, TMS, are shared between the devices. The TDI of the first device is connected to the TDI of the header and the TDO of the last device is connected to the TDO of the header. As depicted in Figure 1, all the devices share the programming voltages (VDDP, VDDL, VPN, VPP, and GND).



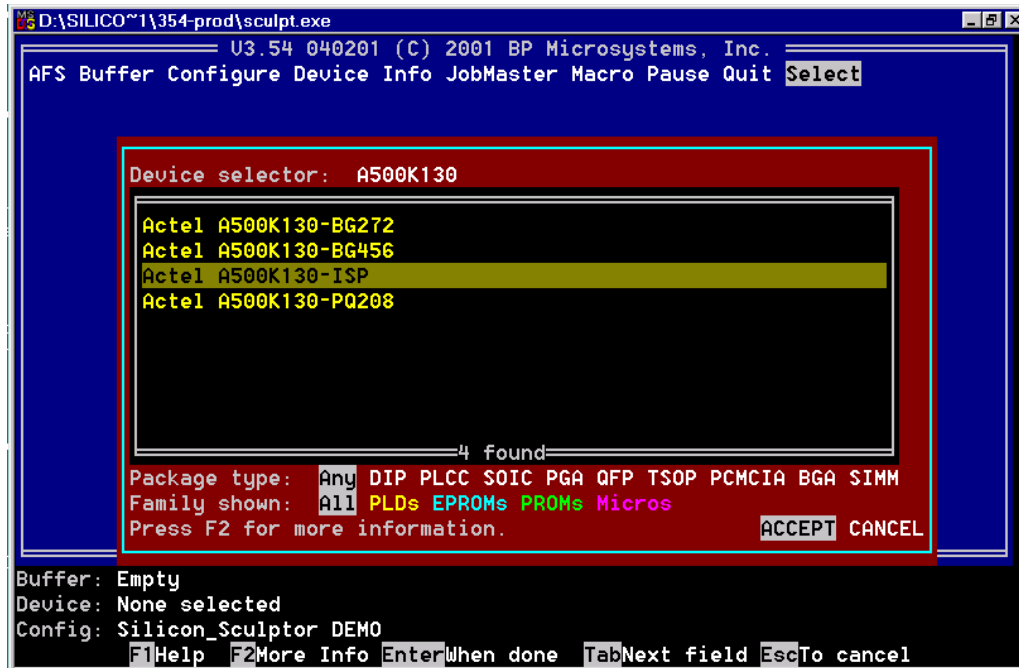
Programming a device within a chain is similar to programming a single device, except that the operator users must supply the software some information regarding the chain.

### ProASIC Daisy-Chain Programming Using Sculptor Software

For illustration purposes, let us assume that we have a chain that consists of six A500K130 devices, and that we plan to program the 3rd device within that chain. Please note that device number 1 is the device connected to the TDO of the header, and device number 6 is the device connected to the TDI of the header. (So the first device is the device nearest to the TDO and the last device is the device nearest to the TDI. This is done because when the devices are connected together, they are consider a single long shift register. The device near the TDO would form the beginning of this shift register and data for that device would need to be shifted in first, hence it is device number 1) The The procedure is almost identical to single device programming except for step 3, where the operator positions the target device in the chain, by providing two numbers **PRE** and **POST**. **PRE** specifies how many devices are in front of the target device, while **POST** indicates to the Sculptor Software how many devices are after the target device. The procedure is briefly described below:

1. Load the bit stream from **BUFFER/LOAD** menu.
2. From the **Select** menu, specify the targeted device. For the example shown in Figure 2, select the A500K130-ISP device.

Notice that in this case we have only A500K130 devices, but if the chain included 4 A500K130s and one A500K180s, and the A500K180 is the targeted device, then the user would need to select the A500180-ISP.



3. Enter information about the chain and the position of the target device. **Device-D\_Chain** will bring up a sub menu allowing the entry of chain and device information as describer earlier.

The screenshot shows a command-line window titled "D:\SILICO~1\354-prod\sculpt.exe". The main menu includes options: AFS, Buffer, Configure, Device, Info, JobMaster, Macro, Pause, Quit, Select, D\_Chain, Device\_Id, Erase, Operations, Options, Program, Read, Secure, Sum, and Verify. A red box highlights the "Daisy Chain settings:" menu with the following values: PRE : 2 and POST : 3. Below the settings are "ACCEPT" and "CANCEL" options. At the bottom of the window, status information is displayed: Buffer: Empty, Device: Actel A500K130-ISP, Size: 364922x8, Pins: 26, and Config: Silicon\_Sculptor DEMO Verify-Twice Check-IDs. A footer line contains: Help, Enter When done, Tab Next field, Esc To cancel.

4. Start the programming sequence as usual, i.e. by using **Device-Program**.

#### Current Limitations

Currently there are some limitations to the daisy-chaining support:

1. The chain must be ProASIC homogeneous, i.e. all the devices in the chain must be ProASIC devices, potentially any combination of A500K050, A500K130, A500K180, or A500K270. Devices from other vendors such as from Altera, Xilinx or others can not be in the chain
2. Because of the driver capability of the Sculptor, the maximum number of devices allowed in a chain is 8
3. Only one device can be programmed at a time
4. Cannot handle one bit-stream for multiple parts