Using Emplant11™

INTRODUCTION

Emplant11 is an assembly consisting of a 52-pin PLCC plug, a printed circuit board, and a 50-conductor ribbon cable. It is designed to permit any of Technological Arts' 50-pin microcontroller modules (both Adapt11 and Adapt12 families) to be used as an emulator for a target 68HC11 board running in single-chip mode. The choice of microcontroller module used as the emulator will depend on what is to be accomplished. Below are some possibilities, and a description of their implementation.

68HC11 CODE DEVELOPMENT

To facilitate code development for a one-time programmable (OTP) version of 68HC11 (namely, 68HC711E9 or 68HC711E20), Emplant11 can be used in conjunction with Adapt11C24DX to provide EEPROM for code, in lieu of OTP. The additional code space can be used to accomodate diagnostic code during development.

For true 68HC711E9 emulation, including on-chip 512-byte block of EEPROM, a 68HC11E1 (or a 68HC711E9 with ROM disabled in the CONFIG register) should be used with Adapt11C24DX. That way, code developed using the emulator can be loaded directly into the OTP part without modification. For true 68HC711E20 emulation, a 68HC711E20 with ROM disabled in the CONFIG register should be used. This will provide the 768-byte RAM block as well as the 512-byte EEPROM block present in the 'E20. Consult your Adapt11C24DX manual for details on modifying the CONFIG register.

If desired, the developer can take advantage of PCBUG11 to develop code. Disassembling and modifying memory, loading s-records– even the breakpoint feature for tracing– can all be used. This can be accomplished by "tricking" PCBUG11 into providing a delay when writing to loacations in EEPROM. Simply specify the range of EEPROM as $8000–$FFFF, and disable ERASE-BEFORE-WRITE. Whenever PCBUG11 needs to modify a location in this address range (eg. to insert breakpoints), it will apply its EEPROM programming algorithm. The algorithm's manipulation of the HC11 EEPROM programming register will have no effect, since internal EEPROM is not being written to, but a delay will be inserted after each byte is written, giving sufficient time to program external EEPROM. Note that the WRITE PROT switch must be put in the WRITE position for this to work. (As long as the BPROT register has not been cleared, inadvertent writes to internal EEPROM will not occur.) To prevent corruption of the external EEPROM contents, however, the switch should be left in the PROT position while the unit is being powered up or down. Consult your Adapt11C24DX Starter Package Manual or the PCBUG11 User Manual for further details on using PCBUG11.

CONVERTING AN APPLICATION FROM HC11 TO HC12

Emplant11 can be used to evaluate and develop a new 68HC12-based design for an existing 68HC11 (single-chip mode) product. Simply attach any Adapt12-family module to the 50-pin ribbon cable on Emplant11, and plug it into the target hardware's HC11 socket. With some minor software changes, you will be able to exercise the target hardware's interface circuits. The 68HC12 provides a four-fold bus speed increase, plus a wealth of new instructions and addressing modes. It also offers a powerful Background Debug Mode (BDM), which can be used with any HC12 BDM pod (such as Adapt912 running in POD mode) to assist in code development without tying up any of the chip's resources.

IMPLEMENTATION ISSUES

1) potential RS232 driver conflicts
The emulator MCU's TX line will feed both the emulator's RS232 driver and the target's RS232 (or RS485) driver (if it exists) without problems; however, the MCU's RX input should be driven from only one RS232 receiver at a time (otherwise the receiver chips could be damaged). An isolation switch on Emplant11 (SW2) has been provided (REV 3 and

higher) to address this. Below is a discussion of some recommended approaches:
• If the target board does not use PD0 and PD1 for anything (ie. unconnected), SW2 doesn't matter, since there will be no conflict when using the emulator's RS232 port to load code.
• If you wish to use the target board's RS232 to load code into the emulator, remove the RX jumper on your emulator board and replace it with a switch. When downloading code, move Emplant11's SW2 to SCI (passing the SCI pins of the MCU through to the target) and turn off the emulator board RX switch. Then use the target RS232 interface for downloading and debugging. If for some reason you don't want to use the target's RS232 port, move SW2 to ISOL and download code directly through the emulator board's RS232 port (with RX switched on). When finished, switch RX off and set Emplant11 SW2 to SCI.
• If the target board is using PD0 and/or PD1 for general purpose I/O lines, then replace the TX link on your emulator board with a switch (you may wish to use a DPDT swtich, so that RX and TX can be switched simultaneously). When downloading through the emulator's RS232 port, set Emplant11 SW2 to ISOL and turn the RX/TX switch on; when finished downloading, turn it off and set SW2 back to SCI.

2) Adapt812 Revision 0 and Revision 1 incompatibilities
The pinout on early revisions of Adapt812 has a different arrangement for the SPI signals (PS5 through PS7). These have been corrected in REV 2 and higher of the board. If you're using a REV 0 or REV 1 board, these pins cannot be used for SPI in your target board. If your application uses them for general purpose I/O, you'll need to modify your software to re-map the pins, as appropriate. Compare the Emplant11 pinouts to your Adapt812 pinouts to determine the required re-mapping.

3) 5-Volt supply
The emulator module can be powered in one of three ways:
• the target hardware can supply regulated 5V via the Vdd and Vss pins of the 68HC11 socket. To avoid reverse-biasing the unused regulator on your emulator board, remove its 5V isolation link (consult schematic/data sheet to determine its location). Make sure the SW1 (5V isolation switch) on Emplant11 is set to +5V.
• the emulator board can supply 5V from its own regulator to the target board via Emplant11. This will work only if the target board's 5V supply requirements do not exceed the emulator board regulator's capacity (consult your emulator board's manual to determine the available capacity of the voltage regulator). Make sure the SW1 on Emplant11 is set for +5V.
• the target board and the emulator board can each be powered independently. Make sure SW1 on Emplant11 is set to ISOL.

4) STRB
The STRB pin on Adapt11C24DX, Adapt11C75, and Adapt11C75DX modules is brought out on pin 43. If STRB is being used, jumper it to pin 34 of Emplant11's 50-pin connector. Consult your Emplant11 datasheet for pin-numbering information.

5) Reversed bit order for PortB
All Adapt12 products have reversed bit-order for the pins corresponding to 68HC11 PortB (ie. pins 35 through 42). For example, Adapt812, Adapt912DT60, and Adapt912DG128 has KWH0 through KWH7 corresponding to Adapt11 PB7 through PB0, respectively. If this port is being used, your software must be modified accordingly.

6) Adapt912/B32 Port PDLC has only 7-bits (ie. there is no connection to pin 35 of H1), and the bit order is reversed. So Adapt11 PC7 through PC1 corresponds to Adapt912/B32 port lines PDLC0 through PDLC6, respectively (ie. pins 42 through 46).