



Pluto 6 Development Kit User Manual

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1 INTRODUCTION

This User Manual describes how to use the Pluto 6 Development Kit in a development environment. The User Manual gives an overview of the software that is included with the Pluto 6 Development Kit. The User Manual also describes how to use the demonstration programs that are also included.

1.1 Pluto 6 Documentation

Hardware documentation for Pluto 6 is covered in a separate User Manual.
Refer to: 80-16322 - Pluto 6 User Manual.

Software documentation for Pluto 6 is covered in a separate Compiled Help file.
Refer to: 80-17314 - Pluto 6 Software User Manual.

These manuals are included on the Pluto 6 Development Kit CD-ROM. The latest versions of these manuals are also available on the Heber website (<http://www.heber.co.uk>).

1.1.1 Viewing the Pluto 6 Documentation

The Pluto 6 Software documentation is supplied in Compiled Help format. After the Development Kit software has been installed the Compiled Help file can be accessed through the PC Start menu.

To open the Compiled Help file, click: **Start - Programs - Pluto 6 - Pluto 6 Software Help**.

All of the Pluto 6 documentation can also be found in the C:\heber\pluto6\documentation directory on the PC where the Development Kit is installed.

1.2 System Requirements

PC running Windows® 2000 or XP.

Note: Windows® 95, 98, NT, or ME are not supported.

1.3 Development Kit Contents

The Pluto 6 Development Kit contains the following items:

Part No.	Description
01-17862	Pluto 6 Dual Video Debug Board
01-16443	2 off Calypso 32 Video cards (2nd Calypso 32 card is located behind the CD case)
01-18012	Pluto 6 Dual Video Development Kit CD-ROM with Pluto 6 Development Kit Software
63-82513	P&E ColdFire® Shielded BDM Interface Module
63-82514	P&E ColdFire® Debug Software
01-16607	Pluto 6 Evaluation Board
21-18535	256MB Compact Flash Card containing Demonstration Software
63-82516	Belkin USB Compact Flash Card Reader/Writer
61-14620	2 off 25-way D-Type Serial Cables
31-81194	25 to 9-Way D-Type Converter
63-81647	FPGA Extractor
63-82413	Development Kit ATX PSU
63-82256	Power Supply Cable

2 SOFTWARE OVERVIEW

The Pluto 6 Development Kit includes software libraries that enable a game developer to start their development on Pluto 6.

2.1 Software Libraries

The Pluto 6 software libraries are organised into modules. Each of the modules provides a set of device drivers each with an Application Programming Interface (API) that provides functions that are accessible to the game developer. Each module is provided in the form of a compiled archive for inclusion in a game project.

The following modules are provided:

- Hardware Abstraction Module
- Standard Peripherals Module
- Custom Peripherals Module
- Standard Interface Module

2.1.1 Hardware Abstraction Module

This module provides an API to access the Pluto 6 hardware and contains the following drivers:

Driver	Description
Advanced Video Driver	The Advanced Video Driver allows the advanced features of the Calypso 32 graphics driver software to be used, including support for Dual Video systems where 2 Calypso 32 graphics cards are used.
Multiplex Driver	The multiplex module is a device driver controlling the multiplexed lamps and seven segment displays.
Multiplexed Inputs	The Multiplexed Inputs module is a device driver controlling system inputs.
Outputs Driver	The Outputs Driver allows the control of the Pluto 6 system outputs.
Serial Communications Driver	The Serial Communications Driver allows access to the services of multiple serial devices available on the Pluto 6 control board.
PIC18 Driver	The PIC18 Driver provides functions to access data on the PIC18 Customer Security Device (CSD).
M-Bus (I2C) Driver	The M-Bus Driver provides an I2C interface on the Pluto 6 control board.
Vacuum Fluorescent Display Driver	The Vacuum Fluorescent Display (VFD) Driver provides low level functions for addressing vacuum fluorescent displays.
ATA Driver	The ATA Driver provides the low level functions to access an ATA hard disk or Compact Flash card.
Device Manager	The Device Manager provides the functionality for manipulating device drivers.

Entry Module	The Entry module provides the low-level initialisation of the Pluto 6 hardware.
Interrupt Module	The Interrupt Module provides functionality to allow the user to install functions that will run triggered by system interrupts

2.1.2 Standard Peripherals Module

This module contains drivers that allow the game developer to control devices that are peripheral to the Pluto 6 control board but are commonly used in game development. The module contains the following drivers:

Driver	Description
Timer Driver	The timers module provides an API to use the Pluto 6 on board timers.
Generic Touch Screen Controller Driver	The Generic touch screen driver provides a common API to specific touch screen controllers.
ELO Touch Screen Controller Driver	The ELO touch screen driver provides an API to allow developers to write applications using ELO touch screens. The basic functionality is accessed through the generic touch screen API. Advanced control functions are also provided that can be accessed directly.
Microtouch Touch Screen Controller Driver	The Microtouch touch screen driver provides an API to allow developers to write applications using Microtouch touch screens. The basic functionality is accessed through the generic touch screen API. Advanced control functions are also provided that can be accessed directly.
Generic Stepper Motor Driver	The Generic Stepper Motor driver provides a common API to control specific stepper motors.
Reel Stepper Motor Driver	The Reel Stepper Motor driver is a specialised driver that allows the developer to control reels in gaming applications. The functionality is accessed through the generic stepper motor API.
E2ROM Driver	The E2ROM driver module provides functions to read from and write data to the EEPROM Device optionally fitted to the Pluto 6 board.

2.1.3 Custom Peripherals Module

The Custom Peripherals Module allows games developers to create their own drivers and build them into GNU library files for inclusion in game projects. This is useful where a developer needs a driver for a particular device, for example a coin mechanism. The source code is supplied for all drivers in this module, which can be adapted to suit a particular hardware device. The module contains the following drivers:

Driver	Description
RM161680	This is the ramp table and definitions for a Starpoint RM161680 reel and can be used as a template from which to derive ramp tables for other types of reels.

2.1.4 Standard Interface Module

This module provides interface drivers that use the services of lower level device drivers. The drivers provide a simple interface to allow the game developer to perform the following tasks:

- Access a file system on an ATA device
- Load audio samples from an ATA device
- Load graphics files from an ATA device

The module contains the following drivers:

Driver	Description
FAT32 Driver	The FAT32 driver provides an API to allow the developer to access files stored on an ATA device formatted with a FAT32 file system.
Streamed Audio Driver	The Streamed Audio driver provides an API to allow the developer to stream audio files in .wav format from an ATA device.
Heber Sound File Audio Driver	The Heber Sound File (HSF) audio driver is an alternative streaming sound driver, which provides the capability to stream up to 4 channels of audio from a Compact Flash card.
Microsoft® Windows® BMP Bitmap Graphics File Loader	The Microsoft® Windows® BMP bitmap graphics file loader allows the developers to load .bmp format graphics files from an ATA device to video memory.
TGA Bitmap Graphics File Loader	The TGA bitmap graphics file loader allows the developers to load .tga format graphics files from an ATA device to video memory.
Heber Image Format Graphics File Loader	The Heber Image Format (HIF) graphics file loader allows the developers to load .hif format graphics files from an ATA device to video memory.

2.2 Application Module Software

The Application Module Provides a starting point for developers to write gaming applications. Files within the module allow the configuration and installation of device drivers provided by the library modules, and provide a basic framework for game development. The source code is supplied for this module.

2.2.1 Application Examples

The following example applications are provided that can be used as a template/starting point for game development:

Example Project	Description
Standard Demonstration Program	Standard project demonstrating use of the Pluto 6 software API.
Dual Video Demonstration Program	Dual screen video project demonstrating advanced features of Calypso 32 video card.
Touchscreen Demonstration Program	Touchscreen Demonstration project demonstrating the Calypso 32 Advanced Video Driver in a touchscreen setup.
Boot Loader Project	Boot loader project demonstrating loading game code from a Compact Flash card.

3 DEMONSTRATION PROGRAMS

The following demonstration programs are supplied with the Pluto 6 Development Kit:

- Standard Demonstration Program
- Dual Video Demonstration Program
- Touchscreen Demonstration Program
- Boot Loader

The demonstration programs give examples of how to use the API calls described in the Pluto 6 Software User Manual.

3.1 Demonstration Program

The Standard Demonstration Program (demo.s19) is included on the Compact Flash card in the Development Kit. The Standard Demonstration Program allows the user to test the hardware functionality of Pluto 6 using the Heber software libraries. The program demonstrates the API functions that would typically be used in a reel based application.

3.1.1 *Audio Samples*

Audio samples are supplied in the Demonstration Program. The audio files are loaded from the Compact Flash card.

3.2 Dual Video Demonstration Program

The Dual Video demonstration program (vdemo.s19) is included on the Compact Flash card in the Development Kit. The Dual Video demonstration program shows the use of the Calypso 32 Advanced Video drivers in a dual screen setup and provides examples of techniques that are common to video gaming applications.

3.2.1 *Video Demonstration Images*

The images used in all of the video demonstrations are in 24 bit per pixel Windows® bitmap (.bmp) format and are loaded from the Compact Flash card.

3.3 Touchscreen Demonstration Program

The Touchscreen demonstration program shows the use of the Calypso 32 Advanced Video Driver in a touchscreen setup and provides examples of techniques that are common to video gaming applications, for example calibration and moving a sprite with the finger on screen.

3.4 Boot Loader Project

The Boot Loader is used to load and execute the demonstration programs. The Boot loader resides in the Boot Flash which is fitted in socket U1 on the Pluto 6 control board and is automatically executed when the Pluto 6 is powered up.

Note: All Compact Flash cards must be formatted with the FAT 32 File system and not the FAT file system.

4 USING THE DEVELOPMENT KIT

Place the Pluto 6 Development Kit CD in the CD-ROM drive of your PC. The Setup program should run automatically. If the CD-ROM does not install automatically, follow the instructions below.

4.1 Installing Manually

If the installation does not start automatically, double-click the CD Drive icon in My Computer, and then double-click the Setup icon. Follow the on screen instructions to complete the installation.

It is recommended that you choose the Complete Installation and accept the Default Install Path. This will create a c:\heber directory for the installation.

Following the installation you will be prompted to reboot your computer. It is recommended that you accept this option because until your computer has been rebooted the paths required by the GNU compiler will not be set up.

Once your computer has restarted, check that the paths have been set up correctly:

1. From the desktop, click: **Start - Settings - Control Panel**.
2. Double-click the **System** icon and choose the **Advanced** tab.
3. Click the **Environment Variables** button.
4. In the 'System Variables' section, select **Path**.
5. Click the **Edit** button.
6. The following paths should be appended to the path:
c:\heber\exe\gcc-m68k\bin
c:\heber\exe\cygnus\cygwin-b20\h-i586-cygwin32\bin
c:\heber\exe\utils

Note: If you are using Windows® 2000 copy and paste the following path:
c:\heber\exe\gcc-m68k\bin;c:\heber\exe\cygnus\cygwin-b20\h-i586-cygwin32\bin;c:\heber\exe\utils

7. Install the P&E In Circuit Debugger software. This software is supplied separately on the P&E Software CD. Put the CD into your CD-ROM drive. If it does not start automatically, open the CD-ROM drive and double-click the Setup icon to start the installation. It is recommended that you install the P&E software onto drive C, as problems may be encountered if it is installed to a different drive.

4.2 Installing the Compact Flash Reader/Writer

To install and use the Compact Flash card reader/writer refer to the manufacturer's instructions on the driver CD provided with the Pluto 6 Development Kit.

4.3 Installing Adobe Acrobat Reader

The documentation for the Pluto 6 is supplied in either Compiled Help or PDF format. In order to view the PDF files you will need to have Adobe® Acrobat® Reader installed on your computer. To install Adobe® Acrobat® Reader, double click on the **AdbeRdr70_enu_full.exe** icon in the c:\heber\pluto6\adobe\reader\v7 directory.

Or download from: <http://www.adobe.com/products/acrobat/readstep2.html>

4.4 Connecting Your Pluto 6 Board

4.4.1 Serial Cable

The serial cable is a 25 way D-Type male to 25 way D-Type female.

1. Connect the male end to the **DATAPORT** connector (P22) on the Pluto 6 board or the **DATAPORT** connector on the Evaluation Board.
2. Fit the 25-to-9 way D-Type converter to the female end of the cable and connect it to a serial port on your PC.

4.4.2 Parallel Port Cable

The parallel port cable is a 25 way D-Type male to 25 way D-Type female.

Connect the male end to the parallel port of your PC and the female end to the ICD Debug Module.

4.4.3 ICD Debug Module

The ICD module has a 25 way D-Type male at one end and a 26 way IDC connector at the other.

Connect the 25 way D-Type end to the parallel port cable and connect the 26 way IDC end to the BDM connector on the Pluto 6 board (P4). Ensure that the module faces away from the Pluto 6 board, as shown in the diagram below.



Pluto 6 BDM Module Connection

4.4.4 Power Supply

1. Plug the mains cable into the ATX power supply and connect the 20 way ATX connector to the Pluto 6 Evaluation Board. The green **STAND BY** LED will be illuminated.
2. To power up the board turn the **POWER** switch into the **ON** position, as shown in the diagram below.

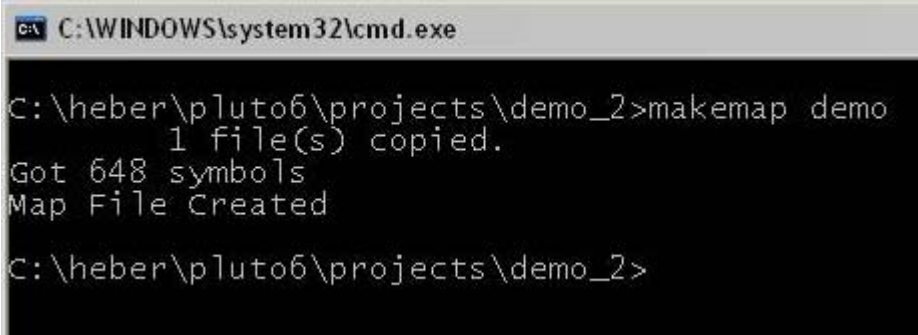


Pluto 6 Evaluation Board Power Switch

4.5 Building Software

To build a Pluto 6 project using the GNU compiler:

1. On the PC where the Pluto 6 Development Kit software is installed, open a Command Prompt (DOS) Window (Start - Accessories - Command Prompt).
2. Change directory into the Pluto 6 demo project directory (C:\heber\pluto6\projects\demo)
3. Type **make** to run the makefile to build the demo project. To force a build of the project delete all of the object files in the directory (**touch *.c**) and type **make**.
4. Type **makemap demo** (if building a standard non-video project) or **makemap vdemo** (if building a dual video project) to create a map which can be read by the P&E debugger.



```

C:\WINDOWS\system32\cmd.exe
C:\heber\pluto6\projects\demo_2>makemap demo
      1 file(s) copied.
Got 648 symbols
Map File Created

C:\heber\pluto6\projects\demo_2>

```

Note: For further information on the makefile, refer to the GNU Compiler section in the Pluto 6 Software User Manual Compiled Help File (Heber part no. 80-17314).

4.6 Using the Demonstration Projects

When using the demonstration projects during your development, it is recommended that you make a copy of the demo folder that you want to change. Any changes that you make should be made to the copied versions of the demo projects.

4.7 Running Your Code on Pluto 6

Built projects in the project directory can be loaded on to the Pluto 6 control board in the following ways:

4.7.1 Running from Compact Flash

The boot flash, fitted into socket U1 on the Pluto 6 control board is programmed with the boot loader project.

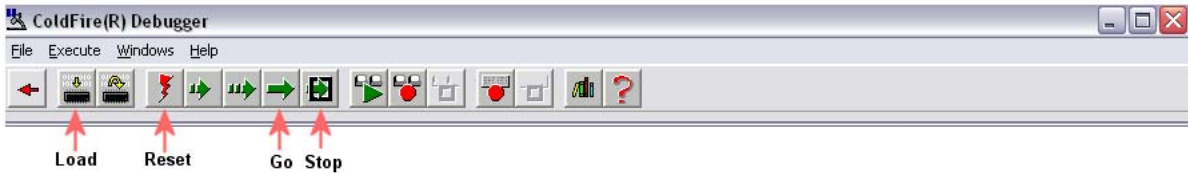
1. Ensure that the output file from the project that you have built is called **demo.s19** if it is a non-video project or **vdemo.s19** if it is a video project.
2. Copy the **.s19** file to the **root directory** of the Compact Flash card using the Compact Flash reader/writer.
3. Fit the Compact Flash card into the **CF SLOT** on the Pluto 6 board.
4. Power the board up and the project will be loaded into DRAM and execute.

Note: If you are attempting to run a dual video project, two Calypso 32 video cards must be fitted to expansion connectors **EXP 0** and **EXP 1** on the Pluto 6 board. If you are running a single screen video project, only one Calypso 32 card needs to be fitted into **EXP 1** on the Pluto 6 board.

4.8 Using the P&E ICD Debugger

Ensure that the ICD software is installed. The ICD software is on the P&E Software CD included with the Pluto 6 Development Kit. Ensure the debug module attached to both the Pluto 6 board and your PC.

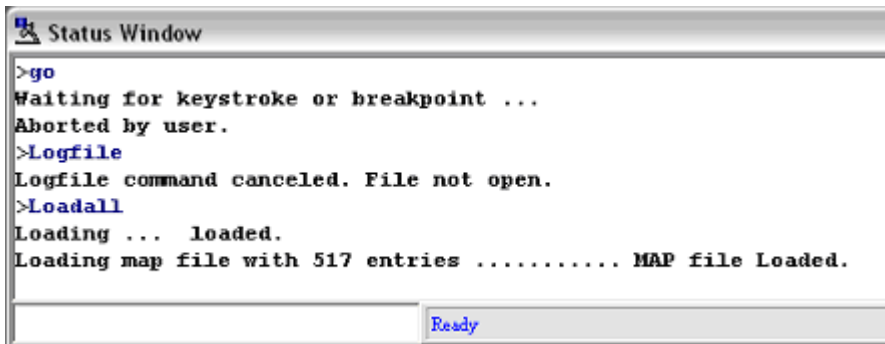
1. Power up the Pluto 6 board and launch the P&E ICDCFZ ColdFire® ICD software. The following toolbar is displayed:



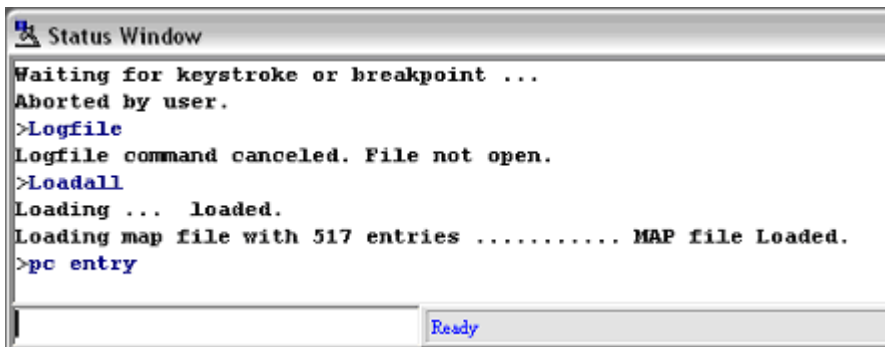
2. Click the **Reset** button on the software tool bar to reset the ColdFire® processor on the Pluto 6 board.
3. Click the **Go** button on the software tool bar to execute the code in the boot flash. This code will run the Pluto 6 entry code and set up the chip select registers on the ColdFire® processor.
4. After a few seconds click the **Stop** button on the software tool bar to stop the boot flash code executing.

Note: Do not reset the CPU at this point because the chip select settings set by the boot flash code will be cleared.

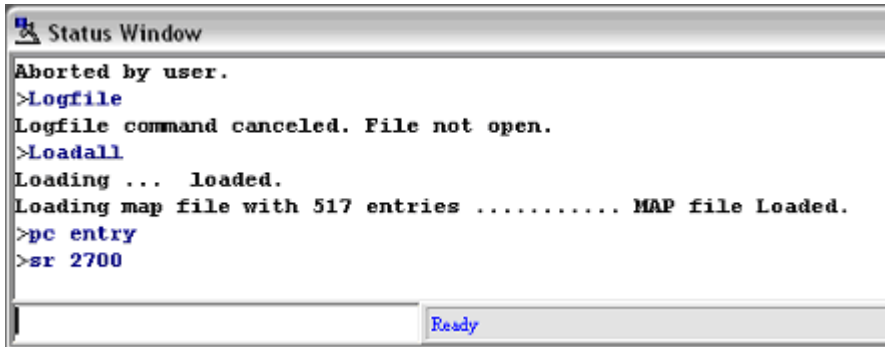
5. Click the **Load** button on the software tool bar, select the .s19 file that you wish to load (e.g. demo.s19) and click Open. In the ICD software Status Window a Loading.... message will appear. When the .s19 file has loaded a loaded message will appear in the Status Window:



6. Type `pc entry`, to set the program counter to the beginning of the program, then press Enter:



7. Type SR 2700, then press Enter to reinitialise the processor to a supervisor mode:

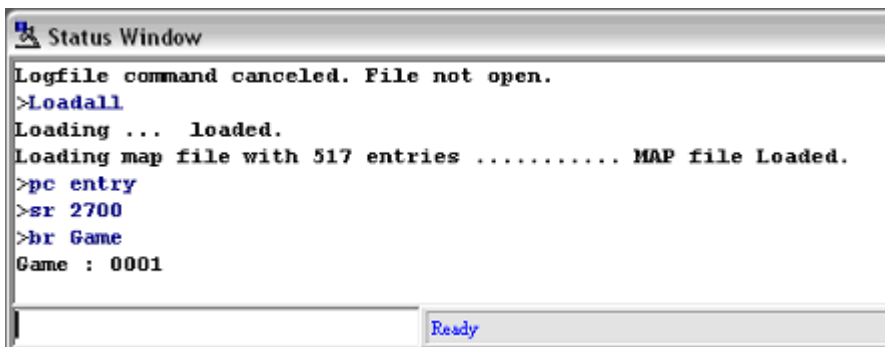


```

Status Window
Aborted by user.
>Logfile
Logfile command canceled. File not open.
>Loadall
Loading ... loaded.
Loading map file with 517 entries ..... MAP file Loaded.
>pc entry
>sr 2700
Ready

```

8. Type br Game, then press Enter to reach a breakpoint at the beginning of function Game:

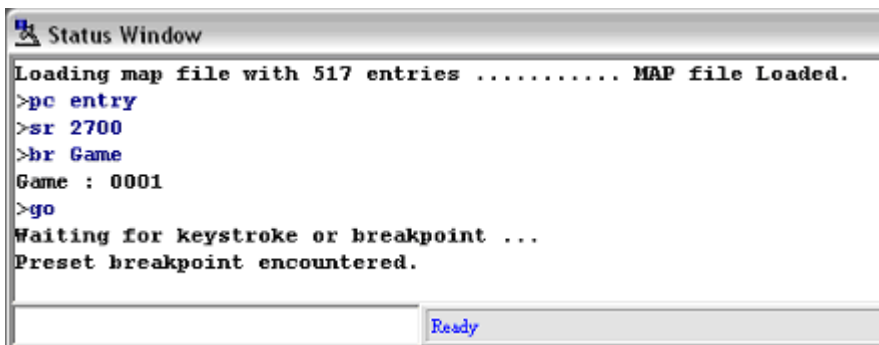


```

Status Window
Logfile command canceled. File not open.
>Loadall
Loading ... loaded.
Loading map file with 517 entries ..... MAP file Loaded.
>pc entry
>sr 2700
>br Game
Game : 0001
Ready

```

9. Type go, then press Enter to run the program:



```

Status Window
Loading map file with 517 entries ..... MAP file Loaded.
>pc entry
>sr 2700
>br Game
Game : 0001
>go
Waiting for keystroke or breakpoint ...
Preset breakpoint encountered.
Ready

```

The debugger will stop when it reaches the breakpoint.

4.9 Further Information

For further information on using the P&E ICD Debugger, refer to the documentation provided on the P&E Software CD that is included in the Pluto 6 Development Kit.