Pluto 6 User Manual

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If your query is not covered in this User Manual, or you require further information, please email Heber Customer Support: support@heber.co.uk

The latest version of this User Manual and other technical information can be found on the Heber website: www.heber.co.uk

The information contained in this User Manual is believed to be accurate and reliable. However, Heber Ltd. assumes no responsibility for its use, and reserves the right to revise the documentation without notice.

Precise specifications may change without prior notice.

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1 INTRODUCTION

The **Pluto 6 Controller** board is the next generation controller in the **Pluto** family of products. It builds on the proven reliability and technical excellence of **Pluto 5** and provides improved performance and flexibility.

Further information can be found in the **PLUTO 6 SOFTWARE HELP FILE** (Heber Part no. 80-17314).

Queries that are not covered by this manual should be sent by email to support@heber.co.uk

2 DIFFERENCES FROM PLUTO 5

The **Pluto 6 Controller** board is an upgrade to the standard **Pluto 5** board to meet the new demands of the gaming market. The following is a list of performance upgrades and additional functionality:

- **Processor;** the Motorola 68304 processor upgraded to the Motorola ColdFire® MCF5206e running at 40Mhz.
- **Programme Memory;** on-board EPROM's have been replaced by a Compact Flash card shown in figure 1.
- **Audio**; the OKI sound system has been replaced with a flexible software driven audio system. This provides flexibility of audio format and the number of implemented audio channels.
- **Power Off Switch Monitoring**; standard monitoring of up to 4 switch inputs while power is removed from the board.
- **Real Time Clock;** now a standard function.
- **HI^2/ccTalk;** a dual interface has been added as standard.
- **RS485;** a low cost RS485 option has been added for multi-player style machines.
- **Stake/Prize keys;** dedicated inputs have been added for the stake and prize keys.

Figure 1 - Compact Flash Card

3 SPECIFICATION

The **Pluto 6 Controller** specification is shown in table 1. A mechanical layout is shown in figure 2 and a photo is shown in figure 3.

This specification may be subject to change without notification.

Table 1 - Pluto 6 Specification

FEATURE	Pluto 6 Controller
Processor	Motorola ColdFire® MCF5206e @ 40MHz.
Flash	Boot flash socket capable of accepting up to 512Kbyte.
RAM	• 256K bytes (128Kx16), battery backed static RAM with Battery Fail Monitor • 2Mbytes EDO DRAM
Program Memory Options	• 1 off Compact Flash (CF) Slot. • 1 off IDE port for Hard Disk or CD-ROM • EPROM/FLASH Card in DIN41612 socket.
Software Security	Multi Level Software protection mechanisms
Sound	Stereo Codec with software multichannel mixing.
Audio Amplifier	5W + 5W, Software controlled volume
Real Time Clock	Yes
Lamp Multiplex	256 Lamps, 12V/1.2W, 48V supply
LED Multiplex	32 digits, 7 Segment LED (256 segments)
Multiplex Features	• Current sensing to allow test for both “Bulb Present” and “Bulb Short” • May be expanded externally by up to 512 Lamps or 512 LED Segments • Fully independent setting of each Lamp/LED to 1 of 8 brightness levels.
Outputs	64 off 250mA Open Drain Outputs (TPIC6259).
Inputs	32 off Inputs +5V CMOS thresholds with +5V pull-ups.
Low Power Outputs	6 off 100mA Open Drain outputs with +5V pull-ups
Input / Output Expansion	Input/ Output Bus Expansion Connector
I^2C	External I^2C bus connector
Security	Current Sensed Meter Supply
DIL Switches	2 off 8 way DIL Switches
Serial Ports	• 4 off RS232 Levels (including one configured as BACTA Dataport). • 1 off TTL level. • 1 off RS485 level. • 2 off HI^2/ccTalk levels. • 4 UARTs on standard Pluto 6. • Socket for optional DUART to provide a total of 6 UARTs. • All routing between UARTs and Serial Ports under software control.
Percentage/Prize Keys	Dedicated connectors
Power-Down Security Monitoring	Up to 4 switch inputs
Video Expansion	Optional Single or Dual Video expansion via 2 168pin DIMM sockets.

3.1 Video Add-on Capabilities

Video performance can be added to Pluto 6 with the Calypso 32 video expansion card.

Pluto 6 boards with the PCB part number: 56-16310 can be used with a single Calypso 32 card.
Pluto 6 boards with the PCB part number: 56-17800 can be used with one or two Calypso 32 cards. When two Calypso 32 cards are used, Pluto 6 provides dual video.

The Calypso 32 card is designed around the Fujitsu Cremson graphics processor and has 32Mbytes of video memory. For more information see the **PLUTO 6 CALYPSO 32 VIDEO CARD USER MANUAL** (Heber Part no. 80-16538).

3.2 Identifying the Version of your Pluto 6 Board

Pluto 6 boards with a single VGA connector (labelled P24 on the PCB) can only be used with a single Calypso 32 card. These boards can be identified by the part number: 56-16310-I (where I is the Issue Number).

Pluto 6 boards with two VGA connectors (labelled P24 and P25 on the PCB) can be used with a single Calypso 32 card or two Calypso 32 cards. These boards can be identified by the part number: 56-17800-I (where I is the Issue Number).

The PCB part number and issue number are printed on the back of a Pluto 6 board.

3.3 Mechanical Construction

Pluto 6 is manufactured as a multilayer PCB assembly of dimensions 206mm x 282mm (8.1" x 11.1").

3.4 Power Supply Requirements

Pluto 6 requires the following power supplies and signals (applied to connector P18):

- +12V. Also provides supply for LED drive, audio amplifier, current sensing +12V output and distributed to various I/O connectors.
- +5V. Internally regulated to provide +3.3V supplies for CPU and FPGA.
- +48V. This is the Multiplexed lamp supply.
- –12V. Used for the RS232 transmitters and distributed to the Dataport connector, P24.
- Power fail signal, active low input connected to pin 10.

Customers with applications where a +48V supply is required may wish to look at the Sanken SPS077W. Customers with applications that do not require a +48V supply may wish to look at PC ATX power supplies. When using this type of supply customers should always check the minimum loading requirements.

3.5 Input / Output connectors

3.5.1 Schedule of Connector Types

The Pluto 6 Controller uses five different families of connectors:

- AMP MTA-100, 2.54mm single in-line headers with friction lock and bump polarisation.
- AMP MTA-156, 3.96mm single in-line headers with friction lock and bump polarisation.
- AMP LOW PROFILE BOX HEADER, 2.54mm dual row headers with bump polarisation.
- 25 way “D” Type header.
- 15 way hi density “D” type header (only used when Calypso 32 is fitted).

3.5.2 Summary of Connectors

Table 2 - Summary of Connectors

IDENT	CONNECTOR TYPE	LABEL	DESCRIPTION
P1	168w DIMM Connector	**EXP 1**	Video Expansion Daughter Board
P2	168w DIMM Connector	**EXP 0**	Video Expansion Daughter Board
P3	96w DIN41612	**Memory Expansion**	Memory Daughter Board
P4	26w 0.1" Low Profile Box Header	**BDM**	ColdFire® Debug Connector
P5	40w 0.1" Low Profile Box Header	**IDE**	IDE
P6	50w Compact Flash	**CF**	Compact Flash Socket
P7	14w 0.1" Low Profile Box Header	**%AGE/ STAKE**	Percentage/Stake Keys
P8	10w 0.1" Low Profile Box Header	**SECURITY**	Power-down Switch Monitor x 4
P9	18w AMP MTA-100 Header	**LAMP SINKS**	Multiplex Lamp Column Sinks
P10	34w 0.1" Low Profile Box Header	**LEDS**	Multiplex LEDs
P11	17w AMP MTA-100 Header	**LAMP SRC**	Multiplex Lamp Row Sources
P12	50w 0.1" Low Profile Box Header	**REELS**	Reels (24 OP / 6 IP)
P13	34w 0.1" Low Profile Header	**I/O 2**	I/O 2 (16 OP / 14 IP)
P14	40w 0.1" Low Profile Header	**I/O 1**	I/O 1 (24 OP / 12 IP)
P15	9w AMP MTA-100 Header	**AUX Ops**	Low Power Outputs (x6)
P16	8w AMP MTA-100 Header	**MPX EXP**	Multiplex Expansion
P17	26w 0.1" Low Profile Box Header	**I/O EXP BUS**	I/O Expansion Bus
P18	11w AMP MTA-156 Header	**POWER**	Power In
P19	6w AMP MTA-100 Header	**LS**	Loudspeakers
P20	20w 0.1" Low Profile Box Header	**HI^2/ccTalk**	HI^2/ccTalk CH1 & CH2
P21	16w 0.1" Low Profile Box Header	**RS232 A/C/D**	RS232 Serial Ports A, C & D
P22	25w D Socket	**DATAPORT**	RS232 Serial Port B (Dataport)
P23	12w AMP MTA-100 Header	**TTL/RS485**	TTL Serial/RS485 Serial
P24	15w Sub-miniature D Socket	**VIDEO EXP 0**	VGA Video Out
P25	15w Sub-miniature D Socket	**VIDEO EXP 1**	VGA Video Out
P26	7w AMP MTA-100 Header		Reserved for future expansion.
P27	5w AMP MTA-100 Header	**I^{2}C**	I^{2}C Bus

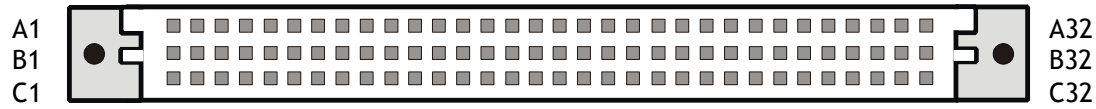
3.5.3 P1 and P2 – Expansion Connectors EXP 0 and EXP 1

Reference: P1 and P2
Type: 168 Way DIMM Connector
Description: Expansion Connectors EXP 0 and EXP 1

Designed for use with the Calypso 32 video add-on card.

3.5.4 P3 – Memory Expansion Connector EXP3

Reference: P3
Type: 96 Way DIN41612 (3 rows x 32 pins)
Description: Memory Expansion Connector. Designed for use with Pluto 6 EPROM card.



3.5.4.1 P3A

A1	Address bus 0
A2	Address bus 2
A3	Address bus 4
A4	Address bus 6
A5	Address bus 8
A6	Address bus 10
A7	Address bus 12
A8	Address bus 14
A9	Address bus 16
A10	Address bus 18
A11	Address bus 20
A12	Address bus 22
A13	Address bus 24
A14	Chip select 1 Upper Byte -
A15	Chip select 1 Lower Byte -
A16	RAM Expansion Output Enable
A17	RAM Expansion Write Enable
A18	RAM Expansion Chip Select 0
A19	Read/Write Signal
A20	Expansion Detect
A21	Ground
A22	Ground
A23	Ground
A24	Ground
A25	Ground
A26	Ground
A27	Ground
A28	Ground
A29	Ground
A30	Ground
A31	Ground
A32	Battery Feed Output (from Pluto 6 board)

3.5.4.2 P3B

There are no connections to pins B1 to B32 (middle row of connector P3).

3.5.4.3 P3C

C1	Address bus 1
C2	Address bus 3
C3	Address bus 5
C4	Address bus 7
C5	Address bus 9
C6	Address bus 11
C7	Address bus 13
C8	Address bus 15
C9	Address bus 17
C10	Address bus 19
C11	Address bus 21
C12	Address bus 23
C13	+5V Output
C14	Data bus 16
C15	Data bus 17
C16	Data bus 18
C17	Data bus 19
C18	Data bus 20
C19	Data bus 21
C20	Data bus 22
C21	Data bus 23
C22	Data bus 24
C23	Data bus 25
C24	Data bus 26
C25	Data bus 27
C26	Data bus 28
C27	Data bus 29
C28	Data bus 30
C29	Data bus 31
C30	+3.3V Output
C31	Ground
C32	Battery Voltage Signal

3.5.5 P4 – BDM

Reference: P4
Type: 26 Way Low Profile
Description: Background Debug Mode Connector

Requests for details of this connector should be sent by email to: support@heber.co.uk

3.5.6 P5 – IDE

Reference: P5
Type: 40 Way Low Profile
Description: IDE Connector

Designed for use with a CD-ROM or Hard Disk.

3.5.7 P6 – Compact Flash

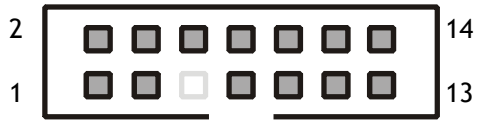
Reference: P6
Type: 50 Way Compact Flash Card Connector
Description: Compact Flash Card Connector

Designed for use with Compact Flash cards. Heber supplies Compact Flash cards that have been approved for use with Pluto 6. These are available in 64MB, 128MB and 256MB capacities. For ordering information, see Ordering Compact Flash on page 19. For information on using other types of Compact Flash cards, please email: support@heber.co.uk

Note: Heber does not recommend the use of Memorex Compact Flash cards with Pluto 6.

3.5.8 P7 – PERCENTAGE / STAKE KEYS

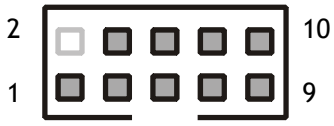
Reference: P7
Type: 14 Way Low Profile
Description: Percentage / Stake Key Inputs



Stake/Prize Key Input 0	1	2	Stake/Prize Key Input 1
Stake/Prize Key Input 2	3	4	Stake/Prize Key Input 3
Polarising Position	5	6	Stake/Prize Key Input 4
Stake/Prize Key Input 5	7	8	Stake/Prize Key Input 6
Ground	9	10	Percentage Key Input 0
Percentage Key Input 1	11	12	Percentage Key Input 2
Percentage Key Input 3	13	14	Ground

3.5.9 P8 – SECURITY

Reference: P8
Type: 10 Way Low Profile
Description: Power Off Switch Monitoring



Security Switch Input 0	1	2	Polarising Position
Security Switch Input 1	3	4	No Connection
Security Switch Input 2	5	6	No Connection
Security Switch Input 3	7	8	No Connection
Security Switch Common Strobe 0 - 3	9	10	No Connection

Note: Do not ground inputs. These must only be connected to the common strobe.

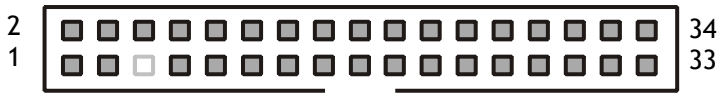
3.5.10 P9 – Multiplexed Lamp Sinks

Reference: P9
Type: Header 18 Way AMP MTA-100
Description: Strobed open drain output sinks.

1	Lamp Column/Sink 0
2	Lamp Column/Sink 1
3	Lamp Column/Sink 2
4	Lamp Column/Sink 3
5	Lamp Column/Sink 4
6	Lamp Column/Sink 5
7	Lamp Column/Sink 6
8	Lamp Column/Sink 7
9	No Connection
10	Polarising Position
11	Lamp Column/Sink 8
12	Lamp Column/Sink 9
13	Lamp Column/Sink 10
14	Lamp Column/Sink 11
15	Lamp Column/Sink 12
16	Lamp Column/Sink 13
17	Lamp Column/Sink 14
18	Lamp Column/Sink 15

3.5.11 P10 – LED's

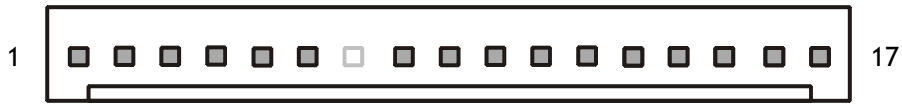
Reference: P10
Type: 34 Way Low Profile
Description: Multiplexed 12V current limited LED drives.



Cathodes, Digit 0	1	2	Cathodes, Digit 1
Cathodes, Digit 2	3	4	Cathodes, Digit 3
Polarising Position	5	6	Cathodes, Digit 5
Cathodes, Digit 6	7	8	Cathodes, Digit 7
Cathodes, Digit 8	9	10	Cathodes, Digit 9
Cathodes, Digit 10	11	12	Cathodes, Digit 11
Cathodes, Digit 12	13	14	Cathodes, Digit 13
Cathodes, Digit 14	15	16	Cathodes, Digit 15
Anodes, Segment 0	17	18	Anodes, Segment 1
Anodes, Segment 2	19	20	Anodes, Segment 3
Anodes, Segment 4	21	22	Anodes, Segment 5
Anodes, Segment 6	23	24	Anodes, Segment 7
Anodes, Segment 8	25	26	Anodes, Segment 9
Anodes, Segment 10	27	28	Anodes, Segment 11
Anodes, Segment 12	29	30	Anodes, Segment 13
Anodes, Segment 14	31	32	Anodes, Segment 15
Cathodes, Digit 4	33	34	Cathodes, Digit 5

3.5.12 P11 – Multiplexed Lamps Sources

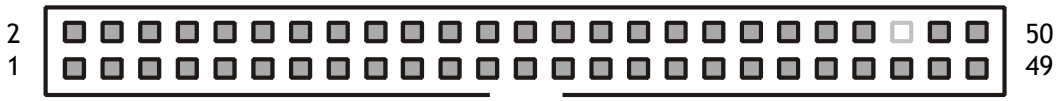
Reference: P11
Type: Header 17W AMP MTA-100
Description: Strobed open collector outputs (source connected to +48V).



1	Lamp Row/Source 0
2	Lamp Row/Source 1
3	Lamp Row/Source 2
4	Lamp Row/Source 3
5	Lamp Row/Source 4
6	Lamp Row/Source 5
7	Polarising Position
8	Lamp Row/Source 6
9	Lamp Row/Source 7
10	Lamp Row/Source 8
11	Lamp Row/Source 9
12	Lamp Row/Source 10
13	Lamp Row/Source 11
14	Lamp Row/Source 12
15	Lamp Row/Source 13
16	Lamp Row/Source 14
17	Lamp Row/Source 15

3.5.13 P12 – Reels

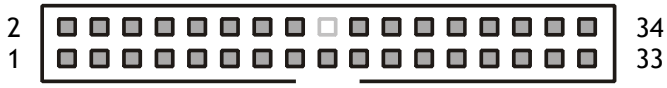
Reference: P12
Type: 50 Way Low Profile Box Header
Description: Reels - Connector for 6 Stepper Motor Reel Mechanisms



Lamp Column 0	1	2	Lamp Column 1
Lamp Column 2	3	4	Lamp Column 3
Lamp Column 4	5	6	Lamp Column 5
Lamp Row 0	7	8	Lamp Row 1
Lamp Row 2	9	10	Lamp Row 3
Lamp Row 4	11	12	Lamp Row 5
Ground	13	14	+5V
TPIC6259 Open Drain, Output 0	15	16	TPIC6259 Open Drain, Output 1
TPIC6259 Open Drain, Output 2	17	18	TPIC6259 Open Drain, Output 3
TPIC6259 Open Drain, Output 4	19	20	TPIC6259 Open Drain, Output 5
TPIC6259 Open Drain, Output 6	21	22	TPIC6259 Open Drain, Output 7
TPIC6259 Open Drain, Output 8	23	24	TPIC6259 Open Drain, Output 9
TPIC6259 Open Drain, Output 10	25	26	TPIC6259 Open Drain, Output 11
TPIC6259 Open Drain, Output 12	27	28	TPIC6259 Open Drain, Output 13
TPIC6259 Open Drain, Output 14	29	30	TPIC6259 Open Drain, Output 15
TPIC6259 Open Drain, Output 16	31	32	TPIC6259 Open Drain, Output 17
TPIC6259 Open Drain, Output 18	33	34	TPIC6259 Open Drain, Output 19
TPIC6259 Open Drain, Output 20	35	36	TPIC6259 Open Drain, Output 21
TPIC6259 Open Drain, Output 22	37	38	TPIC6259 Open Drain, Output 23
Input 0, CMOS Level Pulled-up to +5V	39	40	Input 1, CMOS Level Pulled-up to +5V
Input 2, CMOS Level Pulled-up to +5V	41	42	Input 3, CMOS Level Pulled-up to +5V
Input 4, CMOS Level Pulled-up to +5V	43	44	Input 5, CMOS Level Pulled-up to +5V
+12V	45	46	Polarising Position
+12V	47	48	+12V
+12V	49	50	+12V

3.5.14 P13 – General I/O 2

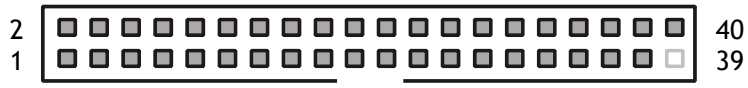
Reference: P13
Type: 34 Way Low Profile Box Header
Description: General Purpose I/O 2



TPIC6259 Open Drain, Output 48	1	2	TPIC6259 Open Drain, Output 49
TPIC6259 Open Drain, Output 50	3	4	TPIC6259 Open Drain, Output 51
TPIC6259 Open Drain, Output 52	5	6	TPIC6259 Open Drain, Output 53
TPIC6259 Open Drain, Output 54	7	8	TPIC6259 Open Drain, Output 55
TPIC6259 Open Drain, Output 56	9	10	TPIC6259 Open Drain, Output 57
TPIC6259 Open Drain, Output 58	11	12	TPIC6259 Open Drain, Output 59
TPIC6259 Open Drain, Output 60	13	14	TPIC6259 Open Drain, Output 61
TPIC6259 Open Drain, Output 62	15	16	TPIC6259 Open Drain, Output 63
Ground	17	18	Polarising Position
Input 6, CMOS Level Pulled-up to +5V	19	20	Input 7, CMOS Level Pulled-up to +5V
Input 8, CMOS Level Pulled-up to +5V	21	22	Input 9, CMOS Level Pulled-up to +5V
Input 10, CMOS Level Pulled-up to +5V	23	24	Input 11, CMOS Level Pulled-up to +5V
Input 12, CMOS Level Pulled-up to +5V	25	26	Input 13, CMOS Level Pulled-up to +5V
Input 14, CMOS Level Pulled-up to +5V	27	28	Input 15, CMOS Level Pulled-up to +5V
Input 16, CMOS Level Pulled-up to +5V	29	30	Input 17, CMOS Level Pulled-up to +5V
Input 18, CMOS Level Pulled-up to +5V	31	32	Input 19, CMOS Level Pulled-up to +5V
+12V	33	34	Current Sensing +12V

3.5.15 P14 – General I/O 1

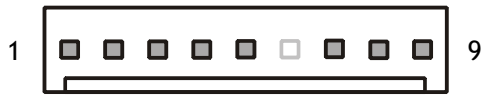
Reference: P14
Type: 40 Way Low Profile Box Header
Description: General Purpose I/O 1



TPIC6259 Open Drain, Output 24	1	2	TPIC6259 Open Drain, Output 25
TPIC6259 Open Drain, Output 26	3	4	TPIC6259 Open Drain, Output 27
TPIC6259 Open Drain, Output 28	5	6	TPIC6259 Open Drain, Output 29
TPIC6259 Open Drain, Output 30	7	8	TPIC6259 Open Drain, Output 31
TPIC6259 Open Drain, Output 32	9	10	TPIC6259 Open Drain, Output 33
TPIC6259 Open Drain, Output 34	11	12	TPIC6259 Open Drain, Output 35
TPIC6259 Open Drain, Output 36	13	14	TPIC6259 Open Drain, Output 37
TPIC6259 Open Drain, Output 38	15	16	TPIC6259 Open Drain, Output 39
TPIC6259 Open Drain, Output 40	17	18	TPIC6259 Open Drain, Output 41
TPIC6259 Open Drain, Output 42	19	20	TPIC6259 Open Drain, Output 43
TPIC6259 Open Drain, Output 44	21	22	TPIC6259 Open Drain, Output 45
TPIC6259 Open Drain, Output 46	23	24	TPIC6259 Open Drain, Output 47
Ground	25	26	Ground
Input 20, CMOS Level Pulled-up to +5V	27	28	Input 21, CMOS Level Pulled-up to +5V
Input 22, CMOS Level Pulled-up to +5V	29	30	Input 23, CMOS Level Pulled-up to +5V
Input 24, CMOS Level Pulled-up to +5V	31	32	Input 25, CMOS Level Pulled-up to +5V
Input 26, CMOS Level Pulled-up to +5V	33	34	Input 27, CMOS Level Pulled-up to +5V
Input 28, CMOS Level Pulled-up to +5V	35	36	Input 29, CMOS Level Pulled-up to +5V
Input 30, CMOS Level Pulled-up to +5V	37	38	Input 31, CMOS Level Pulled-up to +5V
Polarising Position	39	40	+12V

3.5.16 P15 – Aux Outputs

Reference: P15
Type: Header 9W AMP MTA-100
Description: Aux. Outputs



1	Ground
2	Open drain output 0, 100mA, 1K pull-up to +5V
3	Open drain output 1, 100mA, 1K pull-up to +5V
4	Open drain output 2, 100mA, 1K pull-up to +5V
5	Open drain output 3, 100mA, 1K pull-up to +5V
6	Polarising Position
7	Open drain output 4, 100mA, 1K pull-up to +5V
8	Open drain output 5, 100mA, 1K pull-up to +5V
9	+12V

3.5.17 P16 – Multiplex Expansion

Reference: P16
Type: Header 8W AMP MTA-100
Description: Multiplex Expansion

1	MPX1 Data, +12V CMOS Levels
2	MPX2 Data, +12V CMOS Levels
3	MPX Strobe Data, +12V CMOS Levels
4	Ground
5	Polarising Position
6	MPX Clock, +12V CMOS Levels
7	MPX Strobe, +12V CMOS Levels
8	MPX Output Enable, +12V CMOS Levels

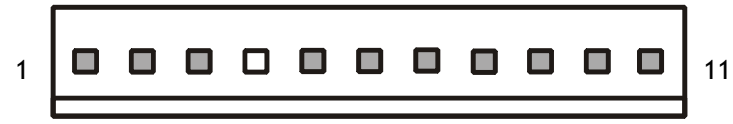
3.5.18 P17 – IO Bus Expansion

Reference: P17
Type: 26 Way Low Profile Box Header
Description: 8 Bit IO Bus Expansion

Requests for details of this connector should be sent by email to support@heber.co.uk

3.5.19 P18 – Power

Reference: P18
Type: Header 11W AMP MTA-156
Description: Power



1	-12V
2	Ground
3	+12V
4	Polarising Position
5	Ground
6	MPX Supply
7	MPX Return (Ground)
8	+5V
9	Ground
10	Power Fail Active Low
11	Ground

3.5.20 P19 – Loudspeaker

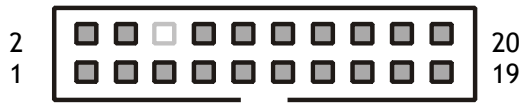
Reference: P19
Type: Header 6 AMP MTA-100
Description: Loudspeaker

1	Loudspeaker 1 Positive
2	Loudspeaker 1 Negative
3	Polarising Position
4	No Connection
5	Loudspeaker 2 Positive
6	Loudspeaker 2 Negative

Note: Do not ground loudspeaker outputs. Minimum speaker load is 4Ω.

3.5.21 P20 – ccTalk / HI² Interface

Reference: P20
Type: 20 Way Low Profile Box Header
Description: ccTalk / HI² Interface

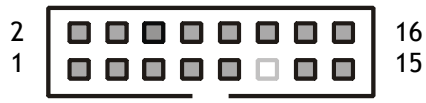


Channel 1 Data	1	2	Ground
Channel 1 Busy	3	4	Ground
Channel 1 Reset	5	6	Polarising Position
+12V	7	8	***** Channel 1 Voltage Select (See Note 1)
Ground	9	10	+12V
Channel 2 Data	11	12	Ground
Channel 2 Busy	13	14	Ground
Channel 2 Reset	15	16	No Connection
+12V	17	18	***** Channel 2 Voltage Select (See Note 1)
Ground	19	20	+12V

- **Note 1 – Link to ground for 5V bus operation. Leave open circuit for 12V bus operation.**
- **Note 2 – To drive the reset signal on Pluto 6, access the signal through Aux6 for ccTalk1 and Aux7 for ccTalk2.**

3.5.22 P21 – RS232

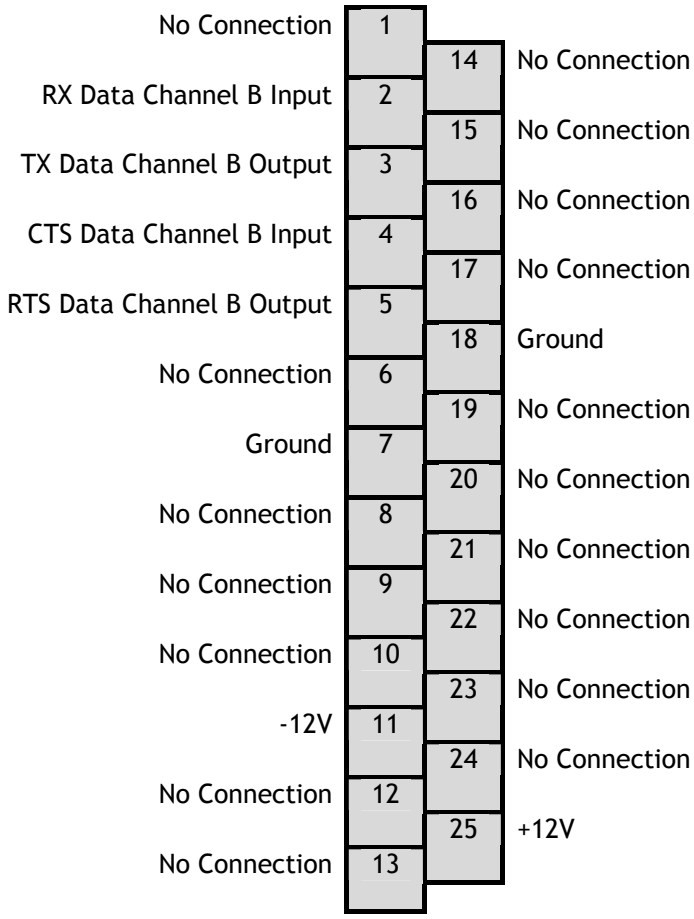
Reference: P21
Type: 16 Way Low Profile Box Header
Description: RS232



+12V	1	2	RX Data Channel A Input
TX Data Channel A Output	3	4	CTS Channel A Input
RTS Data Channel A Output	5	6	Ground
TX Data Channel C Output	7	8	RX Data Channel C Input
RTS Data Channel C Output	9	10	CTS Data Channel C Input
Polarising Position	11	12	Ground
TX Data Channel D Output	13	14	RX Data Channel D Input
RTS Data Channel D Output	15	16	CTS Data Channel D Input

3.5.23 P22 – Dataport (RS232 Channel B)

Reference: P22
Type: 25W 'D' Socket
Description: BACTA Dataport / RS232 Channel B



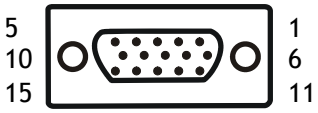
P23 – TTL / RS485

Reference: P23
Type: Header 12W AMP MTA-100
Description: TTL / RS485 Level UART

1	+5V
2	TTL Level TX Output
3	TTL Level RX Input
4	TTL Level RTS Output
5	TTL Level CTS Input
6	Ground
7	RS485 Positive
8	Polarising Position
9	RS485 Negative
10	Ground
11	Link to Pin 7 for RS485 Termination
12	Link to Pin 9 for RS485 Termination

3.5.24 P24 – Video Expansion 0

Reference: P24
Type: 15W Hi Density 'D' Socket
Description: Video Output (VGA)

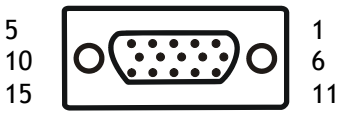


Red	**1**		**11**	No Connection
Ground		**6**		
Green	**2**		**12**	No Connection
Ground		**7**		
Blue	**3**		**13**	Horizontal Sync
Ground		**8**		
No Connection	**4**		**14**	Vertical Sync
No Connection		**9**		
Ground	**5**		**15**	No Connection
Ground		**10**		

These signals are only present if a Calypso 32 Video card is fitted.

3.5.25 P25 – Video Expansion 1

Reference: P25
Type: 15W Hi Density 'D' Socket
Description: Video Output (VGA)



Red	**1**		**11**	No Connection
Ground		**6**		
Green	**2**		**12**	No Connection
Ground		**7**		
Blue	**3**		**13**	Horizontal Sync
Ground		**8**		
No Connection	**4**		**14**	Vertical Sync
No Connection		**9**		
Ground	**5**		**15**	No Connection
Ground		**10**		

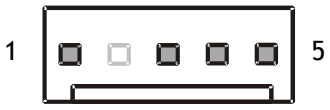
These signals are only present if a Calypso 32 Video card is fitted.

3.5.26 P26

Reference: P26
Type: Header 7W AMP MTA-100
Description: Reserved for future expansion.
This connector does not have any active signal.

3.5.27 P27 – I^2C

Reference: P27
Type: Header 5W AMP MTA-100
Description: I^2C



1	+3.3V
2	Polarising Position
3	SDA (data input / output)
4	SCL (clock output)
5	Ground

3.5.28 SW3 – Switch

Reference: Switch
Type: Bush button switch
Description: Software configurable general purpose switch, for example, can be configured as reset switch, or service switch.

4 DEVELOPMENT

4.1 Development Kit

The development kit contains all you need to begin your game development. The following is a list of the key items supplied in the development kit:

- Pluto 6 Debug Board.
- Calypso 32 Video Card.
- Pluto 6 Evaluation Board.
- P&E Assembly level debugger.
- Pluto 6 CDROM containing the following key items:
  - Low Level software libraries for driving the Pluto 6 inputs / outputs.
  - A video demonstration programmes using the supplied drivers.
  - A non-video demonstration programme using the supplied drivers.
  - GNU open source 'C' compiler.
  - Product user manuals
- PSU

The Pluto 6 Evaluation board supplied in the development kit can be used as a tool to start game development. The evaluation board has indicators and switches on all of the Pluto 6 inputs and outputs. This enables developer to start using the Pluto 6 board and supplied software.

For further information on the drivers and software supplied in the development kit consult the Pluto 6 Software Manual.

4.2 Software Development

A number of options exist for the development and debug of software for use on Pluto 6.

Software is normally generated using a cross-assembler, cross-compiler and linker package. A suitable package is supplied in the Pluto 6 Development kit.

When software has been successfully compiled and linked, it may be tested and debugged using the Background Debug Mode port of the ColdFire® MCF5206e. A suitable debug tool is provided in the development kit. There are, however, plenty of other debug tools available offering different graphical interfaces and electrical interfaces such as USB. They will also offer different functions such as flash programming and 'C' source level debugging.

For full details of debugging please consult the development kit software documentation.

5 ORDERING PLUTO 6

5.1 Pluto 6 Family Products

The following table details Pluto 6 products that are available from Heber. To order, please contact Heber, or email: sales@heber.co.uk.

HEBER PART No.	DESCRIPTION
01-17802	Pluto 6 Standard Board
01-17862	Pluto 6 Debug Board
01-16443	Calypso 32 Video Card
01-18011	Pluto 6 Development Kit (Dual Video)

5.2 Optional Devices

A number of optional devices are available for the Pluto 6 Debug board. These devices can be ordered separately from Heber. Please contact Heber, or email: sales@heber.co.uk.

HEBER PART No.	DESCRIPTION	IDENT on PLUTO 6 DEBUG BOARD	FUNCTION
20-82283	Boot Flash	U1	512KB Boot Flash Memory
20-82208	EEPROM	U7	4K or 8K bit EEPROM. Used for permanent non-volatile memory storage.
20-00521	RS485 Transceiver	U41	Transceiver for RS485 serial port.
20-81693	DUART	U56	Dual full-duplex asynchronous receiver/transmitter provides a total of 6 UARTS.

5.3 Compact Flash

Heber has approved the following Compact Flash cards and programmer for use with Pluto 6. To order, please contact Heber, or email: sales@heber.co.uk.

HEBER PART No.	DESCRIPTION
63-82370	64MB Compact Flash card
63-82658	128MB Compact Flash card
63-82530	256MB Compact Flash card
63-82516	Compact Flash Programmer

6 RECOMMENDED FURTHER READING

Software programmers should read the following Motorola publications.

- ColdFire MCF5206e User Manual
- ColdFire MCF5206e Programmers Reference

For further information on the Pluto 6 video add-on card please see the **PLUTO 6 CALYPSO 32 VIDEO CARD USER MANUAL** (Heber Part no. 80-16538).

7 SUPPORT

To request further documentation, such as circuit schematics that may be needed for approval purposes, please email your requests to support@heber.co.uk. These will be made available directly to the approvals body once a non-disclosure agreement is in place.

Figure 2 - Mechanical Layout

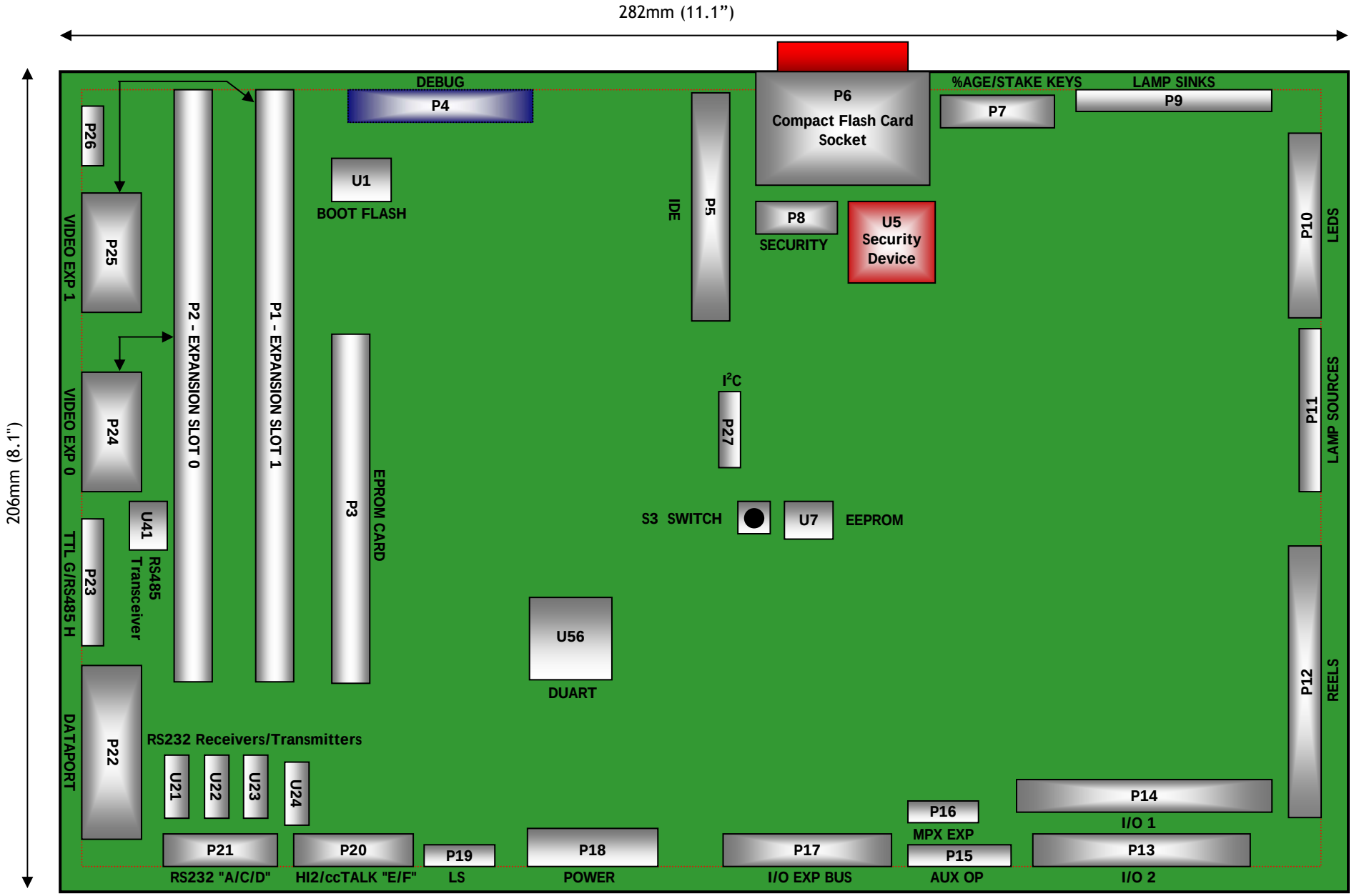


Figure 3 - Photograph of Pluto 6

NOTE: This photograph may differ from the stated specification.