

# **uGCI-P<sup>™</sup>**

## **User Documentation**

JAMMA / PC Low Cost Interface  
Part Number 990-uGCI-P-UCT-02E

**Version 02E**  
**June 18, 2005**





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## !!! IMPORTANT NOTE !!!

This document refers to version 02E of the uGCI-P interface board. 02E is the combination of PCB version 02 along with its build options. Different versions of the PCB may differ from the details presented in this document. Please refer to the correct documentation for your specific hardware (see 'Revision History' on page 15).

## Legal Statement

The uGCI-P PCB is copyright © & trademark ™ 2003-05 by UltraCade Technologies, All Rights Reserved. The uGCI-P PCB and algorithms are Patent Pending. uGCI-P is a trademark of UltraCade Technologies.

## Package Contents

- User Documentation
- Parallel Cable 6ft
- Video Cable (VGA) 3ft
- Free Gift Offer Card
- uGCI-P PCB
- Reset cable 2ft
- Audio Cable (3.5mm jack) 6ft

## Overview

The uGCI-P interface card is part of UltraCade Technologies' series of JAMMA compatible PC interface cards. The uGCI-P is a low cost version of the USBlinx JAMMA / PC interface card. For more information and a full list of current products, please go to [www.ultracade.com](http://www.ultracade.com).

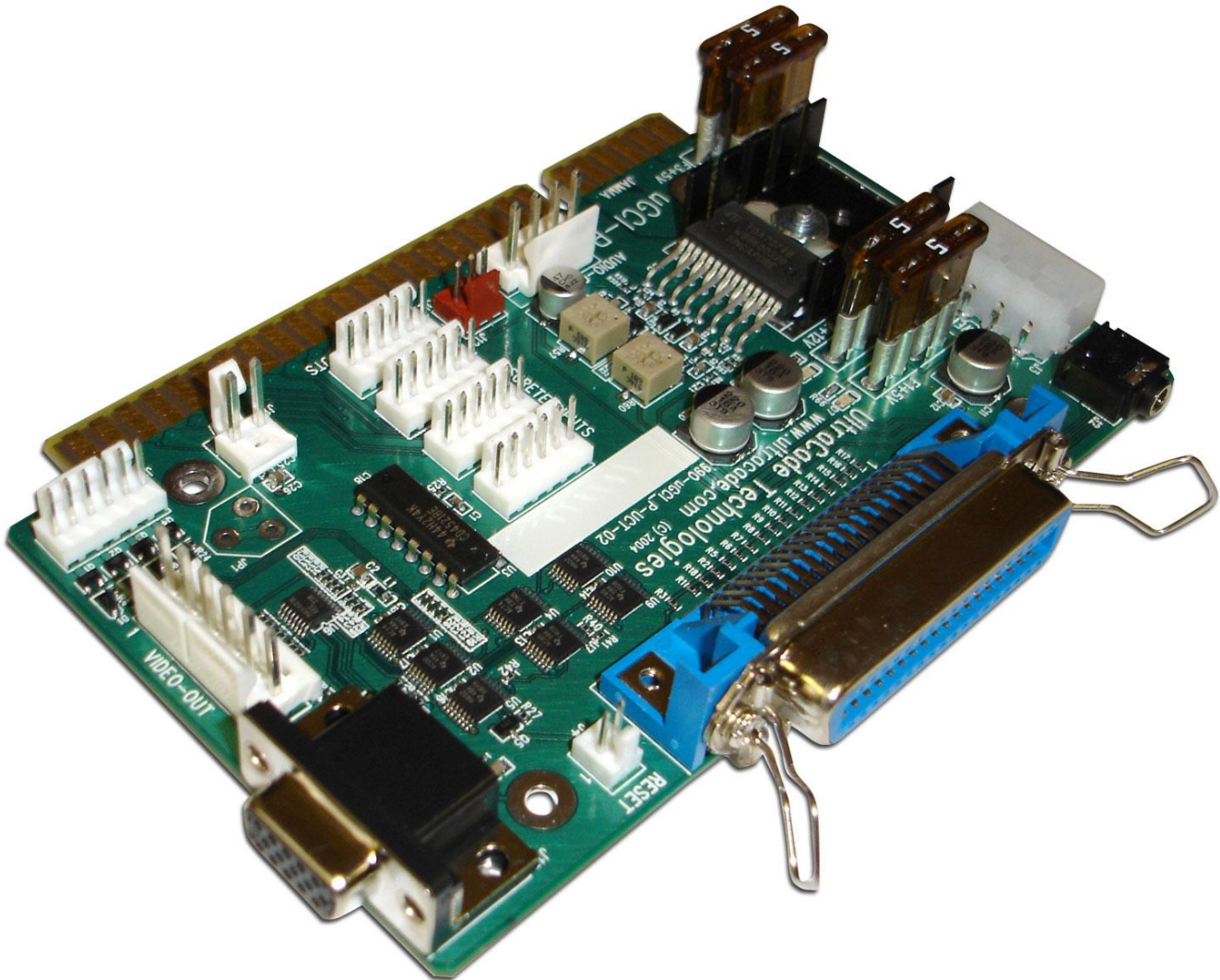
The uGCI-P provides a standard JAMMA interface for simple replacement of arcade motherboards with a more reliable, configurable and upgradeable PC system.

The standard JAMMA interface supports two players with four buttons each. The uGCI-P supports all of the JAMMA interface signals required for a single joystick cabinet. JAMMA outputs are also supported, including coin counter and coin lock signals.

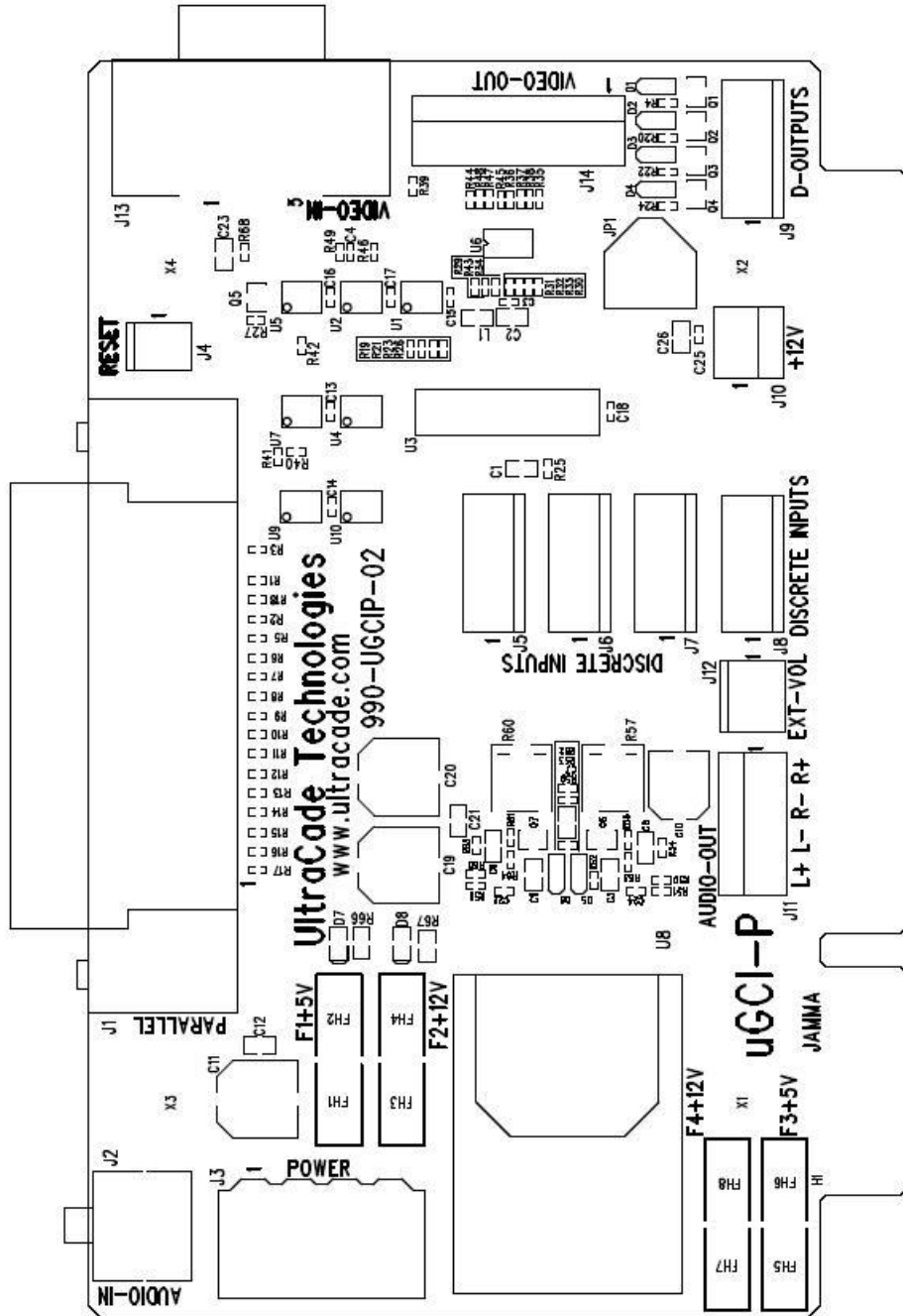
The uGCI-P provides 4 digital outputs that, in default configuration, are designed for +5v operation, and includes surge protection for electro-mechanical devices. The uGCI-P may be quickly altered for +12v outputs; in this case, devices requiring +5v may still be used, but care is required as the surge protection will be minimal.

Conversions are provided for PC to arcade video and PC to arcade audio. A watchdog circuit is also included to enable the uGCI-P to detect a system crash and initiate a complete system restart.

## Board Image



## Board Layout





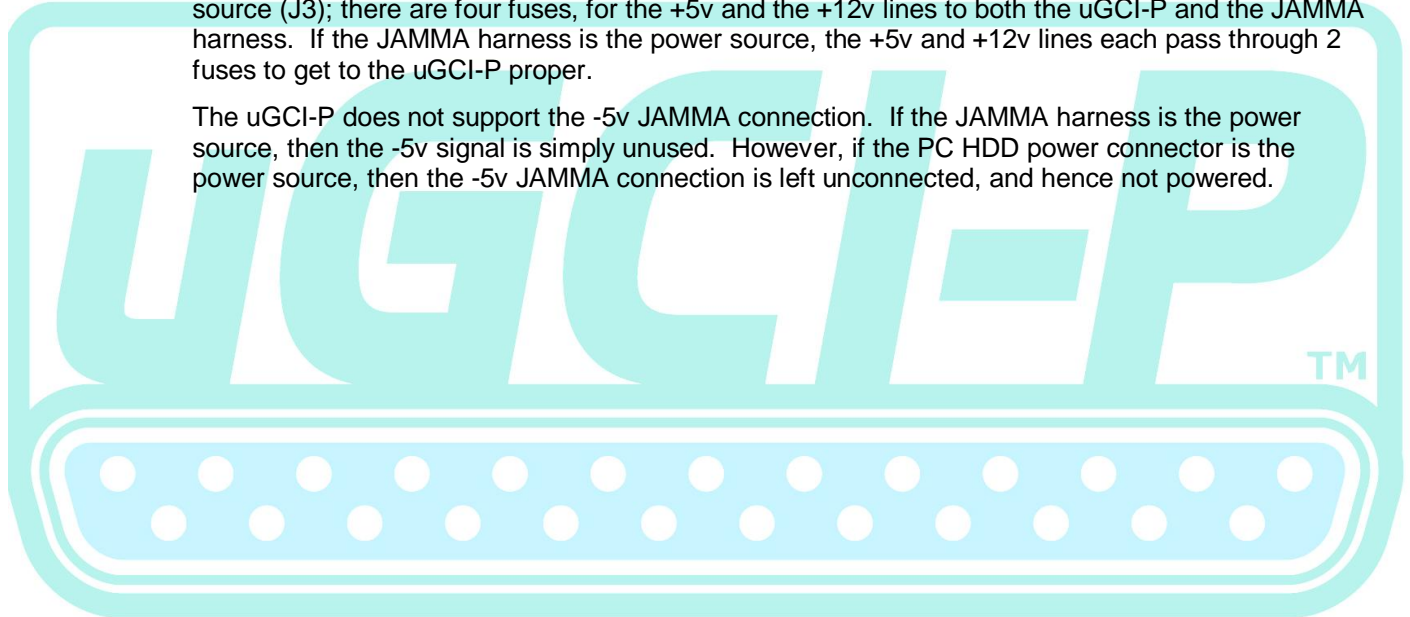
## Power

The uGCI-P has two potential sources of power which must never be connected simultaneously. The source of power depends on the application. Some JAMMA harnesses are self-powered, while others require power to be supplied from the uGCI-P. In the former case, the uGCI-P is powered from the JAMMA connector and the PC HDD (hard disk drive) connector must not be connected. In the latter case, the uGCI-P is powered from a standard PC HDD connector, which then powers the JAMMA harness. **NOTE: be sure the JAMMA harness is not self-powered before connecting the PC HDD power connector to the uGCI-P.**

Another potential power source is the USB connector; however, no power from the USB connector is used on the uGCI-P.

Irrespective of the method of connecting power, the uGCI-P is protected from the power source by 5A fuses on both the +12v and +5v lines. If power is connected using the PC HDD power connector, then the uGCI-P and the JAMMA harness are independently protected from the power source (J3); there are four fuses, for the +5v and the +12v lines to both the uGCI-P and the JAMMA harness. If the JAMMA harness is the power source, the +5v and +12v lines each pass through 2 fuses to get to the uGCI-P proper.

The uGCI-P does not support the -5v JAMMA connection. If the JAMMA harness is the power source, then the -5v signal is simply unused. However, if the PC HDD power connector is the power source, then the -5v JAMMA connection is left unconnected, and hence not powered.







## Parallel Interface

Bringing up a design with the uGCI-P is made simple by the use of standard hardware and direct control of all signals. Depending on the operating system used, the method of accessing direct control over the parallel port will differ.

Inputs may be sampled from the parallel port at any time to give their 'real-time' values. Outputs are driven by the uGCI-P through grounding transistors controlled directly from the parallel port signals.

The use of each of the PC parallel port's 25 signals (DB25 connector) are given in the table below; note that the uGCI-P uses a standard 36 pin Centronics connector. The additional 11 pins are mostly grounding or otherwise unused.

DB25	Centronics 36-pin	Direction	Printer Usage	uGCI-P Usage
1	1	PC->Printer	~Strobe	
2	2	PC->Printer	Data 0 (lsb)	
3	3	PC->Printer	Data 1	
4	4	PC->Printer	Data 2	
5	5	PC->Printer	Data 3	
6	6	PC->Printer	Data 4	
7	7	PC->Printer	Data 5	
8	8	PC->Printer	Data 6	
9	9	PC->Printer	Data 7 (msb)	
10	10	Printer->PC	~Ack	
11	11	Printer->PC	Busy	
12	12	Printer->PC	Paper End	
13	13	Printer->PC	Select	
14	14	PC->Printer	~Auto Feed	
15	32	Printer->PC	~Error	
16	31	PC->Printer	~Initialise	
17	36	PC->Printer	~Select	
18	19?	n/a	Ground	Ground
19	21?	n/a	Ground	Ground
20	23?	n/a	Ground	Ground
21	25?	n/a	Ground	Ground
22	27?	n/a	Ground	Ground
23	29?	n/a	Ground	Ground
24	??	n/a	Ground	Ground
25	??	n/a	Ground	Ground



## Digital Outputs

The uGCI-P provides 4 output signals. These signals are accessible from either the JAMMA connector or a standard 6-pin 100mil Molex connector (J9). The pinout of the JAMMA connector is given in the section entitled “JAMMA Interface”, and the Molex pinout is given at the end of this section.

The 4 digital outputs are designed for +5v operation, and include surge protection for the safe use of electro-mechanical devices. The uGCI-P may be quickly altered for +12v outputs via the JP1 output voltage selector. JP1 contains 3 terminals in the shape of a “D”: the pin in the curve of the “D” is the output voltage; the pin at the top of the “D” is +5v (connected to the output voltage pin with a thick trace); the pin at the bottom of the “D” is +12v. To convert the output voltage from +5v to +12v, simply cut the trace between +5v and output voltage terminals, and bridge the +12v and output voltage terminals. When using an output voltage of +12v, devices requiring +5v may still be used, however, care is required as the surge protection will be minimal.

To connect a device to one of the uGCI-P’s outputs, connect the positive terminal to the relevant voltage supply, and the negative (or ground) terminal to the relevant output pin on the uGCI-P (or JAMMA wiring harness). Enabling that output will enable the circuit, and therefore the device.

Implementing the outputs using decoupling FETs enables the only limitation on the current draw to be from the power supply itself (the FETs used have maximum ratings of 1.6 amps continuous and 10 amp pulse).

The output connections are shown in the table below. The JAMMA pins are given in the format of C or S and then the pin number. C refers to the component side of the PCB, while S is the solder side.

Name	Molex Pin Num	JAMMA Pin Num	Centronics Pin Num	DB25 Pin Num	Recommended Usage
Gnd	1	n/a	n/a	n/a	n/a
Out 1	2	C8	1	1	Coin counter
Out 2	3	S8	14	14	Watchdog
Out 3	4	C9	31	16	Coin lock
Out 4	5	S9	36	17	undefined
Vcc	6	n/a	n/a	n/a	n/a

**NOTE: If connecting outputs devices’ positive voltage supply from anything other than J9 pin 1 (output Molex connector), it is strongly recommended that the voltage used be the same as that selected via JP1 (default +5v).**





## Video

The uGCI-P accepts video input from a DB15 (J13) standard PC VGA video connector. Video is then produced at both the JAMMA connector and a standard arcade monitor 6-pin 156mil Molex (J14). The pinout of the JAMMA connector is given in the section entitled “JAMMA Interface”, and the Molex pinout is given at the end of this section.

The uGCI-P does not do any scaling of the video. The video must already be in a resolution compatible with the target monitor. If rescaling is required, the video signal can be routed through an UltraCade uVC video converter (see [www.ultracade.com](http://www.ultracade.com)).

Two forms of video processing are performed by the uGCI-P. The 0.7vpp PC video signal is amplified to the 5vpp arcade levels, and the synchronization method is ensured to be in composite format.

All current main stream monitors use +5v synchronization signals, however, the red, green and blue signals are different voltages in VGA monitors and arcade monitors. Therefore, only the 0.7vpp RGB signals produced by a PC need to be amplified to 5vpp.

The format of the synchronization signals used can vary. Most arcade monitors support both composite and separate horizontal and vertical synchronization signals. However, the JAMMA connector requires just the composite synchronization signal. The uGCI-P therefore combines the separate synchronization signals into a composite signal. If the input video signal is already in composite format, the signal is unchanged. The composite signal is then routed to both the JAMMA and Molex connectors, and the vertical sync signal is not output.

Molex	Signal	JAMMA side / pin
1	Horizontal / Composite Sync	Solder / 13
2	Vertical Sync (unused)	n/a
3	Ground	Component / 14
4	Blue	Component / 13
5	Green	Solder / 12
6	Red	Component / 12

TM



## Audio

Standard PC audio output is a pre-amplified signal through a 3.5mm stereo jack. A standard arcade cabinet just contains one or two  $8\Omega$  speakers, accessed through the JAMMA connector pins 10 (left) and 11 (right). The positive audio is on the component side and negative on the solder side.

The uGCI-P bridges these disparate standards. A standard 3.5mm stereo jack socket is provided to connect the PC audio input. The audio is then amplified by a 2x37W audio amplifier. Finally, the amplified audio is routed to the speakers through either the standard pins of the JAMMA connector, or a standard 4-pin 156mil Molex connector (J11).

Volume control is provided both on-board and through an optional external connection. The on-board volume control is in the form of variable resistors (R57 and R60). The optional external volume control is through a 3-pin 100mil Molex (J12). If unconnected, the uGCI-P assumes maximum volume, and the only volume control is on-board. For best results, the external volume control should be a 5K ohm variable resistor. Connect the external volume control to J12 pins 1-3; assuming pin 2 of the POT provides the variable resistance between pins 1 and 3, connect the pins directly to J12 (1-1, 2-2 and 3-3).

Mono output is available by simply joining the left and right pins at the 3.5mm jack on the uGCI-P. Fully amplified mono audio signals are then available at the JAMMA and Molex connectors on both of the left and the right positive/negative pair.

## JAMMA Interface

The JAMMA interface is the standard interface for arcade motherboards. To simplify the replacement of single game non-upgradeable arcade machines with PC based systems, the uGCI-P allows the old motherboard to simply be unplugged and a PC plugged in. The old controls will flow through the same JAMMA interface and be passed to the PC by the uGCI-P via the standard PC parallel port.

The standard JAMMA interface supports 2 joysticks, each with four buttons (along with many other ancillary signals). The uGCI-P is targeted at the low-cost market, and therefore supports just a single joystick with 4 buttons, along with almost all of the ancillary player 1 and 2 signals. For a PC interface that supports the full JAMMA interface, along with additional extended interfaces, see the UltraCade USBInx at [www.ultracade.com](http://www.ultracade.com).



The table below shows the standard use for each of the JAMMA pins, its alternate connector, and the source pin it is generated from. For example, the video green signal on JAMMA pin S12 is also available at J14 pin 5, and its original source is J13 pin 2 (the PC video input DB15 connector). The player 2 start button on JAMMA pin S17 is also available at J7 pin 5, and its original source from the parallel port (J1) pin 13.

PCB Side	Pin	Standard Usage	Alt Pin	Source Pin	PCB Side	Pin	Standard Usage	Alt Pin	Source Pin
Solder	1	Gnd	n/a	n/a	Component	1	Gnd	n/a	n/a
Solder	2	Gnd	n/a	n/a	Component	2	Gnd	n/a	n/a
Solder	3	+5v	n/a	n/a	Component	3	+5v	n/a	n/a
Solder	4	+5v	n/a	n/a	Component	4	+5v	n/a	n/a
Solder	5	-5v	n/a	n/a	Component	5	-5v	n/a	n/a
Solder	6	+12v	n/a	n/a	Component	6	+12v	n/a	n/a
Solder	7	KEY	n/a	n/a	Component	7	KEY	n/a	n/a
Solder	8	coin counter 2	J9 pin 3	J1 pin 14	Component	8	coin counter 1	J9 pin 2	J1 pin 1
Solder	9	coin lock 2	J9 pin 5	J1 pin 36	Component	9	coin lock 1	J9 pin 4	J1 pin 31
Solder	10	left speaker -	J11 pin 3	J2 ring	Component	10	left speaker +	J11 pin 4	J2 tip
Solder	11	right speaker -	J11 pin 2	J2 ring	Component	11	right speaker +	J11 pin 1	J2 tip
Solder	12	green	J14 pin 5	J13 pin 2	Component	12	red	J14 pin 6	J13 pin 1
Solder	13	comp sync	J14 pin 1	J13 pins 13 & 14	Component	13	blue	J14 pin 4	J13 pin 3
Solder	14	service 1	J7 pin 4	J1 pin 12	Component	14	video ground	J14 pin 3	J13 pins 5-8 & 10
Solder	15	tilt	n/c	n/c	Component	15	test 1	J7 pin 4	J1 pin 12
Solder	16	p2 coin	J7 pin 2	J1 pin 10	Component	16	p1 coin	J7 pin 3	J1 pin 11
Solder	17	p2 start	J7 pin 5	J1 pin 13	Component	17	p1 start	J8 pin 2	J1 pin 32
Solder	18	p2 up	n/c	n/c	Component	18	p1 up	J5 pin 2	J1 pin 2
Solder	19	p2 down	n/c	n/c	Component	19	p1 down	J5 pin 3	J1 pin 3
Solder	20	p2 left	n/c	n/c	Component	20	p1 left	J5 pin 4	J1 pin 4
Solder	21	p2 right	n/c	n/c	Component	21	p1 right	J5 pin 5	J1 pin 5
Solder	22	p2 button 1	n/c	n/c	Component	22	p1 button 1	J6 pin 2	J1 pin 6
Solder	23	p2 button 2	n/c	n/c	Component	23	p1 button 2	J6 pin 3	J1 pin 7
Solder	24	p2 button 3	n/c	n/c	Component	24	p1 button 3	J6 pin 4	J1 pin 8
Solder	25	p2 button 4	n/c	n/c	Component	25	p1 button 4	J6 pin 5	J1 pin 9
Solder	26	service 2	J7 pin 4	J1 pin 12	Component	26	test 2	J7 pin 4	J1 pin 12
Solder	27	Gnd	n/a	n/a	Component	27	Gnd	n/a	n/a
Solder	28	Gnd	n/a	n/a	Component	28	Gnd	n/a	n/a



## Connector Interface

All of the pinouts of the connectors on the uGCI-P are given in the sections above. However, they have been ordered for the part under examination (Parallel port, JAMMA connector). Therefore for convenience, this section will list the pinouts of the connectors in order. All connectors will be given, with the exception of the parallel, 3.5mm audio, DB15 video and JAMMA connectors.

Two pieces of information are given for each pin: firstly, the connector that is directly connected; secondly, the connector that is either also directly or {indirectly} connected. For example, the output video green of J14 pin 5 is directly connected to JAMMA pin S12, and indirectly connected to J13 pin 2 (via the video amplifier).

Conn	Pin	Usage	Directly To	Also Directly {Indirectly} To
J3	1	+12v	{many}	{many}
J3	2	Gnd	{many}	{many}
J3	3	Gnd	{many}	{many}
J3	4	+5v	{many}	{many}
J6	1	Gnd	J3 pins 2&3	none
J6	2	P1 Btn1	J1 pin 6	JAMMA C22
J6	3	P1 Btn2	J1 pin 7	JAMMA C23
J6	4	P1 Btn3	J1 pin 8	JAMMA C24
J6	5	P1 Btn4	J1 pin 9	JAMMA C25
J6	6	+5v	J3 pin 4	none

J8	1	Gnd	J3 pins 2&3	none
J8	2	P1 Start	J1 pin 32	JAMMA C17
J8	3	n/c	n/a	n/a
J8	4	n/c	n/a	n/a
J8	5	n/c	n/a	n/a
J8	6	+5v	J3 pin 4	none

Conn	Pin	Usage	Directly To	Also Directly {Indirectly} To
J4	1	Gnd	J3 pins 2&3	none
J4	2	Reset	n/a	n/a

J5	1	Gnd	J3 pins 2&3	none
J5	2	P1 Up	J1 pin 2	JAMMA C18
J5	3	P1 Dn	J1 pin 3	JAMMA C19
J5	4	P1 Lf	J1 pin 4	JAMMA C20
J5	5	P1 Rt	J1 pin 5	JAMMA C21
J5	6	+5v	J3 pin 4	none

J7	1	Gnd	J3 pins 2&3	none
J7	2	P2 Coin	J1 pin 10	JAMMA S16
J7	3	P1 Coin	J1 pin 11	JAMMA C16
J7	4	Test	J1 pin 12	JAMMA S14 C15 S26 C26
J7	5	P2 Start	J1 pin 13	JAMMA S17
J7	6	+5v	J3 pin 4	none



Conn	Pin	Usage	Directly To	Also Directly {Indirectly} To
J9	1	Gnd	J3 pins 2&3	none
J9	2	Coin Ctr	JAMMA C8	{J1 pin 1}
J9	3	Watchdog	JAMMA S8	{J1 pin 14}
J9	4	Coin Lock	JAMMA C9	{J1 pin 31}
J9	5	Undefined	JAMMA S9	{J1 pin 36}
J9	6	Out Vcc	JP1 +5v	{JP1 +12v}

Conn	Pin	Usage	Directly To	Also Directly {Indirectly} To
J10	1	Gnd	J3 pins 2&3	none
J10	2	+12	J3 pins 1	none

J11	1	Right +	JAMMA C11	{J2 ring}
J11	2	Right -	JAMMA S11	{J2 ring}
J11	3	Left -	JAMMA S10	{J2 tip}
J11	4	Left +	JAMMA C10	{J2 tip}

J14	1	H/C Sync	JAMMA S13	{J13 pin 13}
J14	2	V Sync	n/c	{J13 pin 14}
J14	3	Vid Gnd	JAMMA C14	{J13 pin 5-8&10}
J14	4	Blue	JAMMA C13	{J13 pin 3}
J14	5	Green	JAMMA S12	{J13 pin 2}
J14	6	Red	JAMMA C12	{J13 pin 1}

J12	1	Vol Min	n/a	n/a
J12	2	Vol Adj	n/a	n/a
J12	3	Vol Max	n/a	n/a







## PCB Connectors

This section provides the part numbers and pin assignments for the mating connectors to all of the connectors on the PCB.

PCB Ref	PCB Connector Description	Required Mate Description	Parts Required	Supplier	Part Number	Inc. in packet
J1	Parallel Port	Male, Centronics for pinout, see "Parallel Interface"	1 x Printer cable 6ft OR 1 x Male plug	UltraCade Norcomp	115-PRINTER-CBL 111-036-103-001	yes no
J2	Audio input	Male, stereo 3.5mm jack	1 x PC audio 6ft	UltraCade	115-AUDMINI-CBL	yes
J3	Power - PC HDD	Female PC HDD connector Pin1 - +12vdc Pin2 - Ground Pin3 - Ground Pin4 - +5vdc	1 x Extension 2ft OR 1 x Female housing 4 x Female terminal 4 x Wire 1 x Male housing 4 x Male terminal	UltraCade AMP AMP {any} AMP AMP	115-HDDPWR-CBL 1-480424-0 60617-1 n/a 1-480426-0 61618-1	no no no no no
J4	Reset switch	Female - 2-pin 100mil header Pin1 - Ground Pin2 - Reset	1 x Custom cable 2ft OR 1 x Female housing 2 x Female terminal	UltraCade Molex Molex	115-2WRESET-CBL 22-01-2027 08-50-0108	yes no no
J5	Digital inputs	Female - 6-pin 100mil header**	1 x Female housing 6 x Female terminal	Molex Molex	22-01-2067 08-50-0108	no no
J6	Digital inputs	Female - 6-pin 100mil header**	1 x Female housing 6 x Female terminal	Molex Molex	22-01-2067 08-50-0108	no no
J7	Digital inputs	Female - 6-pin 100mil header**	1 x Female housing 6 x Female terminal	Molex Molex	22-01-2067 08-50-0108	no no
J8	Digital inputs	Female - 6-pin 100mil header**	1 x Female housing 6 x Female terminal	Molex Molex	22-01-2067 08-50-0108	no no
J9	Digital outputs	Female - 6-pin 100mil header**	1 x Female housing 6 x Female terminal	Molex Molex	22-01-2067 08-50-0108	no no
J10	+12v supply	Female, 2-pin 156mil header**	1 x Female housing 2 x Female terminal	Molex Molex	09-50-8021 08-50-0106	no no
J11	Audio output	Female, 4-pin 156mil header**	1 x Female housing 4 x Female terminal	Molex Molex	09-50-8041 08-50-0106	no no
J12	Volume Use 5K ohm pot.	Female, 3-pin 100mil header**	1 x Female housing 3 x Female terminal	Molex Molex	22-01-2037 08-50-0108	no no
J13	Video input	Male, D-Sub 15-pin Standard PC video	Std PC video 3ft Extension Cable	UltraCade Assmann	115-VGA3MM-CBL AK322-2	yes no
J14	Video output	Female, 6-pin 156mil header**	1 x Custom OR 2 x Female housing 12 x Female terminal 6 x Wire	UltraCade Molex Molex {any}	115-UVCSTR-CBL 09-50-8061 08-50-0106 n/a	no no no no

\*\* For pin connection details, see section entitled "Connector Interface"





## Revision History

- Version 02E. PCB version 02:
  - 06/18/2005, DT. First release of the user documentation.

## Contact Information

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