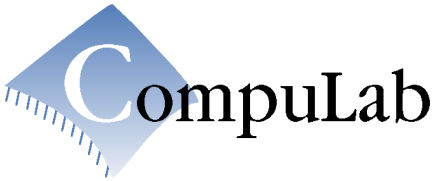


686BASE
PC/104+ Single Board Computer

Reference Guide

Table of Contents

1. REVISION NOTES 3

2. INTRODUCTION 4

2.1. HIGHLIGHTS 4
2.2. BLOCK DIAGRAM 5
2.3. FEATURES 6

3. CONNECTOR DESCRIPTION 8

3.1. COM1 HEADER (P13) 8
3.2. PS/2, ACCESSBUS & RESET (P19) 8
3.3. COM, GPIO, ADC, S-VIDEO HEADER (P14) 9
3.4. LPT / FDC HEADER (P10) 11
3.5. IDE – HARD DISK INTERFACE (P8) 13
3.6. PC CARD - CARDBUS / PCMCIA SLOTS (P3, P4) 14
3.7. CRT VGA HEADER (P9) 15
3.8. TFT PANEL CONNECTOR (J1) 16
3.9. STN PANEL CONNECTOR (P20) 17
3.10. USB, IR AND TV INTERFACE HEADER (P18) 18
3.11. PC/104 (SUB-ISA) CONNECTOR (J2) 19
3.12. PC/104+ PCI BUS CONNECTOR (P16) 21
3.13. AUDIO AND POWER HEADER (P17) 23
3.14. ETHERNET INTERFACE HEADER (P21) 23

4. FUNCTIONS IMPLEMENTED ON THE 686BASE 25

4.1. RS-232 AND RS-422/485 SERIAL PORT DRIVERS 25
4.2. POWER SUPPLY OPTIONS 27
4.3. DUAL PC CARD CONTROLLER 28
4.4. 10/100 MBIT ETHERNET PORT 29
4.5. LCD POWER SWITCH 29

5. CONNECTOR LOCATION 30

6. OPERATING TEMPERATURE RANGES 33

1. Revision Notes

Date	Description
15-Oct-2002	Preliminary release
18-Mar-2003	Updated Industrial Temperature availability - now available for all on-board functions.
16-Apr-2003	Cancelled IRQ9 input on PC/104 connector. This due to cancellation of SPIRQ1 interrupt input of 686CORE, as the result of Super-I/O chip specifications change.
10-Sep-2003	RI-1 - Ring Indicator input for COM1 canceled, since it is not properly supported by Geode chipset. This input is now tied to GND.
03-Feb-2004	Added clarifications regarding COM ports enumeration.
17-Jun-2004	Added detailed description about RS-422/485 modes

2. Introduction

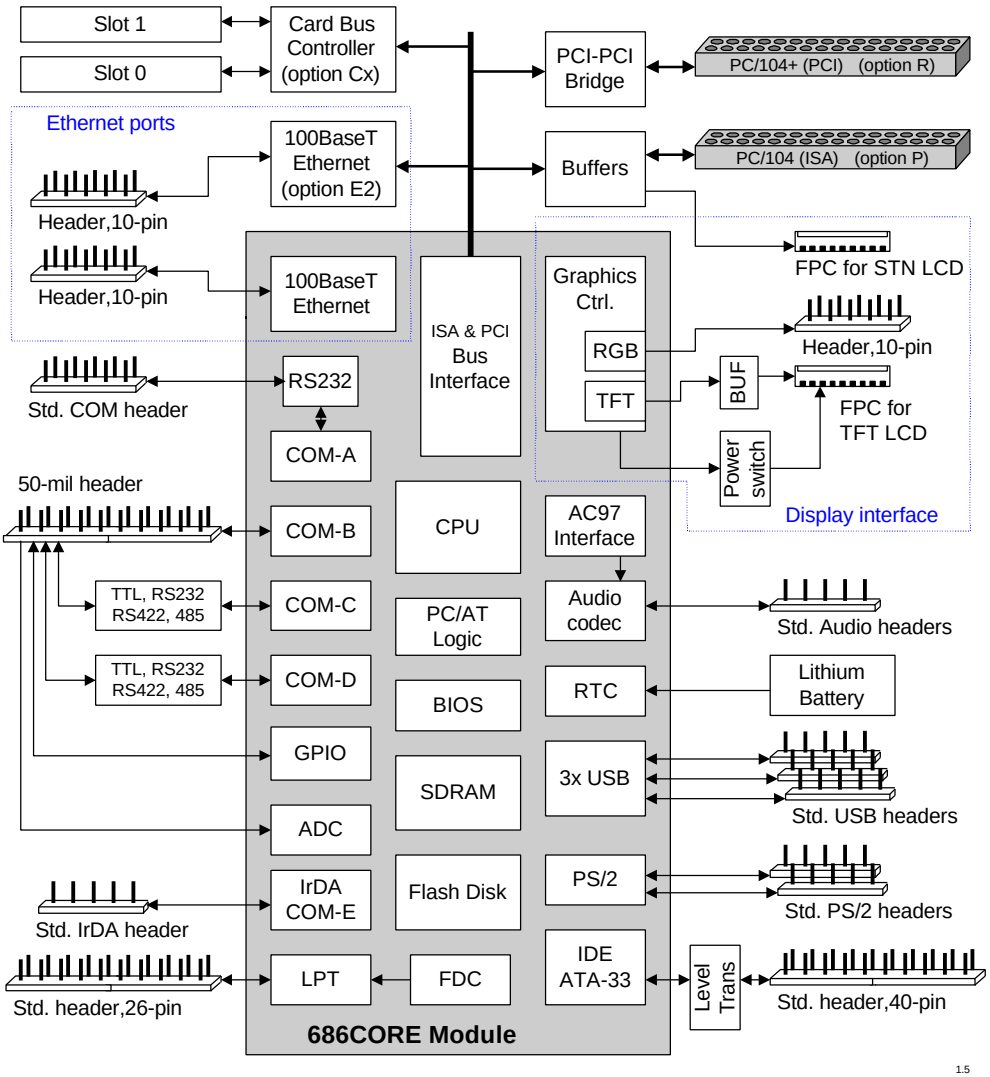
2.1. Highlights

- **PC/104+ Single Board Computer using the 686CORE module**
- **NS Geode CPU @ 266 MHz**
- **PCI and ISA expansion buses in PC/104+ format**
- **32 - 128 MB SDRAM**
- **1 - 256 MB Flash Disk**
- **COM1 - 4 with RS232 / RS485 / RS422 / TTL driver options**
- **IrDA, LPT, GPIO, PS/2 keyboard and mouse interfaces**
- **3 Host USB ports**
- **Hard and floppy disk interfaces**
- **Sound I/O**
- **VGA / SXGA graphics controller. Connectors for LCD panel and CRT monitor**
- **Single or dual 10/100BaseT Ethernet ports** (optional)
- **Single or Dual Card Bus / PCMCIA slots** (optional)
- **Lithium battery for RTC**
- **Small size - 96 mm x 91 mm**

The 686BASE is a PC/104+ standard compliant, single board computer. It uses a 686CORE module to implement most of the provided functions and also implements several additional important functions on-board. The rich set of features provided by the 686BASE is customizable according to price / performance targets of the user's application.

The 686BASE contains PC/104+ expansion connectors which open it to the wide range of standard peripheral cards. Furthermore, the 686BASE contains a PCMCIA / Card Bus controller and slots. A PCMCIA card may be inserted and secured in the slot, with no additional mechanical means. Off-the-shelf PCMCIA modules can extend the system with capabilities such as a larger solid state disk, modem, and wireless LAN.

2.2. Block Diagram



2.3. Features

The "BASE Option" column specifies the P/N code of a686BASE with a particular feature. The "CORE Option" column specifies the P/N code of a 686CORE with a particular feature. The 686BASE's content is the combination of features provided by the attached 686CORE and features implemented on the 686BASE itself. To have the particular feature, both CORE and BASE options of that feature must be implemented. "+" means that the feature is always available, regardless of P/N code.

Feature	Specification	BASE Option	CORE Option
CPU SDRAM Flash Disk	See Features List of 686CORE module		
COM 1	RS-232 levels, standard 10-pin header for DB-9 cable/connector	+	+
COM 3	Rx/Tx only, TTL levels, 50-mil header	+	+
COM 2 & 4	RS-232 / RS-485 / RS-422 / TTL level options, 50-mil header	X,Y	S
IrDA / COM5	Standard header for SIR LED module or COM 5 Tx/Rx TTL	+	+
LPT (Parallel Port)	Standard 26-pin header for DB-25 cable/connector. Shared with FDC	+	S
IDE	PIO and ATA-33 modes. Standard 40-pin header for HDD cable.	H	+
FDC	Routed through LPT header	+	S
Ethernet	One or two 10/100BaseT Ethernet ports. Realtek RTL8139 controller with MAC and PHY functions, PCI interface. 10-pin header per port. Optional interface module with transformer, RJ-45 connector and activity LED's.	+ or E2	E
CRT Monitor	10-pin header. Optional interface module with standard HD-15 VGA connector.	+	Gx
TFT Panel	31-pos FPC connector for direct interface to certain TFT panels	L	Gx
STN Panel	10-pos FPC connector for direct interface to certain STN panels with built-in controller. (STN panels w/o built-in controller are not supported)	+	+
PS/2	Standard headers for PS/2 cable/connector	+	S

GPIO	20 lines, through 50-mil header.	+	S
ADC	Analog to Digital converters, 8-bit, 6 channels. Through 50-mil header.	+	S
PCMCIA / Card Bus	TI PCI1420 controller. Support for 16-bit PCMCIA and 32-bit CardBus standards. Single or dual PCMCIA / Card Bus slot with card guides, for cards type I, II and III.	Cx	+
USB	3 Host ports, 12 Mbps. Header for Type-A cable/ connector.	U	+
Sound I/O	Header for standard cable/connectors for Microphone (mono), Line input and Speakers (stereo)	+	A
PC104	ISA bus through standard PC/104 connector	P	+
PC104+	PCI bus through standard PC/104+ connector	R	+

Electrical, Mechanical and Environmental Specifications

Power Supply	5.0V or 3.3V (The 3.3V option is only for cards w/o Audio and Super-I/O functions)	
Dimensions	96 mm x 91 mm x [10-22] mm. Height ranges from 10 mm to 22 mm, depending on the connectors assembled. Height specified includes the 686CORE module.	
Operation temp (case)	Commercial:	0^o to 70^o C
	Extended:	-20^o to 70^o C
	Industrial:	-40^o to 85^o C (available only for certain configurations)
Weight	135 gram	
Storage temperature	-40^o to 85^o C	
Relative humidity	10% to 90% (operation) 05% to 95% (storage)	
Shock	50G / 20 ms	
Vibration	20G / 0 - 600 Hz	

3. Connector Description

The 686BASE uses the attached 686CORE module to implement most of the provided functions. For these functions, the 686BASE routes the signals from the 686CORE's miniature connectors to the standard connectors. Function descriptions are therefore provided in the 686CORE Reference Guide. The section below provides only the description of the external interface connectors. The following section provides the specifications of those functions implemented on the 686BASE itself.

3.1. COM1 Header (P13)

2x5, 100 mil header, compatible with a standard DB9 cable/connector. RS-232 levels.

Pin	Name	Pin	Name
1	DCD1	2	RXD1
3	TXD1	4	DTR1
5	GND	6	DSR1
7	RTS1	8	CTS1
9	~~RI1~~	10	-

RI (Ring Indicator) input is not available for COM1, because it is not supported by Geode chipset. This input is tied to GND on 686BASE.

3.2. PS/2, AccessBus & Reset (P19)

1x18, 100 mil header. Pin assignment is directly compatible with standard PS/2 cables/connectors.

Pin	Name
01	-
02	-
03	-
04	GND
05	MCLK
06	MDATA
07	GND
08	VCC5
09	-

Pin	Name
10	KCLK
11	KDATA
12	GND
13	VCC5
14	-
15	AB2C-GPIO12
16	AB2D-GPIO13
17	RST_IN
18	GND

* AB2 - Access.Bus signals

3.3. COM, GPIO, ADC, S-Video Header (P14)

High-density connector, 60-pin, 50 mil pitch, 100 mil width

Pin	Name	Pin	Name
01	GND	02	SGP25 [SIRRX]
03	SGP26 [SIRTX]	04	SGP21
05	SGP20	06	VCC3
07	SGP22	08	GND
09	ADC0	10	ADC1
11	ADC2	12	ADC3
13	ADC4	14	ADC5
15	GND	16	SGP10
17	SGP11	18	SGP12
19	SGP13	20	SGP14
21	SGP15	22	SGP16
23	SGP17	24	SGP30
25	SGP31	26	SGP32
27	SGP33	28	SGP34
29	SGP35	30	FANIO1
31	FANPWM1	32	VCC3
33	GND	34	TXD4 [TXP4]
35	RTS4 [TXN4]	36	DTR4 [RXP4]
37	RXD4 [RXN4]	38	CTS4
39	DSR4	40	DCD4
41	RIN4	42	GND
43	TXD2 [TXP2]	44	RTS2 [TXN2]
45	DTR2 [RXP2]	46	RXD2 [RXN2]
47	CTS2	48	DSR2
49	DCD2	50	RIN2
51	GND	52	RXD3
53	TXD3 [CLKSEL1]	54	DTR3
55	VCC5	56	GPIO-CS1
57	GND	58	CVBS-TVG
59	SVY-TVR	60	SVC-TVB

Notes

1. [BLACK] names in brackets - serial port signals for RS422/485 interface options.
2. [GRAY] names in brackets - alternative option of shared pin.
3. Specifications of the mating flat cable for this header is found in CompuLab's website, following the [Developer] >> [586BASE] >> [586BASE - Mating Connectors Specifications] links.

3.4. LPT / FDC Header (P10)

2x13, 100 mil header, directly compatible with standard LPT cable/connector. This header is used for two different functions:

1. LPT - Parallel Port
2. FDD - Floppy Disk Drive interface

Selection between these two functions is performed in the BIOS setup. Pin functions change according to the mode selected.

When used as a LPT, the connector's pin-out is:

Pin	Name	Pin	Name
1	STROBE	2	AUTOFD
3	DATA0	4	ERROR
5	DATA1	6	INIT
7	DATA2	8	SLCTIN
9	DATA3	10	GND
11	DATA4	12	GND
13	DATA5	14	GND
15	DATA6	16	GND
17	DATA7	18	GND
19	ACK	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	-

When used as an FDC, the header's pin-out is:

Pin	Name	Pin	Name
1	(DS0)	2	DENSEL
3	INDEX	4	HDSEL
5	TRK0	6	DIR
7	WP	8	STEP
9	RDATA	10	GND
11	DSKCHG	12	GND
13	MEDIA-ID0	14	GND
15	(MTR0)	16	GND
17	MEDIA-ID1	18	GND
19	DS1	20	GND
21	MTR1	22	GND
23	WDATA	24	GND
25	WGATE	26	-

A ready to use adapter from LPT (26-pin) to FDD (34-pin) connector format is available from CompuLab. Adapter design is published in CompuLab's website following [Developer] >> [586BASE] >> [LPT to FDD Adapter Design] links.

3.5. IDE – Hard Disk Interface (P8)

Standard 40-pin header, directly compatible with an IDE flat cable

Pin	Name	Pin	Name
1	RESET#	2	GND
3	DATA7	4	DATA8
5	DATA6	6	DATA9
7	DATA5	8	DATA10
9	DATA4	10	DATA11
11	DATA3	12	DATA12
13	DATA2	14	DATA13
15	DATA1	16	DATA14
17	DATA0	18	DATA15
19	GND	20	-
21	-	22	GND
23	IOW#	24	GND
25	IOR#	26	GND
27	IOCHRDY	28	-
29	DMAACK#	30	GND
31	IRQ	32	IOCS16#
33	ADDR1	34	-
35	ADDR0	36	ADDR2
37	CS0#	38	CS1#
39	DASP#	40	GND

3.6. PC Card - CardBus / PCMCIA slots (P3, P4)

68-pin PC Card slots which conform to CardBus and PCMCIA standards. Include card guides. The 686BASE can be assembled with either no, one or two PC Card slots. Signal names are specified for both P3 and P4 slots; however, they are physically connected to separate signal groups of the controller.
The selection of PCMCIA versus CardBus mode is performed automatically under driver control, according to the inserted card type.

Pin	PCMCIA Name	CardBus Name	Pin	PCMCIA Name	CardBus Name
1	GND	GND	35	GND	GND
2	D3	CAD0	36	CD1#	CCD1#
3	D4	CAD1	37	D11	CAD2
4	D5	CAD3	38	D12	CAD4
5	D6	CAD5	39	D13	CAD6
6	D7	CAD7	40	D14	RFU
7	CE1#	CCBE0#	41	D15	CAD8
8	A10	CAD9	42	CE2#	CAD10
9	OE#	CAD11	43	VS1#	CVS1
10	A11	CAD12	44	IOR#	CAD13
11	A9	CAD14	45	IOW#	CAD15
12	A8	CCBE1#	46	A17	CAD16
13	A13	CPAR	47	A18	RFU
14	A14	CPERR#	48	A19	CBLOCK#
15	WE#	CGNT#	49	A20	CSTOP#
16	RDY#/IREQ#	CINT#	50	A21	CDEVSEL#
17	VCC	VCC	51	VCC	VCC
18	VPP1	VPP1	52	VPP2	VPP2
19	A16	CCLK	53	A22	CTRDY#
20	A15	CIRDY#	54	A23	CFRAME#
21	A12	CCBE2#	55	A24	CAD17
22	A7	CAD18	56	A25	CAD19
23	A6	CAD20	57	VS2#	CVS2
24	A5	CAD21	58	RESET	CRST#
25	A4	CAD22	59	WAIT	CSERR#
26	A3	CAD23	60	INPACK#	CREQ#
27	A2	CAD24	61	REG#	CCBE3#
28	A1	CAD25	62	BVD2/SPK	CAUDIO
29	A0	CAD26	63	BVD1/STS	CSTSCHG
30	D0	CAD27	64	D8	CAD28

31	D1	CAD29	65	D9	CAD30
32	D2	RFU	66	D10	CAD31
33	WP/IOIS#	CCLKRUN#	67	CD2#	CCD2#
34	GND	GND	68	GND	GND

PCMCIA slot types

- In single slot assembly, the slot can accommodate all types of PCMCIA cards - Type I, II or III.
- In dual slot assembly, the inner slot can accommodate Type I and II cards only, due to height limitation, while the outer slot can accommodate all types.

3.7. CRT VGA Header (P9)

2x5, 100 mil header for connection of a 10-wire flat cable to DB-15 connector. Flat cable to DB-15 adapter is available from CompuLab.

Pin	Name	Pin	Name
1	GND	2	RED
3	GND	4	GREEN
5	GND	6	BLUE
7	GND	8	VSYNC
9	VCC3	10	HSYNC

3.8. TFT Panel Connector (J1)

51-pos FPC connector. Direct interface for certain TFT panels (such as LP064V1)

Pin	Name
01	LCD-VDD
02	LCD-VDD
03	LCD-R0
04	LCD-R1
05	GND
06	LCD-R2
07	LCD-R3
08	GND
09	LCD-R4
10	LCD-R5
11	GND
12	-
13	-
14	GND
15	GND
16	LCD-G0
17	LCD-G1
18	GND
19	LCD-G2
20	LCD-G3
21	GND
22	LCD-G4
23	LCD-G5
24	GND
25	-
26	-

Pin	Name
27	LCD-VDD
28	LCD-VDD
29	LCD-B0
30	LCD-B1
31	GND
32	LCD-B2
33	LCD-B3
34	GND
35	LCD-B4
36	LCD-B5
37	GND
38	-
39	-
40	GND
41	GND
42	LCD-HSYNC
43	LCD-VSYNC
44	LCD-DE
45	GND
46	LCD-CLK
47	GND
48	LCD-ENVEE
49	LCD-ENVDD
50	LCD-VDD
51	LCD-VDD

3.9. STN Panel Connector (P20)

The 686BASE (including 686CORE) graphics controller doesn't support STN panels directly. However, many low-cost STN panels have a built-in controller. Interface for such a panel is provided by the P20 connector. In general, it has 8-bit data and read/write strobe signals. The implemented interface was checked for direct compatibility with Ampire AT-320240Q1FIEW, 320 x 240 STN panel, but will probably fit many other panels of that type.

Pin	Name	Description
01	RESET	Simple bus interface to panel's built-in controller
02	ISA-IOR#	
03	ISA-IOW#	
04	GPIO-CS1	
05	ISA-A0	
06	ISA-D0	
07	ISA-D1	
08	ISA-D2	
09	ISA-D3	
10	ISA-D4	
11	ISA-D5	
12	ISA-D6	
13	ISA-D7	

Pin	Name	Description
14	VCC3	Power supply
15	GND	
16	CONTRCTL	Contrast control
17	ELCTL	
18	SGP30	Touch panel interface
19	SGP31	
20	SGP32	
21	SGP33	
22	TOUCH-IRQ	
23	-	
24	-	

3.10. USB, IR and TV Interface Header (P18)

1x26, 100 mil header contains interface of several separate functions. Signal pinouts are compatible with standard cables/connectors.

Pin	Name	Description
01	VCC3	LCD voltage supply selection
02	VSRCLCD	
03	VCC5	
04	CVBS	TV output
05	GND	
06	USB1-VCC	USB1 interface
07	USB1-DN	
08	USB1-DP	
09	GND	
10	SHIELD	
11	USB2-VCC	USB2 interface
12	USB2-DN	
13	USB2-DP	
14	GND	
15	SHIELD	

Pin	Name	Description
16	USB3-VCC	USB3 interface
17	USB3-DN	
18	USB3-DP	
19	GND	
20	SHIELD	
21	VCC5	IR module interface
22	-	
23	IR-RXD	
24	GND	
25	IR-TXD	
26	PCBEEP	PC beeper

Notes

- LCD Supply selection: VSRCLCD ("Voltage Source for LCD") is an output to LCD power supply pins - LCD-VDD. User can select 3.3V or 5V supply by placing a jumper on 1-2 or 2-3 pins of P18.

- USBx-VCC pins have overcurrent protection as required by USB standard specifications.

3.11. PC/104 (Sub-ISA) connector (J2)

PC/104 (ISA bus type) stackthrough connector. Provides limited ISA functionality. The 686CORE's Sub-ISA bus lines are connected through buffers to their respective counterparts on the PC/104 connector. All non-obvious connections and unsupported signals (due to reduced functionality) are mentioned in notes.

Pin	Name	Notes	Pin	Name	Notes
A01	IOCHCHK#	N/C	B01	GND	
A02	SD7		B02	RESETDRV	
A03	SD6		B03	+5V	
A04	SD5		B04	IRQ9	N/C
A05	SD4		B05	-5V	N/C
A06	SD3		B06	DRQ2	N/C
A07	SD2		B07	-12V	N/C
A08	SD1		B08	0WS#	Pullup
A09	SD0		B09	+12V	
A10	IOCHRDY		B10	KEY	
A11	AEN	GND	B11	SMEMW#	Pullup
A12	SA19		B12	SMEMR#	Pullup
A13	SA18		B13	IOW#	
A14	SA17		B14	IOR#	
A15	SA16		B15	DACK3#	Pullup
A16	SA15		B16	DRQ3	N/C
A17	SA14		B17	DACK1#	Pullup
A18	SA13		B18	DRQ1	N/C
A19	SA12		B19	REFRESH	Pullup
A20	SA11		B20	SYSCLK	CLK8M hz
A21	SA10		B21	IRQ7	N/C
A22	SA9		B22	IRQ6	N/C
A23	SA8		B23	IRQ5	SPIRQ0
A24	SA7		B24	IRQ4	N/C
A25	SA6		B25	IRQ3	N/C
A26	SA5		B26	DACK2#	Pullup
A27	SA4		B27	TC	GND
A28	SA3		B28	BALE	Pullup
A29	SA2		B29	+5V	
A30	SA1		B30	OSC	CLK16M hz
A31	SA0		B31	GND	
A32	GND		B32	GND	

Pin	Name	Notes	Pin	Name	Notes
C00	GND		D00	GND	
C01	SBHE#		D01	MEMCS16#	N/C
C02	LA23		D02	IOCS16#	N/C
C03	LA22		D03	IRQ10	N/C
C04	LA21		D04	IRQ11	N/C
C05	LA20		D05	IRQ12	N/C
C06	LA19		D06	IRQ15	N/C
C07	LA18		D07	IRQ14	N/C
C08	LA17		D08	DACK0#	Pullup
C09	MEMR#		D09	DRQ0	N/C
C10	MEMW#		D10	DACK5#	Pullup
C11	SD8		D11	DRQ5	N/C
C12	SD9		D12	DACK6#	Pullup
C13	SD10		D13	DRQ6	N/C
C14	SD11		D14	DACK7#	Pullup
C15	SD12		D15	DRQ7	N/C
C16	SD13		D16	+5V	
C17	SD14		D17	MASTER#	Pullup
C18	SD15		D18	GND	
C19	KEY		D19	GND	

Signals marked in [GRAY] are not supported. In general, functionality of the Sub-ISA bus of the 686BASE has the following limitations:

- DMA channels on ISA bus are not supported.
- Only one interrupt input is supported.
- Obsolete / irrelevant signals are not supported: SMEMW#, SMEMR#, REFRESH.
- Some signals of secondary importance are not supported: MEMSC16, IOCS16#, BALE.

For more information regarding ISA bus limitations in 686CORE/BASE please refer to 686CORE Reference Guide, Section 3.13 - "Sub-ISA Bus Interface >> Unsupported ISA Signals". Despite the above-mentioned limitation, the 686BASE can work with most of standard ISA cards, since mentioned unsupported signals are rarely used by modern cards.

In addition to mentioned hardware limitations, ISA bus access requires configuration of access window in run-time. This is practical only if user has an ability to add window configuration code to his application. Please consult CompuLab's technical support for more information about software compatibility issues.

3.12. PC/104+ PCI bus connector (P16)

Standard PC/104+ (PCI bus) connector. The 686CORE's PCI bus lines are connected to their respective counterparts on the PC/104+ connector through the bridge. All non-obvious connections are mentioned in notes.

Pin	Name	Notes	Pin	Name	Notes
A01	KEY2	n/c	B01	(reserved)	
A02	V I/O	3.3V	B02	AD02	
A03	AD05		B03	GND	
A04	CBE0#		B04	AD07	
A05	GND		B05	AD09	
A06	AD11		B06	V I/O	3.3V
A07	AD14		B07	AD13	
A08	+3.3V		B08	CBE1#	
A09	SERR#		B09	GND	
A10	GND		B10	PERR#	
A11	STOP#		B11	+3.3V	
A12	+3.3V		B12	TRDY#	
A13	FRAME#		B13	GND	
A14	GND		B14	AD16	
A15	AD18		B15	+3.3V	
A16	AD21		B16	AD20	
A17	+3.3V		B17	AD23	
A18	IDSEL0	AD22 via 150R	B18	GND	
A19	AD24		B19	CBE3#	
A20	GND		B20	AD26	
A21	AD29		B21	+5.0V	
A22	+5.0V		B22	AD30	
A23	REQ0#		B23	GND	
A24	GND		B24	REQ2#	
A25	GNT1#		B25	V I/O	3.3V
A26	+5.0V		B26	CLK0	PCI-CLK1
A27	CLK2		B27	+5.0V	
A28	GND		B28	INTD#	N/C
A29	+12V		B29	INTA#	
A30	-12V	N/C	B30	(reserved)	

Pin	Name	Notes	Pin	Name	Notes
C01	+5.0V		D01	AD00	
C02	AD01		D02	+5.0V	
C03	AD04		D03	AD03	
C04	GND		D04	AD06	
C05	AD08		D05	GND	
C06	AD10		D06	M66EN	GND
C07	GND		D07	AD12	
C08	AD15	Pullup	D08	+3.3V	
C09	SB0#		D09	PAR	
C10	+3.3V	Pullup	D10	SDONE	Pullup
C11	LOCK#		D11	GND	
C12	GND		D12	DEVSEL#	
C13	IRDY#		D13	+3.3V	
C14	+3.3V		D14	CBE2#	
C15	AD17		D15	GND	
C16	GND		D16	AD19	
C17	AD22		D17	+3.3V	
C18	IDSEL1	AD23 via 150R	D18	IDSEL2	AD24 via 150R
C19	V I/O		D19	IDSEL3	AD25 via 150R
C20	AD25		D20	GND	
C21	AD28		D21	AD27	
C22	GND		D22	AD31	
C23	REQ1#		D23	V I/O	
C24	+5.0V		D24	GNT0#	
C25	GNT2#		D25	GND	
C26	GND		D26	CLK1	
C27	CLK3		D27	GND	
C28	+5.0V		D28	RST#	
C29	INTB#		D29	INTC#	N/C
C30	(reserved)		D30	KEY2	

Note: INTC# and INTD# are not connected, due to the limited number of available interrupt inputs on the 686CORE. This limitation has no practical effect on the card's functionality.

3.13. Audio and Power Header (P17)

1x18, 100 mil header. Has two functions: Audio input/output and power supply entry.

Pin	Name	Description
01	OUT-R	Audio output
02	GND	
03	GND	
04	OUT-L	
05	IN-R	Line input
06	GND	
07	GND	
08	IN-L	
09	MIC-VCC	Microphone input
10	GND	
11	MIC-IN	

Pin	Name	Description
12	RTC-VCC	RTC supply
13	GND	
14	VCC12	Main power entry
15	GND	
16	VCC5	
17	VCC3	
18	GND	

Notes

VCC12 is not used by any on-board resources. It is routed to the appropriate pins of the PC/104 and PCMCIA connectors, in case an add-in card requires it.

For certain configurations, the VCC3 is optional and for another configurations, the VCC5 is optional. For details, see the "Power Supply Options" section.

3.14. Ethernet Interface Header (P21)

The Ethernet Interface Header provides two separate groups of signals, one per Ethernet port available in the 686CORE / 686BASE system. The first port (ETH1) belongs to the 686CORE, the second port belongs to the 686BASE itself.

Pin	Name	Pin	Name
1	ETH2-LED2	2	ETH2-TXN
3	ETH2-TXP	4	ETH2-LED2
5	ETH2-LED0	6	ETH2-LED1
7	ETH2-RXSHLD	8	ETH2-RXP
9	ETH2-RXN	10	ETH2-RXSHLD
11	-	12	-
13	-	14	-
15	ETH1-LED2	16	ETH1-TXN
17	ETH1-TXP	18	ETH1-LED2

19	ETH1-LED0	20	ETH1-LED1
21	ETH1-RXSHLD	22	ETH1-RXP
23	ETH1-RXN	24	ETH1-RXSHLD

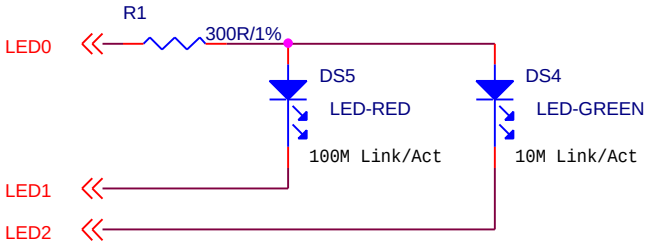
The header is designed for the connection of two separate 10-wire flat cables, one per port. The flat cable connects the header to the RJ-45 interface module, which includes the RJ-45 connector, transformer and activity LED's. An RJ-45 interface module is available from CompuLab.

Activity LED signals settings are controlled by software. Default settings are:

LED0	RX/TX
LED1	Link 100
LED2	Link 10

Note: LED signal wires in flat cable are also used as secondary shielding, so their locations on the header may appear non-obvious.

The LED signal connections as implemented in CompuLab's RJ-45 interface module are:



This connection supplies full information about speed / link / activity.

LED-RED : 100 Mbps activity indicator
LED-GREEN : 10 Mbps activity indicator

Activity	**LED (Red/Green)**
none	off
Link (only)	on
Tx / Rx (and Link)	blink

4. Functions Implemented on the 686BASE

Most of the 686BASE board functions are implemented by the attached 686CORE module, while the 686BASE board provides headers to standard cables/connectors. However, several additional functions are implemented on the 686BASE itself. This section describes those functions.

4.1. RS-232 and RS-422/485 Serial Port Drivers

The 686CORE module has on-board RS-232 drivers for the COM1 serial port. Other serial ports of the 686CORE have TTL level interface. The 686BASE adds several driver options for some of the serial ports as specified in the table below. Driver support includes modem control lines.

686CORE Name	686BASE Name	Modem control lines	Origin	Level options		
				RS 232	RS 422/485	TTL
COM-A	COM1	+	Geode	+	-	-
COM-B	COM3	-	Geode	-	-	+
COM-C	COM2	+	SIO	+	+	+
COM-D	COM4	+	SIO	+	+	+
COM-E	COM5	-	Geode	-	-	+

Notes:

1. *COM5 is shared with the IR port*
2. *RIN (Ring Indicator) is not available for COM1.*
3. *Difference between port enumeration in CORE and BASE is result of backward compatibility concerns.*

The interface type of the COM2 and COM4 ports can be selected individually to the RS-232 or RS-422/485 standard by assembling the appropriate drivers. If the 686BASE is assembled with no drivers for a particular COM port, then port signals are available with TTL levels.

RS-422 and RS-485 modes

In RS-422/485 modes, TXD outputs of the COM2 and COM4 ports are enabled by RTS2 / RTS4 signals, or alternatively by SGP23 and SGP24 general purpose pins:

- SGPx "1" level enables TX output, and SGPx "0" disables it, regardless of RTS state. SGPx at high-Z state has no influence on TX output, in which case TX output is controlled by RTS.
- When SGP is in high-Z, RTS "1" enables TX output, RTS "0" disables it.

Note: RTS effect as specified above applies to 686BASE rev 1.2 or later. In earlier versions of 686BASE, RTS effect is inverted. The rev 1.2 the change was made in order to match RTS effect to regular operating systems. Please check the revision code of your 686BASE board. Revision code is printed on PCB nearby lithium battery.

In RS-485 (half duplex) mode, transmit and receive operations are performed on TX lines. To achieve this, user have physically connect RX and TX lines of the serial driver, i.e. RX+ to TX+ and RX- to TX-. In this case selection between receive and transmit operations is performed by RTS or SGP.

In RS-422 (full duplex) mode, transmit and receive operations are performed on separate line pairs. TX output can be always enabled, though qualifying it by RTS has no practical effect on system operation. RX and TX lines should not be connected together as in case of RS-485.

For better understanding of RS-422/485 drivers operation, please refer to 686BASE design schematics, available following [developer] >> [686CORE] >> [Hardware] links in CompuLab's web-site.

4.2. Power Supply Options

The 686BASE has an optional on-board 5V-to-3.3V linear converter. Supply voltage options are:

1. **3.3V only**
   In this case, the converter is not assembled. This option can be used only if the selected 686CORE module doesn't contain Audio or Super-I/O components, since otherwise the 3.3V supply alone is not sufficient for the card's requirements.

2. **3.3V and 5.0V**
   This option is the same as (1), but it supports all types of 686CORE modules, including those having Audio and/or Super-I/O.

3. **5.0V only**
   In this case, a 5V-to-3.3V linear converter is assembled on the 686BASE. Supports all types of 686CORE modules.

Bypassing the on-board converter:
If 3.3V is applied on the power entry connector, the on-board 5V-to-3.3V converter is disabled automatically and doesn't interfere with externally applied power.

Power output specifications:
5V to 3.3V converter maximum output current: 3 A
Power entry specifications:

Power entry pins	Maximum allowed input current	Input tolerance
5.0V	3 A	5 %
3.3V	3 A	5 %

Converter and power entry specifications are designed in excess of 686CORE/BASE requirements. Maximum current drawn by the 686CORE and 686BASE together is less than 1.5 A, maximum power consumption is less than 5 watt. The spare power can be used by attached PC/104 or PCMCIA / CardBus cards.

4.3. Dual PC Card Controller

The 686BASE implements a dual PC Card interface using a TI PCI1420 controller. The PC Card controller and slots are optional, according to the 686BASE's configuration. The PCI1420 is a high-performance PCI-to-CardBus controller that supports two independent card sockets compliant with the PC Card Standard. The PC Card Standard retains the 16-bit PC Card specification (PCMCIA) and defines the new 32-bit PC Card, CardBus, capable of full 32-bit data transfers at 33 MHz. The 686BASE supports any combination of PCMCIA and CardBus PC Cards in the two sockets, powered at 5 V or 3.3 V as required. The controller is compliant with the PCI Local Bus Specification, and its PCI interface can act as either a PCI master device or a PCI slave device. The PCI bus mastering is initiated during 16-bit PC Card DMA transfers or CardBus PC Card bridging transactions. The controller is also compliant with the latest PCI Bus Power Management Interface Specification.
All PC Card signals are internally buffered to allow hot insertion and removal. The PCI1420 is register-compatible with the Intel 82365SL controller in 16-bit PCMCIA mode. The controller's internal data path logic allows the host to access 8-, 16-, and 32-bit cards using full 32-bit PCI cycles for maximum performance.

Features

- Mix-and-match 5-V/3.3-V 16-bit PC Cards and 3.3-V CardBus Cards
- Two PC Card or CardBus slots with hot insertion and removal
- Dual-slot PC Card power switch
- Burst transfers, 130 MB/s throughput
- Five PCI memory windows and two I/O windows available for each socket
- Two I/O windows and two memory windows available by each CardBus socket
- Intel 82365SL register compatible
- Distributed DMA (DDMA) and PC/PCI DMA
- 16-Bit DMA on both PC Card sockets

The controller is initialized by 686CORE BIOS and supported by all operating system packages provided for the 686CORE / BASE.

4.4. 10/100 Mbit Ethernet Port

The 686BASE contains one full-featured, optional 10/100 Mbit Ethernet port. This is in addition to the optional Ethernet port contained in the 686CORE module. The user can therefore order the 686CORE / BASE system with none, one or two Ethernet ports. The Ethernet interface is based on the Realtek RTL8139 MAC/PHY component. In functional terms, it is identical to the Ethernet port available on the 686CORE. Please refer to the 686CORE Reference Guide for details.

The Ethernet port's interface to the external world is through a 100 mil interface header. The header is designed for connection to a flat cable with a RJ-45 connector on the other end. This cable and RJ-45 module are available from CompuLab.

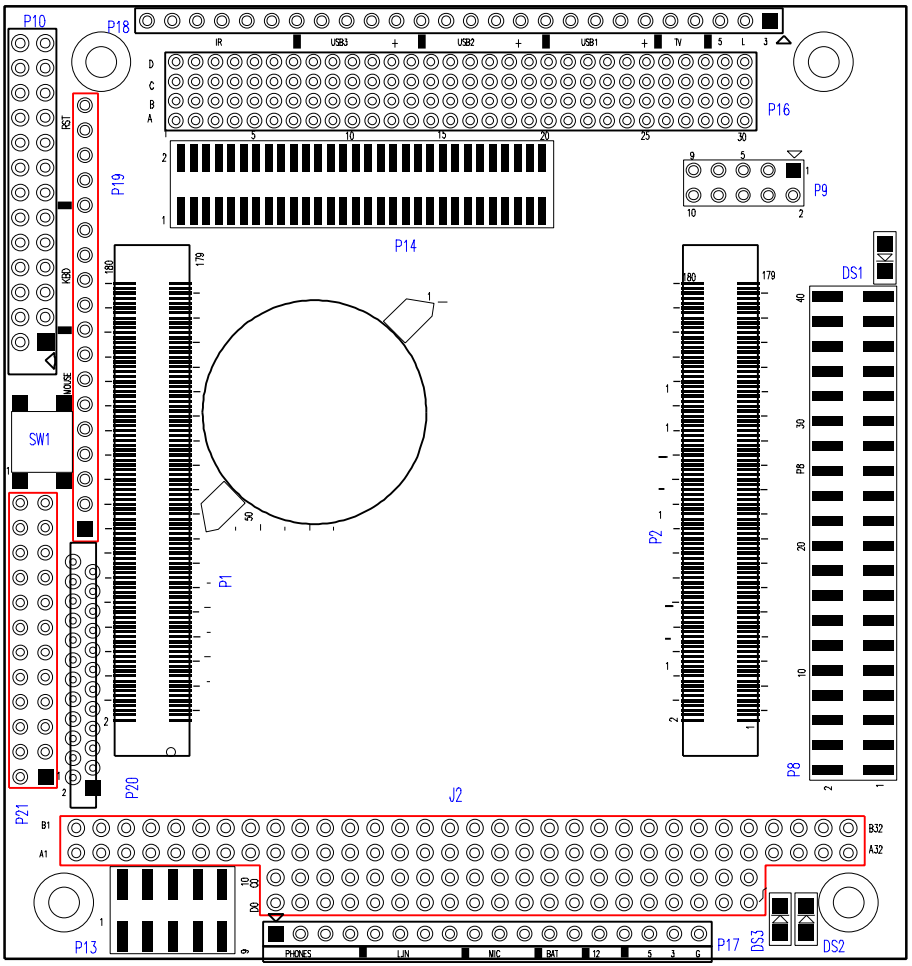
Note: the operating system assigns the 686CORE's Ethernet to be Port0 and the 686BASE's Ethernet, Port1.

4.5. LCD Power Switch

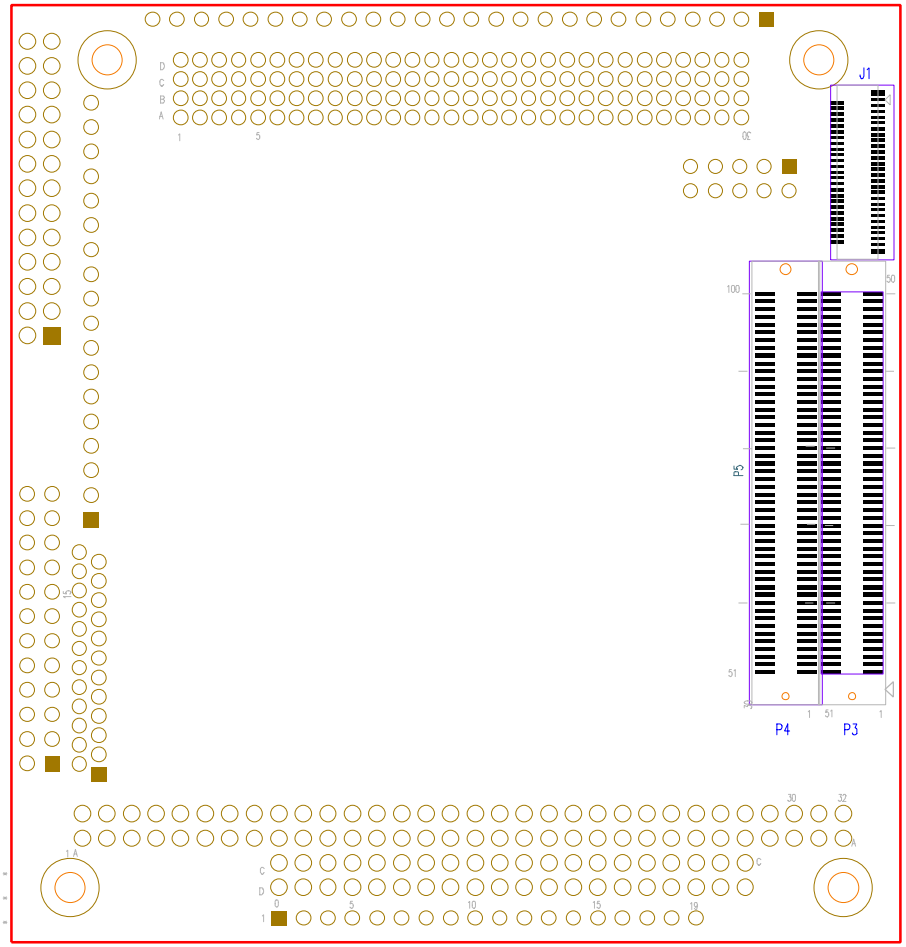
The graphics controller for TFT panels is located on the 686CORE module. The 686BASE adds one feature for LCD panel support - the power switch. Most LCD panels require proper power sequencing in order to avoid panel damage. The graphics controller of the 686CORE provides the FPVDDON signal indicating when power should be applied. The LCD power switch circuit of the 686BASE applies a VDD on LCD interface connector under the control of FPVDDON.

LCD Supply selection: User can select 3.3V or 5V supply by placing a jumper on 1-2 or 2-3 pins of P18.

5. Connector Location



686BASE Top side



686BASE Bottom side (Top side view)

Reference

J1	TFT Panel Connector
J2	PC/104 (Sub-ISA) connector
P10	LPT / FDC Header
P13	COM1 Header
P14	COM, GPIO, ADC, S-Video Header
P16	PC/104+ PCI bus connector
P17	Audio and Power Header
P18	USB, IR and TV Interface Header, LCD power selection
P19	PS/2 & System Control
P20	STN Panel Connector
P21	Ethernet Interface Header
P3, P4	PC Card - CardBus / PCMCIA slot mating connectors
P8	IDE – Hard Disk Interface
P9	CRT VGA Header
DS1	Harddisk LED
DS2, DS3	BIOS Status Leds
P1, P2	686CORE mating connectors
SW1	Reset Switch

6. Operating Temperature Ranges

The 686BASE is available with three options of operating temperature range:

Commercial	0^o to 70^o C
Extended	-20^o to 70^o C
Industrial	-40^o to 85^o C

The cards' manufacturing and certification method for each option is explained in the "Operating Temperature Ranges" section of the 686CORE Reference Guide.

Availability of Industrial temperature range is not limited to certain functions. However, not all components are certified by manufacturers for industrial temperature grade. The table below lists which functional blocks have components certified by manufacturer. For more information refer to the "Operating Temperature Ranges" section of the 686CORE Reference Guide.

Function	**Component certification**
Ethernet	-
CardBus / PCMCIA	-
RS-232	+
RS-422/485	+
5V & 12V power supply	+
Lithium battery (for RTC)	-10^o to 85^o C
All other functions	According to 686CORE spec.

The mating 686CORE module should be ordered for the same as or better than temperature range of the 686BASE. For example, it is not valid to use a 686BASE manufactured for industrial temp range with a 686CORE manufactured for commercial temp range. Such a combination is practically limited to the commercial temp range. On the other hand, it is valid to use a 686CORE manufactured for industrial range while using a 686BASE manufactured for commercial range, assuming that such a 686BASE does not contain temperature-dependent functions, as specified in the table above.