



HUNT ENGINEERING
Chestnut Court, Burton Row,
Brent Knoll, Somerset, TA9 4BP, UK
Tel: (+44) (0)1278 760188,
Fax: (+44) (0)1278 760199,
Email: sales@hunteng.demon.co.uk
URL: <http://www.hunteng.co.uk>



We are a
committed
member of the
Texas Instruments
3rd party
programme

For Sales and Support in North America Please Contact Our Strategic Partner:

Traquair Data Systems Inc, 114 Sheldon Road, Ithaca, NY 14850 USA

Tel 607 266 6000, Fax 607 266 8221

Email Traquair@traquair.com, URL <http://www.traquair.com>

For Sales and Support in Other Areas Please Contact Your Local Reseller.

HEBASE104

Generic Comport Interface

PC/104 format card

USER MANUAL

Hardware Rev B
Document Rev B
P.Warnes 6/7/99

COPYRIGHT

This documentation and the product it is supplied with are Copyright HUNT ENGINEERING 1999. All rights reserved. HUNT ENGINEERING maintains a policy of continual product development and hence reserves the right to change product specification without prior warning.

WARRANTIES LIABILITY and INDEMNITIES

HUNT ENGINEERING warrants the hardware to be free from defects in the material and workmanship for 12 months from the date of purchase. Product returned under the terms of the warranty must be returned carriage paid to the main offices of HUNT ENGINEERING situated at BRENT KNOLL Somerset UK, the product will be repaired or replaced at the discretion of HUNT ENGINEERING.

Exclusions - If HUNT ENGINEERING decides that there is any evidence of electrical or mechanical abuse to the hardware, then the customer shall have no recourse to HUNT ENGINEERING or its agents. In such circumstances HUNT ENGINEERING may at its discretion offer to repair the hardware and charge for that repair.

Limitations of Liability - HUNT ENGINEERING makes no warranty as to the fitness of the product for any particular purpose. In no event shall HUNT ENGINEERING'S liability related to the product exceed the purchase fee actually paid by you for the product. Neither HUNT ENGINEERING nor its suppliers shall in any event be liable for any indirect, consequential or financial damages caused by the delivery, use or performance of this product.

Because some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, the above limitations may not apply to you.

TECHNICAL SUPPORT

Technical support for HUNT ENGINEERING products should first be obtained contacting your local supplier, if you are unsure of details please refer to www.hunteng.co.uk for the list of current re-sellers.

HUNT ENGINEERING technical support can be contacted by emailing support@hunteng.demon.co.uk, calling the direct support telephone number +44 (0)1278 760775, or by calling the general number +44 (0)1278 760188 and choosing the technical support option.

TABLE OF CONTENTS

INTRODUCTION.....	4
PHYSICAL LOCATION OF ITEMS ON THE HEBASE104.....	5
BLOCK DIAGRAM OF THE HEBASE104	6
GENERAL DESCRIPTION OF INTERFACES	7
RESET.....	7
A. SLAVE TO ANOTHER 'C4x SYSTEM.....	7
B. SLAVE OF A 'C4x SYSTEM VIA A REMOTE BOOTING MODULE.	8
CONFIG.....	8
POWER DOWN CONTROL	9
COMPORT DIRECTION JUMPERS AND LEDs.....	9
HARDWARE DETAILS	11
COMPORT CONNECTORS	11
RESET.....	12
CONTROL CONNECTORS.....	13
POWER DOWN CONTROL CONNECTOR	14
OPTIONAL POWER CONNECTOR	14
PHYSICAL DIMENSIONS OF THE BOARD.....	16
POWER REQUIREMENTS OF THE HEBASE104.....	17
FITTING GDIO MODULES TO YOUR HEBASE104	18
STACKING PC/104 BOARDS	19
GDIO PHYSICAL SPECIFICATION	20
GDIO ELECTRICAL SPECIFICATION.....	23
SOFTWARE REQUIREMENTS	27
CE MARKING.....	28
TECHNICAL SUPPORT	29

The HEBASE104 is a PC/104 card that removes the Comport interfacing problem from developing Comport based I/O boards. There is a fast growing range of standard GDIO format I/O board available from HUNT ENGINEERING, which is made accessible to PC/104 systems by this board.

It also provides a means for you to develop your own Comport based I/O without having to understand the Comport interfacing problems. Alternatively, HUNT ENGINEERING can develop your 'custom' board in short timescales and with low cost.

The HEBASE104 enables quick and easy development of custom I/O solutions by providing an interface between a Comport and a GDIO module. The HEBASE104 accepts GDIO modules by providing a standard pair of connectors. Hence each GDIO custom module can be quickly and easily designed to plug on to the standard HEBASE104 connectors, thereby removing the designer from the issues of the Comport interface.

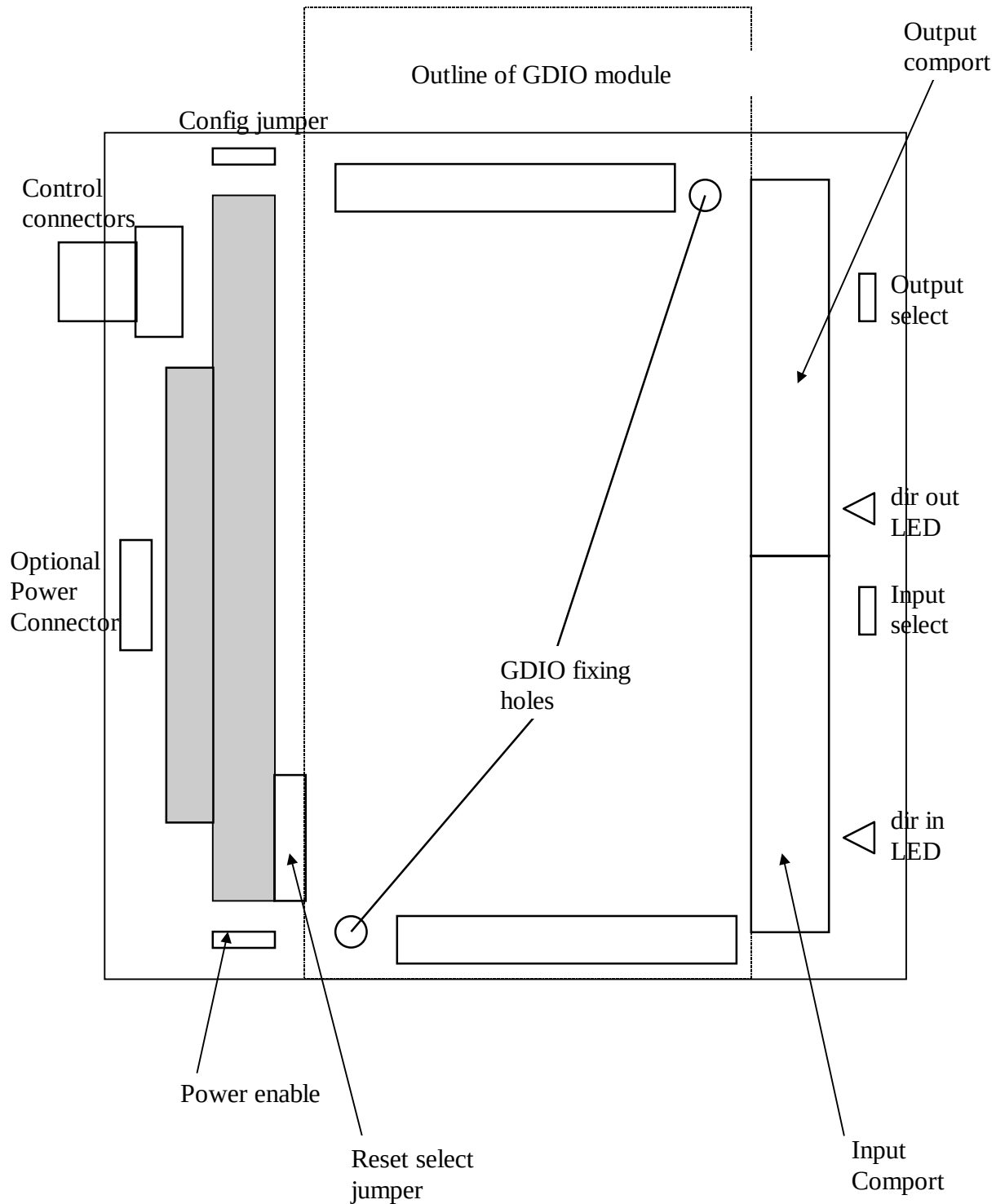
The HEBASE104 interfaces two 'C4x Comports to a GDIO module via banks of FIFO. Because the HEBASE104 is a separate card in your PC/104 stack, the Comport connections have to be made using cables. The comport connectors on the HEBASE104 are not polarised, as they can accept connections from either RTO or RTI comports, as long as the selection jumper is correctly fitted to the HEBASE104. This allows the fixed direction data paths to be connected to comports that do not have that reset direction, as the HEBASE104 will switch the comport direction to the required direction if necessary, immediately after the system reset.

The interface to the GDIO module is through two independent 16 bit buses one from each bank of FIFOs, along with the relevant read/write pins and status flags of the FIFOs. This interface also provides +/-12V and 5V to the GDIO, allowing the use of regulators to provide stable voltages for I/O circuitry.

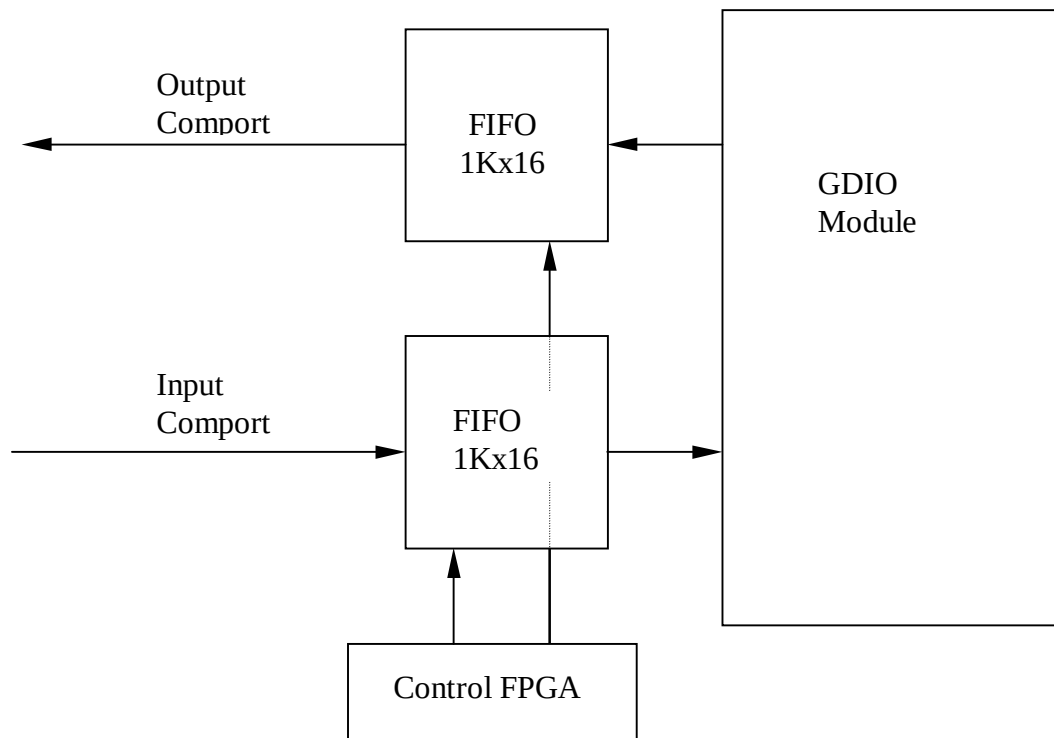
The 'GDIO module' is 4.0" x 2.5" and is mounted above the PC/104 card with a board to board spacing of 0.2".

Hence the HEBASE104 can be used in an arbitrarily large network of HUNT ENGINEERING PC/104 DSP cards, to provide I/O through the use of GDIO modules.

Physical Location of Items on the HEBASE104



Block Diagram of the HEBASE104



General Description of Interfaces

The HEBASE104 has a 16bit stack through PC/104 connector, which can be used to supply the card's power. No other signals from this connector are used by the HEBASE104

The pinout of the PC/104 connectors can be found in the PC/104 specification.

There is an optional power connector that can be used to provide the power for the card if the HEBASE104 is used standalone. This can be fitted as a build option, and in this case it would be usual (but not always necessary) to omit the PC/104 connectors.

There is a pair of control connectors that accept standard HUNT ENGINEERING control cables, which can be used to pipeline the system control signals in and out of the HEBASE104.

There is a power control connector, which can be used to control FETS that connect the 5V, +12V and -12V to the HEBASE104. This can be connected to an external power down control such as that provided by the HEPC2104 cards. However care must be taken to ensure that no connections are made to external signals that remain powered up, see a later section.

The HEBASE104 provides one Comport interface for output data, and one Comport interface for input data. The Comports are connected to banks of FIFOs for interfacing to a GDIO module via the GDIO connectors. The HEBASE104 allows each comport to have its reset direction selected independently of each other, and the direction of data flow. If the direction of data flow is different to the reset direction the HEBASE104 will attempt to switch the direction of the comport immediately after the removal of the system reset.

The HEBASE104 provides an interface to a GDIO module, via two 50-way connectors on the top of the card. The connectors and the GDIO interface are fully detailed in the following sections.

Reset

The first level of reset on the HEBASE104 is a single reset pin that must be taken low to assert the reset and taken high to de-assert the reset. The reset must be driven at all times as the hardware will not function predictably with this signal floating. This signal is also connected through to the GDIO connectors for use on GDIO modules.

Any system of 'C4xs must have a valid reset signal at all times. If there are comports connected between motherboards in the system, then these motherboards must be operated with a common Reset signal. This ensures that the direction and control of the comports operates correctly at all times.

Hence the "RESET" jumper on the HEBASE104 must have one jumper link fitted to it in ALL cases.

The HEBASE104 can operate in two types of reset system as follows :-

A. Slave to another 'C4x system.

In this case the 'C4x system reset must be connected to the 'reset in' pin of the Control in

connector. This reset can then be selected for use by the HEBASE104 by moving the reset jumper link to join the pins of the header as follows:-

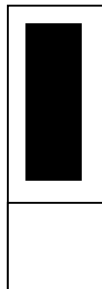


When operating in this mode the used reset is also buffered and provided on the 'reset out' pin of the Control out connector, allowing the 'chaining' of boards in the system using control cables.

B. Slave of a 'C4x system via a remote booting module.

In this case the 'C4x system reset is propagated through the remote booting module and used to operate the UDP reset feature of the HEBASE104.

This reset can then be selected for use by the HEBASE104 by moving the reset jumper link to join the pins of the header as follows: -



When operating in this mode the used reset is also buffered and provided on the 'reset out' pin of the Control out connector, allowing the 'chaining' of boards in the system using control cables.

Config

The second level of reset on the HEBASE104 is the system Config pin that must be taken low to 'assert Config' and taken high to 'de-assert Config'. In a HUNT ENGINEERING system the Config line is an open collector line that is pulled high only when all modules connected to it have booted and released their Config line. Each processor will drive the system-wide Config signal low by switching on a transistor that pulls the Config line low. All processors must therefore have booted and the Config to be de-asserted (high). This signal is also connected through to the GDIO connectors.

It is important to de-assert the Config line as the on-board logic of the HEBASE104 is held in a reset state all the time that Config is asserted. This is to keep the HEBASE104 inactive so that any processor connected to the HEBASE104 is not booted by data output by the active HEBASE104 and also so that a flood-fill application does not incorrectly send a boot sequence to its input Comport.

There is one situation where this disabling behaviour is not required, which is the situation where the boot stream for the processors is to be supplied by the GDIO module. There is a boot enable signal driven by the GDIO module, which when driven low indicates to the HEBASE104 that the config signal should be ignored.

Note any module which does not have a processor (such as the HEBASE104) should not drive the Config line and hence will not affect the HEBASE104

In any system, there must be a 100R pull up resistor on the Config line. The HEBASE104 can provide this pull up if the Config jumper is fitted.

Power down control

The power down control connector allows a control signal to be applied, so that the three FETS controlling the power connections of the HEBASE104 and hence the GDIO module plugged into it.

When no connection is made to this connector the power is switched on due to a pull down resistor on the input signal.

If the comports of this module are connected to those on an HEPC2014 AND that board is using the power down modes, the same power control signal must be connected to the input pin of this connector. This input pin is the one closest to the GDIO socket.

The other pin provides a buffered output version of the control signal allowing multiple boards to use the same control signal without fanout problems.

The HEBASE104 should not be powered down if any of the comport connections or GDIO I/O connections are connected to signals that are not powered down ,or at least tri-stated when the HEBASE104 is powered down.

Comport direction jumpers and LEDs

Each comport connector has associated with it a select jumper which allows the selection of the reset direction of that comport connector.

The jumper should be fitted to make the connector be a reset to input, leaving it open makes it default to reset to output.

If the output comport is set as reset to input, it will request the token of the comport immediately after reset. Normally the other end of the comport will immediately allow the token to be switched.

If the output comport is set as reset to output no such direction switch is needed. If the DSP requests the token it will never be granted.

When the comport is in the direction required for correct operation of the GDIO the DIR OUT LED will illuminate.

If the input comport is set as reset to output, the HEBASE104 will tolerate one token request from the other end of the comport in order to gain the required direction. It will never issue a request.

If the input comport is set as reset to input no such direction change is necessary .

When the comport is in the direction required for correct operation of the GDIO the DIR IN LED will illuminate.

Comport connectors

The 'C4x Comport is a parallel communications 'bus' which can transmit in either direction, but to change that direction a 'Token' must be passed between the communicating processors. This scheme relies on the fact that some of the 'C4x Comports power up (or get reset) with a token and the others power up (or get reset) without a token. Care must be taken to only connect a reset_to_input comport to a reset_to_output comport. The cables available from HUNT ENGINEERING are polarised in such a way as to prevent incorrect connection. Care should be taken to ensure that any cables provided by the user are similarly polarised.

To allow interconnection within or between boards it has been found that the Comports must be buffered and that care must be taken in cabling these Comport connections. A polarised scheme for providing a buffered Comport at a connector is shown below:-

*

*CSTRB	1	O	O	2	Ground
*CRDY	3	O	O	4	Ground
D0	5	O	O	6	TERMGND 0
D1	7	O	O	8	TERMGND 1
D2	9	O	O	10	POLARISE 0
D3	11	O	O	12	Ground
D4	13	O	O	14	Ground
*CREQ2	15	O	O	16	Ground
D5	17	O	O	18	POLARISE 1
D6	19	O	O	20	Ground
D7	21	O	O	22	Ground
*CREQ1	23	O	O	24	Ground
*CACK	25	O	O	26	Ground

The normal polarisation of the on-board connectors is as follows:-

POLARISE 0

Cut Short

Pin

POLARISE 1

Pin

Cut Short

Reset_to_output Comport connector

Reset_to_input Comport connector

but the HEBASE104 does not polarise its connectors as the reset directions can be selected by jumper.

All comport signals are parallel terminated using 220R to +5V and 330R to Ground. This termination network dissipates significant power and the resistor packs used are often hot to touch.

In order to limit the power consumption of these resistor packs when the comport is not being used, the ground pin of the parallel terminators, and the enable pin of the data buffers, has also been placed on these connectors. Thus when there is no cable fitted the power consumption of that comport is reduced. However when a (one to one) cable is fitted between an RTI connector and an RTO connector, each TERMGND signal is grounded by the Ground connection at the other end of the cable.

The TERMGND pins are allocated as follows:-

TERMGND 0	TERMGND 1	
buffer and Rpack enable	Gnd	Reset_to_output Comport connector
Gnd	Buffer and Rpack enable	Reset_to_input Comport connector

The CREQ1 and CREQ2 signals are the only signals that are not bi-directional, but are a buffered permanent representation of the CREQ signal at the 'C4x pin at that end of the comport connection. This enables the buffering scheme to delay the direction switch of the buffers until the signals have been driven to the far 'C4x, regardless of cable length.

The CREQ pins are allocated as follows:-

CREQ1	CREQ2	
Driven	Input	Reset_to_output Comport connector
Input	Driven	Reset_to_input Comport connector

The Buffering scheme used on the HEBASE104 is the 2nd generation HUNT ENGINEERING comport buffering scheme. This has the advantage of increased bandwidth and reduced power consumption.

This is NOT compatible with the first generation scheme.

It should be noted, if trying to connect a non HUNT ENGINEERING product to this connector, that the signals are not inverted from the 'C4x signals but that they are terminated in an equivalent 100R and that for correct operation the product being connected should both provide this termination and have sufficient drive capability to drive this termination on the HEBASE104.

If you are attempting to design your own hardware to interface with the HEBASE104 please ask for the application note that covers this subject.

The signals are all driven using FCT245AT or FCT244AT buffers with 64mA drive capability, and are essentially TTL levels but with the effective 100R termination at both ends of the cable.

The HEBASE104 uses the state of the select jumpers to determine the pinout used.

Reset

The Reset of the HEBASE104 is provided from the centre pin of the reset jumper. The possible sources are :-

Reset in from 'CONTROL IN' connector.

The TTL input on the 'CONTROL IN' connector is buffered and not inverted to

drive the reset.

UDP Reset

The UDP reset is generated by the GDIO module on the HEBASE104. This signal is buffered before the reset select jumper.

This allows remote C4x systems to be reset over a data link. Such a system would comprise of a HEBASE104 together with HEGD7(fiber optic Rx/Tx) or HEGD8(coax Rx/Tx) in the GDIO slot.

The reset signal must be taken to a logic low to assert the reset and high again to de-assert the reset.

This signal must be driven at all times as a floating reset signal will cause spurious operation.

The HEBASE104 provides a buffered version of the reset on the "CONTROL OUT" connector which can be used to drive further slaves without fanout problems. This is also a TTL level signal, suitable for connecting directly to the reset input on any HUNT ENGINEERING motherboard.

Control connectors.

In a system of 'C4xs there must be a single reset used in order to maintain the correct directions of the comports.

There should also be a system wide connection of the open collector Config signal.

The Control connectors provided on the HEBASE104 are pinned out in a manner that is standard to all HUNT ENGINEERING Motherboard products as follows:-

The 'CONTROL OUT' header is

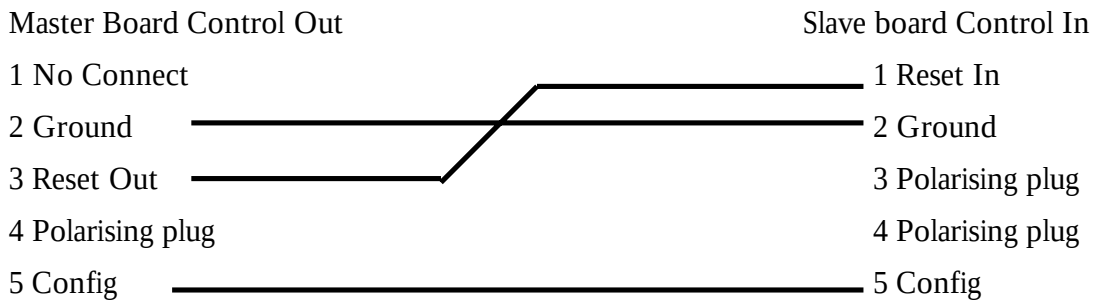
Reset in	1
Ground	2
Reset out	3
Polarising	4
Config	5

and the 'CONTROL IN' header is

Reset in	1
Ground	2
Polarising	3
Polarising	4
Config	5

INTERCONNECTING BOARDS

Standard HUNT ENGINEERING control cables can be used to connect multiple boards together as follows :-



Further slave boards can be added in the same way, chaining Control Out connectors to Control In connectors, using standard cables as above, as long as their reset and Config jumpers are Configured correctly.

If the modules are to be connected as a slave to another HUNT ENGINEERING motherboard the control in connector can be connected to the control-out connector of another motherboard, using a HUNT ENGINEERING standard control cable.

If there are further modules connected in the same system as these ones, then the Control out header is provided to enable a HUNT ENGINEERING standard control cable to be used to connect the control of this HEBASE104 to the control in of the next motherboard in the system.

The Control headers will accept many connector types. An example of a suitable connector is the DuPont 65039-32 housing with DuPont 47712-002 crimps. Note, the HEBASE104 has a silkscreen box around the header to indicate where pin 1 is located, in addition to the polarising pins.

Power down control connector

The power enable connector has two pins, the one closest to the GDIO slot is an input to control the power FETS on the HEBASE104. There is a 10K pull down on this signal to ensure correct operation when the connector is not connected.

Driving this pin high with a TTL level signal will cause the FETS to be switched off, thus powering down the entire HEBASE104 and its associated GDIO. Driving it low again will switch the power back on.

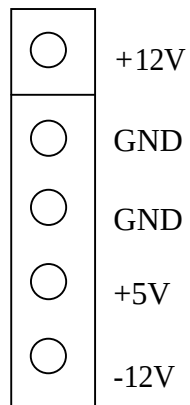
Optional Power Connector

There is an optional power connector on the HEBASE104, which allows the board to be powered in a situation where it is not plugged into a PC/104 slot.

This connector when fitted by HUNT ENGINEERING would be a right angle 0.1" AMP MTA connector such as part number 640457-5.

This would accept a variety of different power connectors, one example of which is AMP 770602-5 housing with 7706656-1 crimps.

The power connector is pinned out as follows :-



Physical Dimensions of the Board

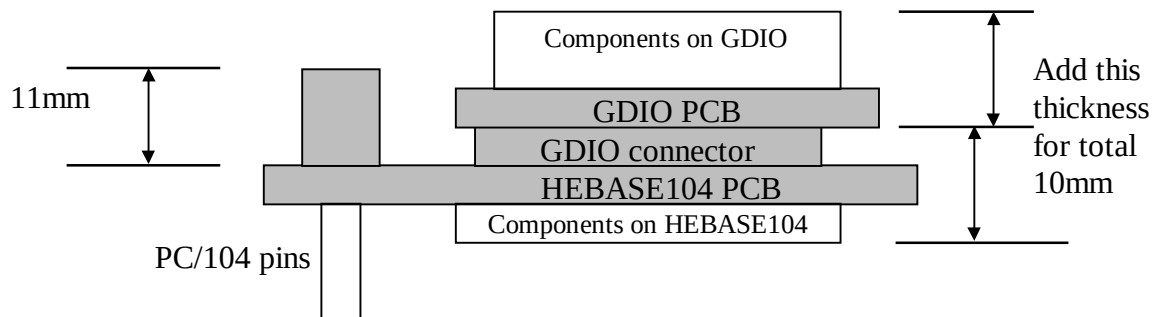
A PC/104 board is 3.55 inches by 3.775 inches overall (90mm x 96mm).

The 0.1" limit on component height under the module is not violated by the HEBASE104.

The maximum height of components above the module is 11mm. It should be noted however the total height will be larger, as the HEBASE104 is intended for use with a Grand-daughter module fitted on top of the connectors on the top of the module.

When fitted to a HUNT ENGINEERING motherboard these dimensions make the whole assembly thickness be 18mm up to the bottom of the PCB of the Grand-daughter module. However, the final assembly thickness will depend on the physical dimensions of the GDIO module fitted to the HETBASEIO.

The following diagram illustrates the dimensions of the assembly.



The above diagram is based on the use of the SAMTEC TMM-125-03-G-D headers for the connectors on the GDIO module. HUNT ENGINEERING recommends the use of these SAMTEC parts on the GDIO module, and with these connectors, the assembly thickness comes to 10 mm as shown.

Power Requirements of the HEBASE104

The HEBASE104 only uses power from the 5V TIM-40 supply. However, it must be remembered that the GDIO module used with the HEBASE104 will draw power from the 5V supply and the +/-12V supply, and hence the power requirements of the GDIO module must be added.

The maximum rating for the HEBASE104 is 0.62A, but the typical (and measured) value is nearer 0.4A.

0.1A must be added for each comport cable inserted, as the terminators will draw this when the termgnd signal is grounded.

When the module is in power down mode no current will be drawn.

Fitting GDIO Modules to your HEBASE104

When fitting a GDIO module to your HEBASE104 ensure that it is correctly orientated before insertion. There is a large “Pin 1” arrow on the HEBASE104, showing the correct orientation, also polarisation keys are fitted to the sockets to further aid correct orientation.

The GDIO modules should only be fitted when there is no power applied to the system. Only small pressure need be exerted over each connector to force it fully home. Take care not to apply excessive pressure to the centre of the board as this could stress the PCB unnecessarily. If the environment demands positive retention of the modules, fixing holes are provided for bolts. Only M3 Nylon bolts should be used for this purpose. We recommend the use of 5mm spacing pillars and nylon washers between the boards to prevent PCB stress due to over-tightened bolts.

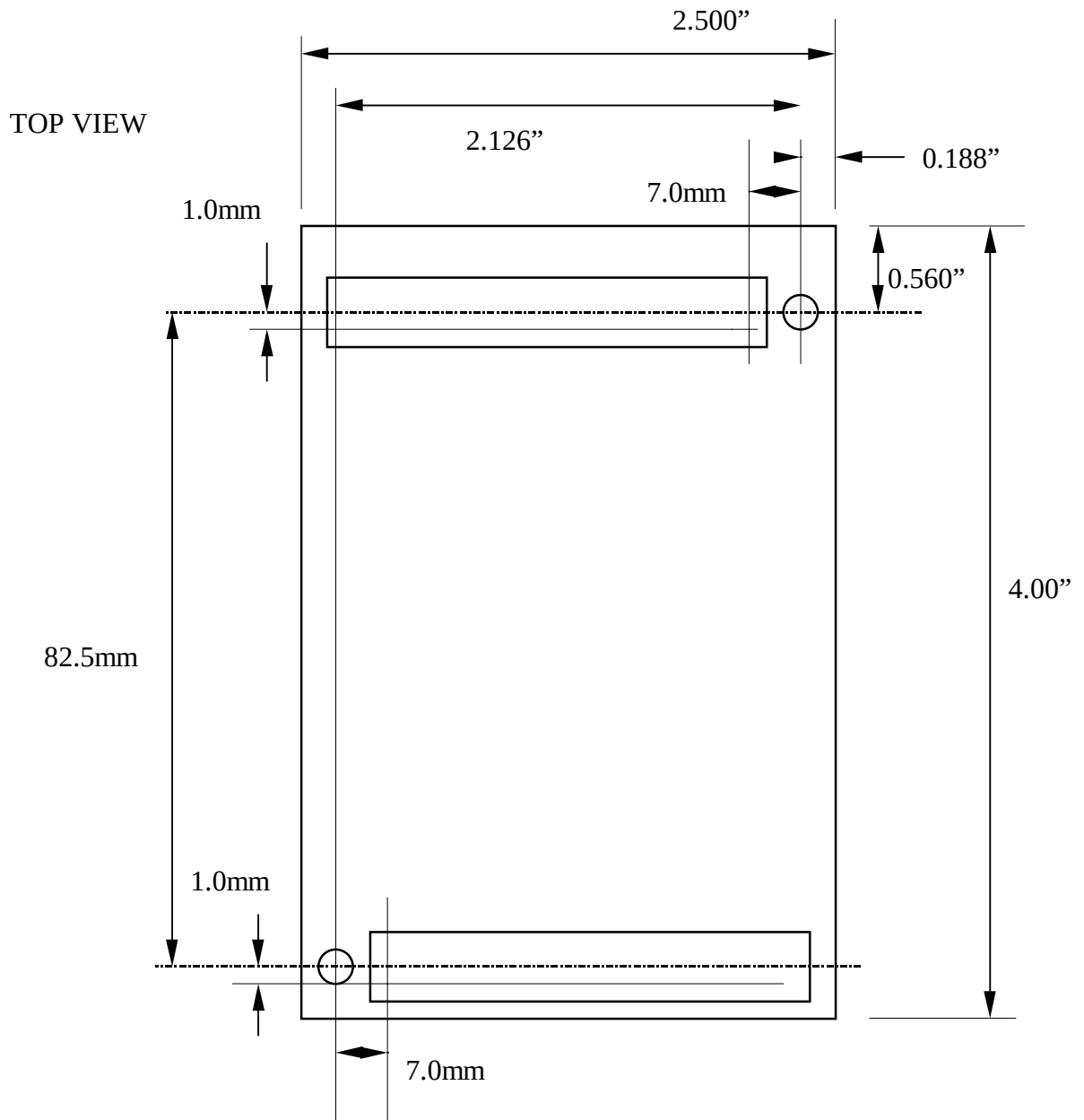
Normal static precaution procedures should be followed at all times.

Stacking PC/104 boards

There are four fixing holes on a PC/104 card, which are intended for mounting pillars between the cards to maintain the 0.6" spacing.

The combination of HEBASE104 and certain GDIOs may require that the cards are double spaced, so the HEBASE104 includes a second set of pillars and a second set of PC/104 connectors to facilitate this double spacing in the PC/104 stack.

GDIO Physical Specification

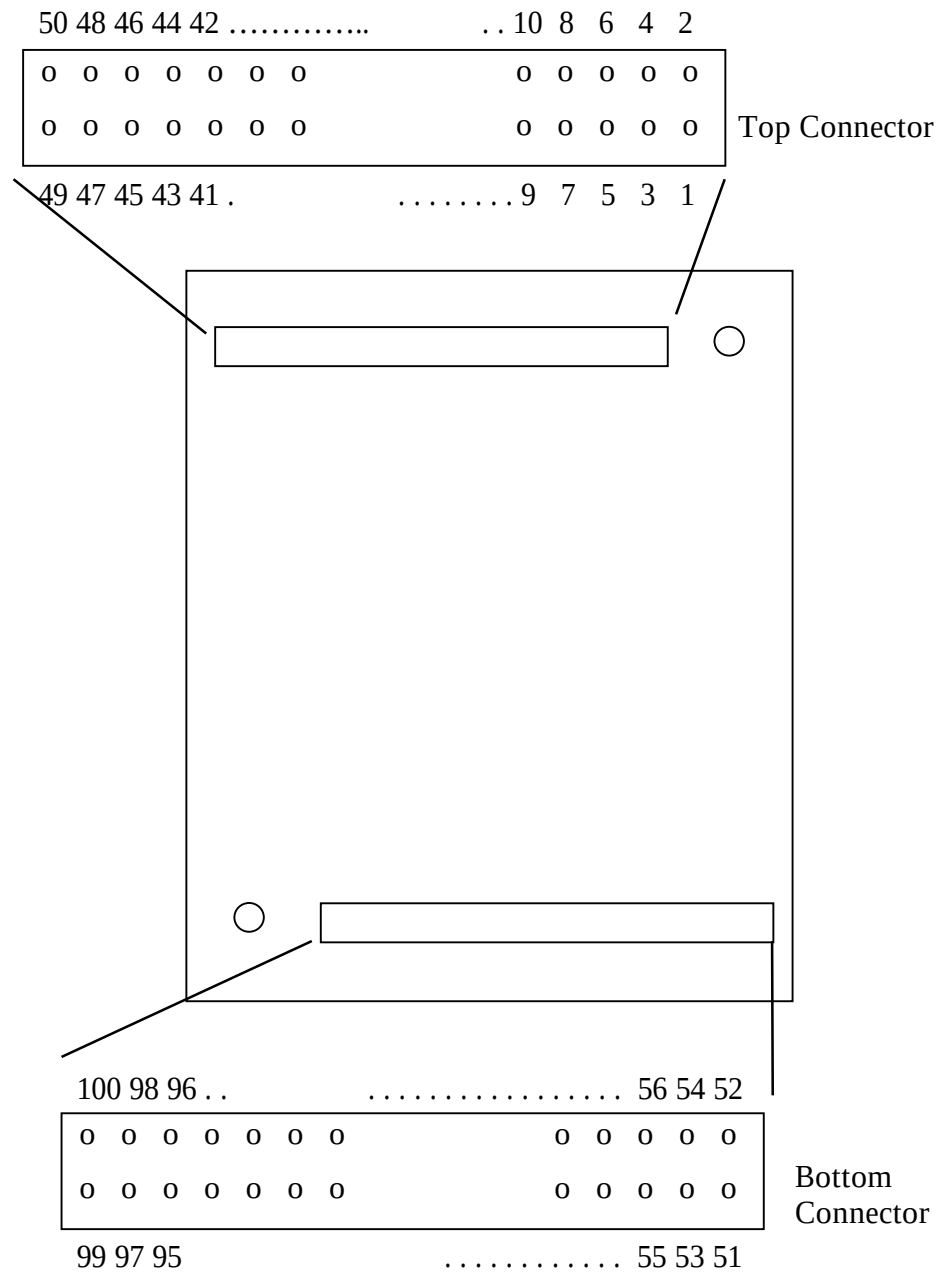


The above drawing shows the required physical dimensions of a GDIO module. The drawing shows the position of two fixing holes, and two 50-way connectors.

The two fixing holes have a diameter of 0.125". The two 50-way connectors are 2x25 DIL connectors (male) with a pitch of 2mm. HUNT ENGINEERING recommends the use of SAMTEC connectors, part no. TMM-125-03-G-D for the 2x25 pin connectors.

The diagram shows the position of the bottom right pin of the top connector. This is pin 1. The diagram also shows the position of the bottom left pin of the bottom connector. This is pin 99. NOTE the pin numbers run through 1 to 50 for the top connector, and continue from 51 to 100 for the bottom connector.

The diagram below shows the pin numbering used for the pair of 2x25 pin connectors.

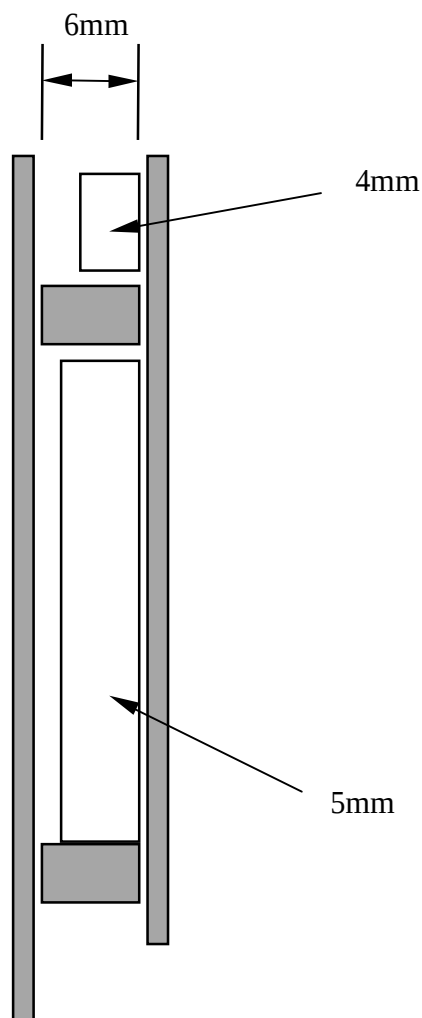


The top connector of the GDIO module is used to supply power and ground. This connector connects to the 5V supply, and Ground of the HEBASE104, as well as the +/- 12V supply.

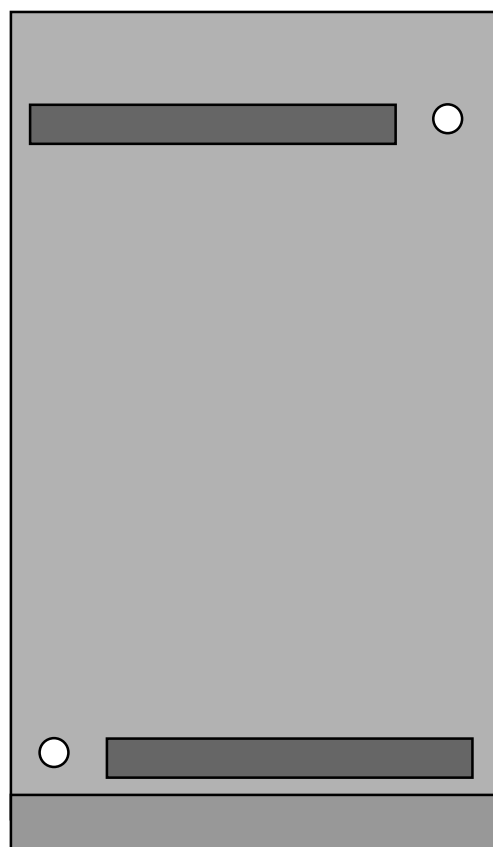
The bottom connector of the GDIO module is used to carry the signals from the two banks of FIFOs, which include two 16-bit data buses, FIFO flags, and FIFO read/write signals.

When using the recommended connectors on the GDIO module, the assembly results in a spacing of 6mm between the top of the HEBASE104 PCB, and the bottom of the GDIO PCB. However, any components placed on the underside of the GDIO must remain below

a certain height in order to clear HEBASE104 components. The diagram below indicates the available space for component spacing. (Note, the space shown at the top of the diagram is less, as it is directly above the pins of the TIM connectors of an HETBASEIO, and any GDIO module should be designed so that it can also be fitted to this board).



Side View



Top View when fitted to an HETBASEIO

The previous section details the physical specifications of two connectors on the GDIO module. These connectors form the electrical interface between the HEBASE104 board and the GDIO. The connectors carry power and ground to the module, and also carry the necessary signals to interface to the input FIFO and output FIFO of the HEBASE104.

Each FIFO bank is organised as 1k x 16. Therefore, each access to either FIFO bank will result in a 16-bit transfer of data. Any data received on the Input Comport of the HEBASE104 will be placed in to 16-bit words in the DATA-IN FIFO. Conversely, any data in the DATA-OUT FIFO will be sent on the Output Comport of the HEBASE104.

When connected to a 'C4x, transmitting and receiving data must happen in complete 32-bit words. The 'C4x processors are 32-bit processors, and accordingly it is necessary to work in 32-bit words when transmitting data to and from the HEBASE104.

When data is received on the Input Comport, each byte is multiplexed in to either the top half or bottom half of the next 16-bit word to be written in to the DATA-IN FIFO. When a 32-bit word is transmitted by a 'C4x, the least-significant byte is sent first. Therefore, the first two bytes to be received by the HEBASE104 will be the bottom half of the 32-bit 'C4x word, and the second two bytes will be the top half of the 32-bit 'C4x word.

The first 16-bit position written in the DATA-IN FIFO will therefore contain the bottom half of the 'C4x word transmitted, and the next position will contain the top half. The following example demonstrates this operation.

1st 'C4x Word Received by HEBASE104 = 0x04030201

2nd 'C4x Word Received by HEBASE104 = 0x08070605

1st FIFO location written with 0x0201

2nd FIFO location written with 0x0403

3rd FIFO location written with 0x0605

4th FIFO location written with 0x0807

The output side of the HEBASE104 works in the exactly the same manner, in that the first 16-bit entry will be transmitted on the Output Comport in the bottom half of the 'C4x word, and the next 16-bit entry will be transmitted in the top half of the 'C4x word. Remember, the Comport is a byte-wide interface, and as such, the HEBASE104 will transmit the bottom byte of each pair first.

The GDIO can access either FIFO bank independently via the module connectors. The connectors provide a FIFO READ signal to enable reading of the DATA-IN FIFO, along with the FIFO EMPTY flag for the DATA-IN FIFO. The FIFO WRITE signal is provided to enable writing to the DATA-OUT FIFO, and is accompanied by the FIFO FULL flag for the DATA-OUT FIFO.

Grand-daughter Connector Pinout

Pin Number	Signal Name	Pin Number	Signal Name
1	Ground	2	+5V
3	Ground	4	+5V
5	Ground	6	+5V
7	Ground	8	+5V
9	Ground	10	Polarisation
11	Ground	12	No Connect
13	Ground	14	No Connect
15	Ground	16	No Connect
17	Ground	18	No Connect
19	Ground	20	No Connect
21	Ground	22	No Connect
23	Ground	24	-12V
25	-12V	26	-12V
27	Ground	28	-12V
29	Ground	30	-12V
31	Ground	32	No Connect
33	Ground	34	No Connect
35	Ground	36	No Connect
37	Ground	38	No Connect
39	Ground	40	No Connect
41	Polarisation	42	No Connect
43	Ground	44	+12V
45	+12V	46	+12V
47	Ground	48	+12V
49	Ground	50	+12V
51	+5V	52	+5V
53	+5V	54	+5V
55	Reset	56	Config
57	Data-In 0	58	Data-In 1
59	Data-In 2	60	Data-In 3

Pin Number	Signal Name	Pin Number	Signal Name
61	Data-In 4	62	Data-In 5
63	Data-In 6	64	Data-In 7
65	Data-In 8	66	Data-In 9
67	Data-In 10	68	Data-In 11
69	Data-In 12	70	Data-In 13
71	Data-In 14	72	Data-In 15
73	Data-In FIFO Read	74	Data-In FIFO Empty
75	Boot enable	76	UDP control
77	Reserved do not connect	78	Reserved do not connect
79	Ground	80	Ground
81	Ground	82	Ground
83	Data-Out 0	84	Data-Out 1
85	Data-Out 2	86	Data-Out 3
87	Data-Out 4	88	Data-Out 5
89	Data-Out 6	90	Data-Out 7
91	Data-Out 8	92	Data-Out 9
93	Data-Out 10	94	Data-Out 11
95	Data-Out 12	96	Data-Out 13
97	Data-Out 14	98	Data-Out 15
99	Data-Out FIFO Write	100	Data-Out FIFO Full

The HEBASE104 uses IDT72082-15 FIFOs which are double versions of the IDT7202. These FIFOs are arranged as 1k x 8, and therefore, the input bank consists of two IDT7202 FIFOs, and the output bank consists of two IDT7202 FIFOs.

The DATA-IN FIFO Read signal is directly connected to the two IDT7202 FIFOs on the input side, with no buffering. Similarly, the DATA-OUT FIFO Write signal is directly connected to the two IDT7202 FIFOs on the output side with no buffering.

The DATA-IN[0..15] bus and the DATA-OUT[0..15] bus are directly connected to the FIFOs, with no buffering.

The FIFO flags (DATA-OUT FIFO Full, and DATA-IN FIFO Empty) however are connected via the control FPGA on the HETBASEIO. The FIFO empty flags from both FIFOs on the input side are ANDed together, and FIFO full flags from both FIFOs on the output side are ANDed together.

In order to be able to read a 16-bit word from the input bank, both input FIFOs must be non-empty. As the FIFO empty flags are active low, then the DATA-IN FIFO Empty signal is only ever set high when both FIFOs are non-empty, that is, when there is at least one 16-bit word to read.

In order to be able to write a 16-bit word to the output bank, both output FIFOs must be non-full. As the FIFO full flags are active low, then the DATA-OUT FIFO Full signal is only ever set high when both FIFOs are non-full, that is, when there is at least one 16-bit location to write to.

In order to correctly interface to the FIFO banks on the HEBASE104 the Grand-daughter module can access either FIFO bank using the directly connected signals, following the timings given in the data-sheet for the IDT-7202-15 1k x 8 FIFO, and by using the FPGA generated version of the FIFO flags.

The TIM-40 signals, Reset and Config are provided so that the GDIO can correctly reset and control any necessary logic according to the state of these system-wide signals.

The 'C4x Reset is asserted low, de-asserted high. It is directly connected from the HEBASE104.

The Config signal is a system-wide signal that can be used to control 'dangerous' parts of hardware within a system. In a 'C4x system the Config line is an open collector line that is pulled high only when all modules connected to it have booted and released their Config line. In this manner, hardware can be held inactive by the Config line, until the processors have been booted, and control has been put in place.

Each 'C4x processor in the system is connected to a transistor that pulls the Config line low. When the system is reset, a pull-up resistor will switch on these transistors, causing the Config line to be asserted (i.e held low). When each processor has been booted, the transistor can be switched off, thereby causing the Config line to become high. With all processors booted, and each removing the drive from the Config line, Config becomes de-asserted (set high). As such the signal should be used by a GDIO module to hold any necessary hardware inactive until the system is under control.

The Boot Enable signal provides a means for the GDIO to instruct the base module that it will be sending a boot stream, so the use of the config signal to block data is not required. When the boot enable signal is high, the config will be used to block the data, when it is low, data will be transferred through the HTBASE104 regardless of the state of the config signal.

The HEBASE104 pulls this signal high, so that any GDIO module that does not require this function can leave it unconnected.

The UDP control signal is used by some GDIOs to indicate that the HEBASE104 should assert the motherboard's UDP reset signal. The UDP reset signal itself is open collector, but this function is provided by the FPGA on the HEBASE104, the UDP enable signal should be driven low to make the HEBASE104 assert the UDP reset.

The HEBASE104 pulls this signal high, so that any GDIO module that does not require this function can leave it unconnected.

Software Requirements

The only requirements placed on software when using the HEBASE104 is that Comport communication is made in 'C4x words, and that the system-wide Config signal is de-asserted when booted.

The first requirement of communicating in words is necessary as the 'C4x is a 32-bit based processor, and as a consequence must transfer data across Comports in 32-bit words.

The second requirement is that the Config line is de-asserted by ALL processors in the system, so that the HEBASE104 becomes able to transmit and receive data. While the Config line is asserted the HEBASE104 is held inactive, so that any processing TIM-40 connected to the HEBASE104 is not booted by data output by the active HEBASE104 and also so that a flood-fill application does not incorrectly send a boot sequence to its Input Comport. Refer to the CONFIG section for further details on removing Config.

When the system has been booted, and Config released, data can be transferred to and from the HEBASE104 and GDIO in 'C4x words using normal Comport access software. However, in order to correctly understand how each 'C4x word is split into 16-bit GDIO words, you will need to refer to the section on the GDIO Electrical Specification and refer to the User Manual for the GDIO module you are using.

HUNT ENGINEERING have performed testing on its products to ensure that it is possible to comply with the European CE marking directives. The HEBASE104 cannot be CE marked as it is a component in a system, but as long as the following recommendations are followed, a system containing the HEBASE104 could be CE marked.

The immense flexibility of the HUNT ENGINEERING product range means that individual systems should be marked in accordance with the directives after assembly.

1. The host computer or housing in which the HEBASE104 is installed is properly assembled with EMC and LVD in mind and ideally should itself carry the CE mark.
2. Any cabling between boards or peripherals is either entirely inside the case of the host computer, or has been assembled and tested in accordance with the directives. The HEBASE104 has no inputs or outputs that need to be protected against Static discharge.

HUNT ENGINEERING are able to perform system integration in accordance with these directives if you are unsure of how to achieve compliance yourself.

Technical support for HUNT ENGINEERING products should first be obtained contacting your local supplier, if you are unsure of details please refer to www.hunteng.co.uk for the list of current re-sellers.

HUNT ENGINEERING technical support can be contacted by emailing support@hunteng.demon.co.uk, calling the direct support telephone number +44 (0)1278 760775, or by calling the general number +44 (0)1278 760188 and choosing the technical support option.