

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Bustec 3510-BB* at our website: ***Click HERE***

ProDAQ

Hardware Manual

ProDAQ 3120

Standard Motherboard

PUBLICATION NUMBER: 3120-XX-HM-0200

Copyright, © 1998-2005, Bustec Production Ltd.

Bustec Production, Ltd.
World Aviation Park, Shannon, Co. Clare, Ireland
Tel: +353 (0) 61 707100, FAX: +353 (0) 61 707106

bustec

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PROPRIETARY NOTICE

This document and the technical data herein disclosed, are proprietary to Bustec Production Ltd., and shall not, without express written permission of Bustec Production Ltd, be used, in whole or in part to solicit quotations from a competitive source or used for manufacture by anyone other than Bustec Production Ltd. The information herein has been developed at private expense, and may only be used for operation and maintenance reference purposes or for purposes of engineering evaluation and incorporation into technical specifications and other documents, which specify procurement of products from Bustec Production Ltd.. This document is subject to change without further notification. Bustec Production Ltd. reserves the right to change both the hardware and software described herein.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents

1. Introduction ____ *1*

2. Installation ____ *3*

2.1 Unpacking and Inspection ____ **4**

2.2 Reshipment Instructions ____ **4**

2.3 Preparing the ProDAQ Module ____ **5**

2.4 Installing a ProDAQ Function Card ____ **5**

2.5 Removing a ProDAQ Function Card ____ **8**

2.6 Installing a ProDAQ Plug-in Module ____ **8**

3. Configuration ____ *9*

3.1 VXIbus Address Space ____ **9**

3.2 VXIbus Logical Address ____ **10**

4. Theory of Operation ____ *11*

4.1 Accessing the Motherboard ____ **12**

4.1.1 Supported Access Types ____ 12

4.1.2 Address Map ____ 13

4.1.3 VXIbus Configuration Registers ____ 14

4.2 VXIbus Configuration Registers ____ **15**

4.2.1 CONFIG ____ 15

4.2.2 LOGADR ____ 15

4.2.3 DEVID ____ 15

4.2.4 STATUS ____ 16

4.2.5 CONTROL ____ 16

4.2.6 OFFSET ____ 16

4.2.7 FCRESET ____ 17

4.2.8 IRQH ____ 17

4.2.9 JTAG ____ 18

4.2.10 FCMASK ____ 18

4.2.11 FCAVAIL ____ 19

4.2.12 FCMOD ____ 19

4.2.13 FCBLOCK ____ 19

4.2.14 FCADR ____ 19

4.2.15 FCMASKOUT ____ 19

4.2.16 VERSION ____ 19

4.3 Board Specific Registers ____ **20**

4.3.1 VoltRefData ____ 20

4.3.2 VoltRefID ____ 20

4.3.3 TrigStatus ____ 20

4.3.4 TrigRapid ____ 20

4.4 Trigger System ____ **21**

4.5 Interrupt Handling ____ **22**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Figures

Figure 1 - Components of a ProDAQ Modular Data Aquisition System 3
Figure 2 - Removing the ProDAQ Module Cover 5
Figure 3 - The module assembly 7
Figure 4 - Location of Voltage Reference Plug-in 8
Figure 5 - Location of Jumper J1 9
Figure 6 - Logical Address Selection 10
Figure 7 - Motherboard Simplified Schematic 11

List of Tables

Table 1 - Address Map 13
Table 2 - Configuration Registers 14

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1. Introduction

This manual describes the ProDAQ 3120 Motherboard and explains how to install and configure the ProDAQ 3120 Motherboard with any of the ProDAQ Plug-in Modules and ProDAQ Function Cards.

The ProDAQ 3120 Motherboard provides a VXIbus interface and common resources like a voltage reference module (optional), trigger routing capability and additional power regulators for up to eight ProDAQ function cards. The ProDAQ 3120 Motherboard together with the ProDAQ Function Cards can be configured to provide any function or combination of functions required for a specific application.

The ProDAQ 3120 Motherboard is part of the ProDAQ Modular Data Aquisition System, which consists of the following components:

- A ProDAQ Motherboard that installs into a VXI slot in a VXIbus chassis. A ProDAQ Motherboard can be populated with a ProDAQ 3201 Voltage Reference Plug-in Module (optional) and up to eight ProDAQ Function Cards.
- The ProDAQ 3201 Voltage Reference Plug-in Module that installs into the Voltage Reference Plug-in slot on a ProDAQ Motherboard.
- The ProDAQ Function Cards which install into ProDAQ Bus slots on a ProDAQ Motherboard.

The ProDAQ Signal Conditioning Unit can be used together with the ProDAQ Modular Data Aquisition System to provide various signal conditioning functions and allows for easy connection to the existing installation.

Copyright, © Bustec Production Ltd.

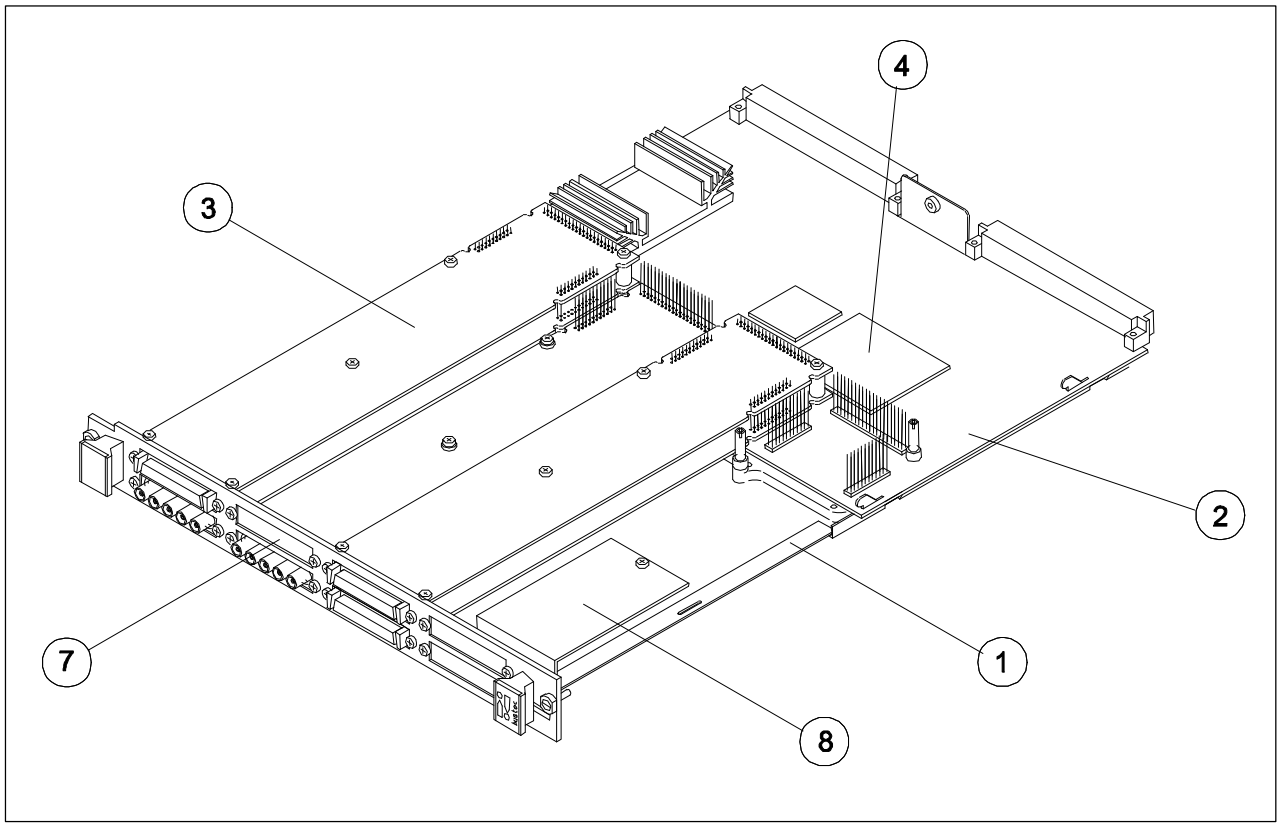
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. Installation

The ProDAQ 3120 Motherboard is shipped in a VXI module enclosure, ready to be installed in a VXIbus chassis. The function cards can be factory-installed or field-installed later on. The front-panel is populated with filler panels for each ProDAQ function card slot, which should be left in place unless a ProDAQ function card is installed in the slot. The ProDAQ function card slots are arranged in four stacks of two function cards each.



1 - Module Cover (Bottom)
2 - ProDAQ Motherboard
3 - ProDAQ Function Card
4 - ProDAQ Voltage Ref. Plug-in Module
7 - Single Filler Panel
8 - Double Filler Panel

Figure 1 - Components of a ProDAQ Modular Data Aquisition System

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.1 Unpacking and Inspection

Before unpacking the ProDAQ module, check the exterior of the shipping carton for any signs of damage. All irregularities should be noted on the shipping bill.

The ProDAQ module is shipped in an antistatic package to prevent any damage from electrostatic discharge (ESD). Proper ESD handling procedures must always be used when packing, unpacking or installing any ProDAQ module, ProDAQ plug-in module or ProDAQ function card:

- Ground yourself via a grounding strap or similar, e.g. by holding to a grounded object.
- Discharge the package by touching it to a grounded object, e.g. a metal part of your VXIbus chassis, before removing the module from the package.
- Remove the ProDAQ module from its carton, preserving the factory packaging as much as possible.

Inspect the ProDAQ module for any defect or damage. Immediately notify the carrier if any damage is apparent.

2.2 Reshipment Instructions

Use the original packing material when returning a ProDAQ module to Bustec Production Ltd. or calibration or servicing. The original shipping carton and the instrument's plastic foam will provide the necessary support for safe reshipment.

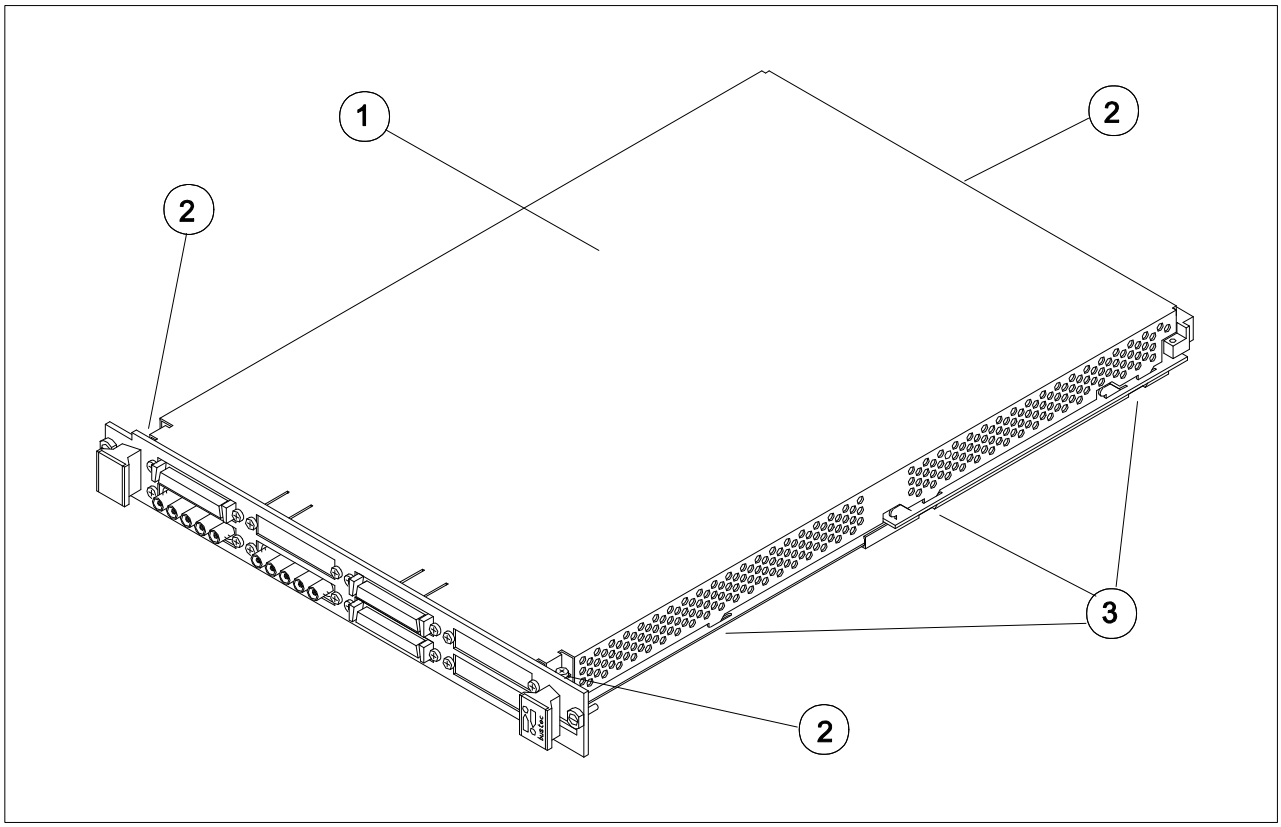
If the original anti-static packing material is unavailable, wrap the ProDAQ module in anti-static plastic sheeting and use plastic spray foam to surround and protect the instrument. Reship in either the original or a new shipping carton.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.3 Preparing the ProDAQ Module

To install a ProDAQ Plug-in Module or a ProDAQ Function Card as well as to configure the addressing mode of the ProDAQ 3120 Motherboard, you need to remove the modules top cover.



1 - Module Cover 2 - Cover Screws 3 - Cover Hooks

Figure 2 - Removing the ProDAQ Module Cover

To remove the top cover, remove the undercut flathead and two panhead screws that hold the cover in place and remove the cover by sliding it out of its position towards the VXIbus connectors and up. Take special care about the hooks holding it into place. Try not to lift the cover straight up. See figure 2 for the location of the screws.

To re-install the cover, slide it back into its position by placing the small hooks over their holes and moving the cover down and forward. Secure the top cover using the three undercut flathead crews.

2.4 Installing a ProDAQ Function Card

The ProDAQ Function Cards are arranged inside the ProDAQ Module in four stacks of two cards each. The function cards are mounted face down, e.g. the front-panel connector as well as the motherboard connectors are underneath the PCB.

Copyright, © Bustec Production Ltd.

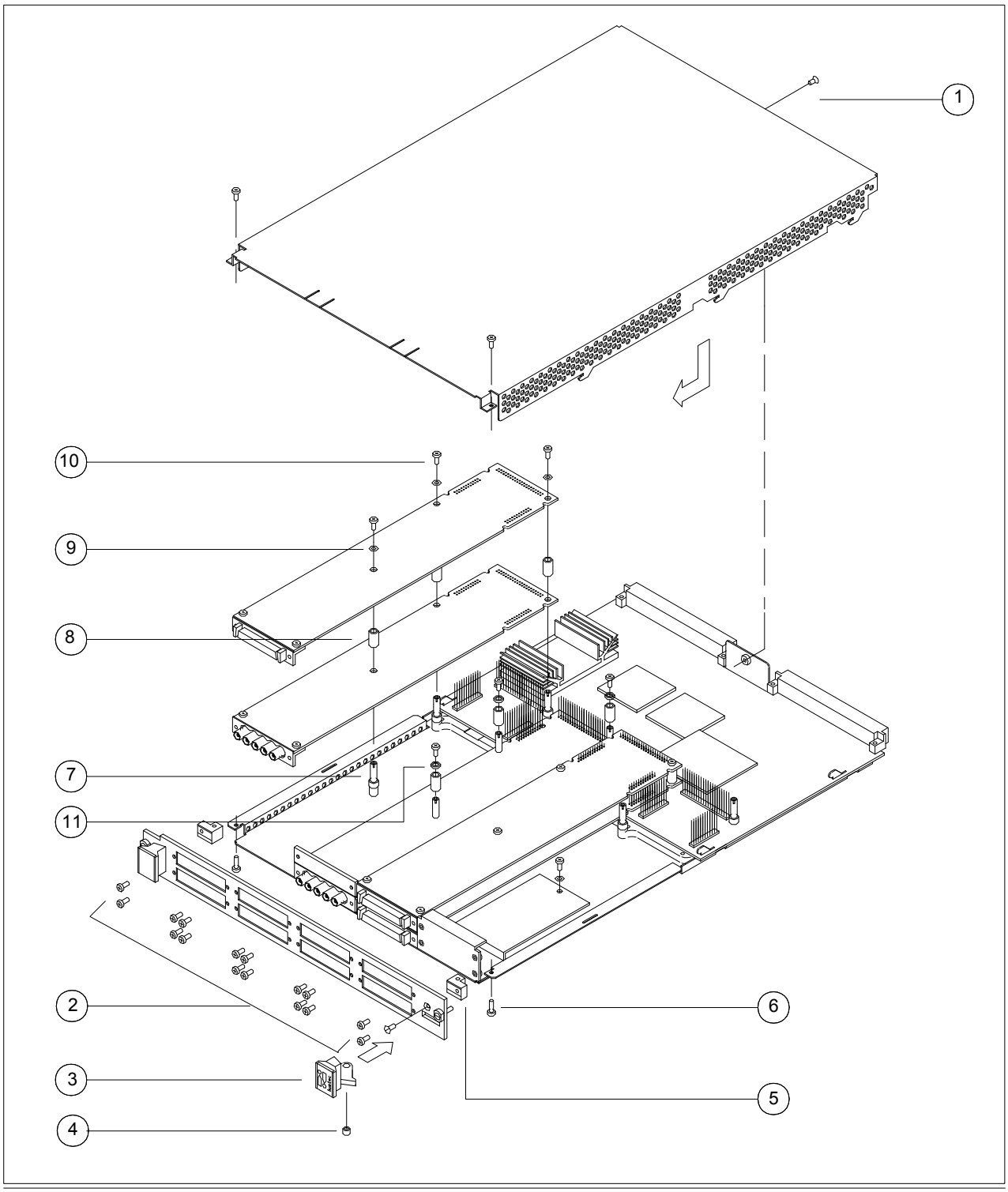
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To install a ProDAQ Function Card in any of the possible positions, use the following procedure (See figure 3 for reference):

- Remove the top cover of the module as described earlier in this chapter (Fig. 3, Pos. 1).
- Remove all screws on the front-panel holding installed function cards or double filler panels in place (Fig. 3, Pos. 2). Screws holding single filler panels don't need to be removed.
- Remove the two panhead screws that mount the front panel to the modules bottom cover (Fig. 3, Pos. 6).
- Please take special care of the module handles and the rings (Fig. 3, Pos. 3 and 4), which are also fixed by those screws. The mounting angle (Fig. 3, Pos. 5) stays fixed to the front panel.
- Remove the front panel by moving it forward carefully so as to avoid bending the installed function cards.
- Choose the stack and position (lower or upper) where you want to mount the function card. If the stack, in which the function card should be installed, is covered by a double filler panel, you have to remove it before installing the function card.
- Remove the three 2.5mm panhead screws and the crinkle washers from the stack's standoffs (Fig. 3, Pos. 9 and 10 for example).
- If you want to install a function card in the upper position of a stack without having a function card in the lower position, you need to mount both spacers (Fig. 3, Pos. 11) on each standoff. If the stack is already populated with a function card in the lower position, mount only the bigger spacer (Fig. 3, Pos. 8) onto each standoff.
- Place a bayonet (supplied) on each standoff. Align the function card over these and slide carefully down. The function card should be held parallel to the modules bottom cover all the time during its way down.
- Fix the function card by mounting the three 2.5mm panhead screws and the crinkle washers onto each standoff. If you install a function card in the lower position of a stack, you need first to mount both spacers (Fig. 3, Pos. 11) onto each standoff.
- Re-mount the modules front-panel. If there is only one function card mounted in a stack, cover the remaining opening in the front panel by a single filler panel.
- Re-mount the modules top cover.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



1 - 2.5mm Panhead Screws
2 - 2.5mm Panhead Screws
3 - Module Handle
4 - Ring
5 - Mounting Angle
6 - 2.5mm Panhead Screws
7 - Standoff
8 - Spacer
9 - Crinkle Washer
10 - 2.5mm Panhead Screw
11 - 2mm Spacer

Figure 3 - The module assembly

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.5 Removing a ProDAQ Function Card

Removing a ProDAQ Function Card is exactly the the reverse operation then installing it. After removing the top cover and the front panel as described previously, remove the three roundhead screws that fix the function card(s) on the standoffs.
Take special care when removing the function card(s) not to bend the motherboard connectors.

After removing the function card(s), install the correct combination of spacers on the standoffs. If a stack is populated with only one function card, each of the standoffs needs to be mounted with both spacers to cover the distance between the cards as well as the PCB thickness of the missing card. If a stack is populated with two function cards, only the bigger spacer must be mounted.

Fix any remaining function card again by mounting the three panhead screws on the standoffs, re-mount the front panel and the modules cover.

2.6 Installing a ProDAQ Plug-in Module

The ProDAQ 3120 Motherboard Module allows the installation of a ProDAQ Voltage Reference Plug-in Module for calibration purposes.

To install the ProDAQ Voltage Reference Plug-in Module, the top cover of the module has to be removed as described earlier in this chapter. Locate the position of the plug-in module slot (See Figure 4 for reference).

The Plug-in Module features two connectors that need to be aligned and inserted into the motherboard sockets. The VXI*plug&play* drivers supplied with the module will automaticly detect and configure an installed Voltage Reference Plug-in Module.

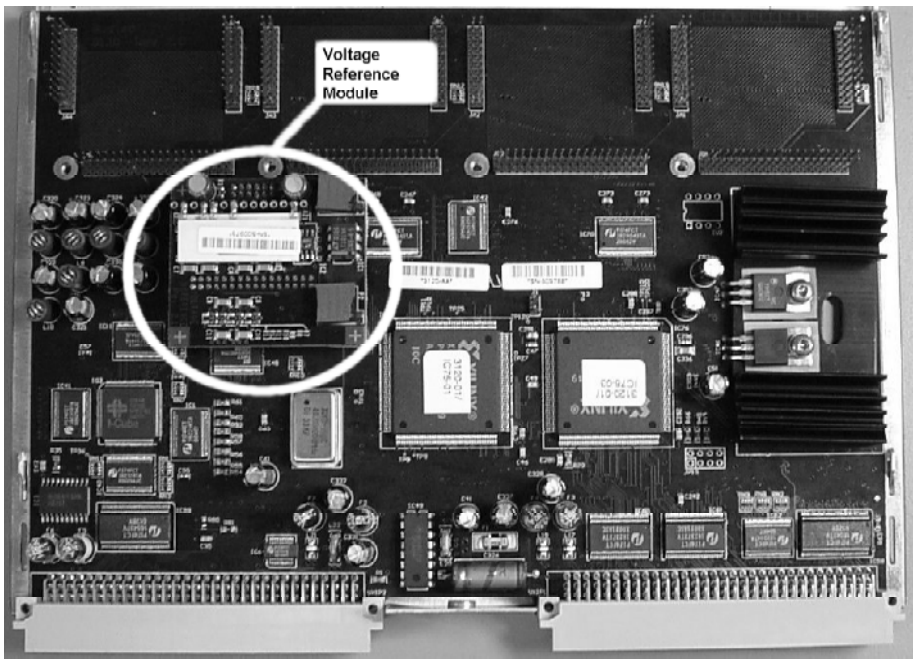


Figure 4 - Location of Voltage Reference Plug-in

 Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. Configuration

3.1 VXIbus Address Space

To simplify the integration of a ProDAQ 3120 module into a VXIbus system, it can be configured to operate using either the VXIbus A24 or the VXIbus A32 address space for access to the function cards in addition to the VXIbus configuration register space in the VXIbus A16 address space.

If jumper J1 on the motherboard is installed, the board will operate as a A16/A24 register based VXIbus module. Without J1 installed, it will operate as a A16/A32 register based VXIbus module.

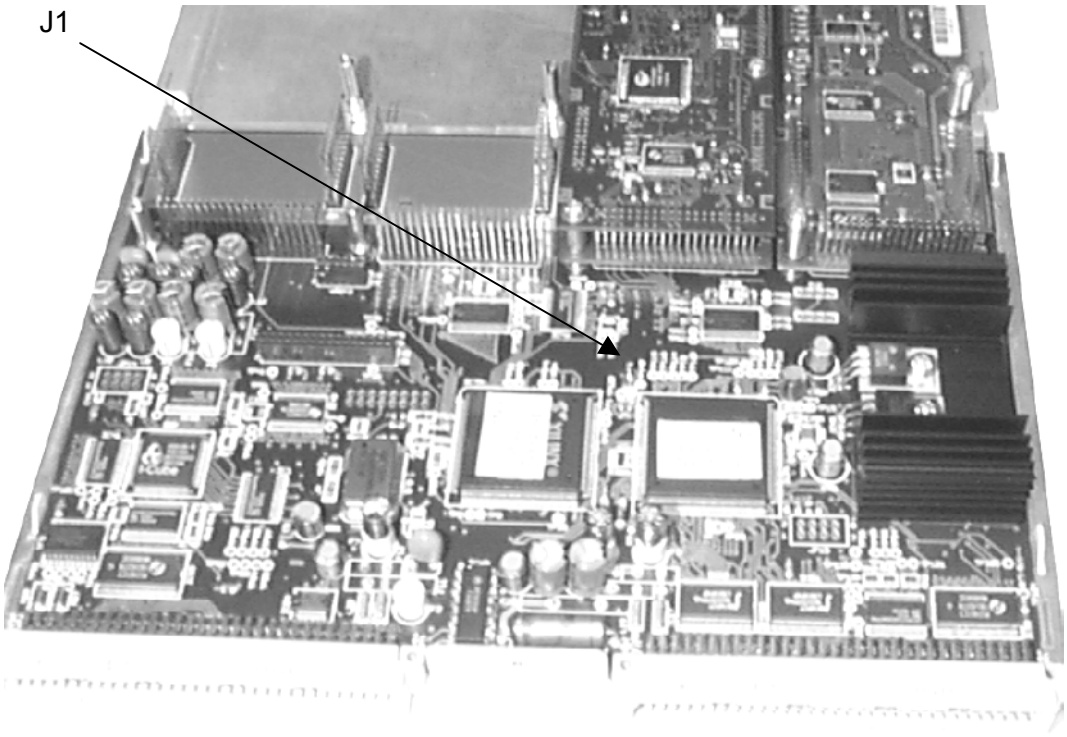


Figure 5 - Location of Jumper J1

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.2 VXIbus Logical Address

Each device in a VXIbus system is assigned a logical address, either statically by the user or dynamically by the resource manager. This logical address, a number between 0 and 255, defines the base address of the board's VXIbus configuration registers in A16 space. Logical address 0 is reserved for the resource manager, and address 255 is used to tell the resource manager to configure the board's logical address dynamically. In this case a free logical address is assigned to the board by the resource manager.

The logical address of the board can be set by changing the setting of the 8-bit DIP switch on the back of the board (See Figure 6). The "Open" or "Off" position of a switch corresponds to a logic value of 1 and the "Closed" or "On" position to a logic value of 0. Keep in mind that each board in the system must be assigned its own unique logical address (if configured statically) when setting the switch.

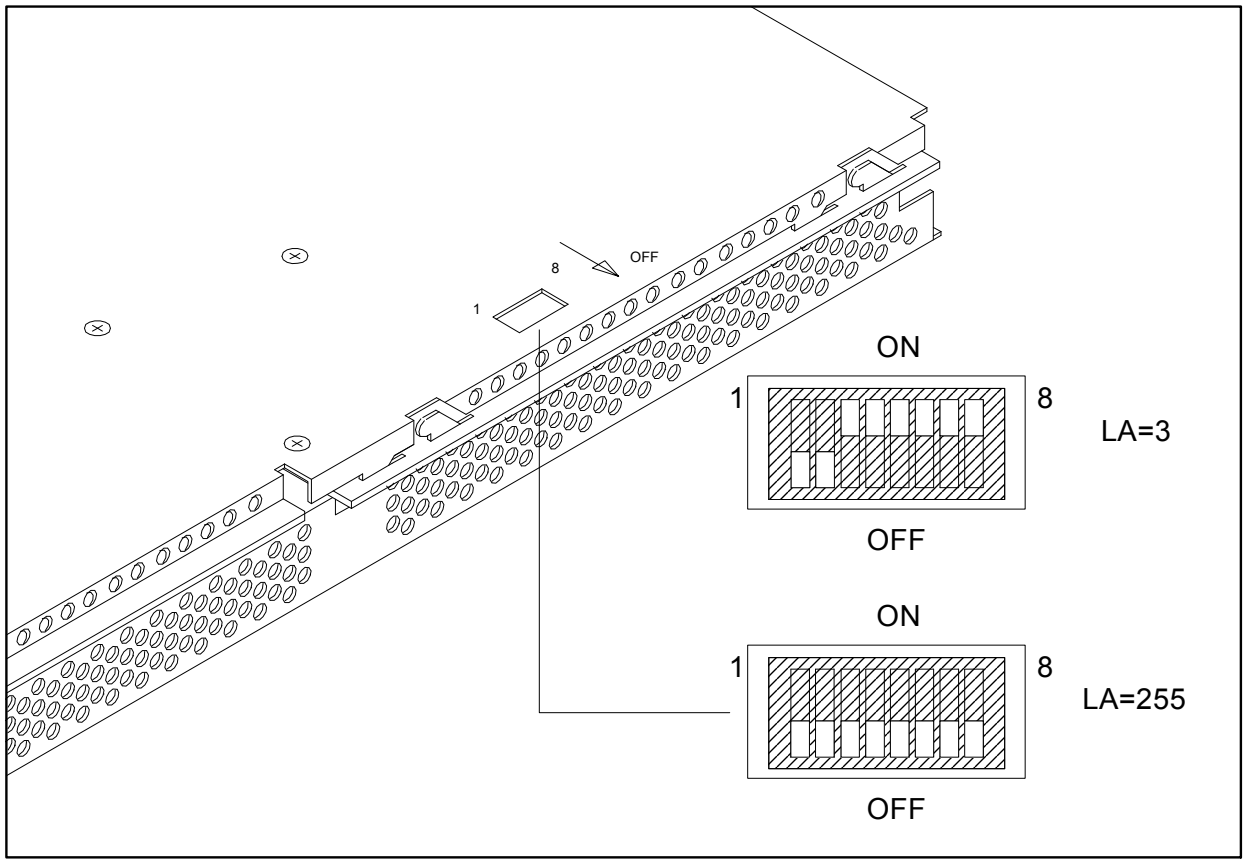


Figure 6 - Logical Address Selection

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. Theory of Operation

The ProDAQ 3120 system is comprised of a Motherboard module (MB) that is a VXIbus Register based device. It is able to access up to eight function cards (FC). The motherboard occupies a single slot in a VXIbus Mainframe. This standard performance motherboard is the first of a series with different capabilities.

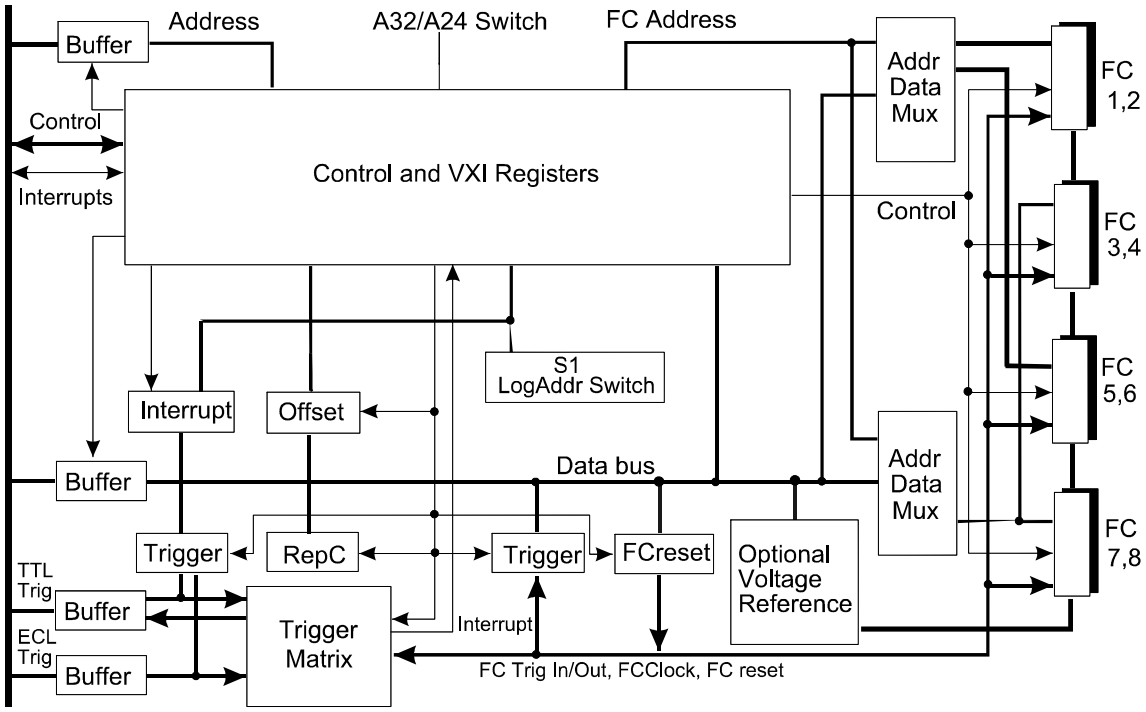


Figure 7 - Motherboard Simplified Schematic

The motherboard (MB) houses the following blocks:

1) VXIbus interface
2) VXIbus configuration registers and address translation
3) Control of the function cards and the address/data switches to the board data bus (ProDAQ bus).
4) Trigger Interface to/from the VXIbus trigger lines and the function cards
5) A power regulator to provide a clean ± 15Volt for the FC's (not shown in Figure 7)
6) An optional Voltage reference source

In addition to the VXI configuration register access, the motherboard allows the addressing of up to eight function cards, organized in two groups. Addresses and data are multiplexed on the 16bit wide data bus to the function cards. To enable high data throughput, single word and block transfer accesses are provided.

The motherboard can be accessed from the VXIbus via a normal byte, word and long word (32bit) access in the A32 or A24 address space. In the A32 address space it occupies 16Mbytes in the A24 space 4Mbytes.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A central feature of the MB is the trigger interface, which is built around a switch matrix allowing 1:n and m:1 (m, n = 1 to 24) connections. The VXIbus ECL and TTL trigger lines can be switched individually to the function cards. Triggers can be sent from the function cards to the VXIbus TTL trigger lines or to other function cards. It is possible to request VXIbus intercept by help of the VXI interface.

The function card address space is directly mapped into the VXIbus address space of the ProDAQ module, allowing control programs to access the function card registers easily. In addition to the single access, common actions to the function card can be initiated using multicast or broadcast operation. For this purpose special address regions of the motherboard have to be used. Multicast write operations will send the same data word to the function cards. In this mask register the set of function cards involved in the multicast operation is set in a mask register found in the VXI configuration area. The ProDAQ bus of this motherboard supports also the read of two function cards in parallel, if long word accesses are used.

4.1 Accessing the Motherboard

4.1.1 Supported Access Types

The VXIbus Interface conforms to the VXIbus specification issue 1.4. In addition to a static VXI device configuration, it supports dynamic configuration. It is a register based VXIbus device, which supports A16/A32 addressing, and requires 16 Mbytes from the A32 address space. With a jumper, J1, the module can be configured as an A16/A24 bit device, occupying 4 Mbytes of the A24 address space.

The module responds to the following AM codes:

AM = 0x29 or 0x2d short IO (A16) for access of VXIbus configuration registers.
AM = 0x0e or 0x0d or 0x0a or 0x09 normal A32 access
AM = 0x3e or 0x3d or 0x3a or 0x39 normal A24 access
AM = 0x0b or 0x0f for A32 block transfers
AM = 0x3b or 0x3f for A24 block transfers

The module can be accessed with byte D08(EO), word (D16) and long word (D32) transfers. Unaligned data transfer, i.e. access to byte 1,2 or 1,2,3 or 0,1,2 is not supported. The module will respond with a bus error to such a transfer request. A data transfer to a valid local address is timed out after 25.6 µsec with a BERR signal if the ProDAQ Bus does not respond.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.1.2 Address Map

If accessed by A32 or A24 address modifiers the address mapping to the internal bus is straightforward. The VME address A17 → A2 is mapped directly to the ProDAQ Bus address FADR15 → FADR0. The upper part of the decoded VMEbus addresses is used to select function cards and special motherboard functions/registers. The following table specifies the internal address map of the motherboard. In the following table VV indicates the address offset within the VXI A32 address space, programmed into the offset register during the initialization of the VXIbus system.

Internal Address Start	VME Address Start	VME Address End	
	0xVVnnnnnn		Offset within the VXIbus A32 Address space as set in the VXIconfig register OFFSET
0x0000FFFF	0x0003FFFC		Address lines translation VXIbus to internal bus and to the FC bus
0x00000000	0xVV000000	0xVV03FFFC	FC 1 access
0x00010000	0xVV040000	0xVV07FFFC	FC 2 access
0x00020000	0xVV080000	0xVV0DFFFC	FC 3 access
0x00030000	0xVV0C0000	0xVV0FFFFC	FC 4 access
0x00040000	0xVV100000	0xVV13FFFC	FC 5 access
0x00050000	0xVV140000	0xVV17FFFC	FC 6 access
0x00060000	0xVV180000	0xVV1CFFFC	FC 7 access
0x00070000	0xVV1c0000	0xVV1FFFFC	FC 8 access
0x00080000	0xVV200000	0xVV23FFFC	Multicast write to function cards or read of two function cards, as specified by the FCMASK register
0x00090000	0xVV240000	0xVV2FFFFC	Reserved
0x000C0000	0xVV300000	0xVV33FFFC	Internal devices Trigger, Vref, ...
0x000C0000	0xVV300000		Trigger status register (32bit word) with update
0x000C0001	0xVV300004		Trigger rapid connect interface (16bit word)
0x000C0001	0xVV300008		Trigger status register without update (e.g. IRQ response) (32bit word)
0x000C8000	0xVV320000		Voltage reference (R/W MB buffer)
0x000C8001	0xVV320004		Voltage reference ID (read only)
0x000C8002	0xVV320008		Voltage reference (RW to module using resources on the Voltage Reference Module)
0x000D0000	0xVV340000	0xVV3CFFFC	Reserved
0x000F0000	0xVV3C0000	0xVV3FFFFC	Broadcast to all FCs
0x00100000	0xVV400000	0xVVFFFFFC	Reserved in case of an A32 bit device, not available if motherboard is jumpered for A24 operation.

Table 1 - Address Map

All addresses not explicitly specified are reserved for future use.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.1.3 VXIbus Configuration Registers

The VXI configuration registers, as required by the VXI standard, are located within a 64 byte block in the A16 address space of the VXIbus. The base address of the block is determined by the device's unique logical address as:

Base Address = Logical Address * 64 + 49152

The logical address is user configurable via a selector which has 256 unique settings (a DIP-Switch or similar) or may be dynamically assigned by using the *Dynamic Configuration* protocol. In this case the logical address is initially set via the selector to 255 (FF_{16}) and the MODID line is used as an address qualifier.

Address	Mnemonic	OP	Description
0	CONFIG	RO	VXI device type and manufacturer ID
0	LOGADR	WO	bit 7 → 0 is the VXI device logical address
2	DEVID	RO	device ID and address space requirement
4	STATUS	RO	general and device specific status information
4	CONTROL	WOC	general and specific control
6	OFFSET	RW	offset in the A32 or A24 address space
20	FCRESET	RW	reset of function cards
26	IRQH	RW	Interrupt vector and level
28	JTAG	RW	JTAG interface for switch matrix loading
2a	FCAVAIL	RO	bit 7 → 0 indicates on which locations a function cards are fitted
2a	FCMOD	RW	bit 15 → 8 defines different ProDAQ bus operation modes and timing adjustments
2c	FCMASK	RW	pattern mask for selecting concurrent write
2e	FCBLOCK	RW	number of words to be transferred
34	FCADR	RO	last address send to the function cards
36	FCMAKOU	RO	last RW mask use to address the function cards
38	SERID	RO	version of the motherboard

Table 2 - Configuration Registers

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2 VXIbus Configuration Registers

4.2.1 CONFIG

This register provides information about the device class, the address space and the manufacturer ID of the motherboard.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
Content	Device Class		Address Space		Manufacturer ID											

Device Class: 11_b – Register Based

Address Space: 00_b – A16 / A24
01_b – A16 / A32

Manufacturer ID: $DE70_h$ – A16 / A24
$CE70_h$ – A16 / A32

The address space can be selected by J1 (jumper not installed A16/A32 (default), jumper installed A16/A24)

4.2.2 LOGADR

Logical Address of the VXIbus device is a write only register.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial									1	1	1	1	1	1	1	1
Content	Not Used								Logical Address							

The new logical address becomes available shortly after the current access cycle has finished (approx. 160 ns).

4.2.3 DEVID

Contains the model code and the required memory

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	1	1	1	1	0	1	0	1	1	0	0	0	0	0	1
Content	Required Memory				Model Code											

Model Code: $C30_h$

Required Memory: 0111_b - A16/A32 (16 Mbyte)
0001_b - A16/A24 (4 Mbyte)

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2.4 STATUS

Indicates the current module status (read only)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
Content	A32ena	MODID*	FEor	VOFSET	LBEND-L	LLIRQ	LIRQ-L			VRAvail	SWFail	RLogSet	Ready	Passed	Sysfail	Reset

Reset: indicates the reset state of the module
Sysfail: indicates the status of the VXIbus SysFail line
Passed: 1 (a device without intelligence)
Ready: 1 after the state machines are initialized
RLogSet: 1 if the logical address is set
SWfail: to indicate error by SW, e.g. to synchronize in a large process environment
VRAVAIL: 1 indicates that a voltage reference is present
LIRQ_L: the status of the interrupt request: 0 indicates local interrupt is set
LLIRQ: monitors requests coming from the trigger switch matrix
LBEND_L: indicates the end of an autonomous block transfer cycle (optional feature)
VOFSET: 1 the A32 or A24 base address is set
FEor: indicates whether function cards are plugged in
MODID_L: 0 indicates the modules are selected with the MODID line active
A32ena: 1 access via the A32 or A24 address space is allowed

4.2.5 CONTROL

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Content	A32ena										SWFail				Sysfail	Reset

Reset: write a 1, resets the device (clears all configuration registers, aborts all operations, initial of FEmaster XEPLD)
SysFail I: 1 disables the device from driving the SYSFAIL_L line. By default Resource Managers set this bit to 0
SWfail: 0 used to indicate errors
A32ena: write of 1 will enable the A32/A24 addressing mode a 0 will disable the A32/A24 addressing

4.2.6 OFFSET

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A32 compare	A31	A30	A29	A28	A27	A26	A25	A24	Not used							
A24 compare	A23	A22	Not used						Not used							
Content	Offset								implemented as read zero							

Defines the offset in the used address space. If the device is configured as:

A32 The A31 ... A24 has to be the same as the content in the offset register, the lower bits (A23 ... A1) are ignored in the address checking.

A24 The A23 … A22 are checked against bit 15,14 of the offset register all other bits are ignored.

4.2.7 FCRESET

Resets the function cards.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	x	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0
Operation	RO	RO	RO	RO	RO	RO	RO	RO	RW	RW	RW	RW	RW	RW	RW	RW
Content	Reserved								Res FC 8	Res FC 7	Res FC 6	Res FC 5	Res FC 4	Res FC 3	Res FC 2	Res FC 1

After initializing, all function cards are held in the reset state. The program has explicitly to enable the function cards to get them running.

4.2.8 IRQH

Register to specify the interrupt property

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Content	Not implemented		SW	Sys-Fail_I	Enab	Interrupt Level			Interrupt Indicator							

Interrupt Indicator Part of the interrupt status word (bit 15 → 8) if the motherboard is configured as a 16bit interrupt responder (default).

Interrupt Level Defines which IRQn* line of the VXIbus should be used. The level, which defines the interrupt priority for the interrupt handler is application dependent. If the level is 0 the VXIbus interrupts are disabled.

Enab 0-disable, 1-enable the interrupt to the VXIbus

SysFail_I Line status if enabled in the status register

SW Free to use by Software

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2.9 JTAG

A simple JTAG interface is used to load and modify the switch matrix. In addition it contains additional control lines for the trigger switch matrix. The complete JTAG protocol is handled by software.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contents	Not Used			Input	Output	RapCon	TrigMat	TrigOut	SW	SW	JTAGenab	TDO	TDI	TMS	TCLK	TRST

TRST	reset of the device (TRST_L) inverted at the output. To reset a device write 1 and after >100µs a 0 into that register bit.
TCLK	clock for the JTAG chain. Note the clock is generated automatically if a 1 is written into that register
TMS	mode bit to modify the JTAG device mode. The output is inverted
TDI	JTAG data into the device (inverted data input for JTAG device)
TDO	data from the JTAG device
JTAGena	status of the JTAG enable input, changeable on special version of the MB
SW	device is configured, set by SW after successful initiation
SW	used by SW
TrigOut	enable trigger output to VXI bus. A one has to be written in to enable the output.
TrigMat	enables the output from the trigger matrix. A one has to be written in to enable the output.
RapCon	rapid connect enable inverted. A one has to be written in to enable the output.
Output	free output inverted, for special MB upgrades
Input	free input with pull-up for special MB upgrades

4.2.10 FCMASK

Used for broadcast write operations and concurrent read/write operations.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Content	FCR 7	FCR 6	FCR 5	FCR 4	FCR 3	FCR 2	FCR 1	FCR 0	FCW 7	FCW 6	FCW 5	FCW 4	FCW 3	FCW 2	FCW 1	FCW 0
	Read Operation								Write Operation							

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2.11 FCAVAIL

Indicates in which location an active function card is plugged in. A one indicates no FC is plugged in, whereas a zero flags an operational FC.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial									1	1	1	1	1	1	1	1
Content									FC8	FC7	FC6	FC5	FC4	FC3	FC2	FC1

4.2.12 FCMOD

Used to set up special ProDAQ bus operation mode and to adjust the address and data cycles timing of the ProDAQ bus.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Operation	RW		RW			RW			RO	RO	RO	RO	RO	RO	RO	RO
Content	Mode		AS width			DS width			FC8	FC7	FC6	FC5	FC4	FC3	FC2	FC1

Please Note: Any change of the AS and DS width effects the data transfer speed. It is strongly recommended to use the values set by the driver. Some function cards may have special requirements.

4.2.13 FCBLOCK

Read only register for testing of the block transfers.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Content	Transfer counter															

4.2.14 FCADR

Address as sent during the last FC access cycle, to the FC address buffer.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Operation	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Initial	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Content	FCA15	FCA14	FCA13	FCA12	FCA11	FCA10	FCA9	FCA8	FCA7	FCA6	FCA5	FCA4	FCA3	FCA2	FCA1	FCA0

4.2.15 FCMASKOUT

Mask as sent to the FC controller on the last FC access.

4.2.16 VERSION

Identifies the version of the motherboard.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.3 Board Specific Registers

The following registers can be accessed in the A24 or A32 address space:

Address in hex	Mnemonic	OP (bits)	Function
0x00320000	VoltRefData	RW (16/32)	Set/Read data from Voltage Reference data bus
0x00320004	VoltRefID	RO (16)	Read the voltage reference module ID
0x00300000	TrigStatus	RO (32)	Trigger status with automatic update
0x00300008	TrigStatusRead	RO (32)	Trigger status without update
0x00300004	TrigRapid	RW (16)	For fast switching of trigger matrix connections.

4.3.1 VoltRefData

Usage is dependent on the voltage reference module fitted.

4.3.2 VoltRefID

To identify the type of voltage reference module fitted to the motherboard.

4.3.3 TrigStatus

Reads the level of the trigger lines and stores them in a register. An interrupt request updates the register to allow the application program to determine the interrupting source. The register has the following bit assignment:

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Contents	FC trig Out8	FC Trig Out7	FC trig Out6	FC Trig Out5	FC trig Out4	FC trig Out3	FC trig Out2	FC trig Out1	FC Trig In8	FC trig In7	FC trig In6	FC trig In5	FC trig In4	FC trig In3	FC trig In2	FC trig In1

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Initial	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Contents	Reserved					LIRQ	ECL trig1	ECL trig1	TTL trig7	TTL trig6	TTL trig5	TTL trig4	TTL trig3	TTL trig2	TTL trig1	TTL trig0

FctrgInn: Trigger signals to the function card n (1..8).

FctrgOutn: Trigger signals from the function card n (1..8).

TTLtrign: VXIbus TTL trigger line status.

ECLtrign: VXIbus ECL trigger line status.

LIRQ: Local interrupt request.

4.3.4 TrigRapid

Rapid connection register for fast switching within the trigger Matrix.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contents	Str	WE	C1	C0	Row 5	Row 4	Row 3	Row 2	Row 1	Row 0	Col5	Col4	Col3	Col2	Col1	Col0

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.4 Trigger System

Inputs and outputs to the trigger matrix. In the table below the port numbers in the switch matrix are shown:

Port No.	Function	Direction	Port No.	Function	Direction
0.	FCtrgIn 1	Out	16.	TTLtrigO 0	Out
1.	FCtrgIn 2	Out	17.	TTLtrigO 1	Out
2	FCtrgIn 3	Out	18.	TTLtrigO 2	Out
3.	FCtrgIn 4	Out	19.	TTLtrigO 3	Out
4.	FCtrgIn 5	Out	20.	TTLtrigO 4	Out
5.	FCtrgIn 6	Out	21.	TTLtrigO 5	Out
6.	FCtrgIn 7	Out	22.	TTLtrigO 6	Out
7.	FCtrgIn 8	Out	23.	TTLtrigO 7	Out
8.	FCtrgOut 1	In	24.	ECLtrigI 0	In
9.	FCtrgOut 2	In	25.	ECLtrigI 1	In
10.	FCtrgOut 3	In	26.	FCCLK 1	Out
11.	FCtrgOut 4	In	27.	FCCLK 2	Out
12.	FCtrgOut 5	In	28.	FCCLK 3	Out
13.	FCtrgOut 6	In	29.	FCCLK 4	Out
14.	FCtrgOut 7	In	30.	FCCLK 5	Out
15.	FCtrgOut 8	In	31.	FCCLK 6	Out
16.	TTLtrigI 0	In	32.	FCCLK 7	Out
17.	TTLtrigI 1	In	33.	FCCLK 8	Out
18.	TTLtrigI 2	In	34.	CLKBase	In
19.	TTLtrigI 3	In	35.	CLKB2	In
20.	TTLtrigI 4	In	36.	not used	
21.	TTLtrigI 5	In	37.	CLK10MHz	In
22.	TTLtrigI 6	In	38.	CLK16MHz	In
23.	TTLtrigI 7	In	39.	LLIRQ	Out

Only 1:n or m:1 connections are allowed. Each of those relations is called a set. Limitations in the hardware do not allow a signal belonging to more than one set. If a signal belongs to different sets, correct function of the switch matrix is not guaranteed.

The input and output signals are low active, with the exception of the clocks. Due to the implementation, it is not allowed to mix clocks.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.5 Interrupt Handling

Interrupts can be requested only if the switch matrix is programmed to forward a request from a function card to the VXI Controller. There the request is stored and forwarded to the VXI/VME interface controller. If the VXI configuration register IRQH is programmed to an Interrupt level between 1 and 7 and the interrupt is enabled then the request is forwarded to the VXIbus and handled according to the VME Spec Revision C.1.

The ProDAQ motherboard responds with a 32bit, 16bit or 8bit status word to the interrupt acknowledge cycle. During the interrupt acknowledge cycle the motherboard provides the following status word:

Status Word	**Bit 15 → 8**	**Bit 7 → 0**
	IRQhand 7 → 0	logical Address

During the interrupt acknowledge cycle the internally stored interrupt request is cleared.

In the event of an interrupt request, the current status is stored in the trigger status word. The MB does not provide any possibility to queue multiple interrupt requests independent of their source. Therefore it is strongly recommended that the software checks, (by reading the trigger status word) whether other possible interrupts are pending. The appropriate action has to be issued by the software.

Copyright, © Bustec Production Ltd.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Bustec Production, Ltd.
World Aviation Park, Shannon, Co. Clare, Ireland
Tel: +353 (0) 61 707100, FAX: +353 (0) 61 707106

Bustec, Inc.
17820 Englewood Dr #14, Middleburg Hts, OH 44130, U.S.A
Tel. +1 440 826 4156, Fax: +1 440 826 4184

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP