Fermi National Accelerator Laboratory

SVX II Silicon Strip Detector Upgrade Project
Readout Electronics

6U to 6U Extender and 6U to 9U Adapter

--PRELIMINARY--

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1 GENERAL INFORMATION

1.1 Description Of 6U to 6U Extender and 6U to 9U Adapter Their Uses

This document describes the 6U to 6U VIPA extender and 6U to 9U adapter boards. These boards assist with operations in 9U size VIPA subrack of the type used in the SVX II Upgrade Readout Electronics System. The extender helps with prototype debugging, diagnosis, and repair of 6U and 9U modules. The adapter provides mechanical and electrical adaptation of existing and new 6U size VME circuit boards to be mounted in a 9U subrack. It also provides space for options for specific modules.

1.2 List Of Component Requirements

The extender and adapter boards must follow the recommend practices of the VIPA specifications and the VME64X bus standards that are the basis of the VIPA specifications. The board will provide the features of the VME64 extensions.

The extender and adapter boards will have active circuitry to provide bus isolation between the extended/adapted module and the subrack backplane. When a passive adapter or extender is plugged into the 9U subrack, that module can cause reflections in the 9U backplane. The long traces on the adapter/extender would act like transmission line stubs and if they are not perfectly terminated, generate reflected versions of the bus transitions. These stubs can be tolerated, to some degree, at the ends of the backplane buses, but one or more such stubs in the middle of the bus can create reflections large enough to corrupt the original bus signals.

1.2.1 Extender

The extender board is envisioned as a tool to assist with prototype testing and problem diagnostics, especially in a test stand environment. It is not intended for use in the day-to-day operation of a system whether for computing, data acquisition or engineering purposes.

The extender will have test points and jumpers to break the traces to the extended module. There will be a stiffener at 9U connectors and two in center. This rigidity can be implemented also by attaching a metal sheet to the top of the extender covering the majority of the board surface. There will be card guides for the extended module and mechanical component to assist with insertion and extraction of the extender in a subrack.

1.2.2 Adapter

The adapter board will provide improved ESD EMC protection for legacy VME boards.

There is a board stiffener at 9U connectors. The card guides for the adapted board extend into the module and provide extra stiffness.

The module will have optional DC-DC converter supplying the +- 12-volt needs of the adapted module.

2 THEORY OF OPERATION AND OPERATING MODES

2.1 Basic Features & Operation (Including Block Diagram)

2.1.1 Adapter

The VIPA 6U to 9U adapter board will allow 6U size VME circuit boards to be mounted and operate within a 9U VIPA subrack. Physically the board will be 9U by 400-mm. It will have a cutout that can accept a 6U by 160-mm VME module. The mechanical components will replicate the guides, electrical connections and support of a standard 6U subrack. The adapter module outline is shown in Figure 1.

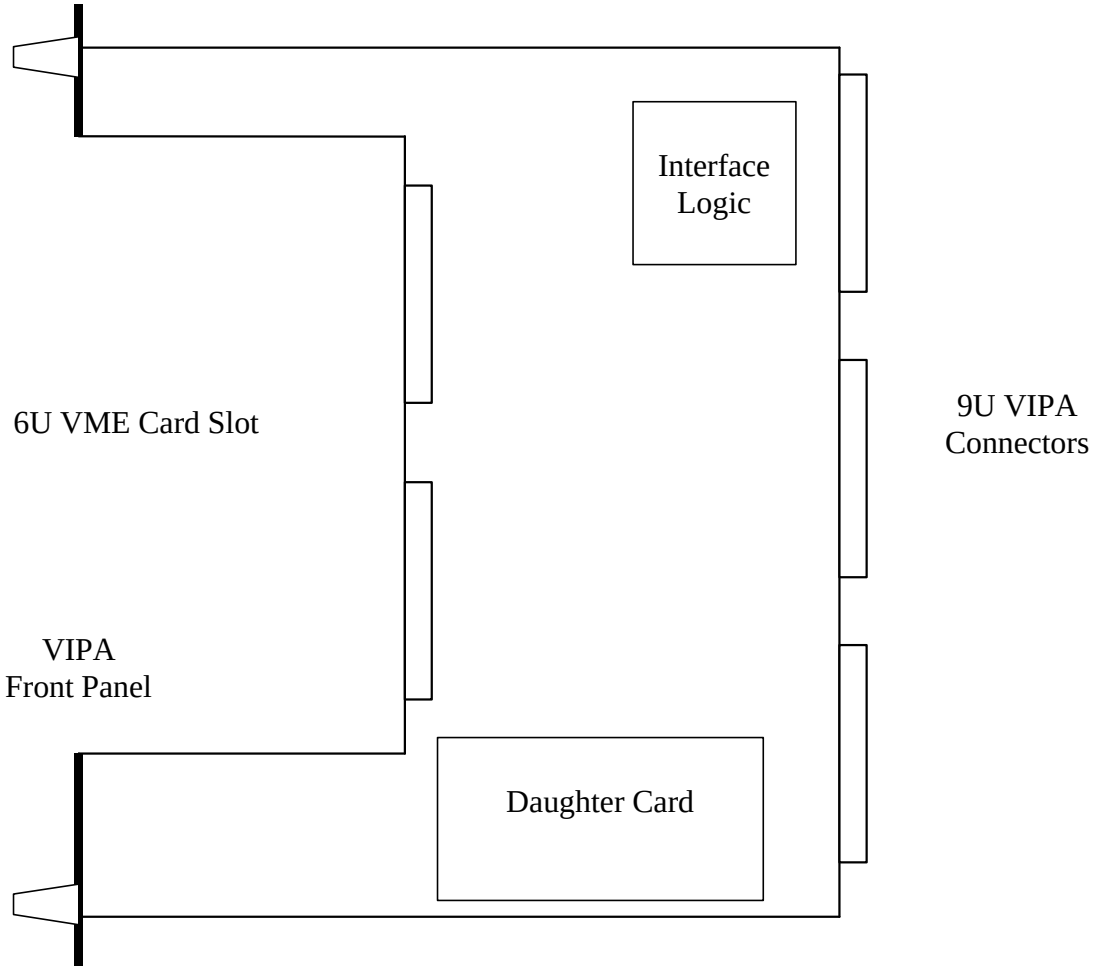

Figure 1 Adapter

The adapter contains electronic circuitry to connect the 6U and 9U signals without distorting the signals on the two buses. There will be an electrical delay added to the signals as

they pass through the adapter card but the delay is not significant unless the adapter must pass a large amount of simple transactions. Block transactions mitigate the delay because bus activity after the first transaction is not subject to this delay. The block diagram of the bus interconnects is shown in Figure 2.

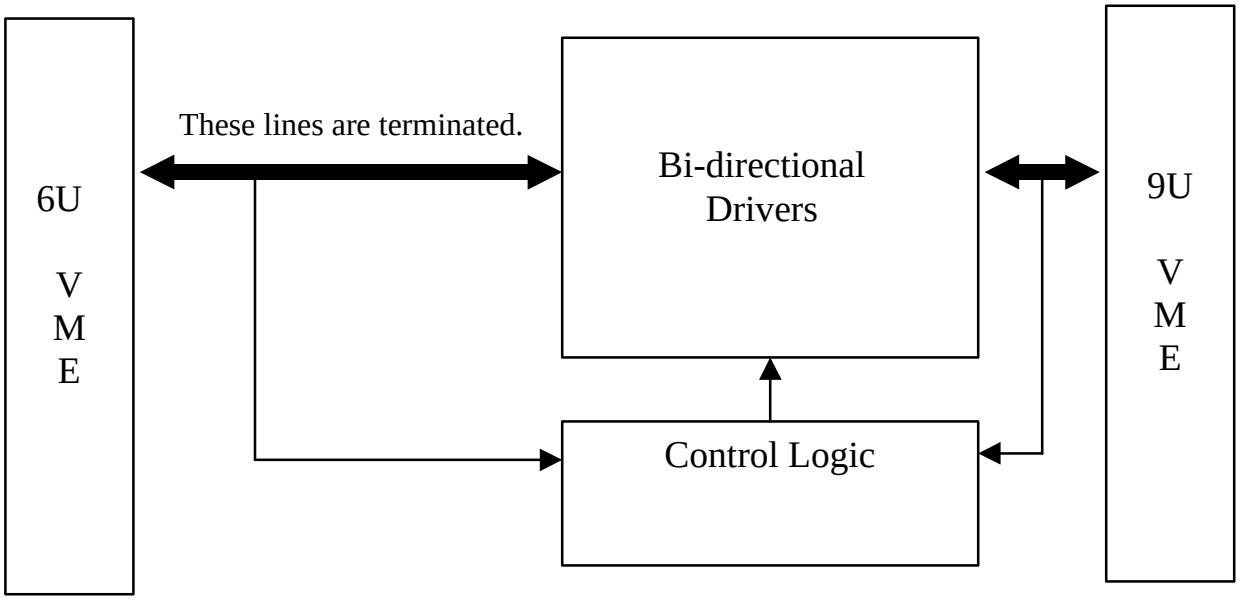

Figure 2 Adapter Block diagram

The adapter can be equiped with optional components that support special functions on the 6U boards or provide support for these boards that the subrack does not provide. These can include

- special power suplies or supplies for one board that do not need to be provided to the rest of the subrack.
- Special interface connections or adapter circuitry for existing interfaces.
- Clock or control signals not provided by the subrack.

2.1.2 Extender

The VIPA 6U to 6U extender boards will allow 6U size VME circuit boards to be extended outside of a 9U VIPA subrack and operate normally. Physically the board will be 6U by 570-mm. It will have adapter hardware that will allow a separate 3U module to be attached. This will provide a full 9U-extender module. The extender will provide the mechanical

components to support a standard 6U card. When a separate 3U module is fitted to make a 9U extender, the extender will provide the mechanical components to support a standard 9U card. The extender module outline is shown in Figure 3.

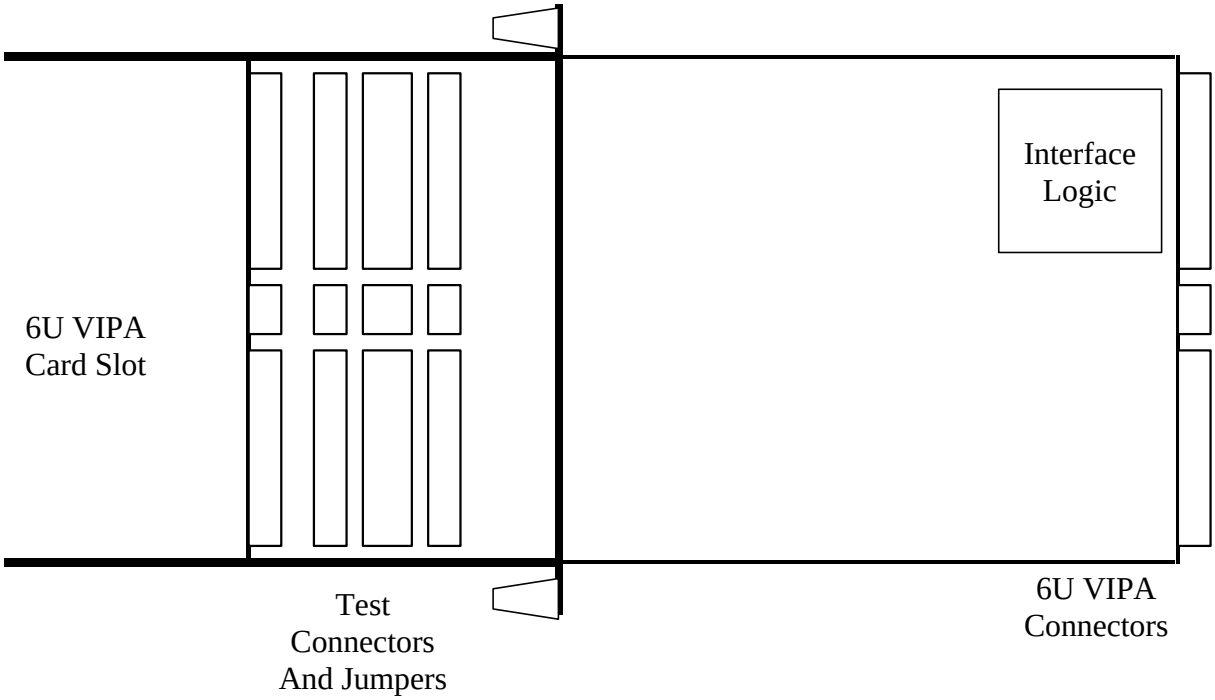

Figure 3 Extender

The extender contains electronic circuitry to connect the extended and backplane signals without distorting the signals on the two buses. There will be an electrical delay added to the signals as they pass through the extender card but the delay is not significant unless the extender must pass a large amount of simple transactions. The block diagram of the bus interconnects is shown in Figure 4.

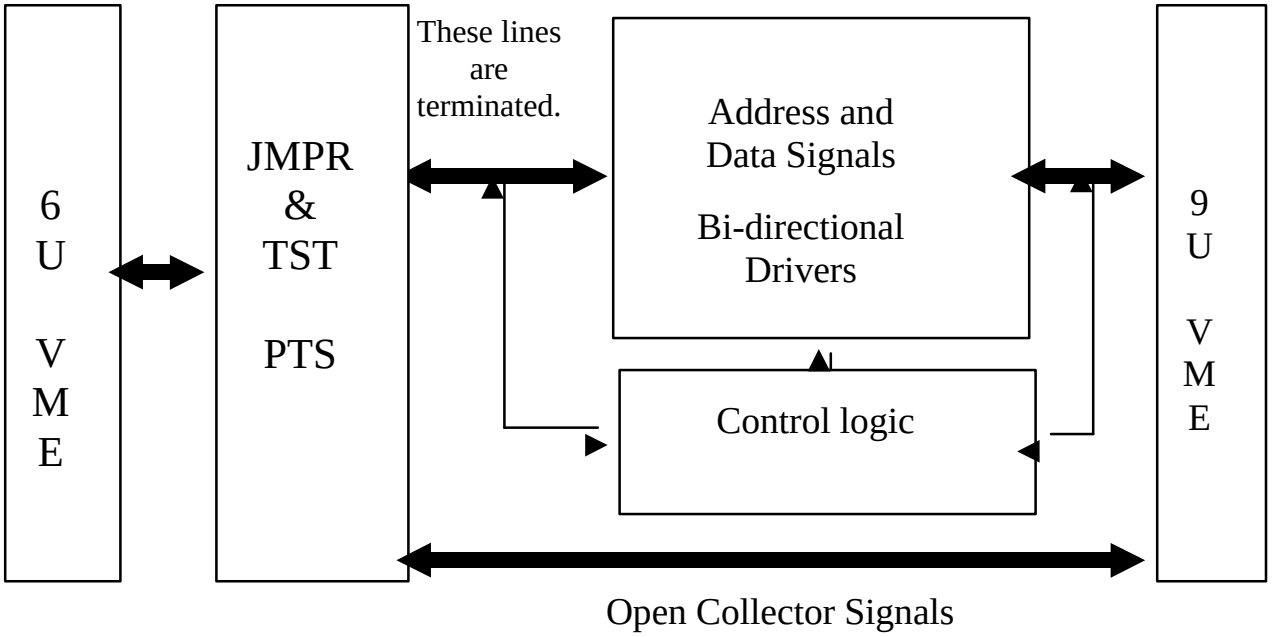

Figure 4 Extender Block diagram

2.2 Diagnostic Features

The extender and adapter will have indicator LEDs for the +5 volt, +12 volt, –12 volt and +3.3 volt power supplies. Both modules are designed to be simple and as transparent as possible to the extended or adapted module. The module will not have any easily run diagnostics.

3 INTERFACE SPECIFICATIONS

(These paragraphs give details of all I/O of the subject of this document including bus interfaces, front panel I/O and monitoring points {e.g., LEDs}, auxiliary card interface and/or daughter-card interface. If the subject of this document requires an auxiliary and/or daughter card, separate documents should be written for each of these cards as well. Figures of the front-panel and its connectors, etc. as well as auxiliary and/or daughter card connectors, etc. are almost always included.)

3.1 VMEbus Interface

3.1.1 Addressing Modes

3.1.2 Data Cycles Types

3.1.3 Register Descriptions

3.2 Front Panel I/O, Test & Monitoring

3.2.1 First Connector

3.2.1.1 Connector Pin Configurations

3.2.1.2 Signal Descriptions

3.2.1.3 Protocols

3.2.1.4 Additional Subsections

3.2.2 Other Connectors

4 ELECTRICAL & MECHANICAL SPECIFICATIONS

4.1 Packaging & Physical Size

4.2 PC Board Construction

4.3 Power Requirements

4.4 Cooling Requirements

5 SAFETY FEATURES & QUALITY ASSURANCE PROCEDURES

This module shall be designed and built with safety in mind. It will be thoroughly reviewed by department and lab safety personnel to verify its safety.

5.1 Module Fusing & Transient Suppression

The adapter and extender will include fusing and transient suppression for all incoming voltages. Fuses and transient suppression diodes will be placed as close as possible to the voltage entry point on the board. The fuses will be sized such that the board is protected against a power short on the board. There will be fuses for the logic on the adapter or extender separate from the fuses for the module being adapted or extended.

6 APPENDICES

6.1 List Of Component Documentation

6.2 Schematics

6.3 PAL, FPGA Equations

6.4 Timing Diagrams

6.5 Parts List