

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.

Visit our website - *Click HERE*



User's Manual

Document No. T-T-MU-MBS#####-A-0-A5



FOREWORD

The information in this document has been carefully checked and is believed to be accurate; however no responsibility is assumed for inaccuracies. Systran reserves the right to make changes without notice.

Systran makes no warranty of any kind with regard to this printed material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

©Copyright 2003, Systran Corporation. All Rights Reserved.

Systran® is a registered trademark of Systran Corporation.

BusXchange® is a registered trademark of Systran Corporation.

Hayes is a registered trademarks of Hayes Microcomputer Products, Inc.
Resource Allocation Manager™ is a trademark of Science Applications International Corporation.
Windows NT® is a registered trademark of Microsoft Corporation.

Any reference made within this document to equipment from other vendors does not constitute an endorsement of their product(s).

ALTERA © 2003, Systran Corporation, Dayton, Ohio USA. All Rights Reserved. The code (program) contained in this product is proprietary to Systran Corporation and copying or other use of the code (program), except as expressly authorized by Systran Corporation, is expressly prohibited.

Revised: November 3, 2003

Systran Corporation
4126 Linden Avenue
Dayton, OH 45432-3068 USA
(800) 252-5601 (U.S. only)
(937) 252-5601

FCC

This product is intended for use in industrial, laboratory or military environments. This product uses and emits electromagnetic radiation, which may interfere with other radio and communication devices. The user may be in violation of FCC regulations if this device is used in other than the intended market environments.

CE

As a component part of another system, this product has no intrinsic function and is therefore not subject to the European Union CE EMC directive 89/336/EEC.

TABLE OF CONTENTS

1. INTRODUCTION 1-1
- 1.1 How to Use This Manual 1-1
  - 1.1.1 Purpose 1-1
  - 1.1.2 Scope 1-1
  - 1.1.3 Style Conventions 1-1
- 1.2 Related Information 1-1
- 1.3 Quality Assurance 1-1
- 1.4 Technical Support 1-2
- 1.5 Ordering Process 1-2

2. PRODUCT OVERVIEW 2-1
- 2.1 Overview 2-1
- 2.2 BusXchange Features 2-2
  - 2.2.1 Subpopulation Configurations 2-2
  - 2.2.2 Command Line Interface 2-2
- 2.3 Structure 2-3
  - 2.3.1 LRU Inputs 2-3
  - 2.3.2 LCD Interface 2-4
- 2.4 Connecting a Terminal 2-5
- 2.5 Resource Allocation Manager Software 2-5
- 2.6 Higher-Level Control Software 2-5
- 2.7 Connecting a Modem 2-5
- 2.8 Applications 2-6
  - 2.8.1 MIL-STD-1553 Bus Switch With One Control Point 2-6
  - 2.8.2 MIL-STD-1553 Bus Switch With Multiple Independent Control Points 2-6
  - 2.8.3 Redundant MIL-STD-1553 Buses 2-6
  - 2.8.4 Using More Than 16 LRUs 2-6

3. INSTALLATION 3-1
- 3.1 Overview 3-1
- 3.2 Installation Package 3-1
- 3.3 BusXchange Enclosure 3-1
- 3.4 Jumper Settings 3-1
- 3.5 Connect an External Ground Connection 3-3
- 3.6 Connect the RS-232 Cable 3-3
- 3.7 Connect Power to the BusXchange 3-3
- 3.8 Connecting the LRUs 3-4
- 3.9 Connecting the Buses 3-4
- 3.10 Activate the BusXchange 3-4
- 3.11 Autobauding 3-4
- 3.12 Connecting a Modem 3-5
- 3.13 Troubleshooting 3-5
- 3.14 Maintenance 3-5

4. COMMAND LINE INTERFACE 4-1
- 4.1 Overview 4-1
- 4.2 Notation 4-1
- 4.3 Command Line Interface 4-1
  - 4.3.1 System Commands 4-1
  - 4.3.2 Control Commands 4-2
  - 4.3.3 Status Commands 4-3

APPENDICES

A SPECIFICATIONS A-1
B RS-232 CABLE B-1
C INSTALLATION DRAWINGS C-1
GLOSSARY GLOSSARY-1
INDEX INDEX-1

FIGURES

Figure 2-1 BusXchange with 16 LRU and 16 Bus Connections 2-1
Figure 2-2 BusXchange with Enclosure 2-1
Figure 2-1 BusXchange LRU Input Numbering 2-3
Figure 2-2 BusXchange Bus Output Numbering 2-3
Figure 2-3 BusXchange Crosspoint Switch Architecture 2-4
Figure 2-4 LCD Status Display 2-4
Figure 2-5 32 x 16 Switch Using Two BusXchange Units 2-7
Figure 3-1 View of Headers J35 through J50 3-2
Figure 3-2 View of Header J58 3-3
Figure 3-3 Back View of BusXchange Unit 3-3
Figure 3-4 BusXchange Power Supply Connection 3-4
Figure 4-1 ST A Command Response 4-4

TABLE

Table 4-1 Command Line Interface 4-1

1. INTRODUCTION

1.1 How to Use This Manual

1.1.1 Purpose

The purpose of this manual is to describe the BusXchange Multiplex 1553 Bus Switch and its unpacking, setup, and operation.

1.1.2 Scope

This manual contains the following information:

- Overview of BusXchange capabilities and features
- Physical and functional description of the BusXchange
- Instructions on how to use the BusXchange

The information in this manual is intended for information systems personnel or system integrators.

1.1.3 Style Conventions

- Command names are capitalized and bolded. For example, **HELP**.
- Hexadecimal values are written with a "0x" prefix. For example, 0x7e.
- Command line interface command notation:

  <LRU#> Indicates that an LRU number is required. Valid LRU numbers are the hexadecimal numbers 0x0 to 0xF.

  <Bus#> Indicates that a Bus number is required. Valid Bus numbers are the hexadecimal numbers 0x0 to 0xF.

1.2 Related Information

The following documents are referred to in this specification.

- *MIL-STD-1553A, Military Standard, Aircraft Internal Time Division Command/Response Multiplex Data Bus*, 30 April 1975.
- *MIL-STD-1553B, Military Standard, Aircraft Internal Time Division Command/Response Multiplex Data Bus*, 21 September 1978.

1.3 Quality Assurance

Systran Corporate policy is to provide our customers with the highest quality products and services. In addition to the physical product, the company provides documentation, sales and marketing support, hardware and software technical support, and timely product delivery. Our quality commitment begins with product concept, and continues after receipt of the purchased product.

Systran's Quality System conforms to the ISO 9001 international standard for quality systems. ISO 9001 is the model for quality assurance in design, development, production, installation and servicing. The ISO 9001 standard addresses all 20 clauses of the ISO quality system, and is the most comprehensive of the conformance standards.

Our Quality System addresses the following basic objectives:

- Achieve, maintain and continually improve the quality of our products through established design, test, and production procedures.
- Improve the quality of our operations to meet the needs of our customers, suppliers, and other stakeholders.
- Provide our employees with the tools and overall work environment to fulfill, maintain, and improve product and service quality.
- Ensure our customer and other stakeholders that only the highest quality product or service will be delivered.

The British Standards Institution (BSI), the world's largest and most respected standardization authority, assessed Systran's Quality System. BSI's Quality Assurance division certified we meet or exceed all applicable international standards, and issued Certificate of Registration, number FM 31468, on May 16, 1995. The scope of Systran's registration is: "Design, manufacture and service of high technology hardware and software computer communications products." The registration is maintained under BSI QA's bi-annual quality audit program.

Customer feedback is integral to our quality and reliability program. We encourage customers to contact us with questions, suggestions, or comments regarding any of our products or services. We guarantee professional and quick responses to your questions, comments, or problems.

1.4 Technical Support

Technical documentation is provided with all of our products. This documentation describes the technology, its performance characteristics, and includes some typical applications. It also includes comprehensive support information, designed to answer any technical questions that might arise concerning the use of this product. We also publish and distribute technical briefs and application notes that cover a wide assortment of topics. Although we try to tailor the applications to real scenarios, not all possible circumstances are covered.

Although we have attempted to make this document comprehensive, you may have specific problems or issues this document does not satisfactorily cover. Our goal is to offer a combination of products and services that provide complete, easy-to-use solutions for your application.

If you have any technical or non-technical questions or comments, contact us. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

- Phone: (937) 252-5601 or (800) 252-5601
- E-mail: support@systran.com
- Fax: (937) 252-1349
- World Wide Web address: www.systran.com

1.5 Ordering Process

To learn more about Systran products or to place an order, please use the following contact information. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

- Phone: (937) 252-5601 or (800) 252-5601
- E-mail: info@systran.com
- World Wide Web address: www.systran.com

2. PRODUCT OVERVIEW

2.1 Overview

Systran's BusXchange, shown in Figure 2-1, is a MIL-STD-1553 "virtual patch panel" housed in a 19" rack-mountable chassis. This 16 x 16 crosspoint switch provides differential connections from 16 transformer-coupled Line Replaceable Unit (LRU) inputs to 16 MIL-STD-1553 differential buses. The BusXchange eliminates time-consuming bus rewiring between different avionics simulations or test scenarios.

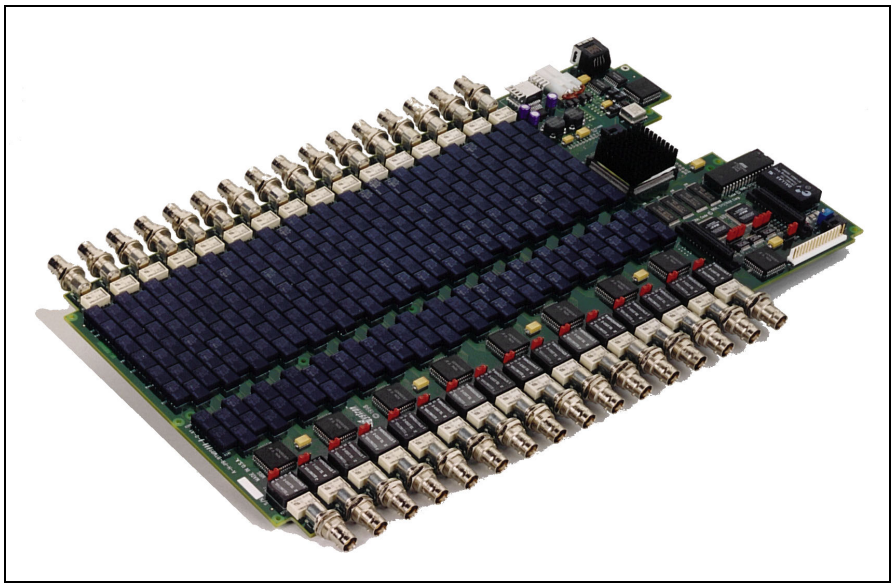


Figure 2-1 BusXchange with 16 LRU and 16 Bus Connections



Figure 2-2 BusXchange with Enclosure

2.2 BusXchange Features

The BusXchange has the following features:

- Up to 16 transformer-coupled LRU inputs via standard concentric twinax connectors. This product is NOT designed to support direct-coupled LRU devices.
- Up to 16 MIL-STD-1553 bus output connections via standard concentric twinax connector.
- Provides logic that ensures that any single LRU port can be connected to only one of the buses at a time.
- LRU and bus coupling relays physically disconnect the LRU and/or bus from the crosspoint switch if they are not currently logically connected.
- The switch configuration is stored in non-volatile memory. After each power-up event, the crosspoint switch is configured in the last working state.
- Support MIL-STD-1553A, MIL-STD-1553B, and mixed-device environments.
- The LRU units can be any transformer-coupled MIL-STD-1553 device: bus controller, remote terminal, or monitor.
- Out-of-band control/status uses an RS-232 port.
- Front-panel LCD indicates switch status.
- Can be connected to a modem and controlled from a remote location.

2.2.1 Subpopulation Configurations

The BusXchange supports up to 16 LRUs and 16 buses. Other configurations are available where the product is partially populated for scenarios when a smaller number of LRU and/or bus connections are required. Contact Sales or Technical Support for the availability of these BusXchange configurations.

2.2.2 Command Line Interface

The BusXchange provides an out-of-band command line interface, which allows configuration of the switch and receipt of status information from the switch. This command line interface has the following features:

- On-line help
- Command set supports the connection of a specified LRU to a specified bus.
- Command set supports the disconnection of a specified LRU.
- Command set supports the display of the crosspoint switch status.
- Provides a “prompt” to indicate the BusXchange is ready to receive and process commands.
- At power-up, the last configuration used is automatically restored.
- Requires no user intervention on startup.

See Chapter 4 for a detailed description of this interface.

2.3 Structure

The BusXchange has three primary functions:

1. Connect LRU inputs to the appropriate specified Bus outputs.
2. Provide an out-of-band command line interface to the user.
3. Provide status information to the user via the command line interface and front-panel LCD status display.

2.3.1 LRU Inputs

The BusXchange is composed of up to 16 LRU Input connections. These port pairs are numbered as shown in Figure 2-1, viewed from the front of the BusXchange.

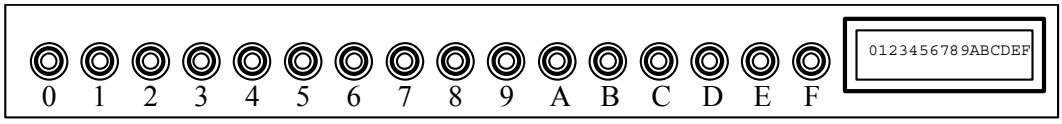


Figure 2-1 BusXchange LRU Input Numbering

The BusXchange Switch is composed of up to 16 Bus Output connections. These port pairs are numbered as shown in Figure 3-2, viewed from the back of the BusXchange.

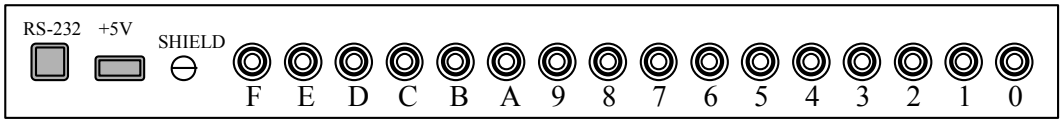


Figure 2-2 BusXchange Bus Output Numbering

The BusXchange uses a crosspoint switch to allow each LRU to be connected or disconnected. If an LRU is connected to a bus, it can only be connected to a single bus at a given time. A bus can have any combination of the LRUs connected to it. The BusXchange uses LRU coupling relays to physically connect each LRU to the crosspoint matrix if the LRU is logically connected to a bus either through configuration by the command line interface (current configuration) or the non-volatile memory (after power-up).

If an LRU is not logically connected to any bus, the LRU coupling relay automatically physically disconnects the LRU from the crosspoint matrix. Each LRU has a coupling transformer and a pair of fault-isolation resistors to provide the proper connection for each of the transformer-coupled LRUs. A crosspoint matrix consisting of 256 relays allows each LRU to be physically connected to each bus.

Bus coupling relays are used to physically disconnect the bus from the crosspoint matrix if no LRUs are logically connected to the given bus. If any LRU is logically connected to a given bus, the bus-coupling relay is automatically physically connected. This architecture described here is illustrated in Figure 2-3.

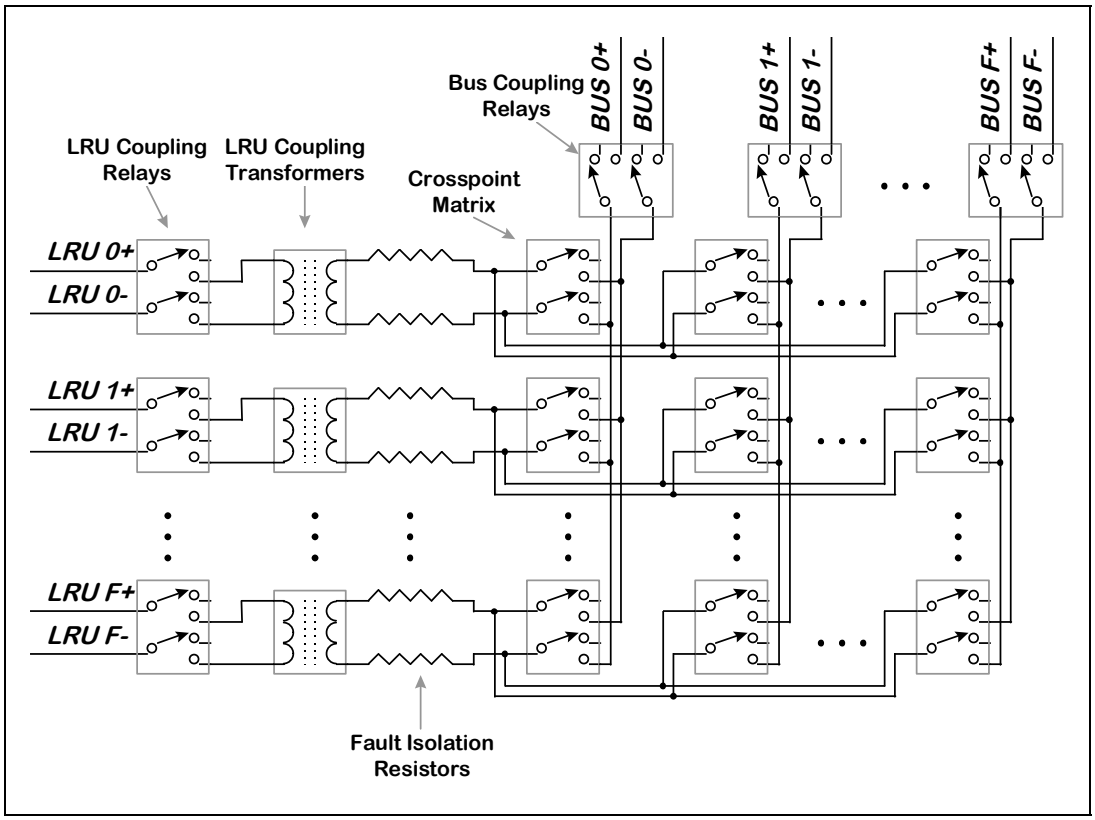


Figure 2-3 BusXchange Crosspoint Switch Architecture

2.3.2 LCD Interface

The BusXchange provides a front-panel LCD status display which indicates the current switch configuration. This is particularly useful if the control terminal in not located in close proximity to the BusXchange unit.

The LCD status display consists of two lines. The top line displays the available LRU connections. A BusXchange with 16 LRU connections will have all 16 input connections ('0' through 'F') displayed. The second line indicates the current connection for each of the available LRUs. The bus connection is displayed directly below the each of the associated LRU connections.

If no bus connection is present, no bus number will be displayed. If the LRU is connected to a bus, the number of the bus will be displayed under the LRU number. Figure 2-4 illustrates an example LCD display. In this situation, all of the 16 LRUs are disconnected, except LRUs 4, 8, and 9. LRUs 4 and 8 are connected to bus 2, while LRU 9 is connected to bus 3.

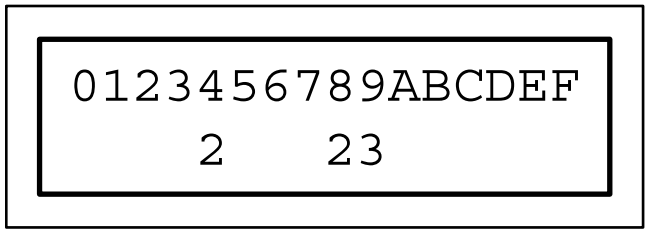


Figure 2-4 LCD Status Display

2.4 Connecting a Terminal

A VT-100 compliant terminal (or terminal program running on a PC) can be connected to the BusXchange using an RS-232 cable. Data rates of 9600, 19200, 38400, and 57600 baud are supported. The terminal should be set for 8 data bits, 1 stop bit, and no parity.

It is not necessary to set the baud rate. The BusXchange can autobaud with the terminal. Connect a terminal to the BusXchange, press several keys to give the BusXchange serial input, and the BusXchange automatically detects the baud rate. See Section 3.11 for details on autobauding.

When the BusXchange has the same baud rate as the terminal, the command prompt, "MBS>>", displays on the terminal. This indicates the BusXchange is ready to process commands.

2.5 Resource Allocation Manager Software

Resource Allocation Manager Software is supplied on CD-ROM with the BusXchange. The software runs under Windows NT 4.0 and is used to configure BusXchange. Complete instructions on the use of the software are included on the CD-ROM.

2.6 Higher-Level Control Software

Software applications may be developed to interface to the BusXchange to isolate the user from the command line interface, to automate laboratory control of this equipment, or to fulfill some other special requirement. Software can be written using the command line interface described in Chapter 4 to communicate with the BusXchange. If developing interface applications, consider the following:

- Each command must be followed by a carriage return. The carriage return can be followed by an optional line feed with the same results.
- The BusXchange will echo received characters. When sending a command string to the BusXchange, the computer interfacing with the BusXchange will receive the sent command before receiving the appropriate response from the BusXchange. The higher-level control software should be designed to filter this out.
- If the serial cable used does not have hardware flow control, it is possible to overrun the UART FIFO in the BusXchange, losing data in the process. A practical solution is to not send the next serial character in the string until the current character has been echoed back. It may be desirable to implement a time-out function so the control software will not wait indefinitely if the BusXchange is not powered-up or if the serial cable is not correctly installed.
- It may be necessary on power-up of the BusXchange to autobaud the BusXchange so that the BusXchange is using the same baud rate as the computer. One possibility is to send a string of carriage returns until the command prompt, "MBS>>" is received.

2.7 Connecting a Modem

To allow for multiple points of control, a modem can be connected to the BusXchange. The process of connecting a modem to the switch is described in Section 3.12.

2.8 Applications

The BusXchange is a "virtual patch-panel" which eliminates time-consuming bus rewiring between different MIL-STD-1553 simulations or test scenarios.



NOTE: The BusXchange is designed as a static bus configuration tool. This eliminates time-consuming bus rewiring between different avionics configurations. The BusXchange is NOT designed to switch LRUs while a device is actively transmitting. When changing system configurations using the BusXchange, there should be no traffic on the respective bus(es).

2.8.1 MIL-STD-1553 Bus Switch With One Control Point

The BusXchange can easily be set up to be controlled by one access point. This access point must be a VT-100 compliant terminal and connected to the BusXchange with an RS-232 cable. Connecting a terminal to the BusXchange allows a system administrator to quickly configure or check the status of the BusXchange.

2.8.2 MIL-STD-1553 Bus Switch With Multiple Independent Control Points

Connecting a VT-100 directly to the BusXchange is simple to set up. This method, however, limits the number of BusXchange control points to one. To allow for multiple access points, a modem can be connected to the BusXchange using the RS-232 port. This allows control of the switch from multiple locations and with no distance limitation.

2.8.3 Redundant MIL-STD-1553 Buses

In many avionics applications, dual-redundant (or greater) buses are used. The BusXchange offers up to 16 LRU and bus connections. In non-redundant applications, this would allow up to 16 LRUs and buses to be connected to a single BusXchange. In a dual-redundant application, up to eight LRUs and buses could be connected to a single BusXchange. In a tri-redundant application, up to five LRUs and buses could be connected to a single BusXchange, with a single LRU and bus connection left over. In most redundant applications, it is necessary to switch both connections (primary and secondary) for a particular LRU when connecting it to a specified bus. However, in certain scenarios it may be desirable to only connect one of the associated connections (for example, the secondary bus) to test system characteristics when the other connection (for example, the primary bus) sustains damage.

2.8.4 Using More Than 16 LRUs

Many avionics applications may require more than 16 LRUs. To accommodate this situation, multiple BusXchange units can be cascaded together. Figure 2-5 shows two 16x16 (16 LRUs and 16 buses) BusXchange units combined to form a 32 x 16 non-blocking MIL-STD-1553 switch.

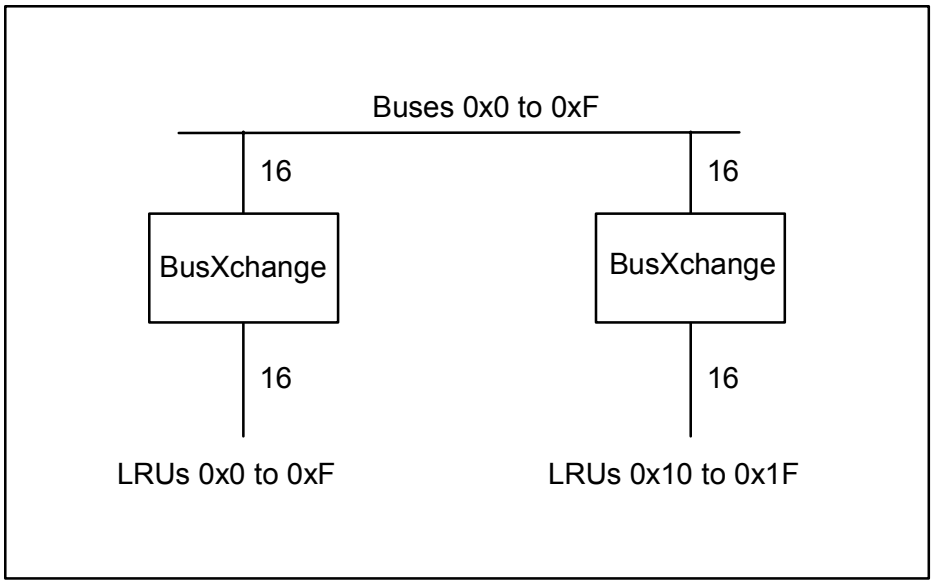


Figure 2-5 32 x 16 Switch Using Two BusXchange Units

This topology is also useful in situations where the LRUs may be situated in different locations. With transformer-coupled LRUs, the LRU must be located within 20 feet of the bus connection, in this case the BusXchange. If the application involved two groups of LRUs, each group within a different room in the laboratory, two BusXchange units could be used. Each BusXchange could be located with each group of respective LRUs, so each LRU could be located within 20 feet of the connected BusXchanges.

This page intentionally left blank

3. INSTALLATION

3.1 Overview

3.2 Installation Package

The BusXchange package contents are listed below:

- BusXchange (installed in enclosure)
- Enclosure side panels for use with 19" rack
- Enclosure non-skid feet
- BusXchange User's Manual
- Resource Allocation Manager CD-ROM
- Power Supply connector
- RS-232 cable and adapter

3.3 BusXchange Enclosure



NOTE: Installation drawings of the BusXchange are located in Appendix C.

The BusXchange is shipped in its enclosure. The side panels installed for shipment do not allow the use of the BusXchange in a 19" rack.

If the BusXchange will be installed in a rack, remove the four screws from each of the side panels, and remove the normal side panels from the enclosure. Using the screws that were just removed, install the side panels designed for use with a 19" rack. The BusXchange can then be mounted in a rack using the associated mounting hardware included with the rack.

If the BusXchange is not going to be installed in a rack, it may be desirable to install the non-skid rubber feet. These four rubber feet can be moved from the adhesive backing and mounted on the bottom of the BusXchange enclosure. Keep the shipping material in the event that the BusXchange needs to be returned.

3.4 Jumper Settings

The BusXchange is shipped with default jumper setting that will be ideal for most applications. It may be desirable to change these jumper settings based on a particular system configuration. If this is necessary, follow these steps.

1. Remove the top of the enclosure by removing the five screws for the top panel. Two of the screws are located on the top of the enclosure and three are located on the rear edge of the top panel. The top panel of the enclosure can then be removed.



CAUTION: Exercise care regarding the static environment. An anti-static mat connected to a wristband should be used when handling or installing the BusXchange.

2. For each of the LRU connections, a coupling transformer is used. J35 through J50 are the associated headers for LRUs 0 though F, respectively. In the default shipping position, the center-tap of this transformer is not connected. If the jumpers are moved from the left position to the right position (when viewed from the front of the BusXchange enclosure), the center-tap of the associated coupling transformers will be connected to the analog ground of the BusXchange. While this will result in a common reference point for the center-tap if all of the jumpers are moved to the right position, it is also likely that some of the noise from the BusXchange's switching power supply will be coupled to the MIL-STD-1553 bus connections. If changing these jumper settings, test and ensure that any noise coupled to the data bus connections will not be excessive for the particular operating environment.

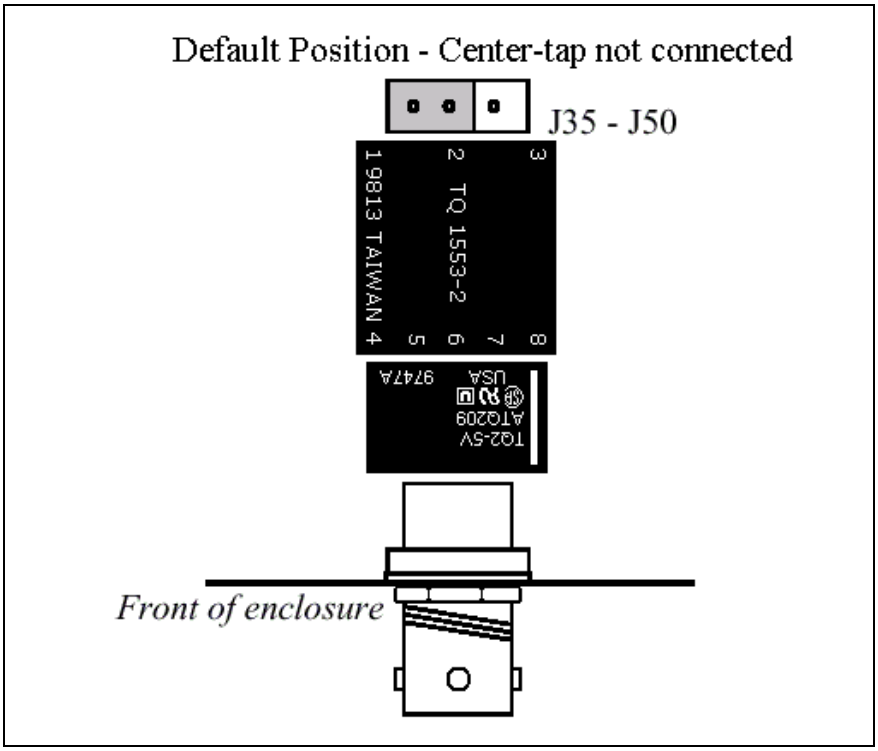


Figure 3-1 View of Headers J35 through J50

3. J54 through J57 are set at the factory and should NOT be changed.
4. Header J58 is used to enable or disable the backlight of the front-panel LCD. In its default position, the LCD backlight will be enabled, making it easier to read the LCD status display and serving as a power-on indicator for the BusXchange. If it is desired to disable the LCD backlight, move the header from the right position to the left position, as viewed from the front of the BusXchange enclosure.

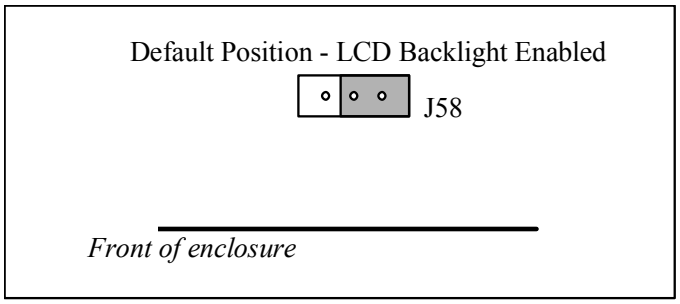


Figure 3-2 View of Header J58

5. Install the top of the BusXchange enclosure using the five screws removed in Step #1.

3.5 Connect an External Ground Connection

The back of the BusXchange is shown in Figure 3-3. The BusXchange enclosure connects all of the shields of the LRU and bus cabling together. However, unless the shielding of this cabling is connected to a reference elsewhere in the system, the shielding will be connected but left floating. It may be desirable to connect the shielding to a common reference point, that is, a centralized ground. The BusXchange enclosure provides a location to connect the shield of the BusXchange to such a potential. A screw and washer on the back of the BusXchange enclosure can be used to connect a wire that could be tied to a common reference voltage for the shield.

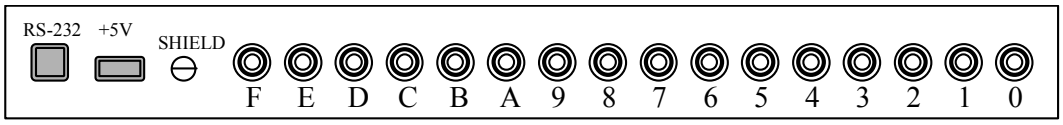


Figure 3-3 Back View of BusXchange Unit



CAUTION: MIL-STD-1553 shielding and ground considerations are system-dependent and must be made with respect to many concerns, including ground loops, EMI/RFI, lightning susceptibility, etc.

3.6 Connect the RS-232 Cable

To use the Out-of-Band command line interface, an RS-232 cable must be connected to the BusXchange. Make this connection using the supplied RS-232 cable with an RJ-45 connector. The RJ-45 connector should be plugged into the RS-232 connector shown in Figure 3-3. Appendix B describes the RS-232 cable requirements.

3.7 Connect Power to the BusXchange

Power must be connected to the BusXchange. The BusXchange is designed to use a power supply available from Systran: H-AS-PWRSPLY-10 (contact Systran Sales for pricing information). This desktop power supply accepts 120 VAC and provides +5 VDC (+/-5%) at 6 A. The PCB-mount connector used to accept the 5 V power on the BusXchange is METHODE part number 2000-302-200. The mating connector supplied with the BusXchange is METHODE part number 2300-202-216. It is supplied to allow you to connect your own source of +5 V power, if desired. For more information on these

connectors, contact Methode Electronics, Inc. at (847) 392-3500 or (800) 323-6858, or on the internet at www.methode.com.

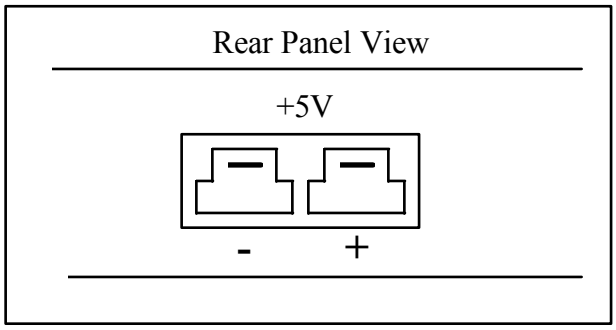


Figure 3-4 BusXchange Power Supply Connection

NOTE: The diagram is shown looking into the "female" connector on the Multiplex Bus Switch board.

3.8 Connecting the LRUs

The MIL-STD-1553 LRUs can now be connected to the front of the BusXchange unit using standard concentric twinax cabling. The LRUs must be transformer-coupled LRUs and the cabling must be less than 20 feet in length. For the LRUs in the system that are connected via the BusXchange, no Bus Coupler is required as the coupling transformers and fault-isolation resistors normally provided by a Bus Coupler are contained within the BusXchange.

3.9 Connecting the Buses

The MIL-STD-1553 buses can now be connected to the rear of the BusXchange unit. Each bus must be terminated at both ends, as required by MIL-STD-1553. No internal termination is provided by the BusXchange to allow maximum system flexibility. If all LRUs used in the system are connected directly to the BusXchange, each bus connection could simply consist of a Tee with two terminators installed. If the BusXchange resides at an end of a bus, the connection would likely be a Tee with the bus connection on one side of the Tee and a terminator on the other. If other LRUs are connected to the bus but do not utilize the BusXchange for connection, they must be connected to the bus via a Bus Coupler.

NOTE: Each end of each bus connection must be properly terminated using a bus terminator.

3.10 Activate the BusXchange

Once the BusXchange has been completely installed, power up the unit to verify proper functionality.

3.11 Autobauding

Since the BusXchange can autobaud with the terminal, it is not necessary to set the baud rate. After connecting a terminal to the BusXchange and pressing a few keys, the

BusXchange automatically detects the baud rate. Follow the steps below to connect a VT-100 terminal to the BusXchange:

1. Connect the terminal to the BusXchange using an RS-232 cable. See Appendix B for connector pin definitions.
2. Power on the terminal.
3. If the BusXchange is off, power it on. If the BusXchange is on, rebooting is not required.
4. Press a character a few times. This enables the BusXchange to detect that a new baud rate is required.
5. Press enter a few times. This enables the BusXchange to detect the new baud rate.
6. The BusXchange command line prompt, "MBS>>", should appear. This shows that the autobaud worked as expected.

3.12 Connecting a Modem

To control the BusXchange from multiple locations, a modem must be connected in place of the terminal. For this configuration to work properly the following must be done:

- The modem must be attached to the BusXchange using an RS-232 cable as described in Appendix B.
- The modem must be turned on before the BusXchange. This allows the BusXchange to properly configure the modem at power up.
- The modem must be Hayes-compatible.

Tested configurations included a Hayes-compatible modem operating at 14.4 and 28.8 Kbps.

3.13 Troubleshooting

If the BusXchange does not boot correctly, double-check cable and power connections. If problems persist, call Technical Support at **(937) 252-5601**.

Please be prepared to supply the following information:

Power Supply Used: _____
Serial Number: _____

3.14 Maintenance

No routine maintenance is required for the BusXchange.

This page intentionally left blank

4. COMMAND LINE INTERFACE

4.1 Overview

The BusXchange can be configured by using a command line interface. To use the command line interface, a VT-100 compliant terminal must be connected to the BusXchange serial port using an RS-232 cable. The available commands, described below, are composed of ASCII characters and are terminated by a carriage return. The command interpreter on the BusXchange is not case-sensitive.

4.2 Notation

To simplify the learning curve for the command line interface commands, a consistent notation is used for all help messages and BusXchange documentation.

<LRU#> Indicates that an LRU number is required. Valid LRU numbers are the hexadecimal numbers 0x0 to 0xF.

<Bus#> Indicates that a Bus number is required. Valid Bus numbers are the hexadecimal numbers 0x0 to 0xF.

4.3 Command Line Interface

The Command Line Interface commands are described in Table 4-1.

Table 4-1 Command Line Interface

Command	Description	Page
HELP	Displays supported BusXchange commands	4-1
Ln **B**m	Connects LRU#n to Bus#m	4-2
Ln **D**	Disconnects LRU#n from Bus	4-2
CLR	Clears crosspoint matrix—All LRUs are disconnected	4-2
ST Ln	Displays status of LRU#n	4-3
ST Bm	Displays status of Bus#m	4-3
ST A	Displays status of all LRUs	4-3
SZ	Displays status of BusXchange population level (or “size”)	4-4

4.3.1 System Commands

HELP

Description: This command is used to display the command set supported by the BusXchange. The data is provided to assist terminal operators who have little or no experience with this product. This command is not intended for use by high-level control software, and as such, its response is not documented in detail here.

Responses: "MBS OK." No error occurred. Command executed.
"MBS ERROR 103: Improperly formatted command." No extraneous text may follow command.

4.3.2 Control Commands

L<LRU#> B<BUS#>

Description: This configuration command is used to establish a connection between the specified LRU and Bus. If the LRU has a current connection to a different bus, it will be disconnected from the current bus and connected to the specified bus. If the LRU is currently connected to the specified bus, no change in the crosspoint switch will occur.

Responses: "MBS OK." No error occurred. Command executed. The switch configuration has been saved in non-volatile storage.
"MBS ERROR 101: Invalid LRU#." The valid range for an LRU# is "0" through "F".
"MBS ERROR 105: LRU not populated." This LRU does not exist on this sub-populated MBS.
"MBS ERROR 102: Invalid Bus#." The valid range for a Bus# is "0" through "F".
"MBS ERROR 103: Improperly formatted command." A single space must separate the two parameters. No extraneous text may follow command.
"MBS ERROR 107: Bus not populated." This Bus does not exist on this sub-populated BusXchange.

Example: **L4 BE** {connect LRU #4 to Bus #E}

L<LRU#> D

Description: This configuration command is used to disconnect the specified LRU from a bus. If the LRU has a current connection to a bus, it will be disconnected from the current bus. If the LRU is not currently connected to a bus, no change in the crosspoint will occur.

Responses: "MBS OK." No error occurred. Command executed. The switch configuration has been saved in non-volatile storage.
"MBS ERROR 101: Invalid LRU#." The valid range for an LRU# is "0" through "F".
"MBS ERROR 105: LRU not populated." This LRU does not exist on this sub-populated BusXchange.
"MBS ERROR 103: Improperly formatted command." A single space must separate the two parameters. No extraneous text may follow command.

Example: **L4 D** {disconnect LRU #4 from its current bus connection}

CLR

Description: This configuration is used to disconnect all LRUs from the buses. This command must be used with care because, as with all BusXchange configuration commands, the configuration of the BusXchange is saved after each change in its configuration.

Responses: "MBS OK." No error occurred. Command executed.
"MBS ERROR 103: Improperly formatted command." No extraneous text may follow command.

Example: **CLR** {disconnect all LRUs from their current bus connections}

4.3.3 Status Commands

ST L<LRU#>

Description: This status command is used to display the current bus connection of the specified LRU. The status display will consist of the text "LRU#<LRU#>: " followed by the number of the bus connection ("0" through "F"), if any. If the LRU is disconnected, no Bus # will be listed.

Responses: "MBS OK." No error occurred. Command executed.
"MBS ERROR 101: Invalid LRU#." The valid range for an LRU# is "0" through "F".
"MBS ERROR 105: LRU not populated." This LRU does not exist on this sub-populated BusXchange.
"MBS ERROR 103: Improperly formatted command." A single space must separate the two parameters. No extraneous text may follow command.

Example: **ST L4** {display the status of LRU #4}

ST B<BUS#>

Description: This status command is used to display the current LRU connections of the specified bus. The status display will consist of the text "Bus#<Bus#>: " followed by a listing of the LRU connections ("0" through "F") in ascending order, if any. If multiple LRUs are connected to the bus, the LRU connections will be separated by a single space. If no LRUs are connected, no LRU# will be listed.

Responses: "MBS OK." No error occurred. Command executed.
"MBS ERROR 102: Invalid Bus#." The valid range for a Bus# is "0" through "F".
"MBS ERROR 103: Improperly formatted command." A single space must separate the two parameters. No extraneous text may follow command.
"MBS ERROR 107: Bus not populated." This Bus does not exist on this sub-populated BusXchange.

Example: **ST B4** {display the status of Bus #4}

ST A

Description: This status command is used to display the status of the entire crosspoint switch. The format of the display is illustrated in Figure 4-1.

Responses: "MBS OK." No error occurred. Command executed.
"MBS ERROR 103: Improperly formatted command." A single space must separate the two parameters. No extraneous text may follow command.

Example: **ST A** {display the status of all LRUs and buses}

LRU#	to	Bus#	LRU#	to	Bus#
0		x	8		x
1		x	9		x
2		x	A		x
3		x	B		x
4		x	C		x
5		x	D		x
6		x	E		x
7		x	F		x

Figure 4-1 ST A Command Response

If an LRU is connected to a bus, the number of the bus it is connected to ("0" though "F") will be displayed in the locations denoted by an "x". If the LRU is not connected to a bus, the "x" will be replaced by a space. The entire display will still be used in sub-populated BusXchange units, with no bus connection possible on these unused LRU inputs.

SZ

Description: This status command is used to determine the population level, or "size", of the BusXchange unit. The status display indicates this as appropriate. The response will be of the form "NxM", where "N" is a 2-digit, right justified string with the number of LRU input connections that have been populated. The "M" is a 2-digit, left justified string with the number of Bus output connections that have been populated.

Responses: "MBS OK": No error occurred. Command executed. Status display follows on the next line.
"MBS ERROR 103: Improperly formatted command." No extraneous text may follow command.

Example: **SZ** {determine BusXchange population level or "size"}

APPENDIX A

SPECIFICATIONS

A.1 General Specifications

Hardware Compatibility: MIL-STD-1553A, MIL-STD-1553B

Weight:..... 6.38 lbs (includes enclosure)

Physical Dimensions
(for enclosure with standard side panels installed and non-skid feet not installed):

Width:..... 17.000 inches
Depth:..... 10.275 inches (including 1553 connectors)
Height:..... 1.725 inches

Electrical Requirements:..... +5 VDC (+/-5%), 3.5 A

Temperature Range:

Operating:..... 0° to +50° C
Storage:..... -25° to +70° C

Humidity Range: ..... 0 to 95% (non-condensing)

MTBF ..... 65,003 hours (7.44 years)*

MTBF (without relays)..... 67,361 hours (7.71 years)*

* The MTBF numbers are based on calculations using MIL-HDBK-217F, Appendix A, for a ground-benign environment.



NOTE: Installation drawings of the BusXchange are located in Appendix C.

This page intentionally left blank

APPENDIX B

RS-232 CABLE

TABLE OF CONTENTS

B.1 Introduction B-1
B.2 Cable Ends B-1
B.3 Pin Assignments B-1
B.4 Cable Connections B-2

FIGURES

Figure B-1 Cable End Pinouts B-1
Figure B-2 Wiring Requirements B-2

TABLES

Table B-1 Pin Assignments B-1

B.1 Introduction

It is possible to connect the BusXchange to a VT-100 compliant terminal or to a modem using an RS-232 cable. There are a large variety of RS-232 cables available. Depending on the use, the BusXchange will use one of two cable wiring methods:

- When connecting to a PC or terminal, the BusXchange requires a cable with a built-in null modem. The RJ-45-female-to-RS-232-female adapter supplied with the BusXchange is a null-modem adapter.
- When connecting to a modem, the BusXchange requires a cable without a null modem.

B.2 Cable Ends

There are numerous cable ends available for RS-232. The BusXchange uses an RJ-45 connector, as do many dumb terminals. DB-25 and DB-9 connectors are available on many PC systems and modems. Figure B-1 shows the pinouts for the connectors mentioned above.

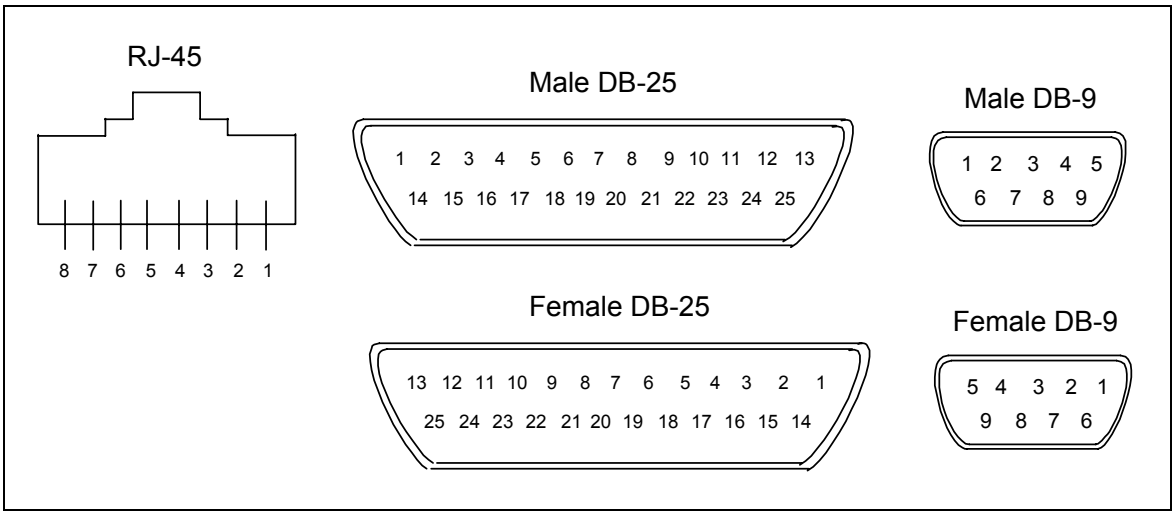


Figure B-1 Cable End Pinouts

B.3 Pin Assignments

Each cable end type has a different pinout signal assignment. Table B-1 shows the signals assigned to each pin.

Table B-1 Pin Assignments

Signal	RJ-45 Pin	DB-25 Pin	DB-9 Pin
DTR (out)	1	20	4
CTS (in)	2	5	8
GND	3	7	5
RxD (in)	4	3	2
TxD (out)	5	2	3
GND	6	7	5
RTS (out)	7	4	7
DCD (in)	8	8	1

B.4 Cable Connections

Figure B-2 shows the connections required for both null modem and non-null modem cables (although connections for DSR are shown for completeness, that signal is not used by the BusXchange).

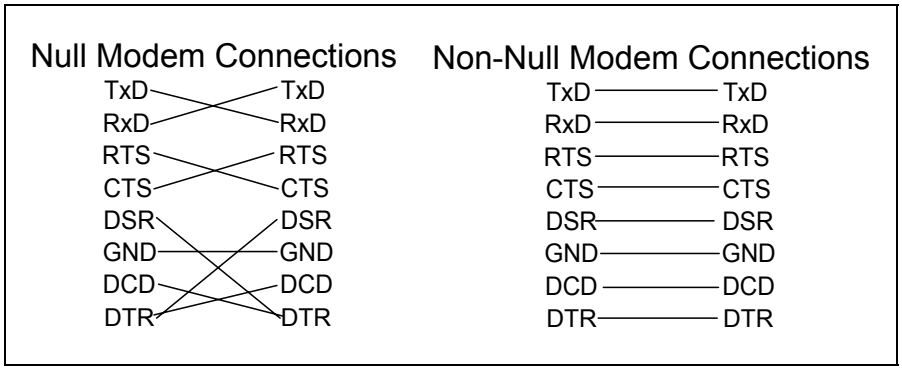


Figure B-2 Wiring Requirements

APPENDIX C

INSTALLATION DRAWINGS

TABLE OF CONTENTS

C.1 BusXchange Cabinet..... C-1
C.1.1 Front Panel..... C-2
C.1.2 Back Panel..... C-2
C.1.3 Side Panel..... C-3
C.1.4 Rack Mount..... C-3
C.1.5 Top Panel..... C-4

FIGURES

Figure C-1 Cabinet Overview..... C-1
Figure C-2 Front Pane..... C-2
Figure C-3 Back Panel..... C-2
Figure C-4 Side Panel..... C-3
Figure C-5 Rack Mount..... C-3
Figure C-6 Top Panel..... C-4

C.1 BusXchange Cabinet

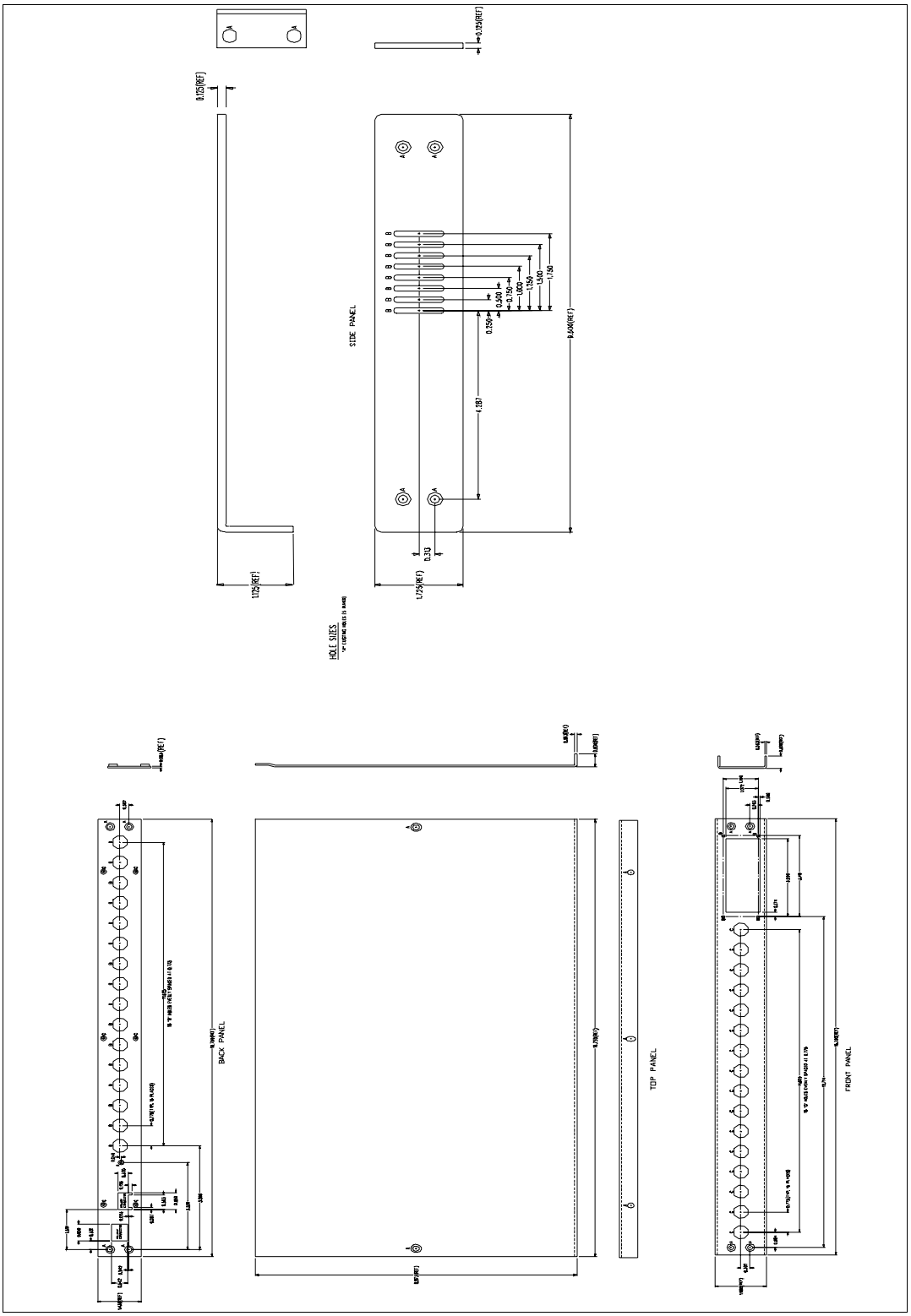


Figure C-1 Cabinet Overview

C.1.1 Front Panel

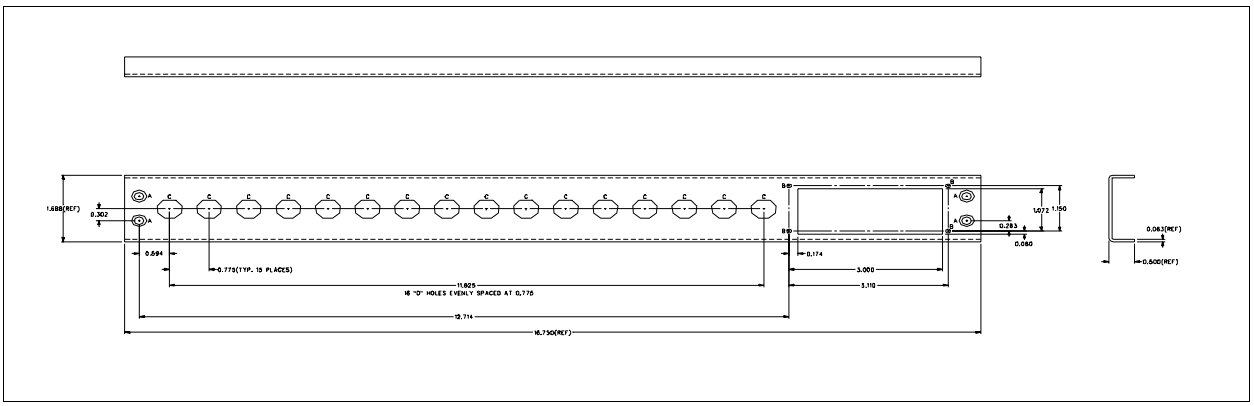


Figure C-2 Front Pane

C.1.2 Back Panel

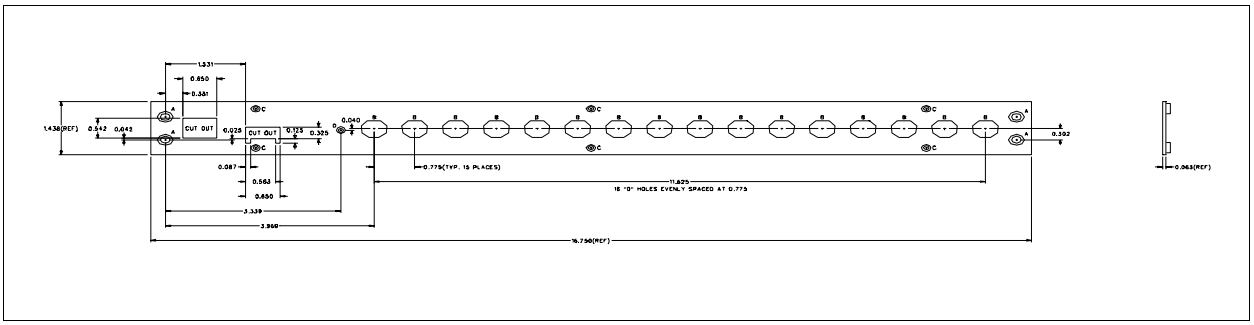


Figure C-3 Back Panel

C.1.3 Side Panel

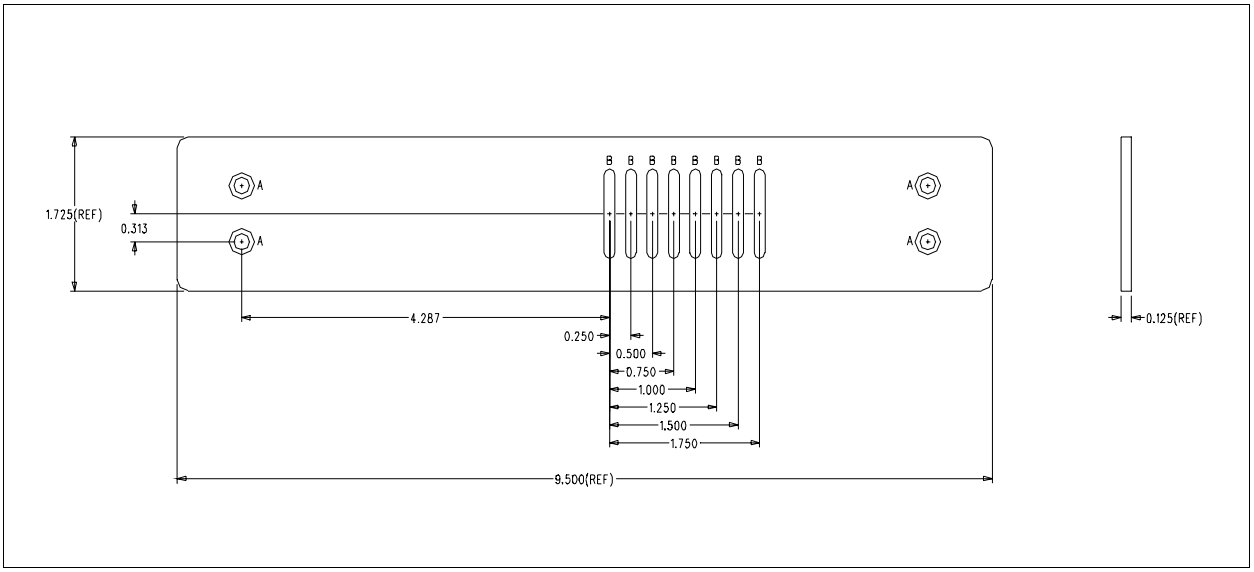


Figure C-4 Side Panel

C.1.4 Rack Mount

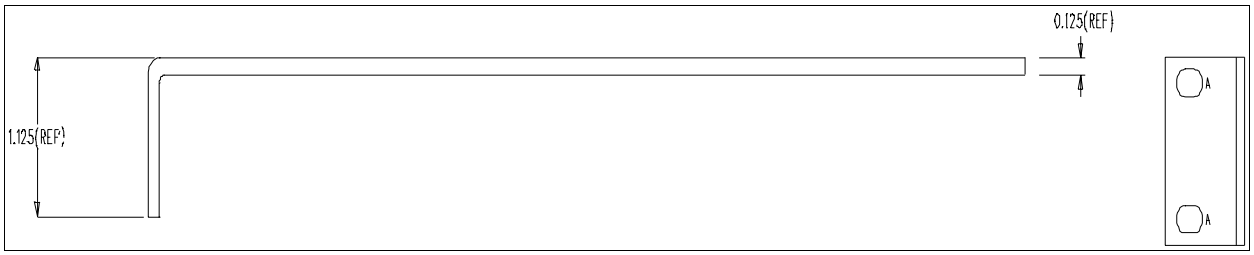


Figure C-5 Rack Mount

C.1.5 Top Panel

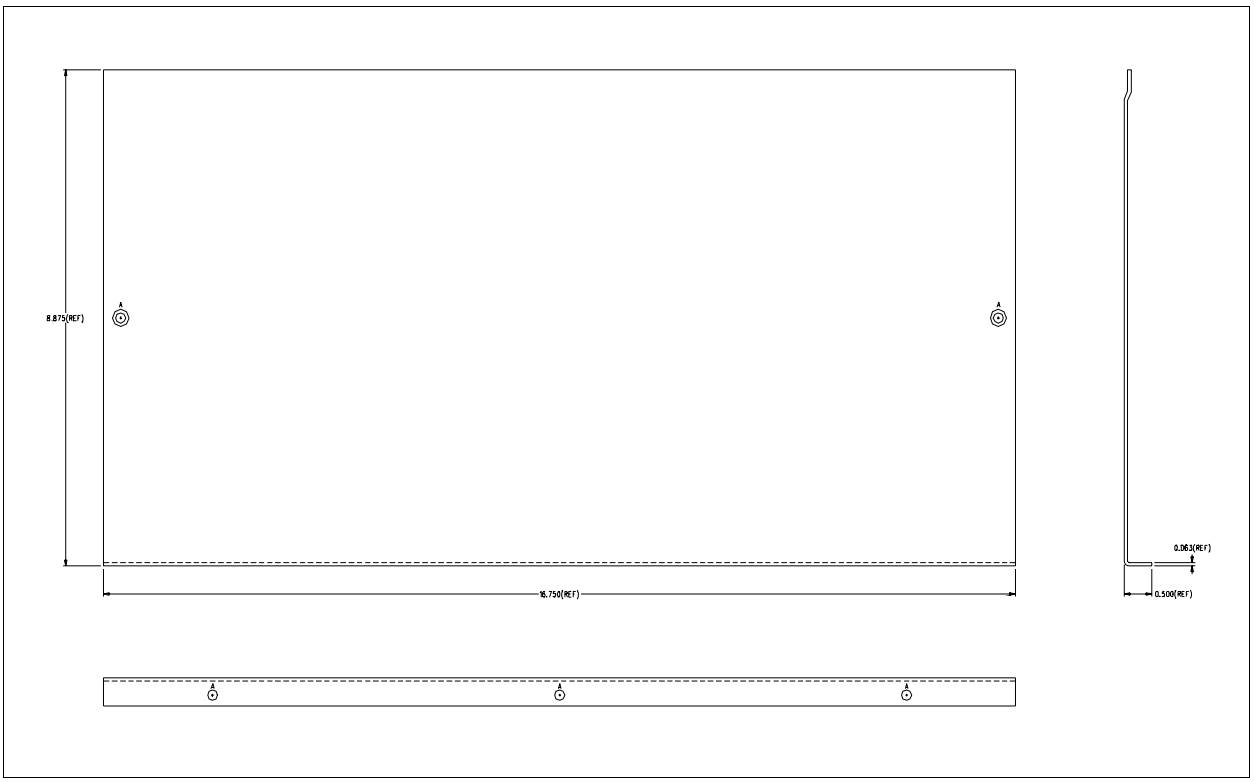


Figure C-6 Top Panel

GLOSSARY

autobaud ---------- Automatic detection and use of the baud rate of the connected terminal.

bus controller ---------- Provides the capability of defining, storing, and executing comprehensive lists of bus instructions.

BusXchange ---------- This 16 x 16 crosspoint switch provides differential connections from 16 transformer-coupled Line Replaceable Unit (LRU) inputs to 16 MIL-STD-1553 differential buses. A "virtual patch-panel."

crosspoint switch ---------- A switch matrix consisting of up to 256 relays which allows each LRU to be connected to each bus

direct coupling ---------- A 1553 bus connection using a T-connector when the distance between the board and the 1553 bus measures 12 inches or less.

LCD---------- Liquid Crystal Display.

LRU---------- Line Replaceable Unit. Can be any real or emulated MIL-STD-1553 device: bus controller, remote terminal or monitor.

RJ-45 ---------- Short for Registered Jack-45. An eight-wire connector commonly used to connect computers onto a local-area network (LAN), especially Ethernet. RJ-45 connectors look similar to the RJ-11 connectors used for connecting telephone equipment, but they are somewhat wider.

Tee ---------- Mechanical twinax connector that allows a MIL-STD-1553 stub to be connected to a bus.

transformer coupling ---------- A 1553 bus connection using a transformer coupler when the distance between the board and the 1553 bus measures exceeds 12 inches but not 20 feet.

UART FIFO ---------- Transmit or receive buffer used on a Universal Asynchronous Receiver Transmitter.

VT-100 compliant terminal ---- A standard display terminal or a terminal program running on a PC.

This page intentionally left blank

INDEX

A

access point 2-6
analog ground 3-2
autobaud 2-5, 3-4, 3-5
automate laboratory control 2-5

B

back panel C-2
baud rate 2-5, 3-4, 3-5
bus connection 2-4, 2-6, 2-7, 3-4, 4-2, 4-3, 4-4
bus connection display 2-4
bus controller 2-2
bus coupler 3-4
bus coupling relays 2-2
bus number 4-1
bus output connections 2-3
bus outputs 2-3
bus terminator 3-4
bus-coupling relay 2-3

C

cable wiring methods B-1
case sensitive 4-1
command interpreter 4-1
command line interface 2-2, 2-3, 2-5, 4-1
  out-of-band 2-2, 2-3, 3-3
common reference voltage 3-3
configuration
  cascaded 2-6
  switch 2-2
configuration command 4-2
configurations 2-2, 2-6, 3-5
connector
  concentric twinax 2-2
  DB-25 ..... B-1
  DB-9 ..... B-1
  PCB-mount 3-3
  pin definitions 3-5, B-1
  RJ-45 3-3
  RS-232 3-3
  twinax 2-2
control points 2-6
coupling relays 2-3
coupling transformer 2-3, 3-2
crosspoint matrix 2-3, 4-1
crosspoint switch 2-1, 2-2, 2-3, 4-2, 4-3

D

differential connections 2-1
direct coupled 2-2
dual-redundant application 2-6

E

electrical requirements A-1
enclosure 3-1, 3-2, 3-3

F

fault-isolation resistors 3-4
front panel C-2
front-panel LCD 2-2, 2-3, 2-4, 3-2

H

hardware compatibility A-1
humidity range A-1

I

isolation resistors 2-3

J

jumper 3-1, 3-2
jumper settings 3-1

L

LCD backlight 3-2

M

modem 2-2, 2-5, 2-6, 3-5, B-1, B-2
monitor 1-1, 2-2

N

non-volatile memory 2-2, 2-3
null modem B-1, B-2

O

out-of-band 2-2
output connections 2-2, 4-4

P

physical dimensions A-1
pinout signal B-1
port pairs numbering 2-3
power-up event 2-2

R

rack mount 2-1, 3-1, C-3
rack-mountable chassis 2-1
remote terminal 2-2
RS-232 cable 2-5, 2-6, 3-3, 3-5, 4-1, B-1

S

serial port 4-1
shielding 3-3
shipping position 3-2
side panels 3-1, C-3

simulations 2-1, 2-6
software applications 2-5
status command 4-3, 4-4
status display 2-3, 2-4, 3-2, 4-3, 4-4
switch configuration 2-2, 2-4, 4-2
system flexibility 3-4

T

temperature range A-1
terminal
VT-100 compliant 2-5, 2-6, 3-5, 4-1, B-1
terminal setting 2-5
test scenarios 2-1, 2-6
time-out function 2-5
top panel 3-1, C-4
transformer coupled 2-1, 2-2, 2-3, 2-7, 3-4
tri-redundant application 2-6

U

UART FIFO 2-5

V

virtual patch panel 2-1, 2-6

W

weight A-1

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