INDUSTRIAL COMPUTER SOURCE®

Model ISA BACKPLANE
Product Manual

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INDUSTRIAL COMPUTER SOURCE®

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FORWARD

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Technical assistance is available at: **1-800-480-0044**.

Manual Errors, Omissions and Bugs: A "Bug Sheet" is included as the last page of this manual. Please use the "Bug Sheet" if you experience any problems with the manual that requires correction.

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One year limited warranty on all products sold with the exception of the “Performance Series” I/O products, which are warranted to the original purchaser, for as long as they own the product, subject to all other conditions below, including those regarding neglect, misuse and acts of God. Within one year of purchase, Industrial Computer Source will repair or replace, at our option, any defective product. At any time after one year, we will repair or replace, at our option, any defective “Performance Series” I/O product sold. This does not include products damaged in shipment, or damaged through customer neglect or misuse. Industrial Computer Source will service the warranty for all standard catalog products for the first year from the date of shipment. After the first year, for products not manufactured by Industrial Computer Source, the remainder of the manufacturer's warranty, if any, will be serviced by the manufacturer directly.

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Current Revision 24A

April 1996

Chapter 1: Introduction

Industrial Computer Source passive backplanes are manufactured to the highest standards. These backplanes are available in size configurations of 4-, 6-, 8-, 10-, 15-, and 20-slot. All connectors are AT 16-bit connectors.

The Industrial Computer Source passive backplanes have been tested with a variety of plug-in CPU cards, from 8088 XT through Pentium and DEC AlphaSystems. For applications involving option cards that are sensitive to bus impedance, termination SIPs are available as plug-ins to terminate the bus of the 8-slot and larger backplanes. Please refer to Appendix A for more detailed information on Resistor Termination.

Each backplanes is of a low capacitance design. This design minimizes signal crosstalk while keeping trace capacitance low which improves signal edges and rise and fall times. The signals are on the outer layers with one inner layer for ground and the other for power. The power plane is predominantly +5VDC.

Each backplane has a bank of LEDs to indicate the presence of the various power supply levels of the standard PC bus ±5VDC and ±12VDC. These LEDs provide a quick check of power supply operation without the need of a multimeter.

Features

- 4 and 6 layer printed circuit boards
- Extremely high EMI and RFI noise immunity
- 0.8" Centers for expansion slots
- Accept power connectors from standard PC bus power supplies
- Bus Power Check™ LED indicators for +5, -5, +12 and -12 VDC supplies
- Bus terminating resistors available as required for the 8-slot and larger backplanes
- Split bus designs available on special request
- Special configuration backplanes available on special order

Bus Architecture

Input Power

Each input is filtered by one or more large electrolytic capacitors for low frequency line noise rejection. Ceramic bypass filter capacitors of 0.1µF improve noise immunity. All four input voltages have bypass capacitors.

Each power supply output is monitored by the exclusive Industrial Computer Source Bus Power Check™ circuitry. A separate LED is lit by each supply voltage for a quick visible check of power supply operation. This is not, however, a tolerance verification. Troubleshooting requirements may require actual measurement of the power supply values to ensure operation to specified limits.

The 20-slot backplane (only) is provided with a location for an optional -5V regulator (LM7905) and filter capacitors. The LM7905 uses the -12V input to generate - 5V, allowing the use of a three-output power supply in custom applications.

Chapter 2: 4-Slot Backplane

4-Slot Backplane Construction

The 4-slot backplane is constructed of four layers, with internal ground and power planes for RFI and EMI noise immunity and low trace capacitance. Signal traces are located on layers 1 and 4 (the outer layers). Layer 2 is the Ground plane. Layer 3 is the Power plane.

Overshielding can distort signals by lengthening rise- and fall-times of the signal edges. Some option cards can have problems driving high-capacitance lines. The 4-slot board is constructed with ground dipoles between signal traces to minimize crosstalk while keeping trace capacitance to the lowest practical value.

The board is constructed with ground dipoles between signal traces to minimize cross-talk while keeping trace capacitance to the lowest value. High trace capacitance in boards which are over shielded distorts the signals by lengthening the rise- and fall-times of the signal edges. Noise in over-shielded backplanes can become a factor in relatively low-noise environments. Some option cards will have problems driving high-capacitance lines, thus minimizing the trace capacitance has some benefit. The board is 0.063" thick.

Connectors

The 4-slot backplane provides two 6-pin connectors populated for compatibility with IBM style power supplies. A variety of auxiliary power and sense connectors are also provided for various chassis functions. Please refer to the Connector Reference section of this chapter for more information.

Bus Termination

The 4-slot backplane does not provide termination socket locations.

Dimensional Drawings

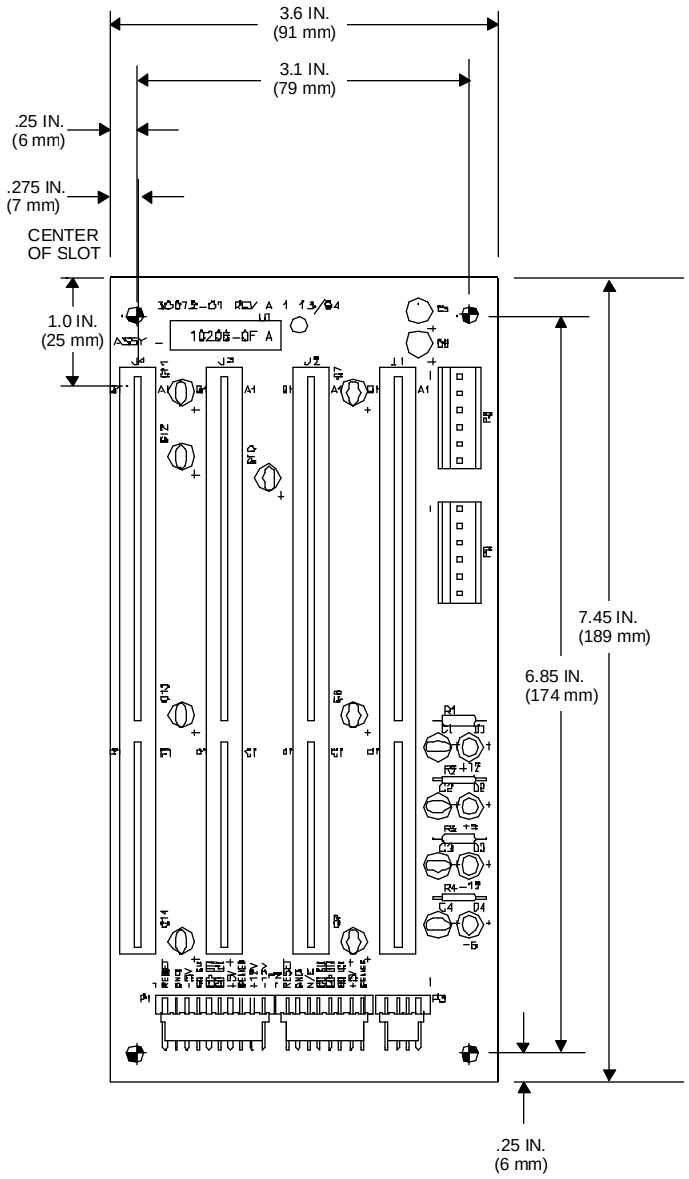

Figure 2-1: 4-Slot Backplane

Connector Reference (4-Slot Backplane)

Connections to IAC

P1-1	Reset
P1-2	Ground
P1-3	-5VDC
P1-4	KBD Clock
P1-5	KBD Data
P1-6	KBD Lock
P1-7	+5VDC
P1-8	Speaker
P1-9	+12VDC
P1-10	-12VDC

CPU Signals

P2 - 1	Reset
P2 - 2	Ground
P2 - 3	No Connection
P2 - 4	Keyboard Clock
P2 - 5	Keyboard Data
P2 - 6	Keyboard Lock
P2 - 7	+5VDC
P2 - 8	Speaker

I/O Power Out

P3 - 1	+5VDC
P3 - 2	Ground
P3 - 3	Ground
P3 - 4	+12VDC

P4-P7	Not Used

Connection from Power Supply

P8 - 1	No Connection
P8 - 2	No Connection
P8 - 3	+12VDC
P8 - 4	-12VDC
P8 - 5	Ground
P8 - 6	Ground

P9 - 1	Ground
P9 - 2	Ground
P9 - 3	-5VDC
P9 - 4	+5VDC
P9 - 5	+5VDC
P9 - 6	+5VDC

Chapter 3: 6-Slot Backplane

6-Slot Backplane Construction

The 6-slot backplane is constructed of four layers, with internal ground and power planes for RFI and EMI noise immunity and low trace capacitance. Signal traces are located on layers 1 and 4 (the outer layers). Layer 2 is the Ground plane. Layer 3 is the Power plane.

Overshielding can distort signals by lengthening rise- and fall-times of the signal edges. Some option cards can have problems driving high-capacitance lines. The 6-slot board is constructed with ground dipoles between signal traces to minimize crosstalk while keeping trace capacitance to the lowest practical value.

The board is constructed with ground dipoles between signal traces to minimize cross-talk while keeping trace capacitance to the lowest value. High trace capacitance in boards which are over shielded distorts the signals by lengthening the rise- and fall-times of the signal edges. Noise in over-shielded backplanes can become a factor in relatively low-noise environments. Some option cards will have problems driving high-capacitance lines, thus minimizing the trace capacitance has some benefit. The board is 0.063" thick.

Connectors

The 6-slot backplane provides two 6-pin connectors populated for compatibility with IBM style power supplies. A variety of auxiliary power and sense connectors are also provided for various chassis functions. Please refer to the Connector Reference section of this chapter for more information.

Bus Termination

The 6-slot backplane does not provide termination socket locations.

Dimensional Drawings

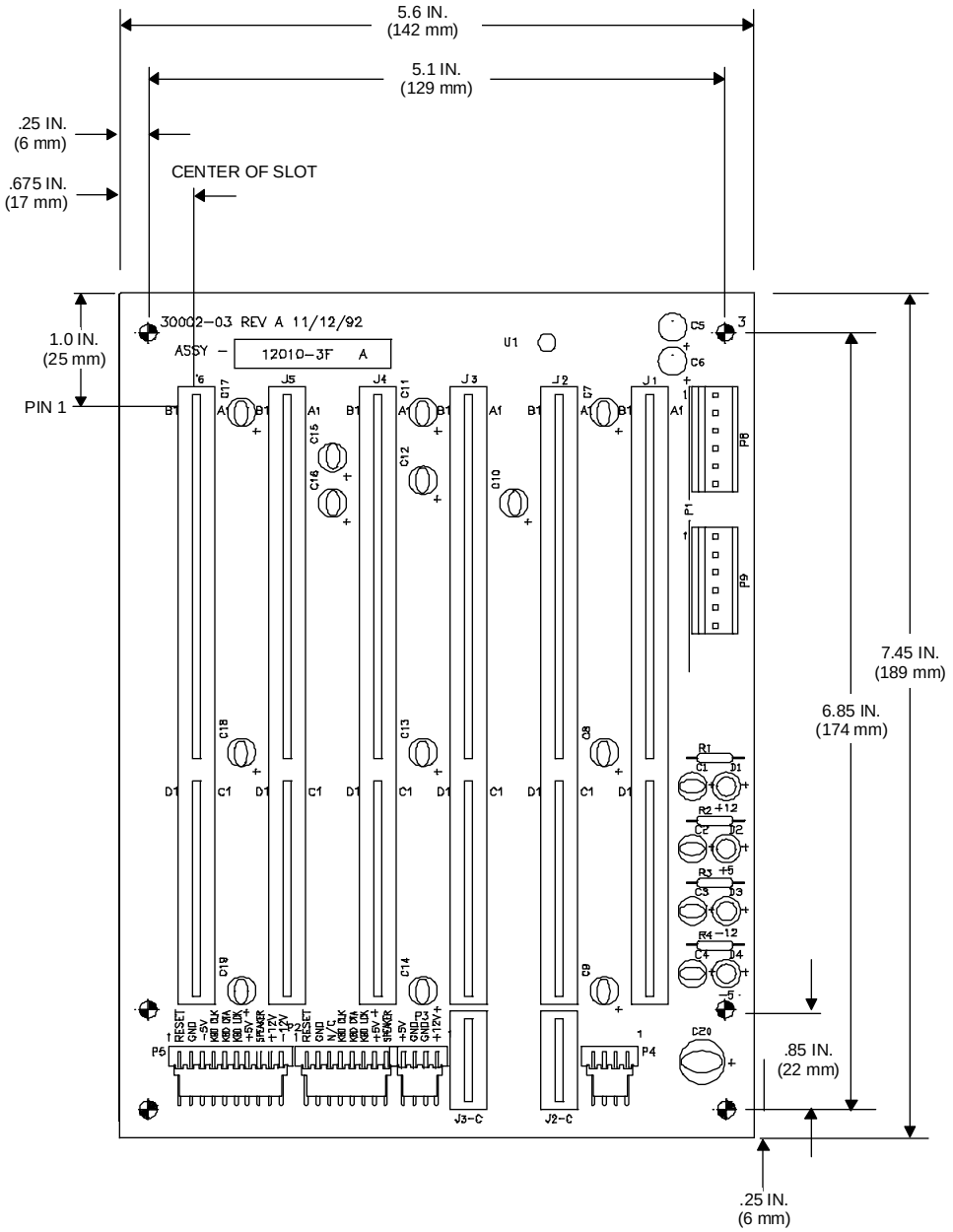

Figure 3-1: 6-Slot Backplane

Connecter Reference (6-Slot Backplane)

CPU Signals

P2 - 1	Reset
P2 - 2	Ground
P2 - 3	No Connection
P2 - 4	Keyboard Clock
P2 - 5	Keyboard Data
P2 - 6	Keyboard Lock
P2 - 7	+5VDC
P2 - 8	Speaker

Drive Power Output

P3 - 1	+12VDC
P3 - 2	Ground
P3 - 3	Ground
P3 - 4	+5VDC

I/O Power Output

P4 - 1	+12VDC
P4 - 2	Ground
P4 - 3	Ground
P4 - 4	+5VDC

Connections to IAC

P5-1	Reset
P5-2	Ground
P5-3	-5VDC
P5-4	KBD Clock
P5-5	KBD Data
P5-6	KBD Lock
P5-7	+5VDC
P5-8	Speaker
P5-9	+12VDC
P5-10	-12VDC

P6 Not Used

P7 Not Used

Connection from Power Supply

P8 - 1	No Connection
P8 - 2	No Connection
P8 - 3	+12VDC
P8 - 4	-12VDC
P8 - 5	Ground
P8 - 6	Ground

P9 - 1	Ground
P9 - 2	Ground
P9 - 3	-5VDC
P9 - 4	+5VDC
P9 - 5	+5VDC
P9 - 6	+5VDC

Chapter 4: 8-Slot Backplane

8-Slot Backplane Construction

The 8-slot backplane is constructed of four layers, with internal ground and power planes for RFI and EMI noise immunity and low trace capacitance. The signal traces are located on layers 1 and 4 (the outer layers). Layer 2 is the Ground plane and layer 3 is the Power plane.

Overshielding can distort signals by lengthening rise- and fall-times of the signal edges. Some option cards can have problems driving high-capacitance lines. The 8-slot board is constructed with ground dipoles between signal traces to minimize crosstalk while keeping trace capacitance to the lowest practical value.

Connectors

On the 11011-FF 8-slot backplane, two Molex 6-pin shells are used for power input connection. A variety of auxiliary power and sense connectors are also provided for various chassis functions. Please refer to the Connector Reference section of this chapter for more information.

Bus Termination

Termination works as an impedance mismatch at the end of the bus, minimizing or preventing reflections and interference. If there is no termination, signals reach the end of the bus and reflect back down the bus. In extreme cases, the reflected signals can interfere with the real bus information, leading to spurious operation or lockups. This can become a significant factor as bus lengths and speeds increase. The applications most likely to be affected are telephony or other applications with many IO boards drawing high current values off the +12V or -12 V power connections.

Industrial Computer Source backplanes have supported 166MHz systems without bus termination and without problem. However, provision is made for installing terminations that might be required for your application.

Terminations connect the bus to +5VDC and ground, providing a path for the bus signals to dissipate. A terminated bus provides signals with less noise, although rise and fall times are slower. However, results are dependent on the CPU and option cards being used and must be evaluated on a case-by-case basis.

The 8-slot backplane provides termination sockets at the left end of the bus. These sockets accept standard 10-position SIPS manufactured by Bournes and others. Not all signal lines are available for termination. Please refer to Appendix A and B for further information on BUS termination and Terminated Bus signals.

Dimensional Drawings

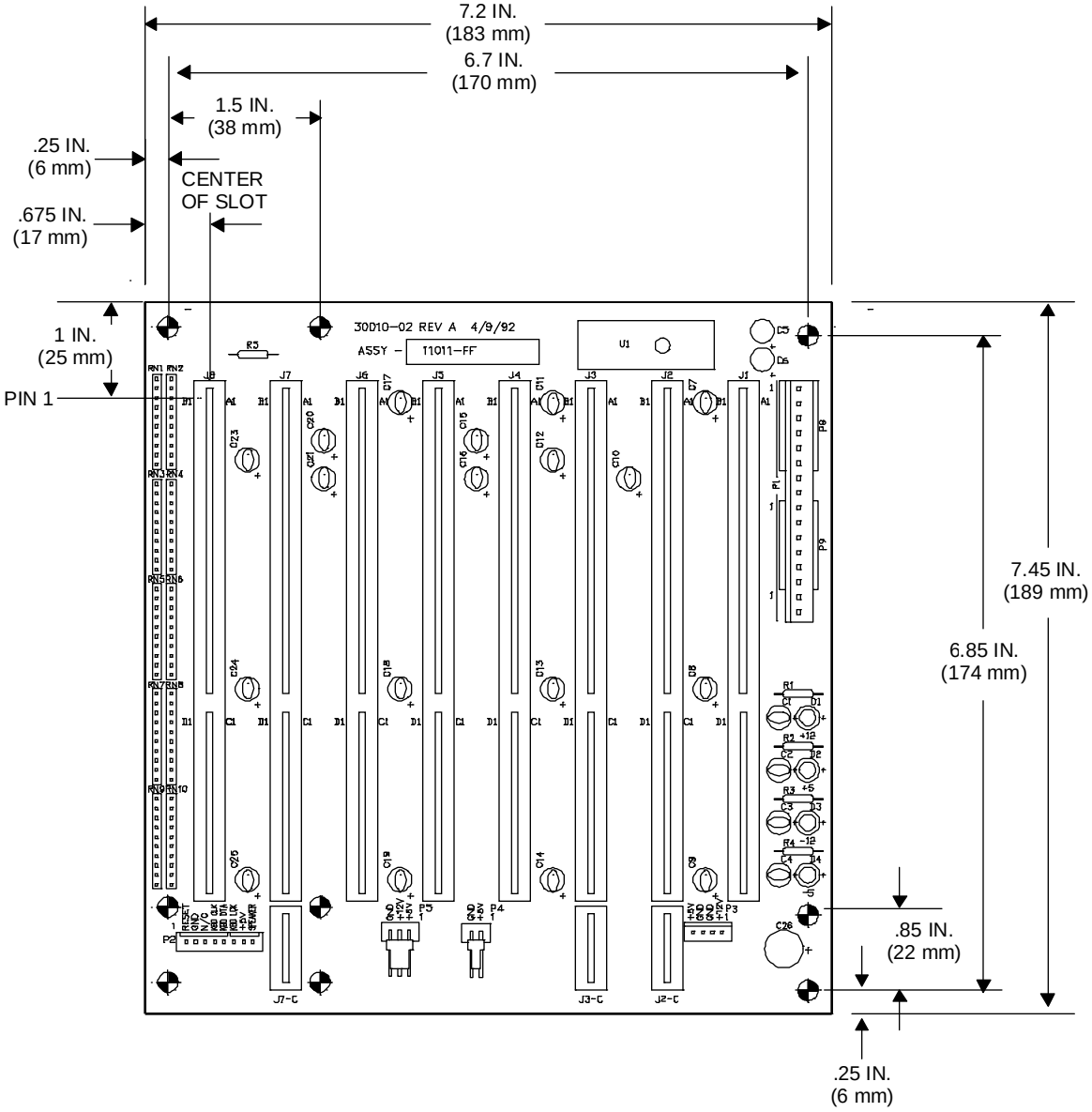

Figure 4-1: 8-Slot Backplane

Connector Reference (8-Slot Backplane)

CPU Signals

P2 - 1	Reset
P2 - 2	Ground
P2 - 3	No Connection
P2 - 4	Keyboard Clock
P2 - 5	Keyboard Data
P2 - 6	Keyboard Lock
P2 - 7	+5VDC
P2 - 8	Speaker

Drive Power Output

P3 - 1	+12VDC
P3 - 2	Ground
P3 - 3	Ground
P3 - 4	+5VDC

Remote Sense

P4 - 1	+5VDC
P4 - 2	Ground

I/O Power Output

P5 - 1	+5VDC
P5 - 2	+12VDC
P5 - 3	Ground

P6 Not Used

P7 Not Used

Connection from Power Supply

P8-1	No Connection
P8-2	No Connection
P8-3	+12VDC
P8-4	-12VDC
P8-5	Ground
P8-6	Ground

P9-1	Ground
P9-2	Ground
P9-3	-5VDC
P9-4	+5VDC
P9-5	+5VDC
P9-6	+5VDC

Chapter 5: 10-Slot Backplane

10-Slot Backplane Construction

The 10-slot backplane is constructed of four layers, with internal ground and power planes for RFI and EMI noise immunity and low trace capacitance. The signal traces are located on layers 1 and 4 (the outer layers). Layer 2 is the Ground plane. Layer 3 is the Power plane.

Overshielding can distort signals by lengthening rise- and fall-times of the signal edges. The 10-slot board is constructed with ground dipoles between signal traces to minimize crosstalk while keeping trace capacitance to the lowest practical value. High trace capacitance in boards which are over shielded distorts the signals by lengthening the rise- and fall-times of the signal edges. Noise in over-shielded backplanes can become a factor in relatively low-noise environments. Some option cards will have problems driving high-capacitance lines, thus minimizing the trace capacitance has some benefit. The board is 0.063" thick.

Connectors

Each backplane provides a 16-pin Molex-type connector for power input. A variety of auxiliary power and sense connectors are also provided for various chassis functions. Please refer to the Connector Reference section of this chapter for more information.

Bus Termination

Termination works as an impedance mismatch at the end of the bus, minimizing or preventing reflections and interference. If there is no termination, signals reach the end of the bus and reflect back down the bus. In extreme cases, the reflected signals can interfere with the real bus information, leading to spurious operation or lockups. This can become a significant factor as bus lengths and speeds increase. The applications most likely to be affected are telephony or other applications with many IO boards drawing high current values off the +12V or -12 V power connections.

Industrial Computer Source backplanes have supported 166MHz systems without bus termination and without problem. However, provision is made for installing terminations that might be required for your application.

Terminations connect the bus to +5VDC and ground, providing a path for the bus signals to dissipate. A terminated bus provides signals with less noise, although rise and fall times are slower. However, results are dependent on the CPU and option cards being used and must be evaluated on a case-by-case basis.

The 10-slot backplane provides termination sockets at the left end of the bus. These sockets accept standard 10-position SIPS manufactured by Bournes and others. Not all signal lines are available for termination. Please refer to Appendix A and B for further information on Bus Termination and Terminated BUS signals.

Split Backplane

The 10 -slot backplane has the option of being "split" to allow several different CPU's to operate in the same chassis. Refer to Appendix C for further information and instructions on split backplanes.

Dimensional Drawings

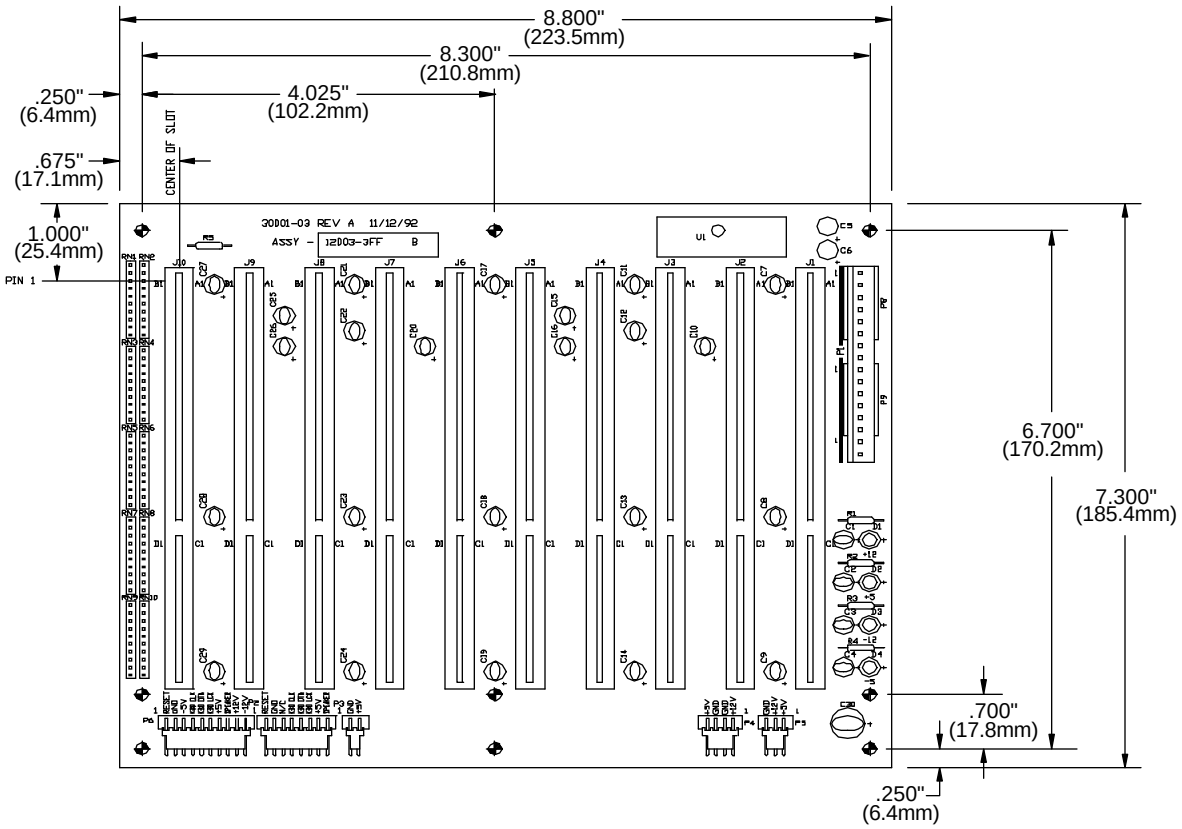

Figure 5-1: 10-Slot Backplane

Connector Reference (10-Slot Backplane)

CPU Signals

P2 - 1	Reset
P2 - 2	Ground
P2 - 3	No Connection
P2 - 4	Keyboard Clock
P2 - 5	Keyboard Data
P2 - 6	Keyboard Lock
P2 - 7	+5VDC
P2 - 8	Speaker

Remote Sense

P3 - 1	Ground
P3 - 2	+5VDC

Drive Power Output

P4 - 1	+12VDC
P4 - 2	Ground
P4 - 3	Ground
P4 - 4	+5VDC

I/O Power Output

P5 - 1	+5VDC
P5 - 2	+12VDC
P5 - 3	Ground

Connections to IAC

P6-1	Reset
P6-2	Ground
P6-3	-5VDC
P6-4	KBD Clock
P6-5	KBD Data
P6-6	KBD Lock
P6-7	+5VDC
P6-8	Speaker
P6-9	+12VDC
P6-10	-12VDC

P7 Not Used

Connection from Power Supply

P8 - 1	No Connection
P8 - 2	No Connection
P8 - 3	+12VDC
P8 - 4	-12VDC
P8 - 5	Ground
P8 - 6	Ground

P9 - 1	Ground
P9 - 2	Ground
P9 - 3	-5VDC
P9 - 4	+5VDC
P9 - 5	+5VDC
P9 - 6	+5VDC

Chapter 6: 15-Slot Backplane

15-Slot Backplane Construction

The 15-slot backplane is constructed of four layers, with internal ground and power planes for RFI and EMI noise immunity and low trace capacitance. The signal traces are located on layers 1 and 4 (the outer layers). Layer 2 is the Ground plane. Layer 3 is the Power plane.

Overshielding can distort signals by lengthening rise- and fall-times of the signal edges. Some option cards can have problems driving high-capacitance lines. The 15-slot board is constructed with ground dipoles between signal traces to minimize crosstalk while keeping trace capacitance to the lowest practical value.

Connectors

The 15-slot backplane provides for 16-pin connectors in addition to other input connectors for solid, noise free input power and minimum Voltage drop across the connectors, regardless of backplane power load.

Power connections are made to the backplanes via Molex-type connectors. On the 11004-7FFF 15-slot backplane, the power connection is made utilizing one Molex 16-pin shell.

Standard AT-type power supplies may be used with the 15-slot backplane by careful installation of the power connectors. The P8 connector will install at the rearmost position of the board. Skip two positions between it and the P9 connector. The backplane silkscreen also reflects these locations as P8 and P9. Please refer to the Connector Reference section of this chapter for more information.

Bus Termination

Termination works as an impedance mismatch at the end of the bus, minimizing or preventing reflections and interference. If there is no termination, signals reach the end of the bus and reflect back down the bus. In extreme cases, the reflected signals can interfere with the real bus information, leading to spurious operation or lockups. This can become a significant factor as bus lengths and speeds increase. The applications most likely to be affected are telephony or other applications with many IO boards drawing high current values off the +12V or -12 V power connections.

Industrial Computer Source backplanes have supported 166MHz systems without bus termination and without problem. However, provision is made for installing terminations that might be required for your application.

Terminations connect the bus to +5VDC and ground, providing a path for the bus signals to dissipate. A terminated bus provides signals with less noise, although rise and fall times are slower. However, results are dependent on the CPU and option cards being used and must be evaluated on a case-by-case basis.

The 15-slot backplane provides termination sockets at the left end of the bus. These sockets accept standard 10-position SIPS manufactured by Bournes and others. Not all signal lines are available for termination. Please refer to Appendix A and B for further information on Bus Termination and Terminated BUS signals.

Split Backplane

The 15 -slot backplane has the option of being "split" to allow several different CPU's to operate in the same chassis. Refer to Appendix C for further information and instructions on split backplanes.

Dimensional Drawings

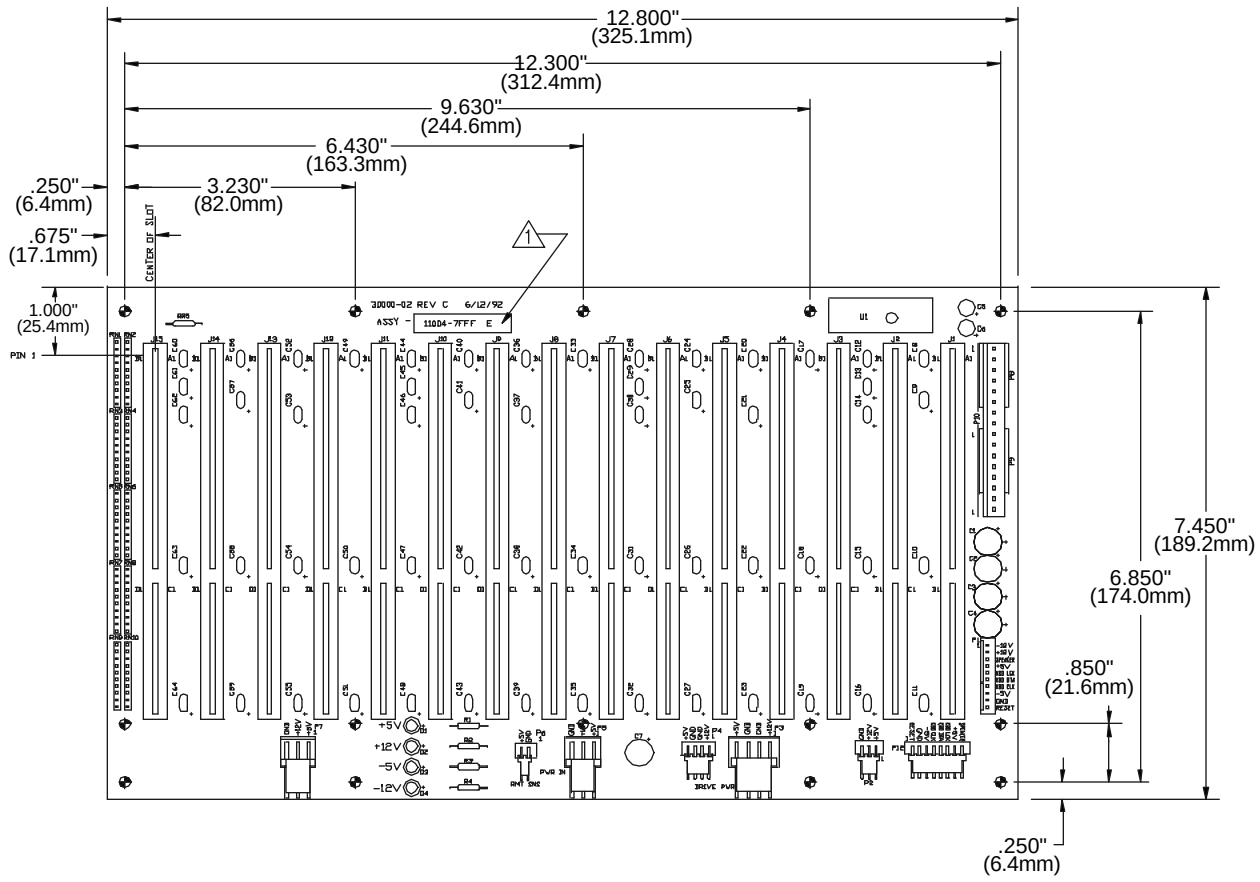

Figure 6-1: 15-Slot Backplane

Connector Reference (15-Slot Backplane)

CPU Signal to I/O Card

P1 - 1	-12VDC
P1 - 2	+12VDC
P1 - 3	Speaker
P1 - 4	+5VDC
P1 - 5	Keyboard Lock
P1 - 6	Keyboard Data
P1 - 7	Keyboard Clock
P1 - 8	-5VDC
P1 - 9	Ground
P1 - 10	Reset

I/O Power Out

P2 - 1	+5VDC
P2 - 2	+12VDC
P2 - 3	Ground

Drive Power Out

P3 - 1	+12VDC
P3 - 2	Ground
P3 - 3	Ground
P3 - 4	+5VDC

P4 - 1	+12VDC
P4 - 2	Ground
P4 - 3	Ground
P4 - 4	

I/O Power Out

P5 - 1	+5VDC
P5 - 2	+12VDC
P5 - 3	Ground

Remote Sense

P6 - 1	+5VDC
P6 - 2	Ground

I/O Power Out

P7 - 1	+5VDC
P7 - 2	+12VDC
P7 - 3	Ground

Connection from Power Supply

P10-1	No Connection	(P8)
P10-2	No Connection	(P8)
P10-3	+12VDC	(P8)
P10-4	-12VDC	(P8)
P10-5	Ground	(P8)
P10-6	Ground	(P8)
P10-7	Ground	
P10-8	Ground	
P10-9	Ground	(P9)
P10-10	Ground	(P9)
P10-11	-5VDC	(P9)
P10-12	+5VDC	(P9)
P10-13	+5VDC	(P9)
P10-14	+5VDC	(P9)
P10-15	+5VDC	
P10-16	+5VDC	

Auxilliary CPU Signals

P11-1	Keyboard Clock
P11-2	Keyboard Data
P11-3	Keyboard Lock
P11-4	Speaker
P11-5	Reset

P12-1	Reset
P12-2	Ground
P12-3	No Connection
P12-4	Keyboard Clock
P12-5	Keyboard Data
P12-6	Keyboard Lock
P12-7	+5VDC
P12-8	Speaker

Chapter 7: 20-Slot Backplane

20-Slot Backplane Construction

(4 Layer) 12020-FFFFF

This 20-slot backplane is constructed of four layers, with internal ground and power planes for RFI and EMI noise immunity and low trace capacitance. The signal traces are located on layers 1 and 4 (the outer layers). Layer 2 is the Ground plane. Layer 3 is the Power plane.

Overshielding can distort signals by lengthening rise- and fall-times of the signal edges. Some option cards can have problems driving high-capacitance lines. The 20-slot board is constructed with ground dipoles between signal traces to minimize crosstalk while keeping trace capacitance to the lowest practical value.

(6 Layer) 11020-FFFFF

This 20-slot backplane, designed using recent technological approaches, is constructed of 6 layers. Because the signals are spread among 3 layers, they are further apart than 4-layer boards and do not require intertrace shielding.

- Layers 1, 3 and 6 are the signal layers.
- Layers 2 and 5 are ground planes.
- Layer 4 is the power plane.

The 20-slot board is 0.125" thick. Each layer thickness is optimized to match the trace impedance closely. Normally, traces on inner layers will have higher impedances because of the surrounding fiberglass than traces on surface layers. Because of this, the layer thicknesses and trace widths in the 20-slot backplane are varied to match theoretically the impedances on the different layers. Impedance mismatches will cause timing shifts in signals and can cause operational errors. With layer optimization and by matching trace impedance in the 20-slot backplane, these timing errors are minimized.

Layers 4 (Power) and 5 (Ground) are only 0.004" apart and act as a large plane capacitor to help filter the power. Signal layers are 1 oz. copper; ground and power planes are 2 oz. copper.

Connectors

Each backplane provides a 16-pin Molex-style connector for power input. The 20-slot backplane provides for 16-pin connectors in addition to other input connectors for solid, noise free input power and minimum voltage drop across the connectors, regardless of backplane power load. The 20-slot backplane provides three additional screw terminal pairs for +5V and ground input for applications with exceptionally high power requirements.

Please refer to the Connector Reference section of this chapter for more information.

Power Input Connectors

Power connections are made to the backplane via Molex-type connectors. On the 11020-FFFFF 20-slot backplane, the power connection is via 1 each Molex 16-pin shells.

Standard AT-type power supplies may be used with the 20-slot backplane by careful installation of the power connectors. The P8 connector will install at the rearmost position of the board. Skip two positions between it and the P9 connector. The backplane silkscreen also reflects these locations as P8 and P9.

Bus Termination

Termination works as an impedance mismatch at the end of the bus, minimizing or preventing reflections and interference. If there is no termination, signals reach the end of the bus and reflect back down the bus. In extreme cases, the reflected signals can interfere with the real bus information, leading to spurious operation or lockups. This can become a significant factor as bus lengths and speeds increase. The applications most likely to be affected are telephony or other applications with many IO boards drawing high current values off the +12V or -12 V power connections.

Industrial Computer Source backplanes have supported 166MHz systems without bus termination and without problem. However, provision is made for installing terminations that might be required for your application.

Terminations connect the bus to +5VDC and ground, providing a path for the bus signals to dissipate. A terminated bus provides signals with less noise, although rise and fall times are slower. However, results are dependent on the CPU and option cards being used, and must be evaluated on a case-by-case basis.

The 20-slot backplane provides for mounting terminations at both ends with the CPU location in the middle of the bus. These sockets accept standard 10-position SIPS manufactured by Bournes and others. Not all signal lines are available for termination. Please refer to Appendix A and B for further information on Bus Termination and Terminated BUS signals.

Split Backplane

The 20-slot backplane has the option of being "split" to allow several different CPU's to operate in the same chassis, but the 20-slot model "must" have new artwork generated because the signal paths are on the inner layers. Industrial Computer Source does offer the 20-slot backplane in two standard configurations of 10x10 and 5x5x5x5. Call the Industrial Computer Sales Department for a quotation to meet your requirements. Refer to Appendix C for further information on split backplanes.

Dimensional Drawings

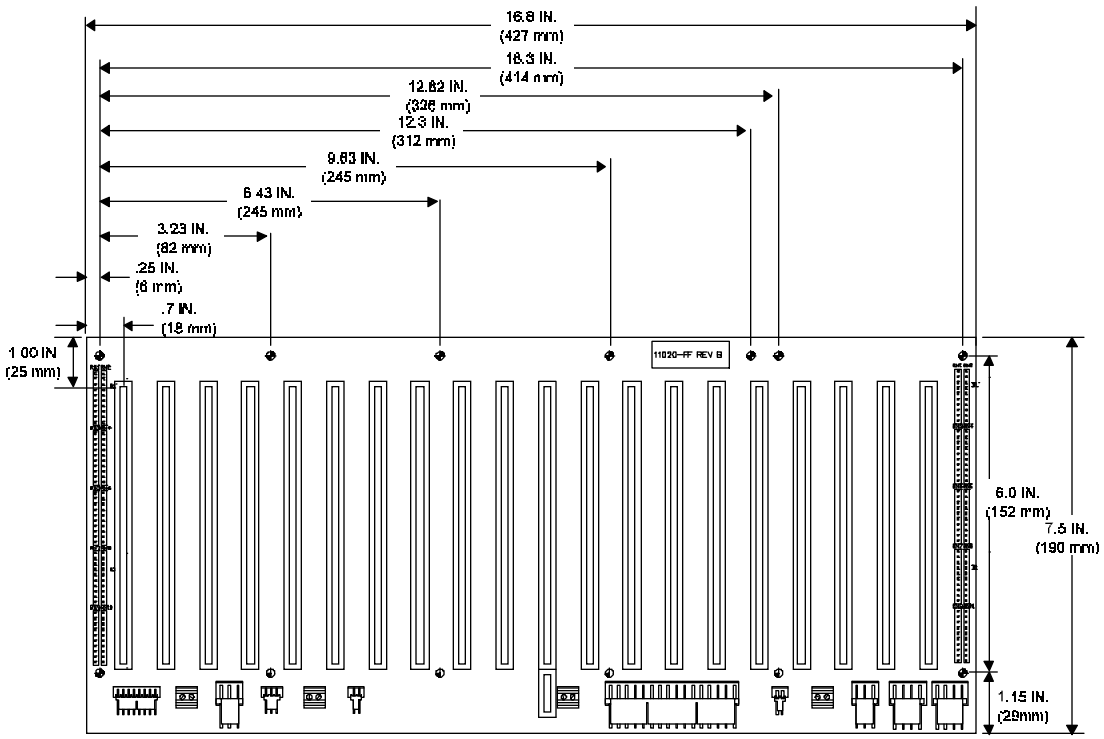

Figure 7-1: 20-Slot Backplane

Connector Reference (20-Slot Backplane)

Connection from Power Supply

P1 - 1	No Connection
P1 - 2	No Connection
P1 - 3	+12VDC
P1 - 4	-12VDC
P1 - 5	Ground
P1 - 6	Ground
P1 - 7	Ground
P1 - 8	Ground
P1 - 9	Ground
P1 - 10	Ground
P1 - 11	-5VDC
P1 - 12	+5VDC
P1 - 13	+5VDC
P1 - 14	+5VDC
P1 - 15	+5VDC
P1 - 16	+5VDC

I/O Power Out

P3 - 1	+5VDC
P3 - 2	+12VDC
P3 - 3	Ground

P4 - 1	+5VDC
P4 - 2	+12VDC
P4 - 3	Ground

Remote Sense

P5 - 1	+5VDC
P5 - 2	Ground

P6 - 1	+5VDC
P6 - 2	Ground

I/O Power Out

P7 - 1	+5VDC
P7 - 2	+12VDC
P7 - 3	Ground

CPU Signals

P10 - 1	Reset
P10 - 2	Ground
P10 - 3	No Connection
P10 - 4	Keyboard Clock
P10 - 5	Keyboard Data
P10 - 6	Keyboard Lock
P10 - 7	+5VDC
P10 - 8	Speaker
TB1 - 1	+5VDC
TB1 - 2	Ground
TB2 - 1	+5VDC
TB2 - 2	Ground
TB3 - 1	+5VDC
TB3 - 2	Ground
TB4 - 1	+12VDC
TB4 - 2	Ground

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Appendix A: Bus Termination

Resistor Termination

The goal of termination resistors is to provide an impedance mismatch at the end of the bus to prevent signal reflections. This mismatch has to be balanced by the electrical capability of the CPU and option cards to drive the load imposed by the resistors.

Generally, terminations that connect to both +5V and ground work best, although terminations to +5V only are allowable.

One way to provide terminations in digital systems is a resistor network connected to both +5V and ground. The following two examples represent such a resistor network. Note that in both examples, the SIPs are inserted with pin 1 of the SIP toward the back of the chassis. While the following examples specify Bourns part numbers, equivalent values from other manufactures may be used. The following provides 330 ohms to +5V and 220 ohms to ground.

- Bourns part # 4610X-104-221/331 (Low profile)
- Bourns part # 4610M-104-221/331 (Medium profile)

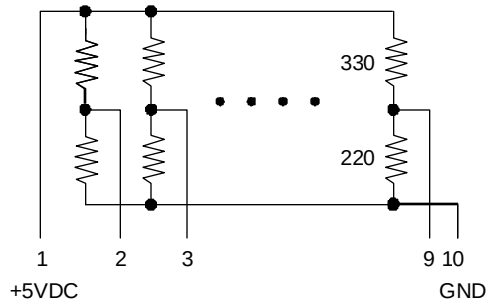

Figure A-1: Resistor SIP Network

Reading the resistance from the signal pin of the SIP to either pin 1 or pin 10 will not provide the expected resistance of, for example, 220 or 330 ohms. This is because of the parallel resistance of the other paths. For example, the 220 ohms side will read 143 ohms (pin 10), and the 330 ohms side will read 156 ohms (pin 1). The actual values will change slightly because of allowed tolerance.

The following combination provides less bus loading than the first example and provides 330 ohms to +5 and 470 ohms to ground:

- Bourns part # 4610X-104-331/471 (Low profile)
- Bourns part # 4610M-104-331/471 (Medium profile)

Other values are manufactured and can certainly be used if a problem persists on the bus. Not all cards behave well on large buses or in combination with other cards and may require some experimentation to completely isolate all intermittent operation. Turning the SIP around is allowed, even recommended occasionally, to better shape the signal being pulled high.

RC Network Termination

An alternative to a resistor network is an RC network. An RC network connects the signal lines, through a resistor in series with a capacitor, to either +5V or ground. The advantage is that no static load is imposed on the bus. The main disadvantage is that increased capacitance on the line affects timing factors. The higher cost of RC Networks may also be significant for some customers.

DIODE Termination

In some cases, diodes can be connected between the signal lines and both +5V and ground. Any spikes greater than the +5V rail are shunted and limited to +5V. Any negative spikes are shunted to ground. Thus, the bus sees only signals in the range of 0-5V. Diode termination reduces over- and under-shoot, but doesn't improve signal shape or edge times. Diode termination is generally used in conjunction with resistor termination.

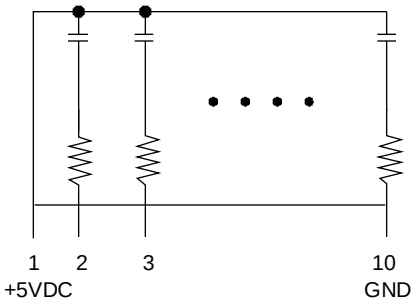

Figure A-2: RC SIP Network

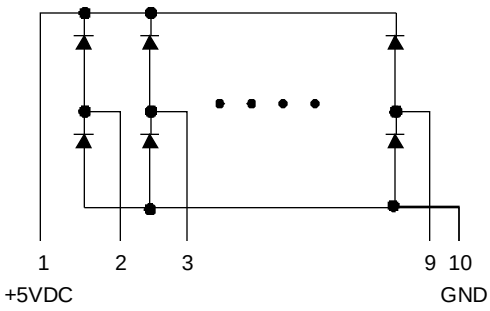

Figure A-3: Diode SIP Network

Note: All Pentium and 486 vesa local or PCI CPU control signals that should never be terminated are as follows:

A-1(RES 2-2)	I/OCHCK
B-8(RES 1-7)	0WS
D-1(RES 7-4)	MEMCS16
D-2(RES 7-5)	I/0CS16
D-17(RES9-9)	MASTER

To end termination of a signal, simply cut the wire on the terminating resistor for the appropriate signal.

Appendix B: Terminated Bus Signals sorted by SIP Resistors

Side	Pin	Res	Description	20 Slot Only	
A	5	1-5	SD4	2-5	11-6
B	8	1-7	-OWS	1-7	11-7
B	11	1-9	-SMEMW	1-9	13-2
A	1	2-2	-I/O CHCK	2-2	12-2
A	2	2-3	SD7	2-3	12-3
A	3	2-4	SD6	2-4	12-4
A	4	2-5	SD5	1-5	12-5
A	6	2-6	SD3	2-6	12-6
A	7	2-7	SD2	2-7	12-7
A	8	2-8	SD1	2-8	12-8
A	9	2-9	SD0	2-9	11-8
A	11	3-2	AEN	3-2	11-9
B	13	3-3	-IOW	3-3	13-4
B	14	3-4	-IOR	3-4	13-5
B	15	3-5	-DACK3	3-5	13-6
A	16	3-6	SA15	3-6	14-6
B	17	3-7	-DACK1	3-7	13-7
A	19	3-8	SA12	3-8	14-8
B	19	3-9	-REFRESH	3-9	13-9

Side	Pin	Res	Description	20 Slot Only	
B	12	4-2	-SMEMR	4-2	13-3
A	12	4-3	SA19	4-3	14-2
A	13	4-4	SA18	4-4	14-3
A	14	4-5	SA17	4-5	14-4
A	15	4-6	SA16	4-6	14-5
A	17	4-7	SA14	4-7	14-7
A	18	4-8	SA13	4-8	13-8
A	20	4-9	SA11	4-9	14-9
B	20	5-2	CLK	5-2	15-2
A	23	5-3	SA8	5-3	15-4
A	25	5-4	SA6	5-4	16-4
B	26	5-5	-DACK2	5-5	15-5
B	27	5-6	+T/C	5-6	15-6
B	28	5-7	+BALE	5-7	15-7
B	30	5-9	OSC	5-9	15-9
A	21	6-2	SA10	6-2	16-2
A	22	6-3	SA9	6-3	15-3
A	24	6-4	SA7	6-4	16-3
A	26	6-5	SA5	6-5	16-5
A	27	6-6	SA4	6-6	16-6
A	28	6-7	SA3	6-7	16-7
A	29	6-8	SA2	6-8	15-8
A	30	6-9	SA1	6-9	16-8
C	1	7-3	SBHE	7-3	18-3
D	1	7-4	-MEMCS16	7-4	17-3
D	2	7-5	-I/OCS16	7-5	17-4
D	8	7-9	-DACK0	10-2	17-9

(continued on next page)

Side	Pin	Res	Description	20 Slot Only	
A	31	8-2	SA0	8-2	16-9
C	2	8-3	LA23	8-3	18-4
C	3	8-4	LA22	8-4	18-5
C	4	8-5	LA21	8-5	18-6
C	5	8-6	LA20	8-6	17-6
C	6	8-7	LA19	8-7	17-7
C	7	8-8	LA18	8-8	17-8
C	8	8-9	LA17	8-9	19-2
D	10	9-3	-DACK5	9-3	19-3
C	11	9-4	SD08	9-4	20-4
D	12	9-5	-DACK6	9-5	19-4
D	14	9-6	-DACK7	9-6	19-6
C	16	9-8	SD13	9-8	19-7
D	17	9-9	-MASTER	9-9	19-8
C	9	10-2	-MRMR	9-2	20-2
C	10	10-3	-MEMW	10-3	20-3
C	12	10-4	SD09	10-4	19-5
C	13	10-5	SD10	10-5	20-5
C	14	10-6	SD11	10-6	20-6
C	15	10-7	SD12	10-7	20-7
C	17	10-8	SD14	10-8	20-9
C	18	10-9	SD15	10-9	19-9

Side	Pin	Res	Description	20 Slot Only	
A	10	NC	I/O CH RDY	NC	NC
B	1	NC	GND	NC	NC
B	3	NC	+5 VOLTS	NC	NC
B	4	NC	+IRQ OR 9	NC	NC
B	5	NC	-5 VOLTS	NC	NC
B	6	NC	+DRQ2	NC	NC
B	7	NC	-12 VOLTS	NC	NC
B	9	NC	+12 VOLTS	NC	NC
B	10	NC	GND	NC	NC
B	16	NC	+DRQ3	NC	NC
B	18	NC	+DRQ1	NC	NC
B	21	NC	+IRQ7	NC	NC
B	22	NC	+IRQ6	NC	NC
B	23	NC	+IRQ5	NC	NC
B	24	NC	+IRQ4	NC	NC
B	25	NC	+IRQ3	NC	NC
B	29	NC	+5 VOLTS	NC	NC
B	31	NC	GND	NC	NC
D	3	NC	+IRQ10	NC	NC
D	4	NC	+IRQ11	NC	NC
D	5	NC	+IRQ12	NC	NC
D	6	NC	+IRQ15	NC	NC
D	7	NC	+IRQ14	NC	NC
D	9	NC	+DRQ0	NC	NC
D	11	NC	+DRQ5	NC	NC
D	13	NC	+DRQ6	NC	NC
D	15	NC	+DRQ7	NC	NC
D	16	NC	+5VDC	NC	NC
D	18	NC	GND	NC	NC
					NC
B	2	4.7K	+RESET TO GROUND	4.7K	NC

Appendix C: Split Backplanes (Option)

Splitting the backplane permits the installation of multiple processors in one enclosure. Splitting provides a break in the bus to provide two or more separate buses on the same printed circuit board. For example, the 10-slot backplane could be split into two 5-slot buses. You could install one of the highly integrated CPUs, a network card for booting and disk access, and three application-specific plug-in cards. Such a combination provides the equivalent of two computers in one compact package.

Although all of the ICS backplanes may be split, please note that splitting the 8-slot and smaller backplanes is not recommended because of the relatively small number of slots, and the 20-slot backplane "must" have new artwork generated in order to be split because the signal paths are on the inner layers. Note that Industrial Computer Source does offer the 20-slot backplane in two standard configurations of 10x10 and 5x5x5x5. Call the Industrial Computer Sales Department for a quotation to meet your requirements.

Note the following:

- Power is common on the backplane and cannot be split.
- Space in a chassis is generally limited for CPU support items such as keyboard connectors, reset buttons, etc. Plan the most effective chassis layout for your requirements.

WARNING

If you modify a Backplane, all warranty on that unit, both expressed and implied, are voided.

The following is a procedure to split the 15-slot backplane.

1. For low quantities, you may cut the traces with a hobby tool such as the Dremmel™, or an X-Acto™ knife. The drawing on the following page shows which traces to cut.

WARNING

Power traces are on the bottom layer and should not be cut

2. After splitting the backplane, use an ohmmeter to be sure no continuity exists between the buses. Power will still be continuous.
3. For larger quantities, Industrial Computer Source can provide a custom designed backplane.

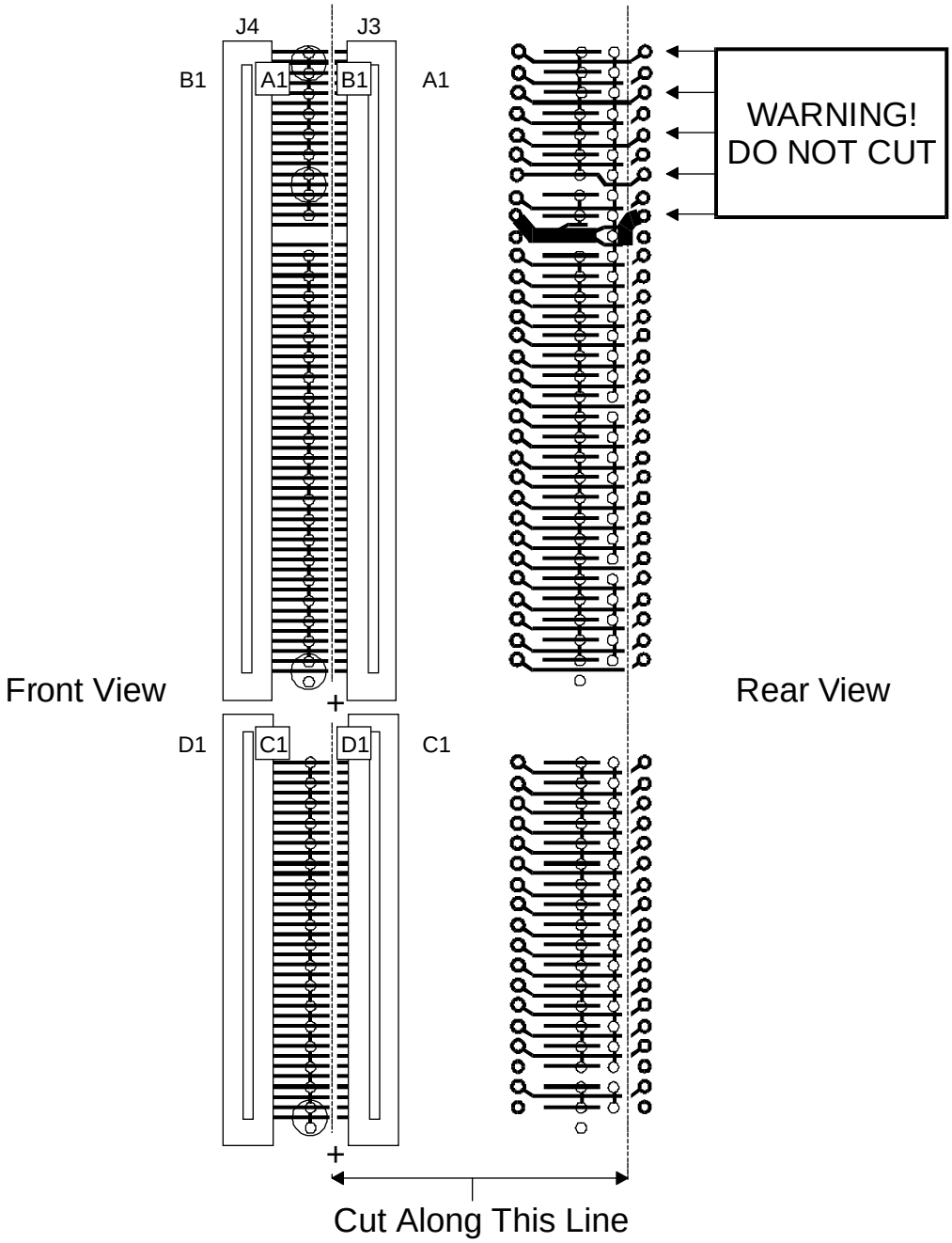

Figure C-1: 15 Slot Backplane

Appendix D: Pin Assignments

XT (8 BIT) Bus Pin Assignments

Solder Side of Option Board			
Description	**Res**	**Pin**	**Side**
Ground	NC	1	B
+Reset	4.7K	2	B
+5 Volts	NC	3	B
+IRQ2 or 9	NC	4	B
-5 Volts	NC	5	B
+DRQ2	NC	6	B
-12 Volts	NC	7	B
-OWS	1-7	8	B
+12 Volts	NC	9	B
Ground	NC	10	B
-SMEMW	1-9	11	B
-SMEMR	4-2	12	B
-IOW	3-3	13	B
-IOR	3-4	14	B
-DACK3	3-5	15	B
+DRQ3	NC	16	B
-DACK1	3-7	17	B
+DRQ1	NC	18	B
-REFRESH	3-9	19	B
CLK	5-2	20	B
+IRQ7	NC	21	B
+IRQ6	NC	22	B
+IRQ5	NC	23	B
+IRQ4	NC	24	B
+IRQ3	NC	25	B
-DACK2	5-5	26	B
+T/C	5-6	27	B
+BALE	5-7	28	B
+5 Volts	NC	29	B
OSC	5-9	30	B
Ground	NC	31	B

Component side of Option Board			
Side	**Pin**	**Res**	**Description**
A	1	2-2	-I/O Chck
A	2	2-3	SD7
A	3	2-4	SD6
A	4	2-5	SD5
A	5	1-5	SD4
A	6	2-6	SD3
A	7	2-7	SD2
A	8	2-8	SD1
A	9	2-9	SD0
A	10	NC	I/O Chck Rdy
A	11	3-2	AEN
A	12	4-3	SA19
A	13	4-4	SA18
A	14	4-5	SA17
A	15	4-6	SA16
A	16	3-6	SA15
A	17	4-7	SA14
A	18	4-8	SA13
A	19	3-8	SA12
A	20	4-9	SA11
A	21	6-2	SA10
A	22	6-3	SA9
A	23	5-3	SA8
A	24	6-4	SA7
A	25	5-4	SA6
A	26	6-5	SA5
A	27	6-6	SA4
A	28	6-7	SA3
A	29	6-8	SA2
A	30	6-9	SA1
A	31	8-2	SA0

Note: Pin B4 is IRQ2 for an XT

Pin B4 is IRQ9 for an AT which is redirected as IRQ2

* -REFRESH is -DACK0 on an XT 8-bit system.

AT (16 BIT) Bus Extension Pin Assignments

Solder Side of Option Board			
Description	**Res**	**Pin**	**Side**
-MEMCS16	7-4	1	D
-I/OCS16	7-5	2	D
+IRQ10	NC	3	D
+IRQ11	NC	4	D
+IRQ12	NC	5	D
+IRQ15	NC	6	D
+IRQ14	NC	7	D
-DACK0	7-9	8	D
+DRQ0	NC	9	D
-DACK5	9-3	10	D
+DRQ5	NC	11	D
-DACK6	9-5	12	D
+DRQ6	NC	13	D
-DACK7	9-6	14	D
+DRQ7	NC	15	D
+5VDC	NC	16	D
-MASTER	9-9	17	D
GROUND	NC	18	D

Component Side of Option Board			
Side	**Pin**	**Res**	**Description**
C	1	7-3	SBHE
C	2	8-3	LA23
C	3	8-4	LA22
C	4	8-5	LA21
C	5	8-6	LA20
C	6	8-7	LA19
C	7	8-8	LA18
C	8	8-9	LA17
C	9	10-2	-MRMR
C	10	10-3	-MEMW
C	11	9-4	SD08
C	12	10-4	SD09
C	13	10-5	SD10
C	14	10-6	SD11
C	15	10-7	SD12
C	16	9-8	SD13
C	17	10-8	SD14
C	18	10-9	SD15

BUG REPORT

While we have tried to assure this manual is error free, it is a fact of life that works of man have errors. We request you to detail any errors you find on this BUG REPORT and return it to us. We will correct the errors/problems and send you a new manual as soon as available. Please return to:

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