

Agilent TS-5400 Functional Test System Series IIB

Agilent E6180 Mass Interconnect User's Manual



Manual Part Number E6170-90043



Agilent Technologies

Notices

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Safety Notices

Caution

A **Caution** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **Caution** notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Safety Summary

The following general safety precautions must be observed during all phases of operation of this system. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the system. Agilent Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

General

This product is provided with a protective earth terminal. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

WARNING: DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the system in the presence of flammable gases or flames.

If the equipment in this system is used in a manner not specified by Agilent Technologies, the protection provided by the equipment may be impaired.

Cleaning Instructions

Clean the system cabinet using a soft cloth dampened in water.

WARNING: DO NOT REMOVE ANY SYSTEM COVER

Operating personnel must not remove system covers. Component replacement and internal adjustments must be made only by qualified service personnel. Equipment that appears damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Environmental Conditions

Unless otherwise noted in the specifications, this system is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 80% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before applying power

Verify that all safety precautions are taken. Note the external markings described in "Safety Symbols and Regulatory Markings" on page 4.

Ground the System

To minimize shock hazard, the system chassis must have a hard-wired connection to an electrical protective earth ground. The system must also be connected to the ac power mains through a power cable that includes a protective earth conductor. The power cable ground wire must be connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective grounding will cause a potential shock hazard that could result in personal injury.

Fuses

Use only fuses with the required rated current, voltage, and specified type (normal blow, time delay). Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

Operator Safety Information

MODULE CONNECTORS AND TEST SIGNAL CABLES CONNECTED TO THEM CANNOT BE OPERATOR ACCESSIBLE:

Cables and connectors are considered inaccessible if a tool (e.g., screwdriver, wrench, socket, etc.) or a key (equipment in a locked cabinet) is required to gain access to them.














Additionally, the operator cannot have access to a conductive surface connected to any cable conductor (High, Low or Guard).

ASSURE THE EQUIPMENT UNDER TEST HAS ADEQUATE INSULATION BETWEEN THE CABLE CONNECTIONS AND ANY OPERATOR-ACCESSIBLE PARTS (DOORS, COVERS, PANELS, SHIELDS, CASES, CABINETS, ETC.): Verify there are multiple and sufficient protective means (rated for the voltages you are applying) to assure the operator will NOT come into contact with any energized conductor even if one of the protective means fails to work as intended. For example, the inner side of a case, cabinet, door, cover or panel can be covered with an insulating material as well as routing the test cables to the module's front panel connectors through non-conductive, flexible conduit such as that used in electrical power distribution.

Safety Symbols and Regulatory Markings

Symbols and markings on the system, in manuals and on instruments alert you to potential risks, provide information about conditions, and comply with international regulations. Table 1 defines the symbols and markings you may encounter.

Table 1 Safety Symbols and Markings

Safety symbols	
	Warning: risk of electric shock.
	Caution: refer to accompanying documents.
	Alternating current.
	Both direct and alternating current.
	Earth (ground) terminal
	Protective earth (ground) terminal
	Frame or chassis terminal
	Terminal is at earth potential. Used for measurement and control circuits designed to be operated with one terminal at earth potential.
	Switch setting indicator. ○ = Off, = On.
	Standby (supply); units with this symbol are not completely disconnected from ac mains when this switch is off. To completely disconnect the unit from ac mains, either disconnect the power cord, or have a qualified electrician install an external switch.
Regulatory Markings	
	The CE mark is a registered trademark of the European Community.
	The CSA mark is a registered trademark of the Canadian Standards Association.
 N10149	The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework regulations under the terms of the Radio Communications Act of 1992.
ISM 1-A	This text indicates that the product is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center.

Agilent on the Web

You can find information about technical and professional services, product support, and equipment repair and service on the Web:

<http://www.agilent.com>

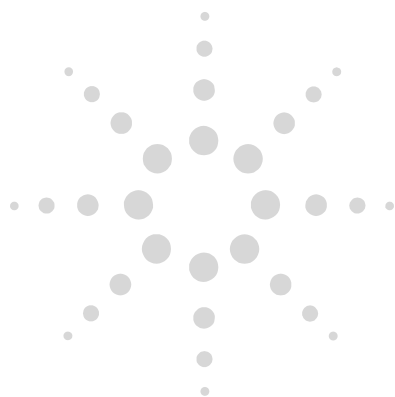
Click the link to **Test & Measurement**. Select your country from the drop-down menus. The Web page that appears next has contact information specific for your country.

Agilent by Phone

If you do not have access to the Internet, call one of the numbers in Table 2.

Table 2 Agilent Call Centers and Regional Headquarters

United States and Canada:	Test and Measurement Call Center (800) 452 4844 (toll-free in US)
Europe:	(41 22) 780 8111
Japan:	Measurement Assistance Center (81) 0426 56 7832
Latin America:	305 269 7548
Asia-Pacific:	(85 22) 599 7777





Manufacturer's Name: Agilent Technologies, Incorporated
Manufacturer's Address: 815 – 14th St. SW
Loveland, Colorado 80537
USA

Declares, that the product

Product Name: TS5400, TS5430, TS5450 Series Automotive Test Systems
Model Number: E6170A/B, E6230A/B, E8770A, E8780A, E8785A, E8786A
Product Options: *This declaration covers all options of the above product(s).*

Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC, and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly.

Conforms with the following product standards:

EMC	Standard	Limit
	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	
	CISPR 11:1990 / EN 55011:1991	Group 1 Class A
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	4kV CD, 8kV AD
	IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80-1000 MHz
	IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5kV signal lines, 1kV power lines
	IEC 61000-4-5:1995 / EN 61000-4-5:1995	0.5 kV line-line, 1 kV line-ground
	IEC 61000-4-6:1996 / EN 61000-4-6:1996	3V, 0.15-80 MHz 1 cycle, 100%
	IEC 61000-4-11:1994 / EN 61000-4-11:1994	Dips: 30% 10ms; 60% 100ms
		Interrupt > 95% @5000ms
	Canada: ICES-001:1998	
	Australia/New Zealand: AS/NZS 2064.1	
	As detailed in: Electromagnetic Compatibility (EMC) Certificate of Conformance No. 71301-KRQ/EMC 97-4165, dated 18 February 1997.	
	Assessed by: KEMA Registered Quality Nederland B.V. Utrechtseweg 310 6812 AR Arnhem, 6800 ET Arnhem The Netherlands	

The product was tested in a typical configuration with Agilent Technologies test systems.

Safety

IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995
Canada: CSA C22.2 No. 1010.1:1992
UL 3111-1: 1994 (NRTL approval issued by CSA)

16 August 2001
Date

Ray Corson
Product Regulations Program Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.
Authorized EU-representative: Agilent Technologies Deutschland GmbH, Herrenberger Strabe 130, D 71034 Böblingen, Germany

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Description

The MacPanel Mass Interconnect shown in Figure 1-1, connects the test system to the fixture. The fixture then connects to the Unit Under Test (UUT). The Mass Interconnect consists of an Interface Connector Assembly (ICA) with ICA connector blocks (Fixture Receiver). The connector blocks connect to the Interface Test Adapter (ITA) which is part of the fixture. Several types of standard connector blocks allow you to use general purpose connectors or high-power connections as needed.

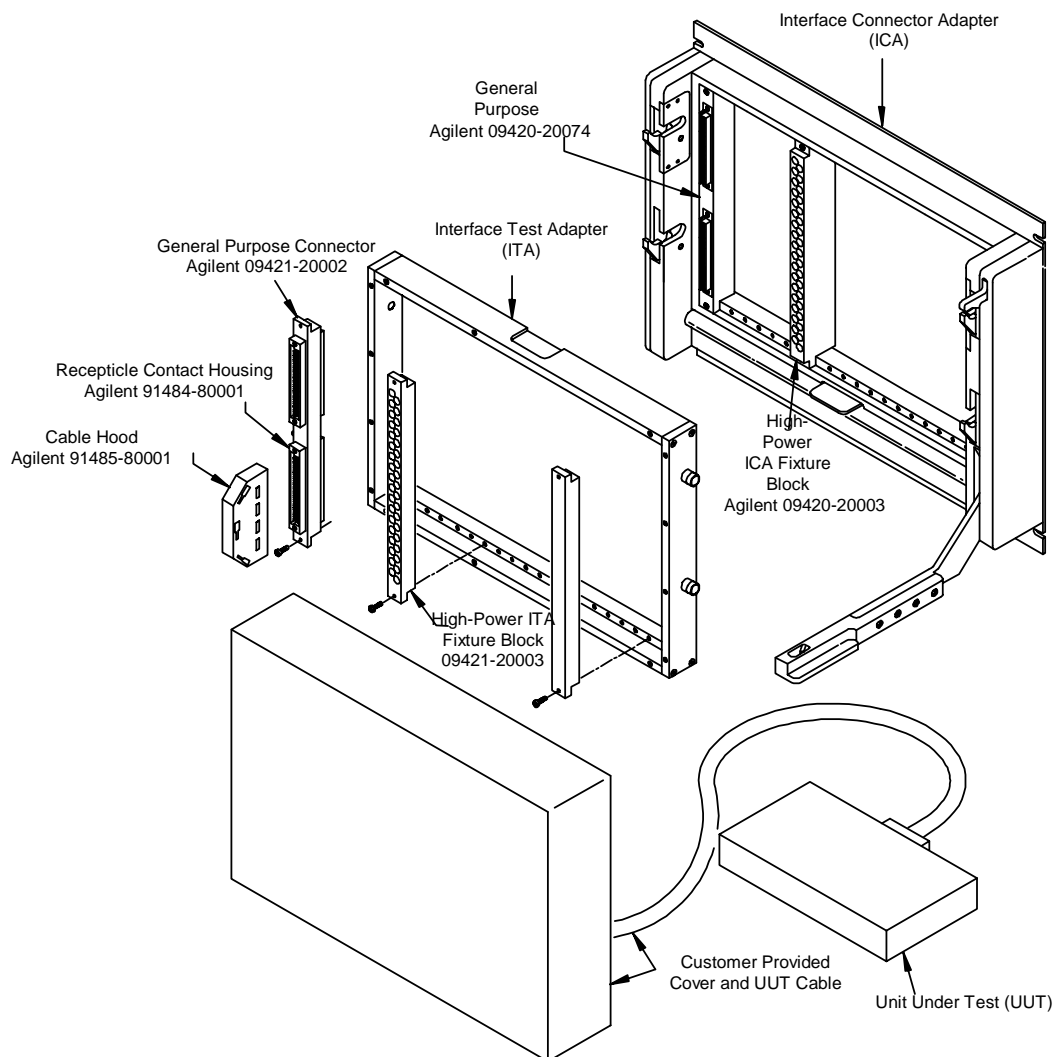


Figure 1-1. MacPanel Mass Interconnect

The default connector block locations depends on the number and type of VXI modules and load cards, but follows this general algorithm:

- Slots one through five connect up to four Agilent E8792/93 32-Pin Matrix Modules.
- Slots six through nine connect Agilent E8792/93 32-Pin Matrix Modules, the Agilent E6174A 32-Channel Event Detector, and the Agilent E1418 DAC.
- Slots ten through twenty-one to connect loads to the Unit Under Test.

Note

Connector blocks are included with Agilent TS-5400 system products. Filler panels cover any unused mass interconnect locations. Refer to Appendix A for parts list information. VXI modules purchased from other sources will require connector cables and expander blocks.

Safety Shrouds

WARNING

An interlocked safety cover is recommended to prevent operator access to electric shock hazard voltages and currents that may be applied to the unit under test. Voltages greater than 30 Vrms, 42 Vpk, or 60 Vdc are considered hazardous voltages. Current greater than 8A or energy greater than 150 VA is also considered hazardous.

AVERTISSEMENT

Un couvercle des sécurité à verrouillage est recommandé afin de protéger l'opérateur des chocs électriques causés par des tensions ou des courants qui peuvent être appliqués à l'appareil à l'essai. Les tensions supérieures a 30 V (eff.), 42 V (crete) ou 60 V (c.c.) sont dangereuses. Un courant supérieures à 8 A ou une énergie supérieure à 150 V-A sont dangereux.

The Safety Shroud protects the operator from electrical shock and is required if voltages of greater than 30 V rms, 42.2 V peak, or 60 V dc are present at the ITA interface. Current greater than 8 A or energy greater than 150 VA is also considered hazardous. The Safety Shroud should completely cover any areas where the operator could be exposed to dangerous voltages. It must be made of a material that is relatively shatter-resistant and non-flammable. Interlock protection should verify that the fixture and safety shroud are in place before the test for the board begins. Refer to Chapter 2 for specific safety interlock information.

Chapter 2

Interface Connector Adapter (ICA)

Figure 2-1 shows the mass interconnect Interface Connector Assembly. It shows typical connector locations for an Agilent TS-5400 system. The figure shows the two types of connectors used on the ICA: Agilent 09420-20074 General Purpose Connector and 09420-20003 High Power Connector.

Slot 1 has factory defined pinouts, as shown in Figure 2-2, Figure 2-3, and Figure 2-9. Beginning in slot 2, the top (A) connector block connects to the left side connector (ROW) on the first Agilent E8792/93 32-Pin Matrix module next to the E6171 Measurement Control Module. In slot 2, the bottom (B) connector connects to the right side connector (AUX) on the Agilent E8792/93 32-Pin Matrix module. The connectors and cable numbers on the E8792/93 32-Pin Matrix module are shown in Chapter 4. Slots 3 through n to the right follow the same pattern until all E8792/93 32-Pin Matrix modules are connected to the ICA. Connectors for the load modules (Agilent E6175A, E6176A, and E6177A) are in the center of the ICA.

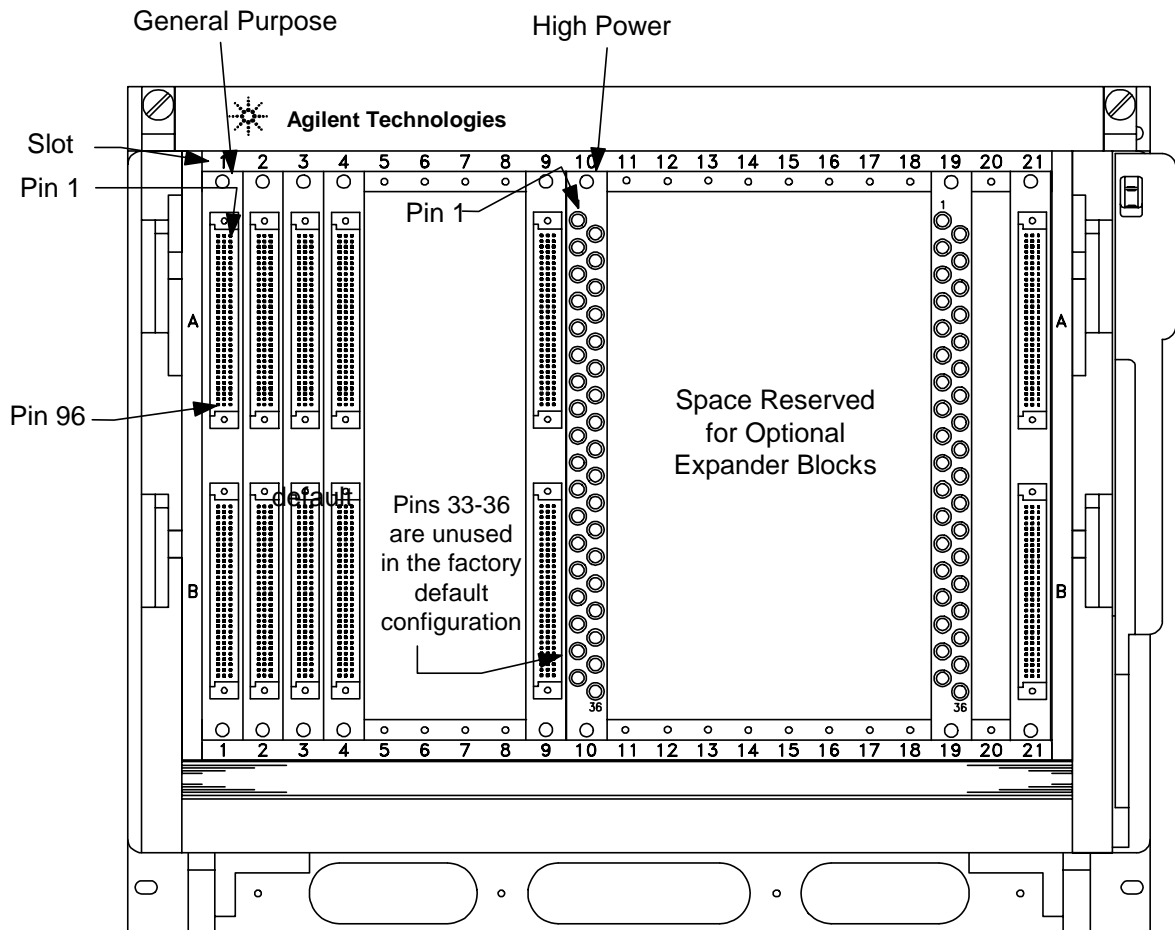


Figure 2-1. Typical Interface Connector Assembly (Fixture Receiver) Connector Block Locations

ICA 1A Connector Block Pinouts

The default factory connections to the ICA 1A signal block Agilent E3750-22100 96-position black connector termination block are shown in Figure 2-2 and Figure 2-3. See Figure 2-6 for making user connections to the Agilent E3750-22100 Connector Block.

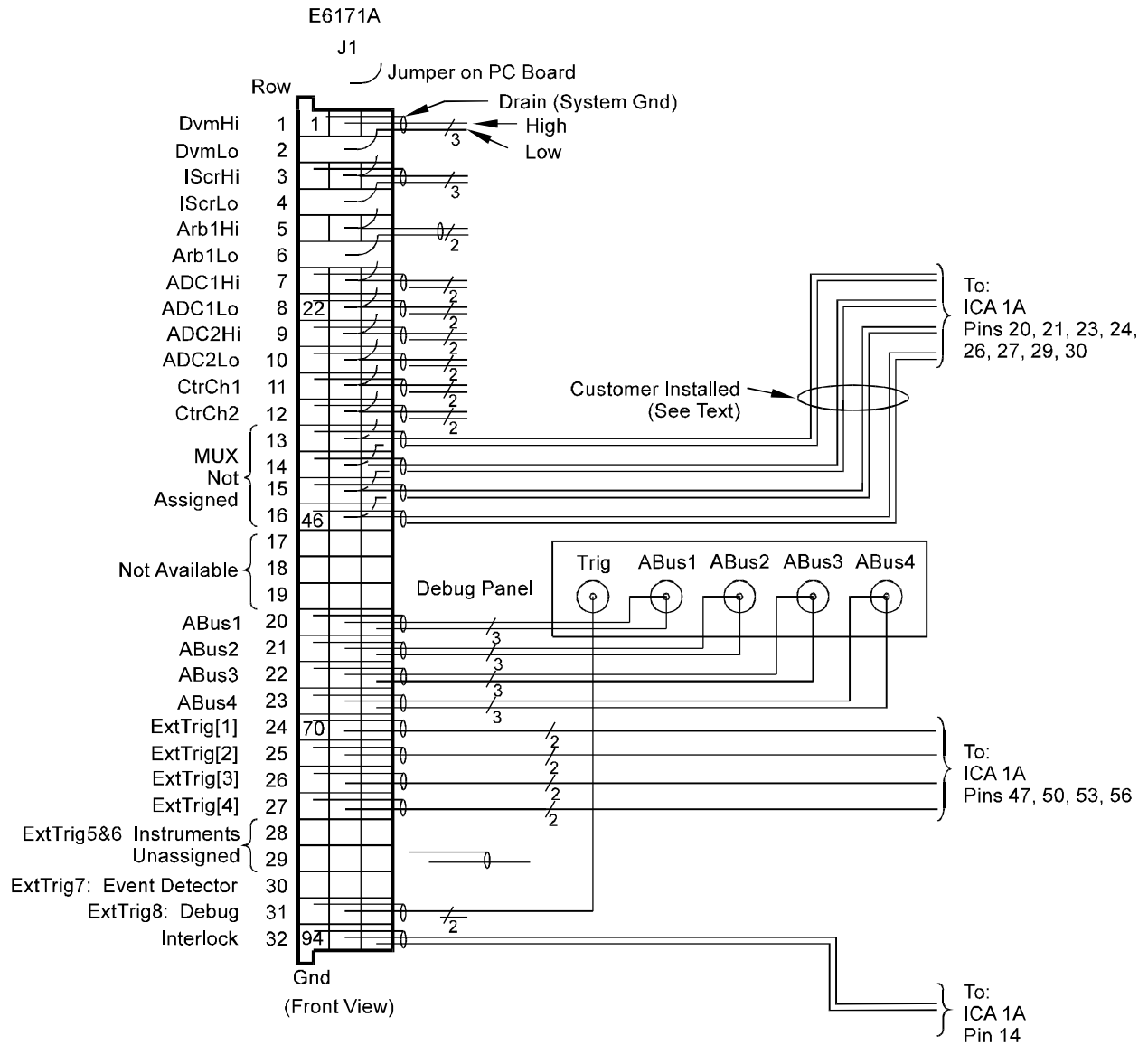


Figure 2-2. ICA Connector 1A Factory Default Connections (continued next page)

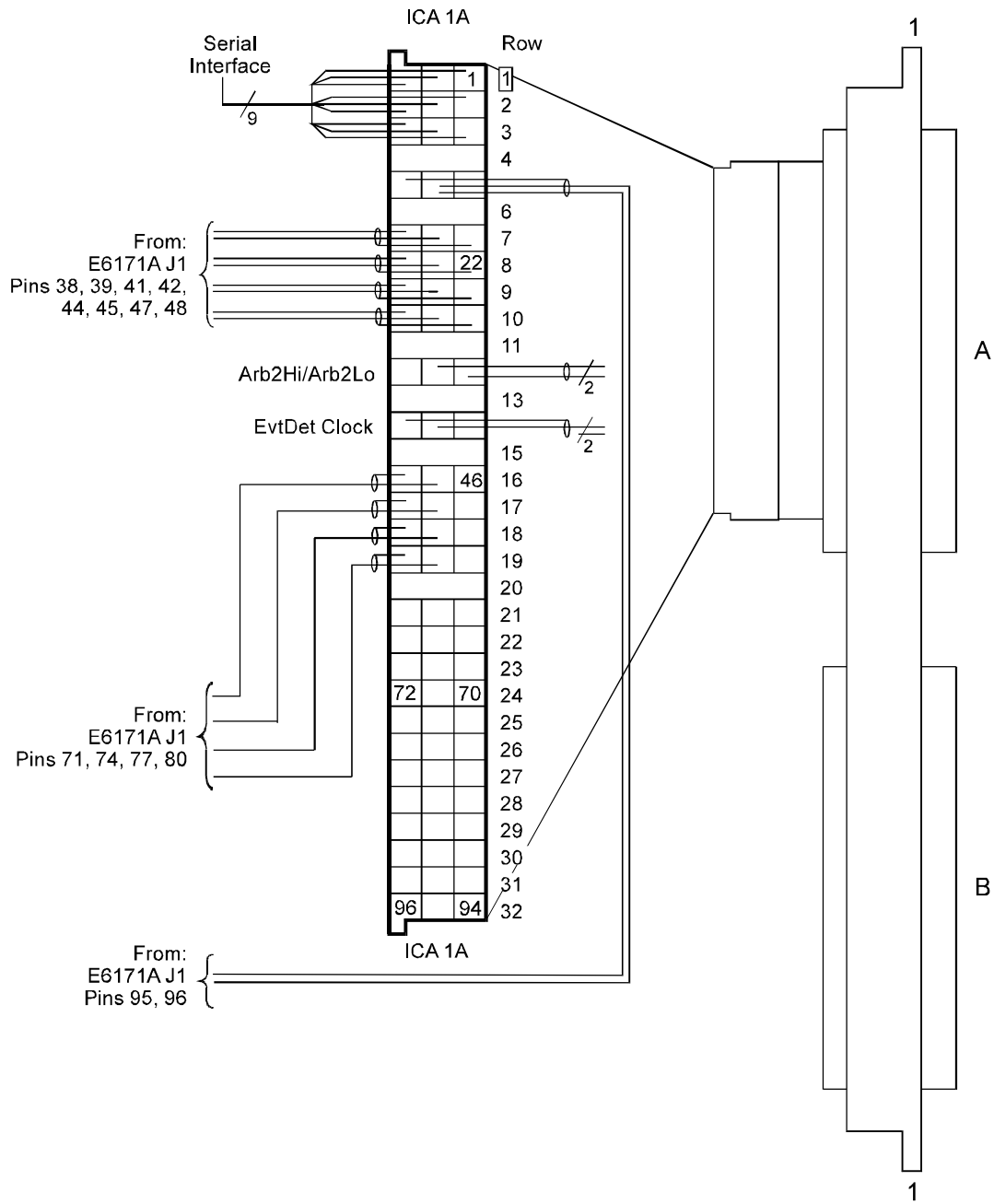


Figure 2-3. ICA Connector 1A Factory Default Connections (Cont.)

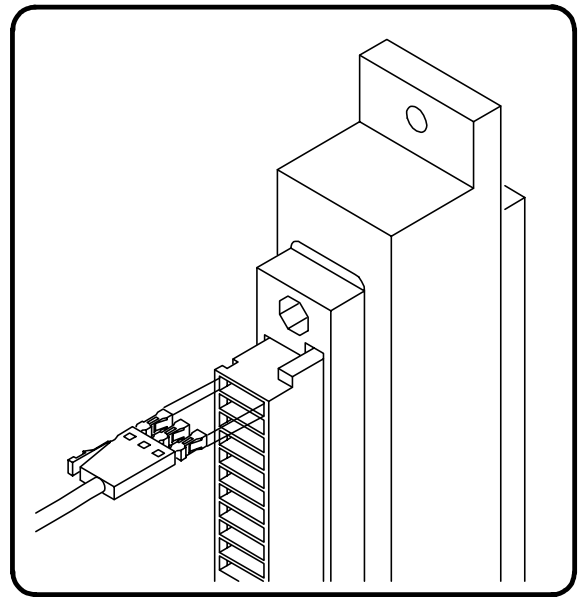
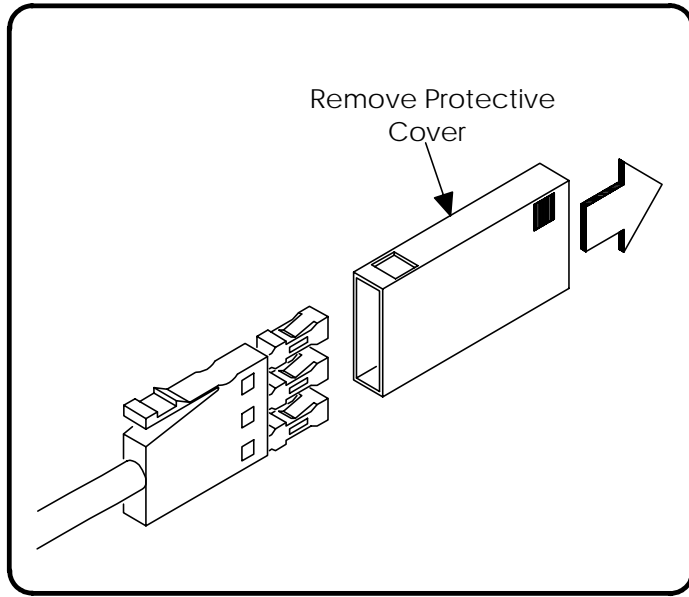


Figure 2-4. Making User Connections to the Agilent E3750-22100 Connector Block

ICA 1B Switch/Load Unit Connector Block Pinouts

Figure 2-5 shows the default factory connections to the ICA 1B signal block. Signals on this connector originate from the Agilent E6198A Switch/Load Unit backplane through an Agilent E3750-61607 cable.

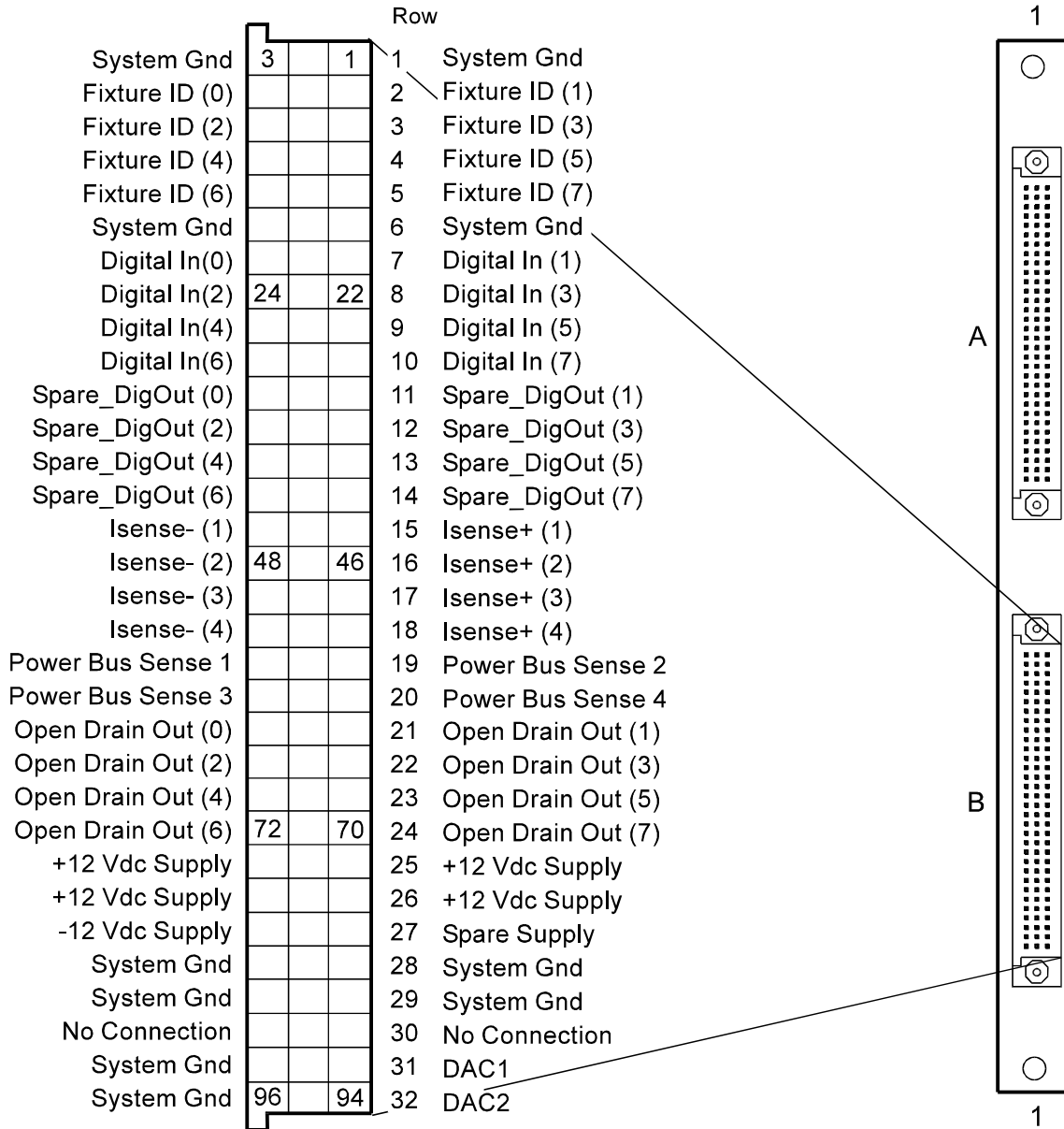


Figure 2-5. ICA 1B Cable Connections

ICA Slot 2A/2B Connector Block Pinouts

Figure 2-6 shows the ICA Cable Termination for the Agilent E8792/93 32-Pin Matrix Module. It uses an Agilent E3751-61601 cable.

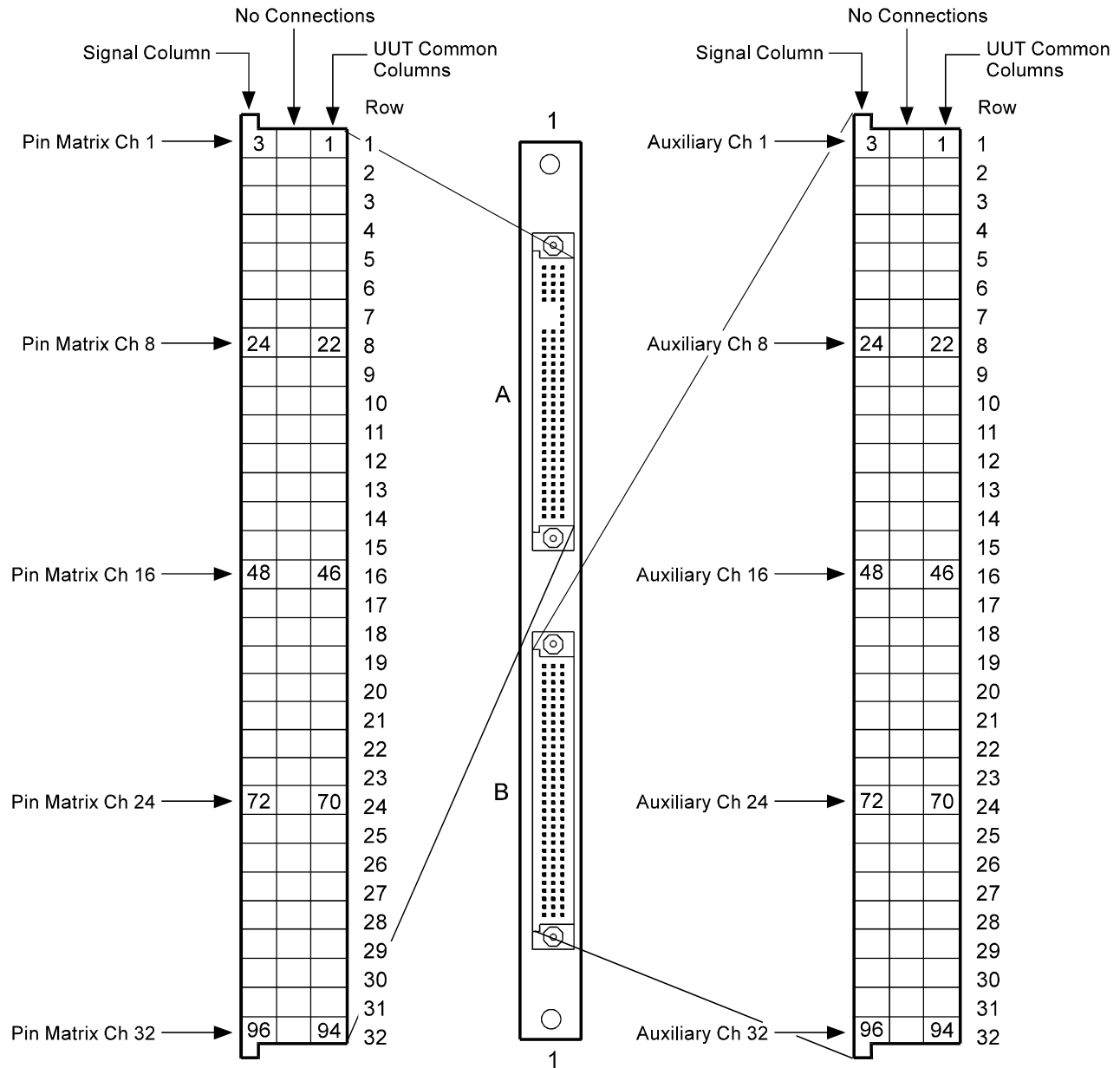


Figure 2-6. ICA Connectors Slot 2A/ 2B Factory Default Connections

ICA Digital/Analog Converter Pinout

Figure 2-7 shows the ICA connector pinouts for both one and two Agilent E1418 16-channel DACs. Two cables, Agilent E3750-61623 and Agilent E3750-61622, connect the first DAC to the ICA connector, refer to Chapter 4. A second Agilent E3750-61622 cable is required for the second DAC.

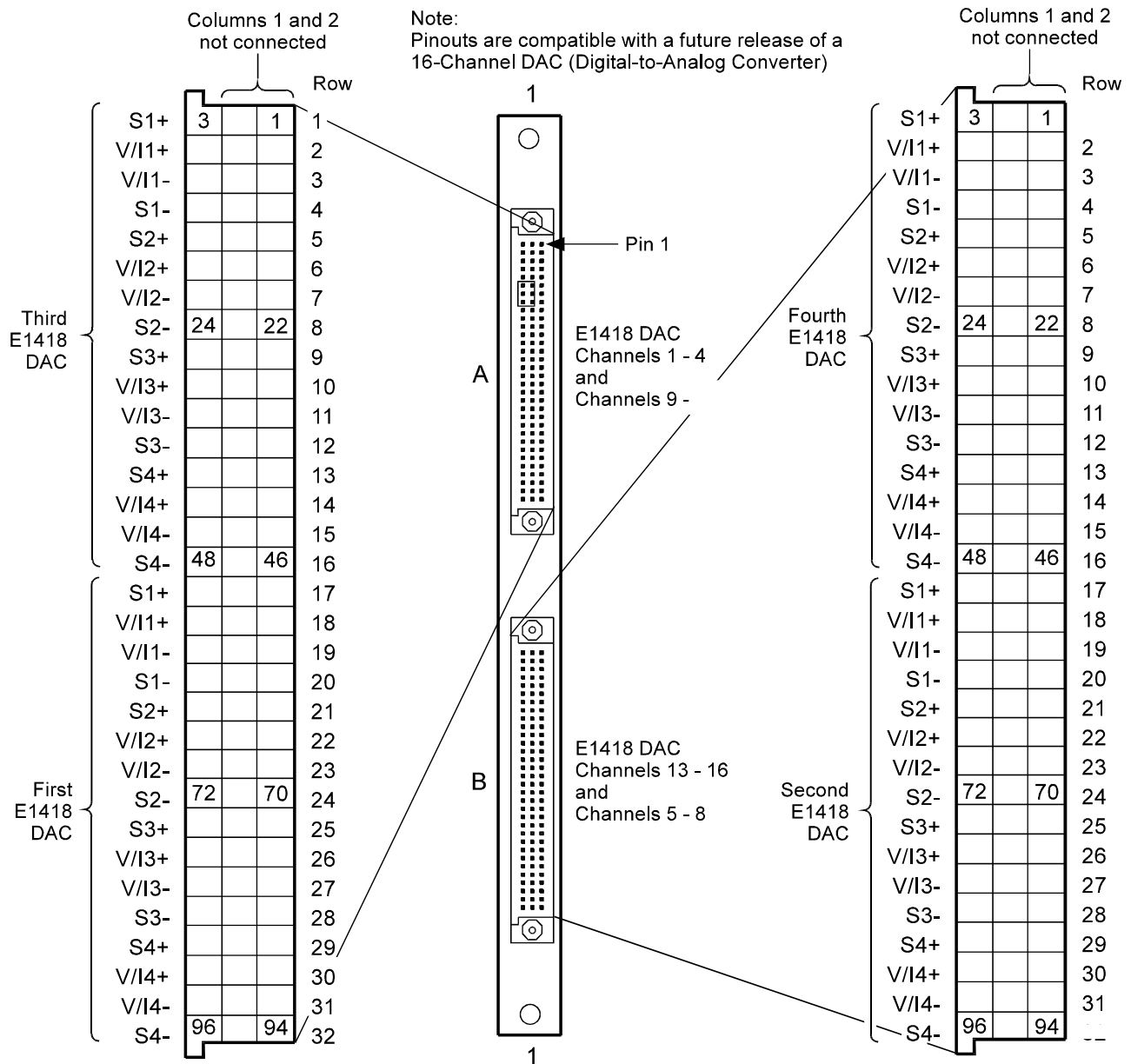


Figure 2-7. ICA Connector Pinout for the Agilent E1418A DACs

ICA Event Detector Pinout

Figure 2-8 shows the ICA connector pinout for the Agilent E6174A Event Detector (formerly the Agilent Z2902A). It mates with an Agilent E3751A-61601 cable.

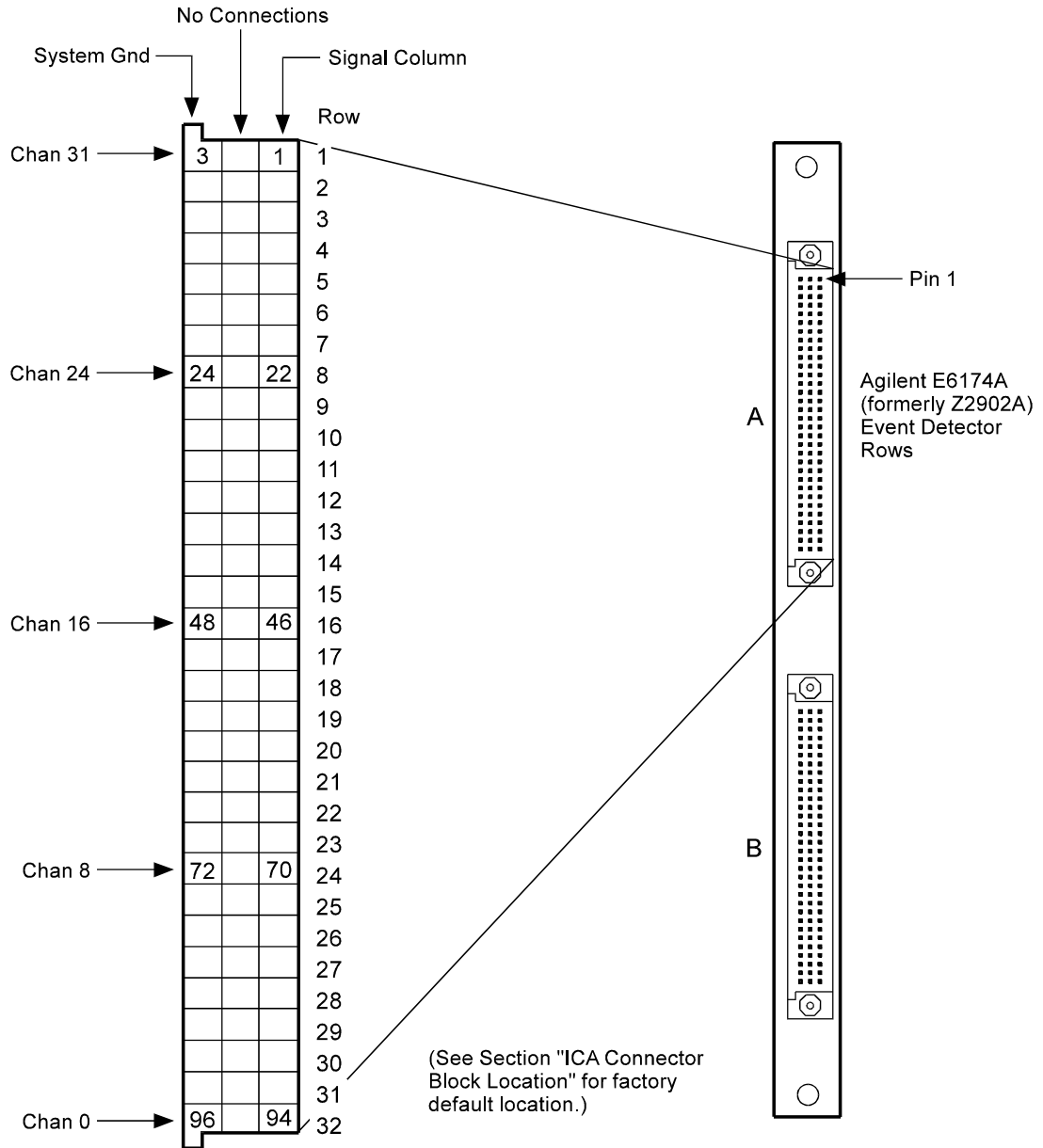


Figure 2-8. ICA Connector Pinout for the Agilent E6174A Event Detector

Load Connector Blocks and Cable Locations

Refer to Figure 2-1. If optional expander blocks are installed in the mass interconnect fixture (ITA), begin installing load connector blocks in slot 13 in the mass interconnect ICA. If the expander blocks are not used, then begin

installing the load connector blocks in slot 21 on the mass interconnect ICA. Load connector blocks are installed from the right-most slot (either slot 13 or slot 21) to left.

Agilent E6177A

24-Channel cards Start with an Agilent 09420-20074 connector block in slot 13 (or 21) of the mass interconnect. The first 24-channel load card connects to the Agilent 09420-20074 top connector, pins 1 - 48. See Figure 2-9. The second 24-channel load card also connects to the Agilent 09420-20074 top connector but to pins 49 – 96. The third 24-channel load card connects to the Agilent 09420-20074 bottom connector, pins 1 -48; and the fourth 24-channel load card connects to the Agilent 09420-20074 bottom connector, pins 49 -96. The fifth through eighth 24-channel load cards connect to the Agilent 09420-20074 in the mass interconnect slot 12 (or 20); etc.

Agilent E6176A

16-Channel cards If there are no 24-Channel load cards, start in slot 13 (or 21) of the mass interconnect. Otherwise, starting immediately to the left of the last Agilent 09420-20074 load block. Install one Agilent 09420-20003 Coax connector block for every two (2) 16-channel load cards. Starting with pin one, load the 16-channels in channel number order. See Figure 2-10. The second 16-channel card uses pins 17 – 32. Leave the last four holes in the Agilent 09420-20074 Coax connector block unused. The third and fourth 16-Channel cards use a second Agilent 09420-20074 Coax connector block, etc.

Agilent E6175A

8-Channel cards If there are no 24-Channel or 16-Channel cards, start in slot 13 (or 21) of the mass interconnect. Install one Agilent 09420-20003 Coax connector block for every four (4) 8-channel load cards. Starting with pin one, load the 8-channels in channel number order. See Figure 2-11. The second 8-channel card uses pins 9 – 16. The third and fourth 8-channel load cards use pins 17-32. Leave the last four holes in the Agilent 09420-20074 Coax connector block unused.

If additional load cards are added later, follow the above patterns where open spaces exist, that match load card channel counts, on the load connectors blocks. Otherwise, add connector blocks where room exists and

identify their locations in the software.

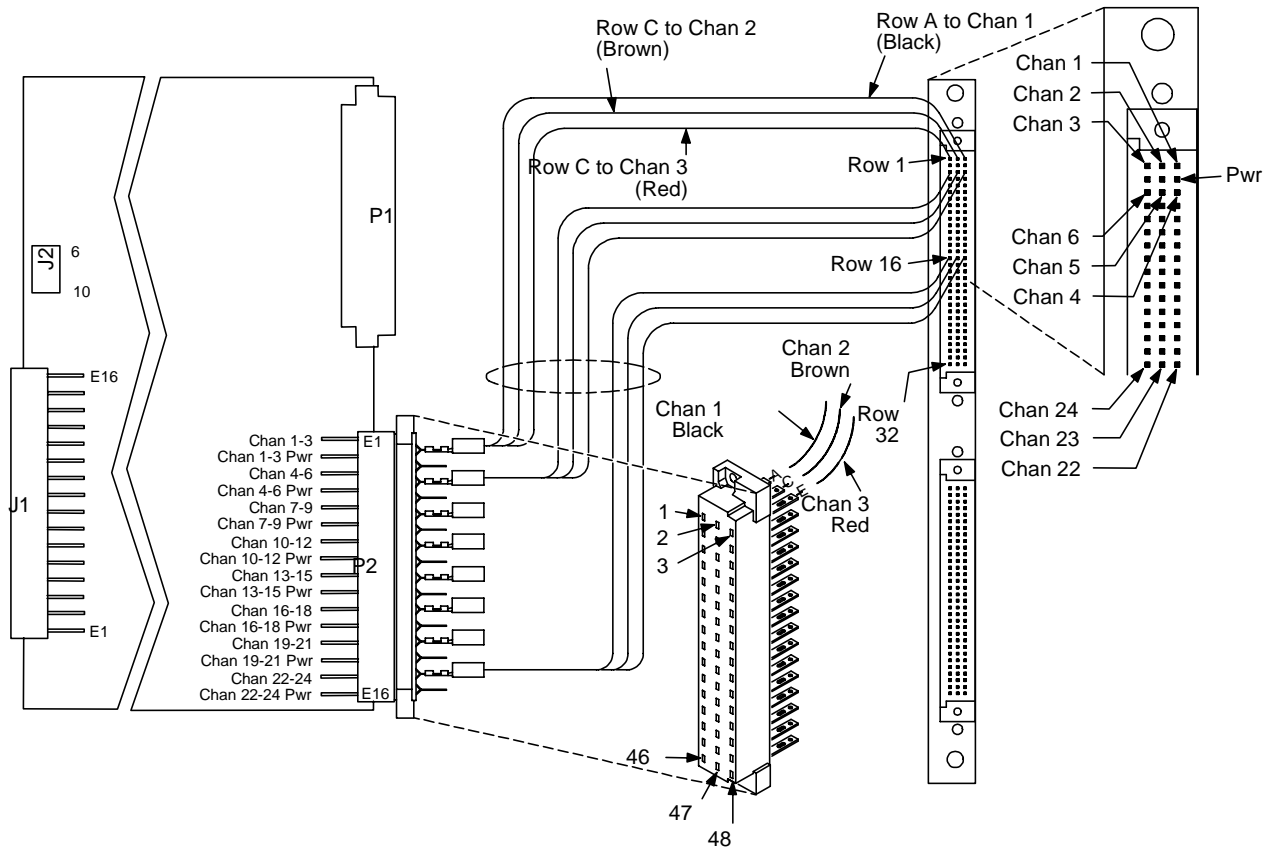


Figure 2-9. Agilent E6177A 24-Channel Load Card Cabling to GP Connector Block

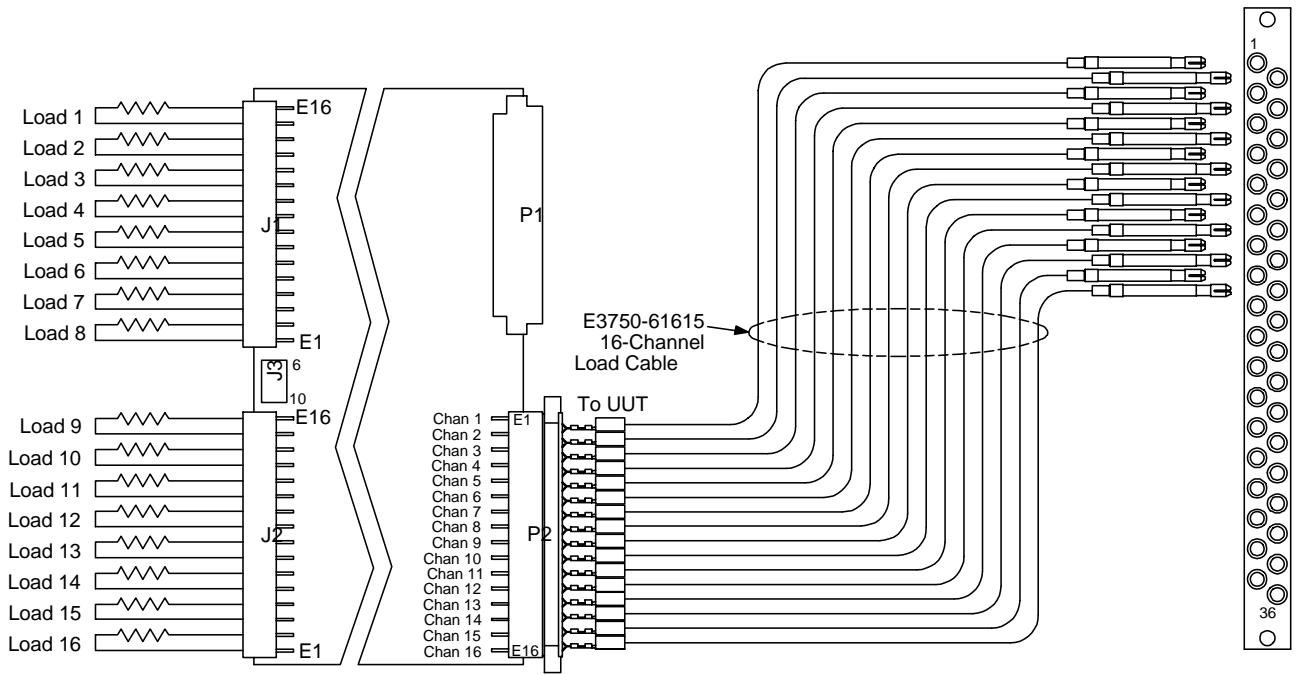


Figure 2-10. Agilent E6176A 16-Channel Load Card Cabling to High Power ICA Fixture Block

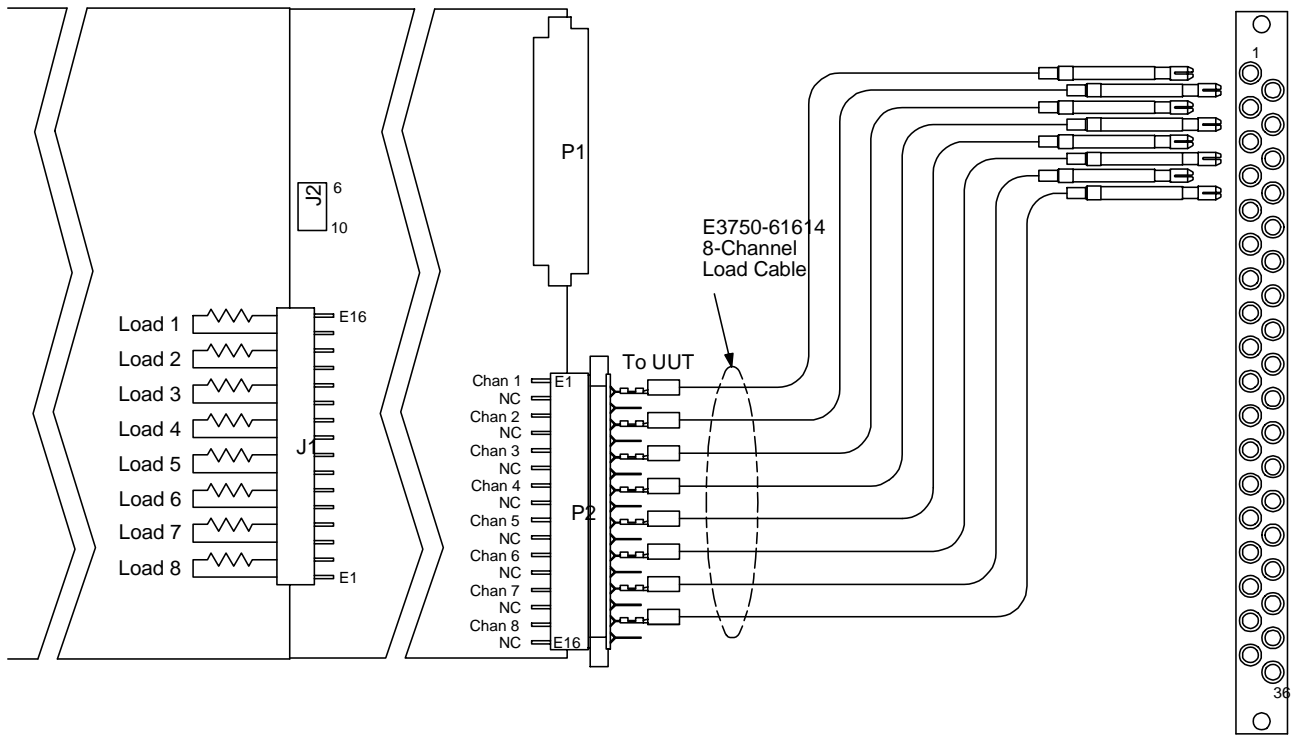


Figure 2-11. Agilent E6175A 8-Channel Load Card Cabling to High Power ICA Fixture Block

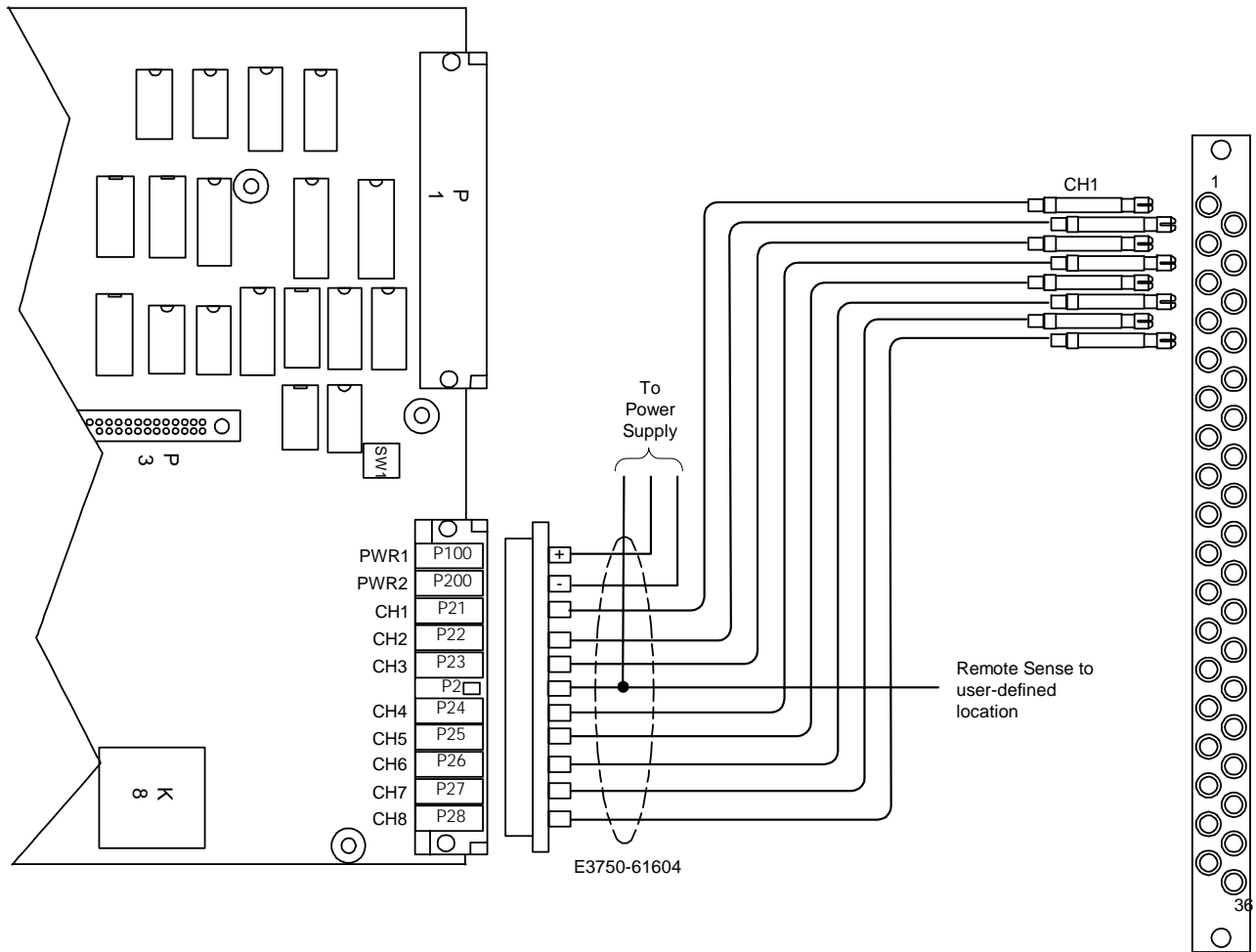


Figure 2-12. Agilent E6178B 8-Ch. Heavy Duty Load Card Cabling to High Power ICA Fixture Block

System Resource Interface Safety Interlocks

Built into the ICA is a safety interlock scheme using three microswitches. This safety interlock scheme provides the flexibility to implement a safe system level interlock strategy suitable for your test system. The three safety interlocks provided are:

1. ITA Present, detects the presence of the ITA on the ICA in the full locked position.
2. ITA Locked, detects the lever position of the ITA cam lever.
3. ICA Closed, detects the position of the ICA.

Each interlock level is identical and consists of a microswitch with both a form A and a form B contact that switch on actuation. This scheme allows for a make or a break switch contact as the actuating event. Figure 2-13 shows the switch position and wiring of one of the interlock switch assemblies.

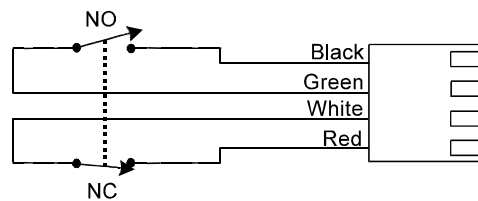


Figure 2-13. ICA Safety Interlock Switch Wiring (1 of 3 identical switches shown)

Note The switch cables exit from the bottom of the ICA fixture. Since all three cables are the same and may not be marked, you will need to use a continuity meter to determine which cable belongs to which set of switches.

This interlock structure is very flexible within the Agilent TS-5400 environment for creating a custom safety interlock scheme. Some of the major elements of an interlock scheme include the Agilent E6171 Measurement Control Module's safety interlock and the system power supplies' fault (FLT) and remote inhibit (INH) functions.

Agilent E6171A/B Safety Interlock

The Agilent E6171 Measurement Control Module (MCM) is capable of sourcing greater than 100 Vdc and 160Vp-p. The MCM's safety interlock consists of a pair of pins to ICA connector IA pins 13 and 14. These two pins need to be shorted together for the MCM to function normally. Unless programmed to perform otherwise, the normal MCM operation disables all high voltage source outputs and opens all relays on the MCM upon opening the interlock loop. This condition is latched and indicated by the red INTRLCK LED on the Agilent E6171's front panel and remains until cleared by the software.

A common implementation of a safety interlock scheme using the MCM's interlock is to series connect the NO switch contacts (Black-Green) of the ICA Closed assembly with the MCM's interlock loop through the ITA contacts. This implementation will only allow normal MCM operation if the ITA is present and locked in place and the ICA closed, otherwise the MCM will be in a safe interlock protect mode.

System Power Supply Safety Interlock

The Agilent 6643A, 6653A, and 6673A power supplies, available in the Agilent TS-5400, provide FLT/INH operation to facilitate the implementation of safety interlock schemes. These supplies are rated at 35V maximum and as such do not represent a serious safety hazard. Details of the FLT/INH capabilities and requirements of the Agilent 66x3A supplies are documented in Appendix D "Digital Port Functions" of *Operating Guide GPIB DC Power Supplies Series 664xA, 665xA, 667xA and 668xA*.

The Agilent 6628A Power Supply, also available with the Agilent TS-5400, comes standard with 0V shutdown pins or optionally with FLT/INH (Option 750). Either one of these methods could also be used to disable the supply's output. This supply is capable of generating 50VDC and should be considered when implementing a safety interlock scheme. Details of the 0V shutdown pins can be found in sections 4- 15 and 4- 16 of *Operating Manual Multiple Output Linear System DC Power Supply Agilent Models 6625A, 6626A, 6628A, and 6629A*. Details of the FLT/INH functionality for the 6628A Power Supply can be found in Appendix E Option 750 *Operating Instructions for the Multiple Output, Linear System DC Power Supply*.

A typical safety interlock scheme using the system power supplies' FLT/INH features would be to disable all of the system power supplies when the ITA isn't present or it isn't locked in place. This scheme can be implemented by wiring the NC contacts (White-Red) of the ITA Present and ITA Locked switches in parallel with the INH contacts of one of the system supplies. The remaining supplies can be cross connected with FLT and INH I/O pins to shutdown all supplies if either of the ITA Present or ITA Locked switches close. To recover from this condition the event must be removed, i.e. the switch actuated, and the clear the protection event from the supplies.

AVERTISSMENT

An interlocked safety cover is recommended to prevent operator access to electric shock hazard voltages and currents that may be applied to the unit under test. Voltages greater than 30 Vrms, 42 Vpk, or 60 Vdc are considered hazardous voltages.

Current greater than 8A or energy greater than 150 VA is also considered hazardous.

AVERTISSEMENT

Un couvercle de sécurité à verrouillage est recommandé afin de protéger l'opérateur des chocs électriques causés par des tensions ou des courants qui peuvent être appliqués à l'appareil à l'essai. Les tensions supérieures à 30 V (eff.), 42 V (c.c.) ou 60 V (c.c.) sont dangereuses. Un courant supérieur à 8 A ou une énergie supérieure à 150 V-A sont dangereux.

Appendix A

Parts Lists

This appendix lists the components that make up the mass interconnect fixture for the Agilent TS-5400 test system. Where possible, both Agilent and MacPanel part numbers are shown.

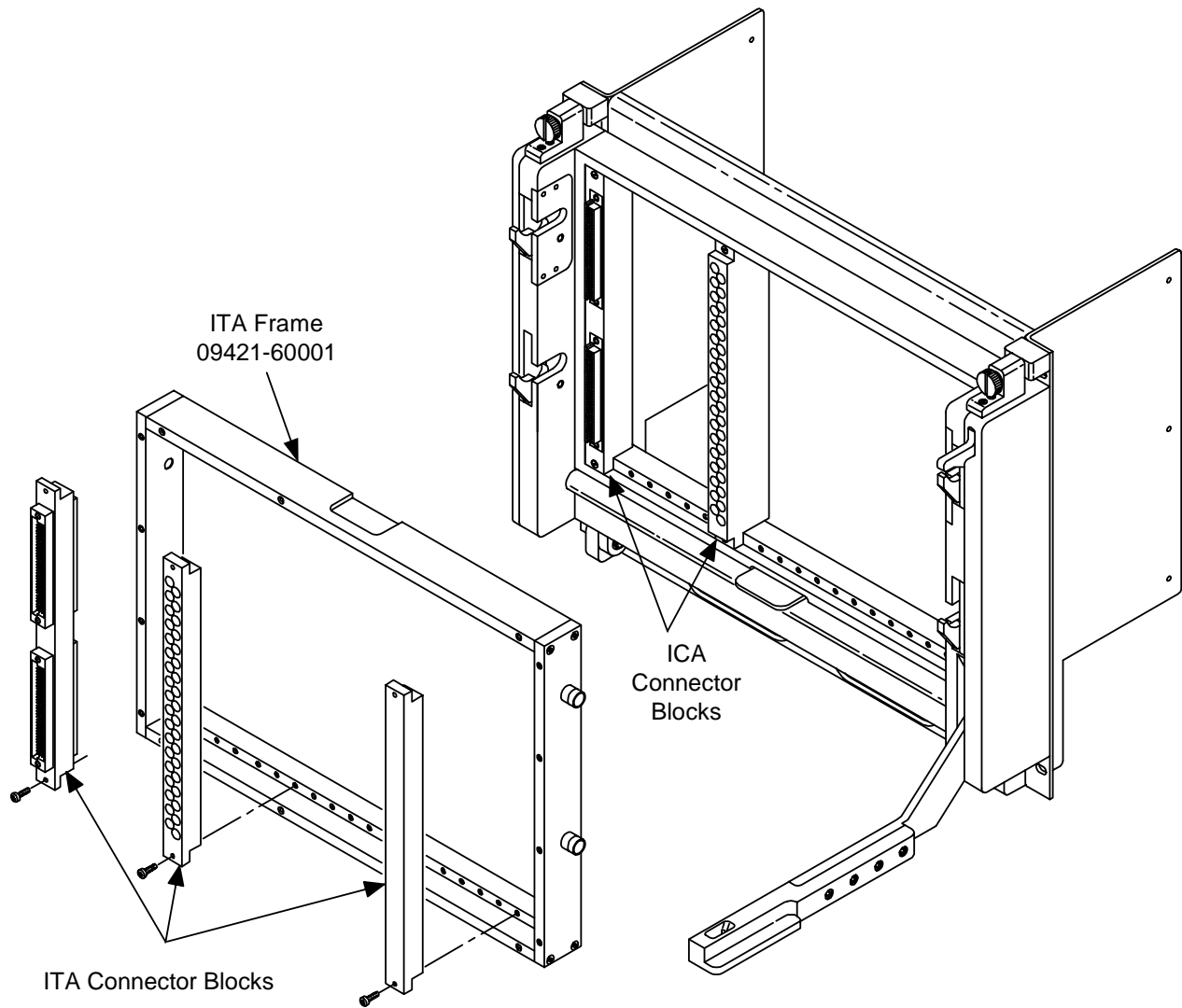


Figure A-1. Mass Interconnect Assembly

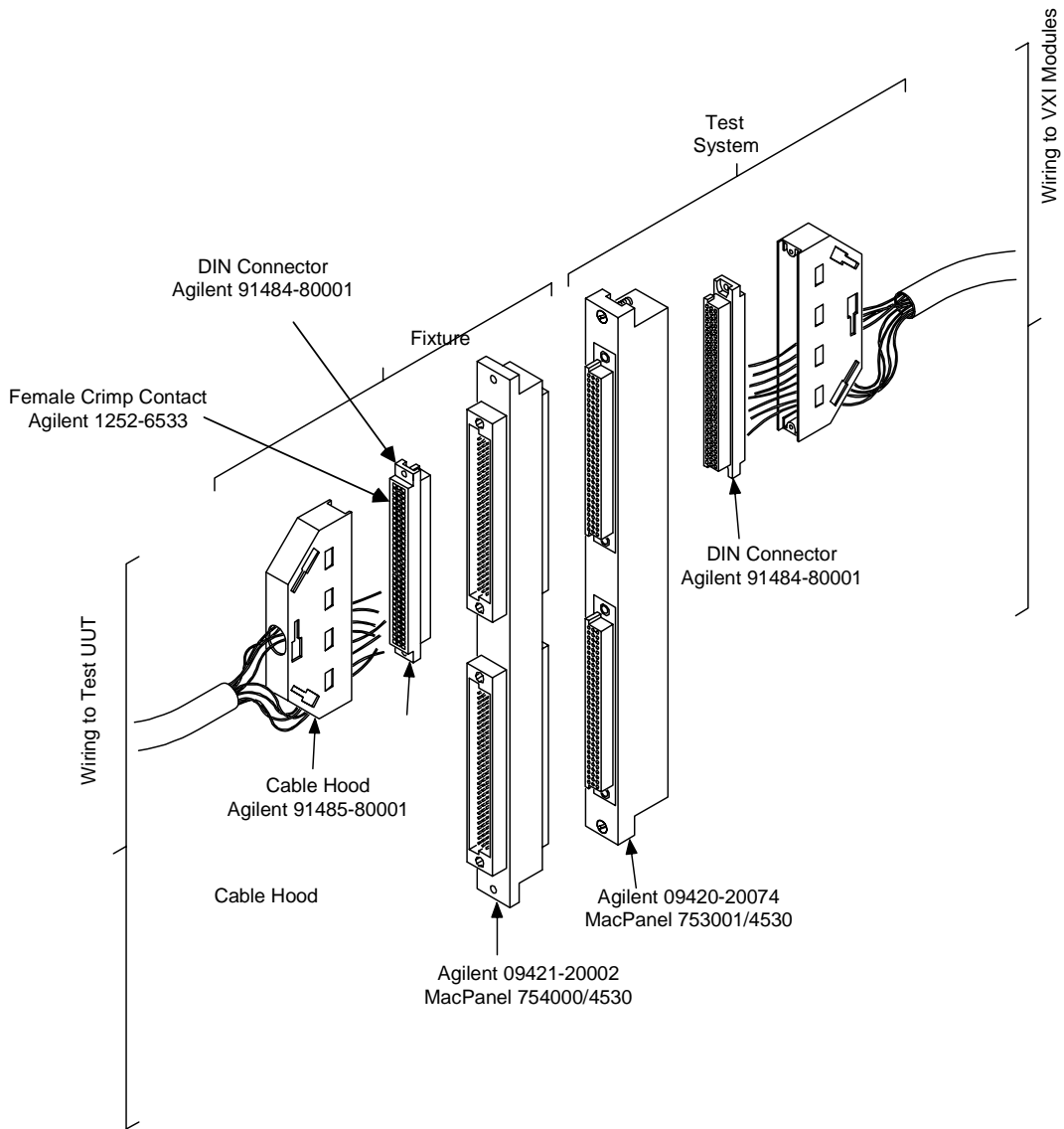


Figure A-2. General Purpose Connector Blocks

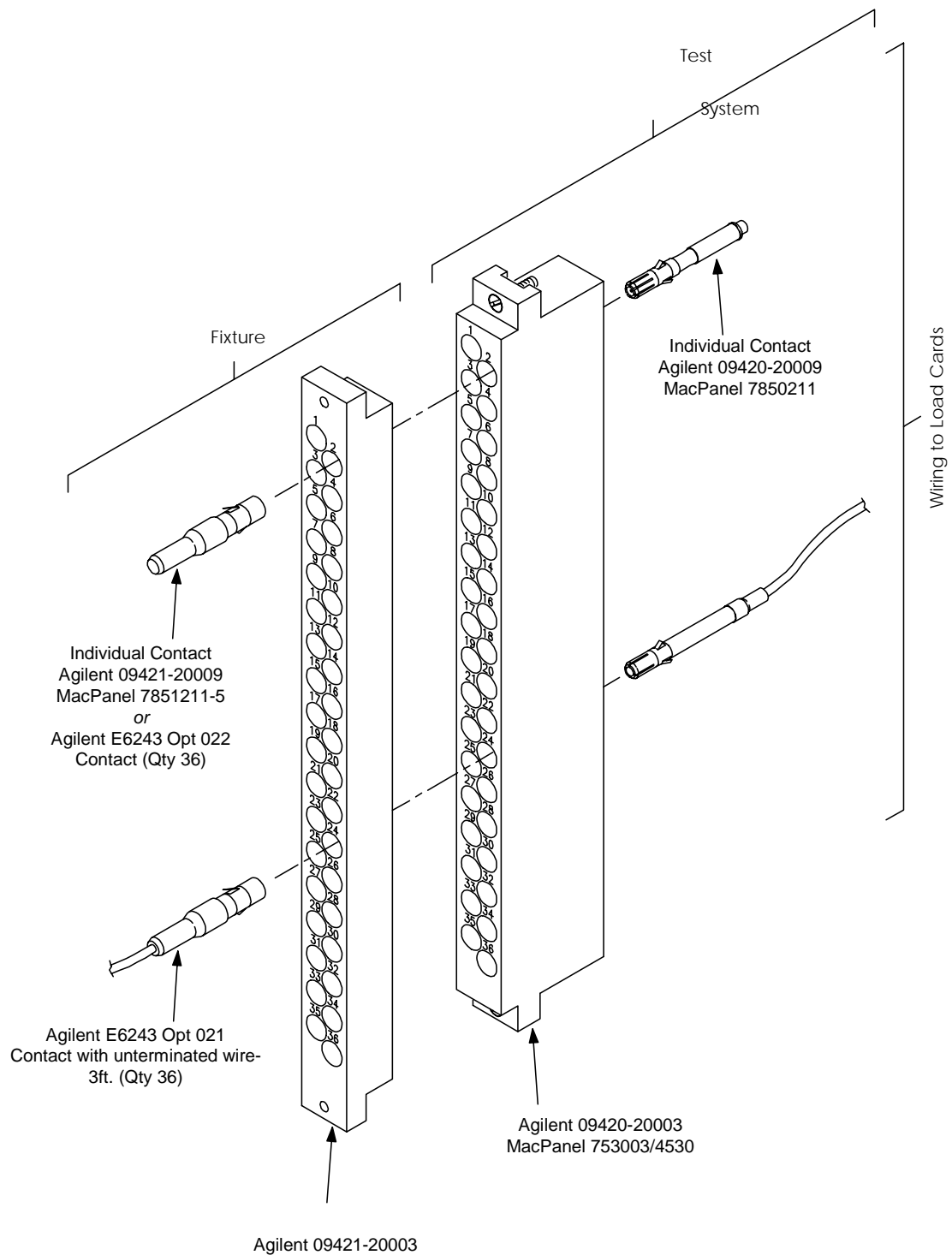


Figure A-3. High Power Connector Blocks

Part Number Cross-Reference

Table 2-1 shows the Agilent Model and Part numbers, the former part number and, where applicable, the Mac Panel Part Number.

Table 2-1. Part Number Cross-Reference

Description	Former Part Number	Remark	Agilent Model Number	Agilent Part Number	Mac Panel Part Number
General purpose connector	91421B	ICA side	E6177A opt. 050	09420-20074	753001/4530
General purpose connector	91451A	ITA side	see below *	09421-20002	754000/4530
Receptacle Contact Housing	91484A	see below *	NA	91484-80001	
Cable Hood	91485A	see below *	NA	91485-80001	
Receptacle Contact	91487A	Crimp type female	NA	1252-6533	NA
High-Power ITA Fixture Block	91453A	ITA side	E6243A opt. 020	09421-20003	754001/4530
High-power Receptacle Contact	91462A	ITA side	E6243A opt. 022 (Qty. 36)	09421-20009	7851211-5
High-Power ICA Fixture Block	91423A	ICA side	E6178B opt. 050	09420-20003	753003/4530
High-Power ICA Contact	91463A	ICA side	NA	09420-20009	7850211

* E6243A option 010 includes:

- 91451A (Qty 1)
- 91484A (Qty 2)
- 91485A (Qty 2)
- Retainer clip E3750-01206 (Qty 1)

Cables

Table 2-2 lists the cables used to connect instruments to the Mass Interconnect. Drawings and pinouts for these cables are located in the TS-5400 System Integrator's Manual. This manual is available online from the TestExec SL Tools menu. Click Tools | TS-5400 Online Manuals.

Table 2-2. Cables

Agilent Part Number	Description
E3750-61602	3x1 twinax to 3x1. Connects the E6171A MCM to ICA 1A connector.
E3750-61608	Digital to Analog Converter Cable. The E1418A DAC Module uses two of these cables to connect to the mass interconnect.

Table 2-2. Cables

Agilent Part Number	Description
E3750-61612	2x1 Coax to 2x1. Connects the E6171A MCM to ICA 1A connector.
E3750-61613	Serial Interface Cable. This cable connects the bus expander module serial interface to the mass interconnect.
E3750-61614	8-Channel Load Card Cable
E3750-61615	16-Channel Load Card Cable
E3750-61624	8-Channel Heavy-Duty Load Card Cable
E3750-61626	Dual 24-Channel Load Card Cable
E3751-61601	64-Conductor Twisted-Pair Cable. This cable is a reversed pinout cable with the signal pins on the 32-Pin Matrix Module (right column) connected to the ICA signal column (left column) beginning with pin 3, then pin 6, etc. The cable is also used to connect the E6174A Event Detector to the ICA.
E6170-61603	E8792/E8793 Pin Matrix Cable
E6170-61610	64-Conductor Twisted-Pair Cable. This cable connects the Switch/Load Unit motherboard connector directly to the mass interconnect connector 1B.

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