Twin-X General Purpose I/O Board

User's Manual

ASDG Incorporated

March 14, 1989

Contents

Part I

NOTICES

1 Copyrights

2 Restrictions

3 Attributions

Amiga is a trademark of Commodore-Amiga, Inc. Twin-X is a trademark of ASDG Incorporated. iSBX and Multibus are trademarks of Intel Corporation.

4 FCC Compliance

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If you suspect interference, you can test the product by turning the Amiga off and on with this product installed and not installed. If this product does cause interference, try the following:

1. Reorient the antenna or AC plug on the affected equipment.
2. Change the relative positions of the Amiga and the affected equipment.
3. Move the Amiga farther away from the affected equipment.

4. Plug either the Amiga or the affected equipment into a different outlet so that the Amiga and the affected equipment are on different circuits.

Use only shield-grounded cables when connecting peripherals to the Amiga.

All peripherals must be labeled to comply with the FCC emissions requirements. Class B certified devices will usually have lower emissions than Class A devices.

Operation with unlabeled peripherals is likely to result in interference.

Use this equipment only with three-pronged type (AC ground) AC wall recepticals.

If necessary, consult your dealer or an experienced Radio Frequency Interference technician for additional suggestions. You may find the FCC booklet “How to Identify and Resolve Radio-TV Interference Problems” helpful. It is available from the U.S. Government Printing Office, Washington, D.C. 20402, stock no. 004-000-00345-4.

5 Disclaimer

THIS MANUAL HAS BEEN CHECKED AND IS BELIEVED TO BE ACCURATE AND CORRECT AND IS SUBJECT TO CHAxNGE WITHOUT NOTICE. THE INFORMATION IN THIS MANUAL IS PROVIDED “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED. THE ENTIRE RISK AS TO THE ACCURACY OF THE INFORMATION HEREIN IS ASSUMED BY THE USER. ASDG INCORPORATED DOES NOT WARRANT, GUARANTEE, OR MAKE ANY REPRESENTATIONS REGARDING THE USE OF, OR THE RESULTS OF THE USE OF, THE INFORMATION IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE. ASDG INCORPORATED WILL NOT BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE INFORMATION EVEN IF ASDG INCORPORATED HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

6 Introduction

Congratulations on the purchase of your new Twin-X expansion board. This board will allow you to add one or two IEEE 959 (iSBX) expansion modules to your Commodore Amiga computer. This provides the Amiga with the ability to communicate through the wide variety of interfaces that IEEE 959 modules exist for.

The iSBX standard was originally defined by Intel Corporation as part of their Multibus board

interface standard. The module concept was used to allow the customer to define his own system by combining a general purpose base board with the modular I/O function necessary for his application. The standard was later submitted to, and accepted by, the Institute of Electrical and Electronic Engineers (IEEE) as an industry wide standard (IEEE 959).

There are a wide variety of Twin-X compatible modules available from many manufacturers. Examples include RS 232 ports, counter/timers, relay outputs, parallel I/O, stepper motor controllers, IEEE 488 controllers, SCSI host adapters, analog to digital converters, battery backed up RAM, Modems, prototyping modules, speech synthesizers, barcode readers, floating point coprocessors, floppy disk controllers, digital to analog converters, graphics controllers, and Centronics printer interfaces.

Call ASDG for a partial listing of available modules and current manufacturers. Let us help you find the module to fit your needs. ASDG can also design modules and write software drivers to help you with your custom projects.

Part II

SPECIFICATIONS

7 Electrical Specifications

7.1 Power Requirements

Twin-X Base Board	+4.75 to 5.25Vdc at 1.8 A Max. (1.4 A Typical)
SBX Modules (each)	+4.75 to +5.25Vdc at 3.0 A Max. + 11.4 to +12.6Vdc at 1.0 A Max. -12.6 to -11.4Vdc at 1.0 A Max.

8 Environmental Specifications

The Twin-X board is rated for the following environmental conditions:

- Storage Temperature.....-40 to +70 degrees C
- Operating Temperature.....0 to +55 degrees C
- Relative Humidity.....5 to 85% (non-condensing)

9 Physical Specifications

Due to adherence to the IEEE 959 physical specification and to module cooling requirements, Twin-X fitted with many IEEE 959 modules will consume two Amiga 2000 Zorro slots. Should the Twin-X be installed in the first Amiga 2000 Zorro slot, however, only one slot will be consumed.

Even if a Twin-X (with modules attached) should appear to fit within a single Amiga 2000 Zorro slot, ASDG does NOT reccomend that the system be operated in this way. This is because most modules require direct airflow to operate correctly.

Maximum 5.50" high by 13.85" long by 1.17" deep (including rear panel bracket and iSBX modules)

See Figure 1 for a drawing of the Twin-X physical specifications.

10 Interface Features

10.1 Zorro Interface

- Separate auto config space for each iSBX module
- Second config space may be turned off if only one iSBX module is to be used
- DIP switches and jumpers define module types to allow full auto-configuring
- Each module occupies one standard Amiga I/O space
- All address, data and control lines are buffered to prevent bus loading
- No wait states with most iSBX modules. Wait states automatically added for iSBX modules that require slower accesses
- Jumper block provided to connect iSBX module interrupts to Amiga interrupt lines allowing user defineable priorities

10.2 iSBX Interface

- iSBX bus baseboard with D16/16 I compliance level
- Supports 8 and 16 bit modules
- Supports interlocked operations using MWAIT* signal
- Supports two single wide or one double wide module

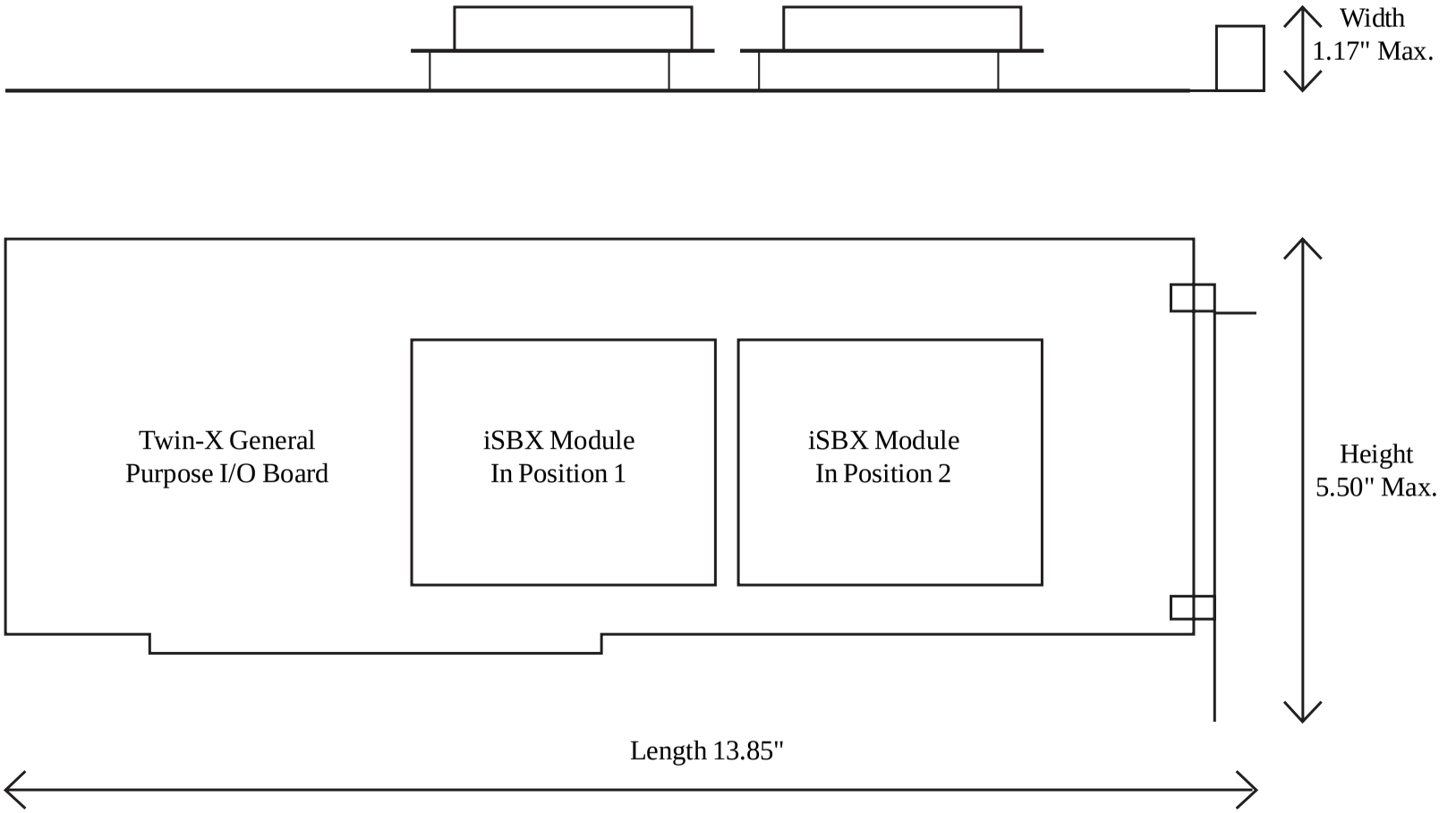


Figure 1: Twin-X Physical Specifications

- Allows the connection of iSBX DMA request lines to Amiga interrupt lines
- Allows Amiga access to the iSBX DMA acknowledge port for software flexibility
- Allows additional address lines to be connected to the module through the iSBX OPT0 and OPT1 lines
- Provides a 10MHz MCLK and supports use of MPST* to determine if a module is installed

11 Interface Pinouts

11.1 Zorro Interface

The Twin-X supported Zorro interface signal lines are shown in Figure 5 below.

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	Ground	2	Ground	51	---	52	A18
3	Ground	4	Ground	53	---	54	A19
5	+5VDC	6	+5VDC	55	---	56	A20
7	---	8	---	57	A22	58	A21
9	/SLAVE	10	+12VDC	59	A23	60	---
11	/CFGOUT	12	/CFGIN	61	Ground	62	---
13	Ground	14	---	63	D15	64	---
15	---	16	---	65	D14	66	---
17	---	18	XRDY	67	D13	68	READ
19	/INT2	20	-12VDC	69	D12	70	/LDS
21	A5	22	/INT6	71	D11	72	/UDS
23	A6	24	A4	73	Ground	74	/AS
25	Ground	26	A3	75	D0	76	D10
27	A2	28	--—	77	D1	78	D9
29	Al	30	---	79	D2	80	D8
31	---	32	---	81	D3	82	D7
33	---	34	---	83	D4	84	D6
35	---	36	---	85	Ground	86	D5
37	Ground	38	--—	87	Ground	88	Ground
39	---	40	/EINT7	89	Ground	90	Ground
41	---	42	/EINT5	91	Ground	92	---
43	---	44	/EINT4	93	DOE	94	/BUSRST
45	A16	46	/BEER	95	--—	96	/EINT1
47	A17	48	---	97	--—	98	---

49	Ground	50	---	99	Ground	100	Ground

Figure 5: Twin-X Zorro Interface Signals

11.2 IEEE 959 (iSBX) Interface Connections

The Twin-X supported iSBX interface signal lines are shown in Figure 6 below.

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	+12VDC	2	-12VDC	23	MD5	24	---
3	GND	4	+5VDC	25	MD4	26	---
5	RESET	6	MCLK	27	MD3	28	(MA4)
7	MA2	8	MPST*	29	MD2	30	(MA3)
9	MA1	10	---	31	MD1	32	MDACK*
11	MA0	12	MINTR1	33	MD0	34	MDRQT
13	IOWRT*	14	MINTR0	35	GND	36	+5VDC
15	IORD*	16	MWAIT*	37	MD14	38	MD15
17	GND	18	+5VDC	39	MD12	40	MD13
19	MD7	20	MCS1*	41	MD10	42	MD11
21	MD6	22	MCS0*	43	MD8	44	MD9

Figure 5: IEEE 959 (iSBX) Interface Signals

Part III

USER INFORMATION

12 Module Installation

Each iSBX module that you receive should include a threaded nylon standoff and two nylon screws (double wide modules should contain three sets of these). Mount the standoff(s) to the module on the same side as the iSBX interface connector using the mounting holes provided in the module.

Snap the module firmly in place over one of the two blue connectors on the Twin-X board. If only one module is used, it should always be placed in the Module 1 position on the Twin-X board (This applies to single and/or double width modules). The module may now be screwed in place using the remaining nylon screw(s) from the solder side of the Twin-X board.

A double wide module will snap in place over the blue connector for Module 1. Two of its three standoffs will line up with mounting holes in the Twin-X board. Screw the module in place using nylon screws through these two holes.

13 Installing Cables And Brackets

Modules provided by ASDG will include cables and brackets to allow all necessary connectors to be available at the rear of the Amiga. Modules provided by other vendors will usually not include cables or brackets for use in the Amiga computer. ASDG may be able to provide cabling and/or brackets to fit your needs if you can not make or procure them yourself.

Install cables onto the iSBX modules being careful to match pin 1 of the cable connector to pin 1 of the module connector. Most cable connectors will have a raised or inset arrow indicating pin 1 or they may have pin numbers set in the plastic of the connector. Pin 1 of the module connector should be clearly marked in the silkscreen of the printed circuit board or pointed out in the manual for the module.

Install the brackets at the other end of each of the cables into Amiga rear panel.

14 Setting DIP Switches

There are two sets of DIP switches on the Twin-X board. The set labeled DS1 is used for Module 1 and the DS2 DIP switches are for Module 2. Driver software will read the DIP switches to determine what types of iSBX modules are present.

ASDG supplies a jumper settings list for each of the modules that it supplies software support for. Set DS1 for the type of module located in Module Position 1 and DS2 for the module type located in Module Position 2.

If you are not using ASDG supplied software, you may use any DIP switch setting to identify the module to your software. Leave the J1 jumpers corresponding to this module position out to prevent this user defined setting from being confused with the ASDG defined settings.

15 Jumper Settings

ASDG supplies a jumper settings list for each of the modules that it supplies software support for.

Please see Figure 2 for a diagram showing the locations and numbering of the Twin-X jumper blocks and DIP switches.

Figure 2:Twin-X General Purpose I/O Board

Jumper Locations And Numbering

J1 Pin Numbers

1 3 5 7

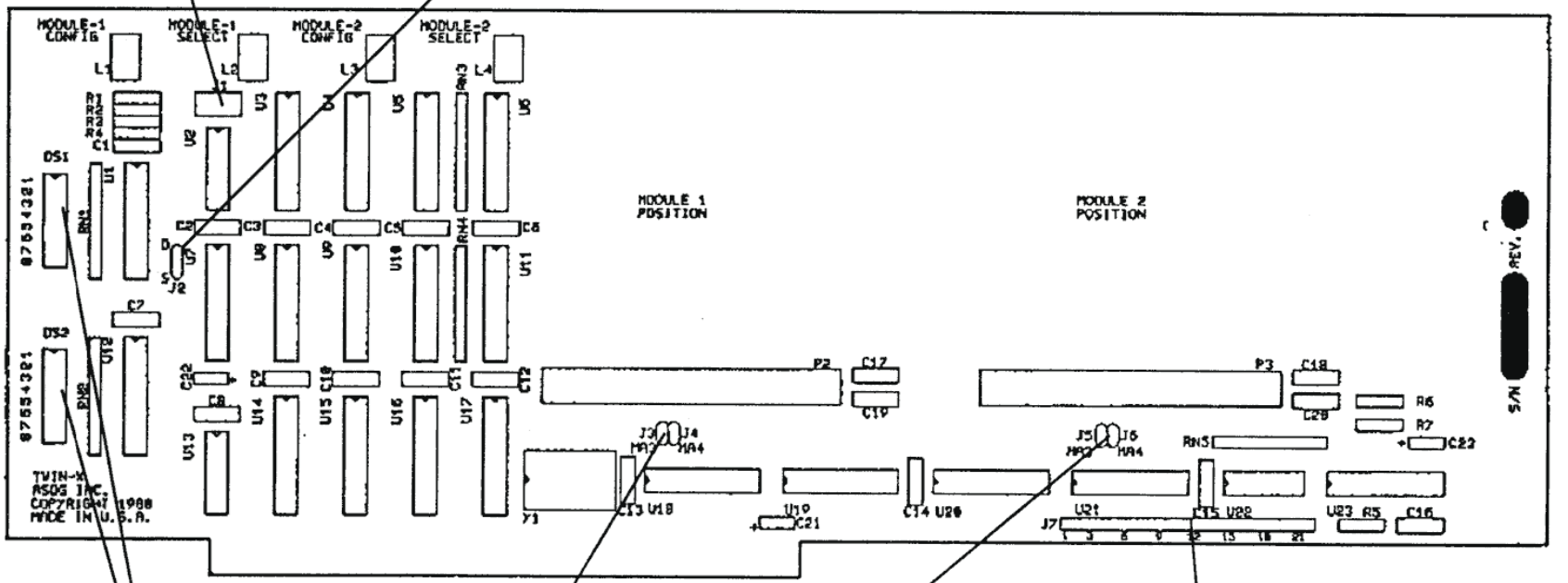
2 4 6 8

J2 Pin Numbers

1

2

3



DS1 & DS2 DIP Switches

Numbering is on the switches and on the board silk screen next to the switches

J3 and J4 Pin Numbers

1 1

J3 2 2 **J4**

J5 and J6 Pin Numbers

1 1

J5 2 2 **J6**

J7 Pin Numbers

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

15.1 J1: ASDG / Non-ASDG Modules

The J1 settings are used along with the DIP switch settings to allow the software to identify the types of modules present.

The numbering and position definitions of J1 are as follows:

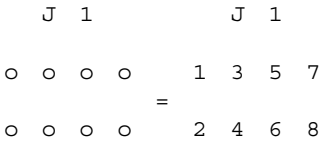


Figure 1: J1 Jumper Positions

Jumper Connection	Function When Installed	Function When Not-Installed	Defined For
1 to 2	Reserved	Standard Module	Module 1
3 to 4	ASDG Software	Non-ASDG Software	Module 1
5 to 6	Reserved	Standard Module	Module 2
7 to 8	ASDG Software	Non-ASDG Software	Module 2

Table 1: J1 Jumper Definitions

15.2 J2: Single / Dual Modules

The position of jumper J2 determines whether one or two config spaces, and therefore modules, will be seen by the Amiga. If two modules are present on the Twin-X board, the jumper should be in the upper position. If only one module is present, the jumper should be in the lower position and the module present must be in Module Position 1.

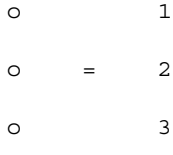


Figure 2: J2 Jumper Positions

Jumper Connection	Function Defined
1 to 2	Dual Modules
2 to 3	Single Module

Table 2: J2 Jumper Definitions

15.3 J3-J6: Extended Module Addressing

Jumpers J3 to J6 allow additional address lines to be connected to the iSBX interface for use with non-standard modules. Adding these address lines is not part of the standard iSBX or IEEE 959 specification. These jumpers should be left off for use with most standard iSBX modules.

The ability to connect to these additional address lines was added to the Twin-X board to allow custom I/O modules to be designed that require more addressing space. See the PROGRAMMERS INFORMATION section for more information on how these lines may be used.

Figure 3: J3 to J6 Jumper Positions

Jumper Installed	Signal Added	Module Affected
J3	MA3	Module 1
J4	MA4	Module 1
J5	MA3	Module 2
J6	MA4	Module 2

Note: Leave These Jumpers Out For Standard Modules

Table 3: J3 to J6 Jumper Definitions

15.4 J7: Interrupts

Jumper J7 allows the module interrupt and DMA request lines to be connected to any of the Amiga 2000 interrupt lines.

Interrupts on standard Amiga expansion boards should connect to either /INT2 or /INT6 on

the Zorro bus. The Twin-X board allows any of the iSBX interrupts and/or DMA requests to be connected directly to Zorro /INT2 or /INT6 with a jumper shunt. Connections to the other Zorro bus interrupts is possible, but requires a jumper connection using wire wrap wire.

All of the interrupt and DMA request outputs in this jumper block are driven by open collector drivers, allowing more than one to be connected to the same interrupt signal line.

Connections other than those called out on the jumper settings sheet may cause incorrect Amiga operation. One common symptom of wrong or unnecessary connections in the J7 space is the Amiga not getting far enough in its initialization sequence to ask for the workbench disk. Be sure to check these jumper settings very carefully.

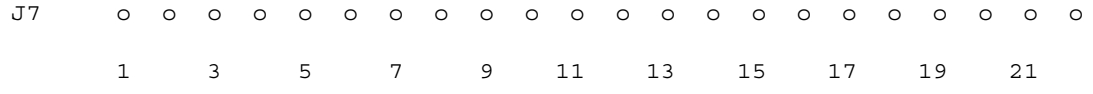


Figure 4: J7 Jumper Positions

J7 Pin:	1		2		3		4			
Signal:	/EINT7		/EINT5		/EINT4		/EINT1			
J7 Pin:	5	6	7		8	9	10			
Signal:	/INT6	M1INT0	/INT2		/INT6	M1INT1	/INT2			
J7 Pin:	11	12	13		14	15	16			
Signal:	/INT6	M1DRQT	/INT2		/INT6	M2INT0	/INT2			
J7 Pin:	17	18	19		20	21	22			
Signal:	/INT6	M2INT1	/INT2		/INT6	M2DRQT	/INT2			

Table 4: J7 Jumper Definitions

16 LED Functional Descriptions

The LEDs provide feedback to the user on the Twin-X board activity. The LED information allows programmers and system designers to verify the auto-configuration of the boards in the system and see the relative access rate to each of the modules on the Twin-X board.

The “MODULE-1 CONFIG” LED will go on AFTER the first module has been linked into the Amiga I/O space as part of the auto-configuration process. This occurs a few seconds after power up or reset. The LED should remain on until the next power down or reset.

The “MODULE-2 CONFIG” LED will go on AFTER the second module has been linked into the Amiga I/O space. If the Twin-X board is jumpered for single module operation (J2 is in the lower or S position), this LED should not come on. Twin-X boards jumpered for single module operation have only one config space and the Amiga will not map the second module into the I/O space.

The “MODULE-1 SELECT” LED will go on during each access to module 1 and the “MODULE-2 SELECT” LED will go on during each access to module 2. The length of most accesses is less than 1 microsecond, so it takes quite a few module accesses per second before the LEDs will appear to be glowing.

The relative brightness of the SELECT LEDs indicates the percentage of the time the modules are being accessed. An LED that appears to be off indicates no or very low module activity and a brightly lit LED shows that the module is being accessed most of the time.

17 Installing Twin-X In An Amiga 2000

A small to medium size Phillips screw driver is required to install a Twin-X board in an Amiga 2000.

Remove the screws along the bottom of the sides of the Amiga 2000. There are two screws along the lower edge of each side of the machine.

Remove the screw in the top center of the back of the Amiga 2000. This screw is located between a similar looking screw which holds in the top corner of the power supply and a smaller screw which holds the bracket for the coprocessor slot in place.

Grasp the cover on both sides and slide it toward the front of the Amiga 2000 and up.

Unscrew the bracket for the slot the Twin-X board will be mounted in and remove it from the system. Install the Twin-X board in the slot you have decided on, making sure that the board seats firmly in the connector. Re-use the screw you removed above to screw the Twin-X board bracket in place.

Remove other brackets from the back of the Amiga as needed. Replace them with the new brackets that have your Twin-X I/O cables on them.

Re-install the cover of the Amiga by reversing the steps you used to remove it.

Part IV

PROGRAMMERS INFORMATION

18 Config Space

The Twin-X board has a separate config space for each of the two module positions. The only difference between the two config spaces is that the config space for module 1 will have the Chained Config Request bit set in nibble 2 if J2 is set in the upper (dual module operation) position. This bit set indicates to the programmer that there are two config spaces on this board. If J2 is in the lower (single module operation) position, this bit will not be set and the second config space (along with the module in Module Position 2) will not be seen by the Amiga.

The config space provides Amiga driver software with information on the board type, the amount of memory space it occupies, the manufacturer and a serial number. The Twin-X board uses the serial number space to pass the DIP switch and J1 jumper information to the software. The software can use this information to determine what iSBX module type is represented by that data.

Twin-X config data is as follows:

Nibbles:	Bits 7 to 0:	Notes:
00/02	1100 X001	Current style board, don't link in memory free list, size = 64 kilobytes and the X is for the Chained Request Bit which is explained above.
04/06	1111 1111	Product Number = 255
08/0A	0100 0000	Any space is OK, Cannot be shut up
0C/0E	0000 0000	Reserved
10/12	0000 0011	ASDG manufacturers id
14/16	1111 1111	
18/1A	0000 0000	Serial Number, byte 0 (msb)
1C/1E	0000 0000	Serial Number, byte 1
20/22	0000 00XY	Serial Number, byte 2 X=l for J1:l-2 connected, X=0 for 1-2 open Y=l for J1:3-4 connected, Y=0 for 3-4 open
24/26	XXXX XXXX	Serial Number, byte 3 (lsb) Contents of DIP

```
                                switches show up here. DIP switch 8 is in
                                data bit 7 and DIP switch 1 is in data bit 0.
                                An open switch is a 0 and a closed or "ON"
                                switch is a 1. These serial number values are
                                used to identify the type of module present.

All Others    0000 0000         The rest of the config space is all 0's
```

19 iSBX / IEEE 959 Interface Overview

The basic iSBX (IEEE 959) interface is comprised of 8 or 16 data lines, 3 address lines, 2 chip select lines, a WAIT line, and read and write strobes. In byte mode, the two chip selects and three address lines provide a total of 16 possible register locations.

The two chip selects are driven at the same time to indicate word (16 bit) mode accesses, so there are still only sixteen bytes accessible (addressed as eight words).

The iSBX (IEEE 959) interface also provides two interrupt lines, a DMA request line (which is used as another interrupt source on Twin-X), a DMA acknowledge line (which Twin-X treats as another memory mapped chip select), a 10 MHz clock line, and a reset line (controlled by the Amiga reset signal).

The Twin-X board provides the option to connect two more address lines to the iSBX interface through jumpers (J3 and J4 for Module Position 1 or J5 and J6 for Module Position 2). This increases the address space available for use on custom module designs, but is not a part of the iSBX or IEEE 959 standard.

20 Byte (8-Bit) Mode Module Addressing

Most iSBX module manuals define their module registers in relation to the three address lines and the two chip selects. Below is a table of the address offsets from the base of the Twin-X module address space. The "Ox" numbers under the "Chip Select Lines" columns are hex offsets from the module base address. The address of a register on a IEEE 959 module is found by adding:

```
Module Base Address + Hex Offset = Address Of  Specific Register
```

Each module's base address gets written into Twin-X base address registers by the Amiga as the system is configured after powerup. The specific location that a module I/O space was mapped to is available to the programmer through the Amiga's ConfigDev List. Each module on the Twin-X board has a separate config space and will receive a separate base address.

Address Lines			Chip Select Lines	
MA2	MA1	MA0	MCS0*	MCS1*
0	0	0	0x01	0x41
0	0	1	0x03	0x43
0	1	0	0x05	0x45
0	1	1	0x07	0x47
1	0	0	0x09	0x49
1	0	1	0x0B	0x4B
1	1	0	0x0D	0x4D
1	1	1	0x0F	0x4F

Table 5: iSBX Module Offsets For 8 Bit Accesses

21 Word (16-Bit) Mode Module Addressing

In word data mode, both module chip select lines go low (true) on each access. Below is a table of the offsets from the module base for 16-bit accesses.

Note: User's should try to avoid making word accesses to modules that are designed for byte (8-bit) accesses only. This is because many 8-bit modules use the two chip selects for different module features and do not protect against having two sets of chips driving the data lines at the same time (which can cause damage to the module).

Address Lines			Chip Select Lines
MA2	MA1	MA0	MCS0* and MCS1*
0	0	0	0x00
0	0	1	0x02
0	1	0	0x04
0	1	1	0x06
1	0	0	0x08
1	0	1	0x0A
1	1	0	0x0C
1	1	1	0x0E

Table 6: iSBX Module Offsets For 16-Bit Accesses

22 Twin-X Module Status

Twin-X has ports for reading the interrupt, DMA request, and Module Present status bits for each module. The bit locations and the address of the port are in Figure 5 below. The status port must always be read as a byte.

Status Port Offset From Module Base = 0xFE

D7	D6	D5	D4	D3	D2	D1	D0
DRQT	INT1	INT0	/MPST	----	----	----	----

Figure 5: Twin-X Module Status Port

The DRQT (DMA request) and interrupt bits are high true. The Module Present STatus (MPST) bit indicates a module is in place when this bit is low. The four least significant bits are unused and will not be in a definate state.

23 Using Extended Module Addressing Jumpers (J3 to J6)

Installing jumpers J3 and J4 adds two more address lines to Module 1 and similarly, installing jumpers J5 and J6 adds two address lines to Module 2. The additional address lines are not necessary for standard modules and may interfere with module operation (if the module uses the OPT lines for any other signals). These additional address lines will allow modules to be made which need more than 16 bytes of direct port addressing.

Table 7, below, provides the address offsets from the module base address for 8-bit module operation. Notice that MCS1 cannot be turned on with MA3 and MA4 set. This is do to hardware considerations on the Twin-X board.

Address Lines					Chip Selects		Address Lines					Chip Selects	
MA4	MA3	MA2	MA1	MA0	MCS0	MCS1	MA4	MA3	MA2	MA1	MA0	MCS0	MCS1
0	0	0	0	0	0x01	0x41	0	1	0	0	0	0x11	0x51
0	0	0	0	1	0x03	0x43	0	1	0	0	1	0x13	0x53
0	0	0	1	0	0x05	0x45	0	1	0	1	0	0x15	0x55
0	0	0	1	1	0x07	0x47	0	1	0	1	1	0x17	0x57
0	0	1	0	0	0x09	0x49	0	1	1	0	0	0x19	0x59
0	0	1	0	1	0x0B	0x4B	0	1	1	0	1	0x1B	0x5B
0	0	1	1	0	0x0D	0x4D	0	1	1	1	0	0x1D	0x5D
0	0	1	1	1	0x0F	0x4F	0	1	1	1	1	0x1F	0x5F

1	0	0	0	0	0x21	0x61	1	1	0	0	0	0x31	*
1	0	0	0	1	0x23	0x63	1	1	0	0	1	0x33	*
1	0	0	1	0	0x25	0x65	1	1	0	1	0	0x35	*
1	0	0	1	1	0x27	0x67	1	1	0	1	1	0x37	*
1	0	1	0	0	0x29	0x69	1	1	1	0	0	0x39	*
1	0	1	0	1	0x2B	0x6B	1	1	1	0	1	0x3B	*
1	0	1	1	0	0x2D	0x6D	1	1	1	1	0	0x3D	*
1	0	1	1	1	0x2F	0x6F	1	1	1	1	1	0x3F	*

NOTE: "*" indicates that these positions cannot be accessed.

Table 7: 8-Bit Address Offsets With Extended Address Jumpers

Table 8 provides the offsets for 16-bit accesses using the extended address lines. Using the word (16-bit) access mode with the extended addressing jumpers provides a total of 32 words of addressing space for module designers to work with.

Address Lines					Chip Selects	Address Lines					Chip Selects
MA4	MA3	MA2	MA1	MA0	MCS0 and MCS1	MA4	MA3	MA2	MA1	MA0	MCS0 and MCS1
0	0	0	0	0	0x00	0	1	0	0	0	0x10
0	0	0	0	1	0x02	0	1	0	0	1	0x12
0	0	0	1	0	0x04	0	1	0	1	0	0x14
0	0	0	1	1	0x06	0	1	0	1	1	0x16
0	0	1	0	0	0x08	0	1	1	0	0	0x18
0	0	1	0	1	0x0A	0	1	1	0	1	0x1A
0	0	1	1	0	0x0C	0	1	1	1	0	0x1C
0	0	1	1	1	0x0E	0	1	1	1	1	0x1E
1	0	0	0	0	0x20	1	1	0	0	0	0x30
1	0	0	0	1	0x22	1	1	0	0	1	0x32
1	0	0	1	0	0x24	1	1	0	1	0	0x34
1	0	0	1	1	0x26	1	1	0	1	1	0x36
1	0	1	0	0	0x28	1	1	1	0	0	0x38
1	0	1	0	1	0x2A	1	1	1	0	1	0x3A
1	0	1	1	0	0x2C	1	1	1	1	0	0x3C
1	0	1	1	1	0x2E	1	1	1	1	1	0x3E

Table 8: 16-Bit Address Offsets With Extended Address Jumpers

24 Using Module DMA Features

The Twin-X board does NOT support standard module DMA modes. This is because there is no DMA on the Twin-X board itself and the Zorro bus does not provide any DMA support.

Twin-X does allow the DMA request line from each module to be connected to an Amiga interrupt line. This is coupled with the ability to read the status port on the Twin-X board to determine if the DMA request is the signal that caused the interrupt. These two features allow the use of the DMA request to be used as an alternate interrupt.

Twin-X also allows the interrupt to be serviced using an address that the module will see as a DMA acknowledge. This allows automatic DMA support features within the chips on a given module to be used even though true DMA support is not available. The DMA acknowledge addresses are listed in Table 9.

```
 8-Bit DMA Acknowledge Address  =  0xFD
16-Bit DMA Acknowledge Address  =  0xFC
```

Table 9: DMA Acknowledge Port Addresses

Part V

SERVICE AND REPAIR INFORMATION

Service and repair assistance can be obtained from ASDG Incorporated by calling: (608) 273 - 6585.

Always contact ASDG before returning a product for service. Please have the following information available when you call:

1. Product name, serial number, and revision number.
2. Your shipping and billing address
3. Your contact name and telephone number

Ship products back in the same container they came in, if at all possible. If the original container is not available, take the following precautions:

1. Place boards in anti-static bags.

2. Allow room for padding material.

3. Send the product, a description of the problem, and the information from your phone conversation with the ASDG service staff to:

ASDG Incorporated
925 Stewart Street
Madison, WI 53713
Attn: Service Department

Professional ScanLab™

Twin-X Board Jumper Settings

DIP Switch Or Jumper Name	Switch Position Orientations and Jumper Shunts Required
DS1	Switch Position No. 8 7 6 5 4 3 2 1 Switch Orientation 0 0 0 0 0 0 1 1 (1=closed or ON, 0=open or OFF)
J1	3-4 (Jumper shunts may be required on positions 5-6 or 7-8 for the module in position 2)
J2	1-2 for two modules present on Twin-X 2-3 for one module present on Twin-X
J3-J4	Don't care (Jumper shunts may be in or out)
J5-J6	Don't care (Check jumper requirements for module position 2)
J7	No jumper shunts required for Professional ScanLab. Module in position 2 may require jumper shunt(s) on J7.

SBX-GPIB Module Jumper Settings

DIP Switch Or Jumper Name	Switch Position Orientations And Jumper Shunts Required
DS1	Switch Position No 8 7 6 5 4 3 2 1 Switch Orientation 1 1 1 1 1 1 1 1 (1=closed or ON, 0=open or OFF)
J1	Place jumper shunt in the "NO" position
J2	Don't care (Normally left open)

Scanner DIP Switch Settings

Scanner Type	Switch Position Orientations
JX450	Switch Position No. 32 16 8 4 2 1 Switch Orientation 0 0 0 1 1 1
JX300	Switch Position No. 8 7 6 5 4 3 2 1 Switch Orientation 0 0 0 0 0 1 1 1 (1=closed or ON, 0=open or OFF)

SHIPPING CHECKLIST FOR PROFESSIONAL SCANLAB™

Shipped	Back Ordered	Item Description
_____	_____	Twin-X Board with SBX-GPIB Module
_____	_____	SBX-GPIB to Amiga 2000 Rear Panel Cable
_____	_____	Two (2) 4-40 x 1/4" Mounting Screws for above Cable
_____	_____	External 2-Meter GPIB Cable
_____	_____	Professional ScanLab™ Software Diskett
_____	_____	Professional ScanLab™ Manual
_____	_____	Twin-X Manual
_____	_____	Professional ScanLab™ Jumper Position Sheet
_____	_____	Warranty Information Sheet

_____ _____

Packers Signature Date

Note To Customer: Please compare the items you received with the items checked off as “shipped” and report any inaccuracies to ASDG Incorporated (by calling (608) 273 -6585) as soon as possible after you detect the error.

Amiga Hardware World

Everything about Amiga hardware...

~

http://amiga.resource.cx