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XVME-220

DIGITAL OUTPUT MODULE

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Printed in the United States of America
Part Number 74220

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REVISION RECORD

REVISION	DESCRIPTION
A	Manual Released 12/84
MANUAL P/N: 74220-001	

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TABLE OF CONTENTS

CHAPTER		TITLE	PAGE
1		**MODULE DESCRIPTION**	
	1.1	Introduction	1-1
	1.2	Manual Structure	1-1
	1.3	Module Operational Description	1-1
	1.4	Specifications	1-3
2		**INSTALLATION**	
	2.1	Introduction	2-1
	2.2	System Requirements	2-1
	2.3	Major Component Locations	2-1
	2.4	Jumper/Switches	2-3
	2.4.1	Base Address Switches	2-3
	2.4.2	Address Space Selection	2-6
	2.4.3	Supervisor/Non-Privileged Mode Selection	2-7
	2.4.4	Address Modifier Reference	2-7
	2.4.5	BGxIN*/BGxOUT* Daisy Chain	2-8
	2.4.6	Interrupt Acknowledge Signals	2-8
	2.5	Front Panel Connectors	2-8
	2.6	Connector P1	2-12
	2.7	DOUT Module Installation	2-12
	2.8	Installation Procedure	2-14
	2.9	Application Example	2-14
3		**USING THE DOUT MODULE**	
	3.1	Introduction	3-1
	3.2	Module Base Addressing	3-1
	3.3	The DOUT I/O Interface Block	3-3
	3.3.1	Module Identification Data (Base + 01H to 3FH - odd byte locations only)	3-3
	3.3.2	Modue Status/Control Register (Base Address + 081H)	3-5
	3.3.3	Module Output Ports (Base Address + 82H to 85H)	3-6
APPENDICES			
A		XYCOM Standard I/O Architecture	A-1
B		VMEbus Connector/Pin Description	B-1
C		Schematics and Diagrams	C-1
D		Quick Reference Guide	D-1

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TABLE OF CONTENTS (continued)

LIST OF FIGURES

FIGURE	TITLE	PAGE
1-1	Operational Block Diagram of the DOUT Module	1-2
2-1	Components Used for Installation	2-2
2-2	Switch Bank S1 - Base Address Switches	2-4
2-3	Switch Bank S1	2-6
2-4	Connector Pin Numbering Scheme	209
2-5	VMEbus Chassis	2-13
2-6	Output Controlling an Indicator Lamp	2-15
3-1	The DOUT I/O Interface Block and the Short I/O Address Space	3-2
3-2	Status/Control Register	3-5
3-3	Output Ports	3-7
A-1	64K Short I/O Address Space	A-2
A-2	XVME I/O Module Address Map	A-4
A-3	Module LED Status	A-6
A-4	Status Register Bit Definitions	A-8
A-5	Intelligent and Non-Intelligent Kernels	A-10

LIST OF TABLES

TABLE	TITLE	PAGE
1-1	DOUT Module Specifications	1-4
2-1	The DOUT Jumper and Switch Definitions	2-3
2-2	Base Address Switch Options	2-5
2-3	Addressing Options	2-6
2-4	Privilege Options	2-7
2-5	Address Modifier Options	2-7
2-6	JK1 and JK2 Pin Definitions	2-10
3-1	Identification Data	3-4
3-2	Relationship of I/O Interface Block Address to Output Channels	3-6
A-1	Module I.D. Data	A_5
B-1	P1 - VMEbus Signal Identification	B-1
B-2	P1 Pin Assignments	B-5

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Chapter 1

MODULE DESCRIPTION

1.1 INTRODUCTION

The XVME-220 Digital Output module (hereafter referred to as the DOUT module) provides VMEbus systems with 32 optically isolated, high-level, DC output channels. The 32 digital outputs are independently programmable and are all capable of handling either resistive or inductive loads up to 30V and 100mA. In addition, each output uses an open-collector design to facilitate sufficient load handling, and transient suppressors to minimize the possibility of damage due to overvoltage.

Typical applications for the DOUT module include:

- Machine control
- Motor control
- Panel light control
- Interface to large relays and solenoids

1.2 MANUAL STRUCTURE

The purpose of this first chapter is to introduce the user to the general specifications and functional capabilities of the DOUT module. Successive chapters will develop the various aspects of module installation and operation in the following progression:

Chapter One -- A general description of the DOUT module, including complete functional and environmental specifications, VMEbus compliance information, and a block diagram.

Chapter Two -- Module installation information covering the location of pertinent module components, switch and jumper options, external connector pin locations, and standard board installation information.

Chapter Three -- General information needed to use the DOUT module including: module base addressing, module identification data, the Status and Control register, and output port addressing.

The Appendices are designed to introduce and reinforce a variety of module-related topics including: XYCOM's Standard I/O Architecture, backplane signal/pin descriptions, a block diagram and schematics, and a quick reference section.

1.3 MODULE OPERATIONAL DESCRIPTION

Figure 1-1 shows an operational block diagram of the DOUT module.

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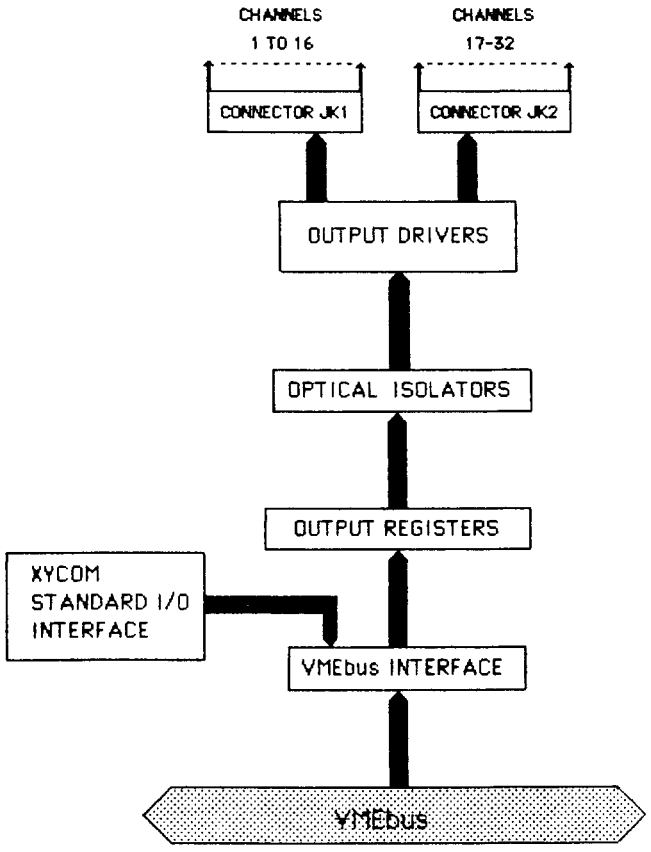


Figure 1-1. Operational Block Diagram of the DOUT Module

The XVME-220 DOUT is a 32 channel, digital output interface, designed to be compatible with the VMEbus architecture. Each output channel is opto-isolated from the system bus and each uses an open-collector configuration to allow a maximum load capability of 30 volts and 100mA. All outputs employ transient suppression circuitry to minimize the possibility of damage due to high-voltage transients occurring in the output application circuit.

The 32 output channels are arranged to form 4 (byte-wide) output registers. The output registers are addressed consecutively allowing the output channels to be accessed in either the "byte" or "word" format. Default initialization will turn off all outputs on both system power-up and during a software reset.

The DOUT module (along with all XYCOM I/O modules) features the XYCOM Standard I/O Architecture. This design has been incorporated in order to provide a simpler and more consistent method of programming for the entire line of XYCOM I/O modules.

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The central core of the XYCOM Standard I/O Architecture is the "kernel". The DOUT uses a non-intelligent kernel which provides the circuitry required to receive and generate all of the signals for a VMEbus defined 16-bit "slave" module. The non-intelligent kernel has the following features:

- Control and Address Buffers
- Base Address Decode circuitry
- Interrupt Decoder/Driver
- Control/Status register
- Module Identification Data
- Pass and Fail LED indicators

These features facilitate the operation of the DOUT in the following areas:

- Base Addressing - The DOUT can be addressed at any one of 64 1K boundaries in the Short I/O Address space.

- I/O Interface Block - The DOUT occupies a 1K block of the Short I/O Address space called the module I/O Interface Block. Within this block, in standard locations, are found: the I/O registers, the module status and control register, and the module identification data.

- Module Status/Control register - This register provides the user with the hardware means for developing module self-diagnostic software to verify the module operational status. In addition, two bits in this register are used to enable the module interrupt capability and to perform a "soft" module reset to a default configuration.

- Module Identification Data - This facet provides a unique method of registering module specific information in an ASCII encoded format. This information can be studied by the system processor on power-up to verify the system configuration and operational status.

Additional information on the XYCOM Standard I/O Architecture can be found in Appendix A of this manual.

1.4 SPECIFICATIONS

The following is a list of operational and environmental specifications for the DOUT module.

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Table 1-1. DOUT Module Specifications

Characteristic	Specification
Number of Output Channels	32 (arranged in 4 logical ports)
Physical Output	Normally off outputs
Off-state output voltage (Voh) On-state output voltage (Vol) Off-state leakage current (Ioh) On-state leakage current (Iol)	30V max. 1V typical, 2V max. 100 microA max. 100mA max.
Turn-on time Turn-off time	30 microsecs max. 100 microsecs max.
Isolation, channel-to-channel and channel-to-system	300V min.
Output transient protection	Reverse voltage protection diode and transient suppression
Power Requirements	+5V, ±5%, 1.62A typical
Environmental	
Temperature Operating Non-operating	 0 to 65°C (32° to 149°F) -40° to 85°C (-40° to 158°F)
Humidity	5 to 95% RH non-condensing (Extreme low humidity conditions may require special protection against static discharge.)
Altitude Operating Non-operating	 Sea-level to 10,000 ft. (3048 m) Sea-level to 50,000 (15240 m)
Vibration Operating Non-operating	 5 to 2000 Hz .015 inches peak-to-peak displacement 2.5 g peak (maximum) acceleration 5 to 2000 Hz .030 inches peak-to-peak
Shock Operating Non-operating	 30 g peak acceleration 11 msec duration 50 g peak acceleration 11 msec duration
VMEbus Compliance	o Fully compatible with VMEbus standard o A16:D16 Data transfer bus slave o Base address jumper-selectable within 64K short I/O address space o Occupies 1K consecutive byte locations.

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Chapter 2

INSTALLATION

2.1 INTRODUCTION

This chapter explains how to configure the DOUT module prior to installation in a VMEbus system. Included in this chapter is information on the jumper option, the jumper location, switch options, switch locations, and external connector pin descriptions.

2.2 SYSTEM REQUIREMENTS

The DOUT module is a double-height VMEbus-compatible, digital output module. As such, the DOUT requires a minimum system component configuration for proper operation. The minimum system requirement can be met by either one of the following:

A) A host procesor module properly installed on the same backplane as the DOUT; and a controller subsystem module which employs a Data Transfer Bus Arbiter, a Subsystem Clock driver, a System Reset driver, and a Bus time-out module. (The XYCOM XVME-010 System Resource Module provides a controller subsystem with the components listed.)

-- OR --

B) A host processor module which incorporates an on-board controller subsystem.

Prior to installing the DOUT, it will be necessary to configure several jumpers and switch selectable options. These options are:

1. Module Base Address.
2. Whether the module will be addressed in Short I/O Memory or the Standard Memory Space.
3. Which Address Modifier codes the module will respond to (i.e., 29 or 2D, 2D only, 39 or 3D, or 3D only).

2.3 MAJOR COMPONENT LOCATIONS

The components relevant to installation are shown in Figure 2-1.

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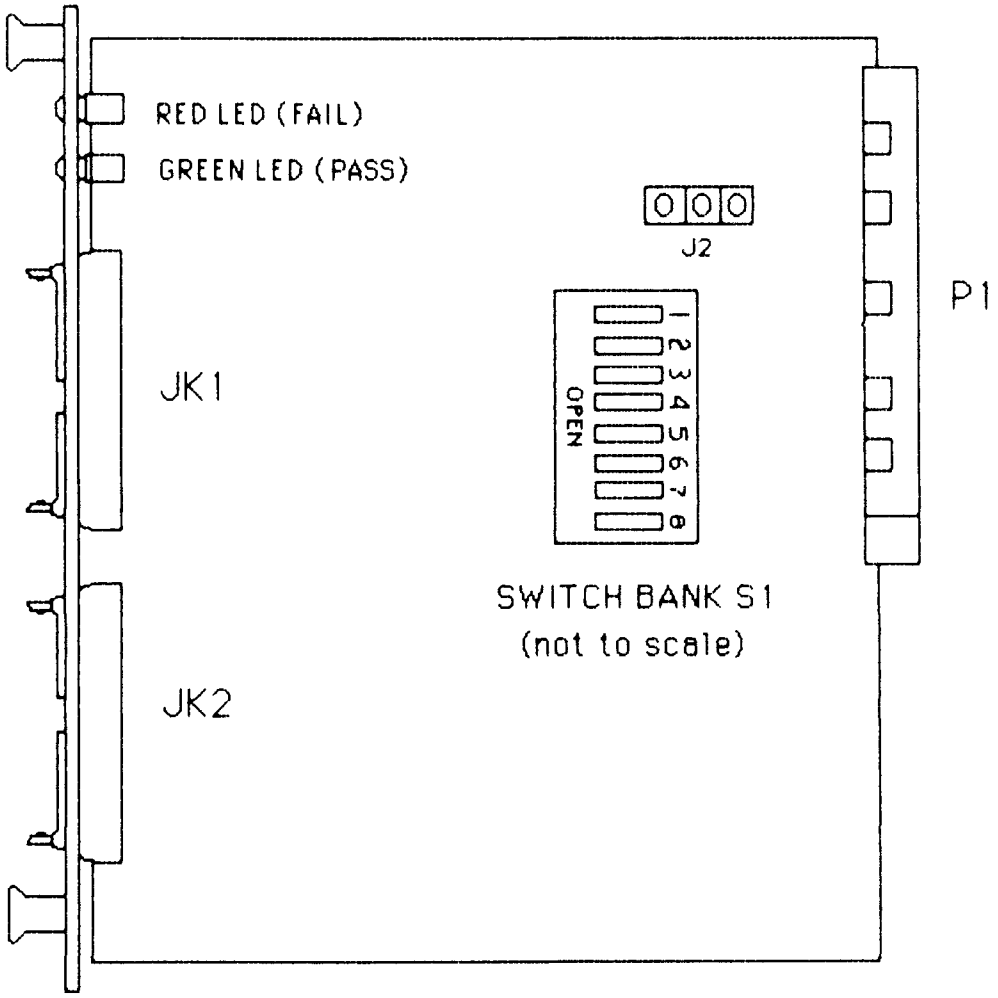


Figure 2-1. Components Used for Installation

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2.4 JUMPER/SWITCHES

The DOUT module has 1 jumper and 1 set of (8) DIP switches. The jumpers and switches are defined in Table 2-1.

Table 2-1. The DOUT Jumper and Switch Definitions

Jumper	Function
J2	Address Space selection jumper (i.e., Short I/O Address Space or Standard Address Space)(1)
Switch Block	**Function**
S1 (switches 1-6)	Module Base Address Select.
S1 (switch 7)	This switch works in conjunction with jumper J2 to determine whether the board operates with address modifiers for Short I/O Address Space or those for Standard Address space.
S1 (switch 8)	This switch determines whether the module will respond to only supervisory accesses or to both supervisory and non-privileged accesses.

NOTES

1. See also Section 2.4.2, Switch 7 of Switch Bank S1.

2.4.1 Base Address Switches

The DOUT module is designed to be addressed within either the VMEbus Short I/O or Standard Memory Space. Since each I/O module connected to the bus must have its own unique base address, the base addressing scheme for XVME I/O modules has been designed to be switch (or jumper) selectable. When the DOUT module is installed in the system, it will occupy a 1K byte block of the Short I/O Memory (called the module I/O Interface Block).

The base address decoding scheme for XYCOM I/O modules is such that the starting address for each I/O Interface Block resides on a 1K boundary. Thus the module base address may be set to any one of 64 possible 1K boundaries within the Short I/O Address space.

The module base address is selected by using the switches labeled 1-6 in DIP switch bank S1. Figure 2-2 shows the switch bank S1 and how the individual switches (1-6) relate to the base address bits.

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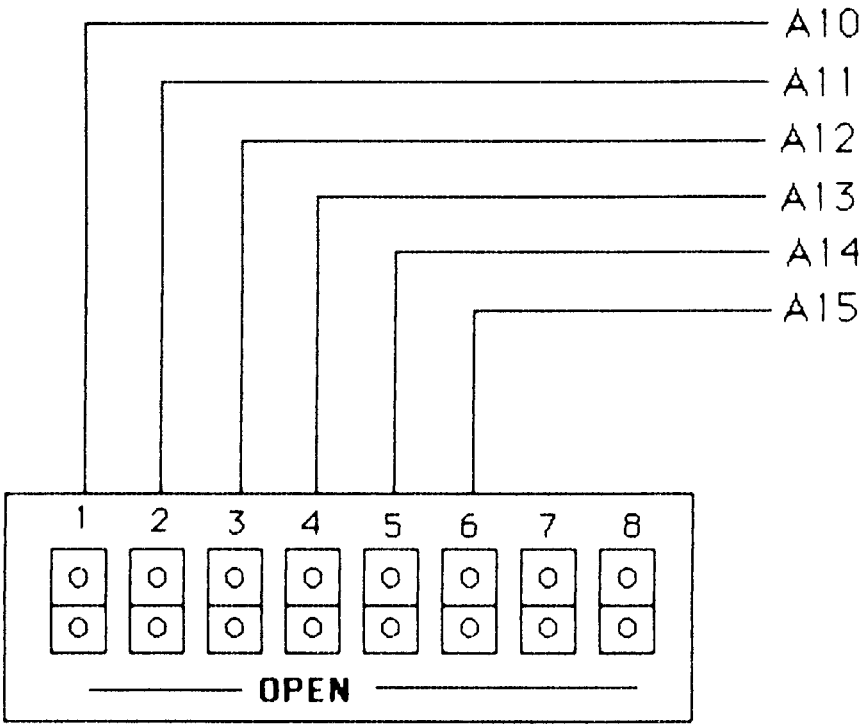


Figure 2-2. Switch Bank S1 - Base Address Switches

When a switch is in the closed position (i.e., when it is pushed in on the opposite end of the switch bank from the "open" label), the corresponding base address bit will be interpreted as a logic "0". When a switch is set to the open position, the corresponding base address bit will be interpreted as a logic "1".

Table 2-2 shows a list of the 64 1K boundaries which can be used as module base addresses in the Short I/O Address space and the corresponding switch settings (switches 1-6) from S1.

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Table 2-2. Base Address Switch Options

Switches						VME base address in VME Short I/O Address space
6(A15)	5(A14)	4(A13)	3(A12)	2(A11)	1(A10)	
0	0	0	0	0	0	0000H
0	0	0	0	0	1	0400H
0	0	0	0	1	0	0800H
0	0	0	0	1	1	0C00H
0	0	0	1	0	0	1000H
0	0	0	1	0	1	1400H
0	0	0	1	1	0	1800H
0	0	0	1	1	1	1C00H
0	0	1	0	0	0	2000H
0	0	1	0	0	1	2400H
0	0	1	0	1	0	2800H
0	0	1	0	1	1	2C00H
0	0	1	1	0	0	3000H
0	0	1	1	0	1	3400H
0	0	1	1	1	0	3800H
0	0	1	1	1	1	3C00H
0	1	0	0	0	0	4000H
0	1	0	0	0	1	4400H
0	1	0	0	1	0	4800H
0	1	0	0	1	1	4C00H
0	1	0	1	0	0	5000H
0	1	0	1	0	1	5400H
0	1	0	1	1	0	5800H
0	1	0	1	1	1	5C00H
0	1	1	0	0	0	6000H
0	1	1	0	0	1	6400H
0	1	1	0	1	0	6800H
0	1	1	0	1	1	6C00H
0	1	1	1	0	0	7000H
0	1	1	1	0	1	7400H
0	1	1	1	1	0	7800H
0	1	1	1	1	1	7C00H
1	0	0	0	0	0	8000H
1	0	0	0	0	1	8400H
1	0	0	0	1	0	8800H
1	0	0	0	1	1	8C00H
1	0	0	1	0	0	9000H
1	0	0	1	0	1	9400H
1	0	0	1	1	0	9800H
1	0	0	1	1	1	9C00H
1	0	1	0	0	0	A000H
1	0	1	0	0	1	A400H
1	0	1	0	1	0	A800H
1	0	1	0	1	1	AC00H
1	0	1	1	0	0	B000H
1	0	1	1	0	1	B400H
1	0	1	1	1	0	B800H
1	0	1	1	1	1	BC00H
1	1	0	0	0	0	C000H
1	1	0	0	0	1	C400H
1	1	0	0	1	0	C800H
1	1	0	0	1	1	CC00H
1	1	0	1	0	0	D000H
1	1	0	1	0	1	D400H
1	1	0	1	1	0	D800H
1	1	0	1	1	1	DC00H
1	1	1	0	0	0	E000H
1	1	1	0	0	1	E400H
1	1	1	0	1	0	E800H
1	1	1	0	1	1	EC00H
1	1	1	1	0	0	F000H
1	1	1	1	0	1	F400H
1	1	1	1	1	0	F800H
1	1	1	1	1	1	FC00H

NOTE

Open = Logic "1"
Closed = Logic "0"

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2.4.2 Address Space Selection

The user is given the option of placing the DOUT in VMEbus Short I/O or Standard Memory Space. The selection is made by configuring jumper J2 and Switch 7 of Switch Bank S1 (see Figure 2-3) as shown in Table 2-3 below.

Table 2-3. Addressing Options

Jumper	Switch 7	Option Selected
J2A	1	Standard Data Access Operation
J2B	0	Short I/O Access Operation

NOTE

Switch Open = Logic "1"
Switch Closed = Logic "0"

If jumper J2A is installed, Switch 7 must be set to 1.

If jumper J2B is installed, Switch 7 must be set to 0.

The Standard I/O Architecture recommends that the DOUT operate within the Short I/O Address Space, in order to take advantage of the Standard I/O Architecture's various features, which are described in Appendix A.

If required, the DOUT can operate in the Standard Address Space. The user should note that in this mode, the DOUT will always reside within the last 64K byte segment of the Standard Memory Address Space (i.e., the address range FF0000H through FFFFFFH).

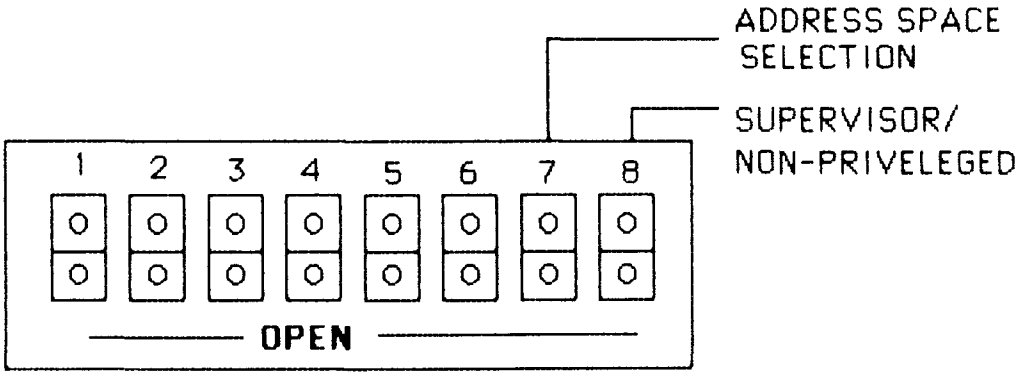


Figure 2-3. Switch Bank S1

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2.4.3 Supervisor/Non-Privileged Mode Selection

The DOUT can be configured to respond to only Supervisory access, or to both Non-Privileged and Supervisory accesses, by selecting the position of Switch 8 (located in Switch Bank S1, see Figure 2-3), as shown in Table 2-4 below.

Table 2-4. Privilege Options

Switch 8	Privilege Mode Selected
0	Supervisory or Non-Privileged
1	Supervisory Only

2.4.4 Address Modifier Reference

The following table (Table 2-5) indicates the actual VMEbus Address Modifier code that the DOUT will respond to based on the position of the two options discussed in the previous two sections.

Table 2-5. Address Modifier Code Options

	Switches 7	8	Jumper J2	Address Modifier Code DOUT will respond to
Normal Short I/O	0	0	B	29H or 2DH
	0	1	B	2DH only
Standard Address	1	0	A	39H or 3DH
	1	1	A	3DH only

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2.4.5 BGxIN*/BGxOUT* Daisy Chain

The Data Bus Arbitration signals BGxIN* and BGxOUT* (where "x" can be a number 0-3 to represent the three levels of arbitration) are not used by the DOUT, and are hardwired together on the module to allow the BGxIN*/BGxOUT* Daisy Chain to pass through the backplane slot occupied by the DOUT. In each slot of the VMEbus backplane, there are four sets of jumpers shorting the signal BGxIN* to BGxOUT* (x=0 thru 3). Since these signals are already hardwired on the DOUT, it is not necessary to insert these VMEbus jumpers on the slot occupied by the DOUT.

2.4.6 Interrupt Acknowledge Signals

The XVME-220 DOUT module is not capable of generating VMEbus interrupts. Therefore, the interrupt acknowledge signals (IACKIN* and IACKOUT*) are hardwired together on the module to allow the daisy chain to pass through the backplane slot occupied by DOUT. In each slot of the VMEbus backplane, there is a jumper shorting the signal IACKIN* to IACKOUT*. Since these signals are hardwired on the DOUT, it is not necessary to insert these VMEbus jumpers on the slot occupied by the DOUT.

2.5 FRONT PANEL CONNECTORS

There are two 50 pin dual row header connectors (labeled JK1 and JK2) located on the front panel of the DOUT module. These connectors provide the 32 output channels (arranged in 4 ports), and one module ground connection for each channel.

Figure 2-4 shows the connector pin numbering orientation from both a side view and a front view.

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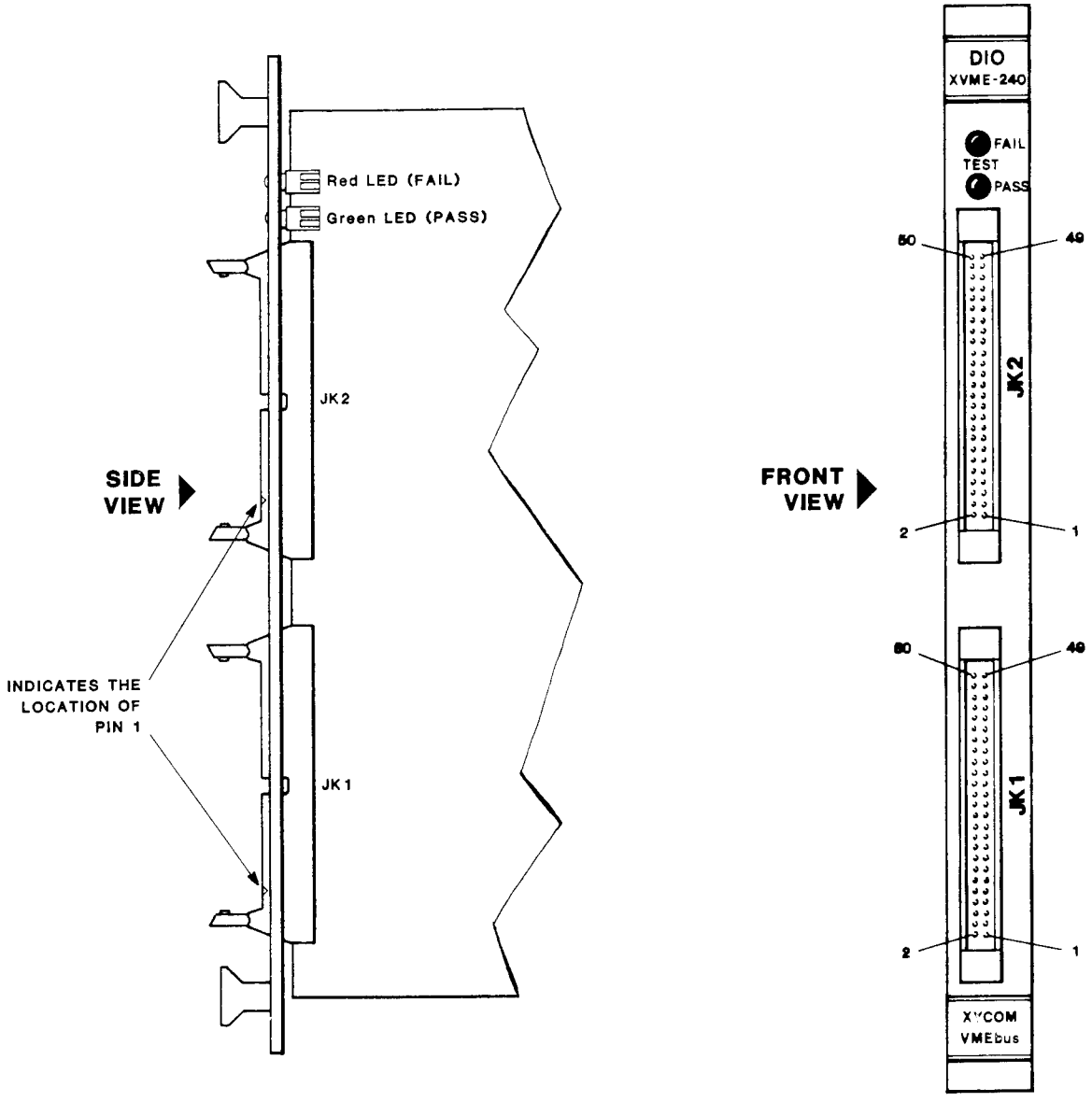


Figure 2-4. Connector Pin Numbering Scheme

Table 2-6 lists the pin definitions for connectors JK1 and JK2. Notice that connector JK1 contains output channel 0-15 and JK2 contains output channels 16-31.

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Table 2-6. JK1 and JK2 Pin Definitions

Connector JK1		
Pin Number	Channel No.	Definition
1	--	Not used
2	--	Not used
3	0	Channel Return
4	0	Channel Output
5	1	Channel Return
6	1	Channel Output
7	--	Not used
8	--	Not used
9	2	Channel Return
10	2	Channel Output
11	3	Channel Return
12	3	Channel Output
13	--	Not used
14	--	Not used
15	4	Channel Return
16	4	Channel Output
17	5	Channel Return
18	5	Channel Output
19	--	Not used
20	--	Not used
21	6	Channel Return
22	6	Channel Output
23	7	Channel Return
24	7	Channel Output
25	--	Not used
26	--	Not used
27	8	Channel Return
28	8	Channel Output
29	9	Channel Return
30	9	Channel Output
31	--	Not used
32	--	Not used
33	10	Channel Return
34	10	Channel Output
35	11	Channel Return
36	11	Channel Output
37	--	Not used
38	--	Not used
39	12	Channel Return
40	12	Channel Output
41	13	Channel Return
42	13	Channel Output
43	--	Not used
44	--	Not used

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Table 2-6. JK1 and JK2 Pin Definitions (continued)

Connector JK1		
Pin Number	Channel No.	Definition
45	14	Channel Return
46	14	Channel Output
47	15	Channel Return
48	15	Channel Output
49	--	Not used
50	--	Not used
Connector JK2		
Pin Number	Channel No.	Definition
1	--	Not used
2	--	Not used
3	16	Channel Return
4	16	Channel Output
5	17	Channel Return
6	17	Channel Output
7	--	Not used
8	--	Not used
9	18	Channel Return
10	18	Channel Output
11	19	Channel Return
12	19	Channel Output
13	--	Not used
14	--	Not used
15	20	Channel Return
16	20	Channel Output
17	21	Channel Return
18	21	Channel Output
19	--	Not used
20	--	Not used
21	22	Channel Return
22	22	Channel Output
23	23	Channel Return
24	23	Channel Output
25	--	Not used
26	--	Not used
27	24	Channel Return
28	24	Channel Output
29	25	Channel Return
30	25	Channel Output
31	--	Not used
32	--	Not used

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Table 2-6. JK1 and JK2 Pin Definitions (continued)

Connector JK2		
Pin Number	Channel No.	Definition
33	26	Channel Return
34	26	Channel Output
35	27	Channel Return
36	27	Channel Output
37	--	Not used
38	--	Not used
39	28	Channel Return
40	28	Channel Output
41	29	Channel Return
42	29	Channel Output
43	--	Not used
44	--	Not used
45	30	Channel Return
46	30	Channel Output
47	31	Channel Return
48	31	Channel Output
49	--	Not used
50	--	Not used

2.6 CONNECTOR P1

Connector P1 is mounted at the rear edge of the board (see Figure 2-1). The pin connections for P1 (a 96-pin 3-row connector) contain the standard address, data, and control signals necessary for the operation of VMEbus-defined NEXP modules. The P1 connector is designed to mechanically interface with a VMEbus-defined P1 backplane.

The signal definitions and pin-outs for connector P1 are found in Appendix B of this manual.

2.7 DOUT Module Installation

The XYCOM VMEbus modules are designed to accommodate typical VMEbus backplane construction. Figure 2-5 shows a standard VME chassis and a typical backplane configuration. There are two rows of backplane connectors depicted here (i.e., the P1 backplane and the P2 backplane). The DOUT requires only the P1 backplane however.

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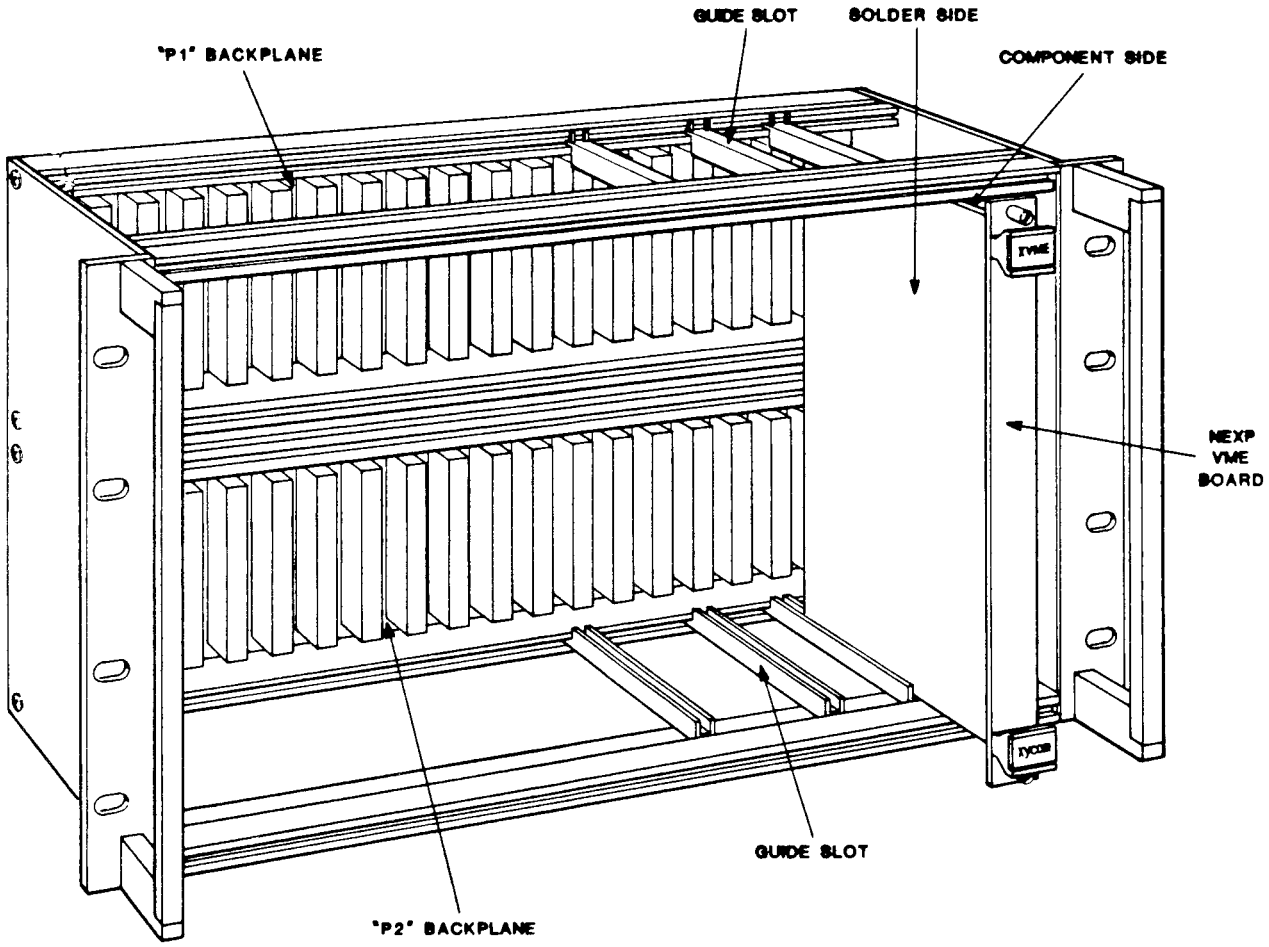


Figure 2-5. VMEbus Chassis

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2.8 INSTALLATION PROCEDURE

CAUTION

Do not attempt to install or remove any boards without first turning off the power to the bus, and all related external power supplies.

Prior to installing a module, you should determine and verify all relevant jumper configurations and all connections to external devices or power supplies. (Please check the jumper configuration with the diagram and lists in the manual.)

To install a board in the cardcage first make certain that the particular cardcage slot which you are going to use is clear and accessible. Each slot should have plastic guides on both the top and the bottom of the chassis opening. Center the board on the plastic guides so that the solder side is facing to the left and the component side is facing to the right (refer to Figure 2-5). Push the card slowly toward the rear of the chassis until the connectors engage (the board should slide freely in the plastic guides). Apply straightforward pressure to the two handles on the outer edge of the board until the connectors are fully engaged and properly seated.

NOTE

It should not be necessary to use excess pressure or force to engage the connectors. If the board does not properly connect with the backplane, remove the module and inspect all connectors and guide slots for possible damage or obstructions.

Once the board is properly seated, it should be secured by tightening the two machine screws at the extreme top and bottom of the front panel.

2.9 APPLICATION EXAMPLE

The XVME-220 DOUT module provides a total of 32 digitally controlled output channels. Each of the 32 output channels is opto-isolated, reverse voltage protected, and equipped with transient suppression. The DOUT module may be used to drive relays or solenoids, to control DC panel indicator lamps, or to switch small DC motors.

Figure 2-6 shows an example of an output connected to a circuit configured for the control of a panel indicator lamp.

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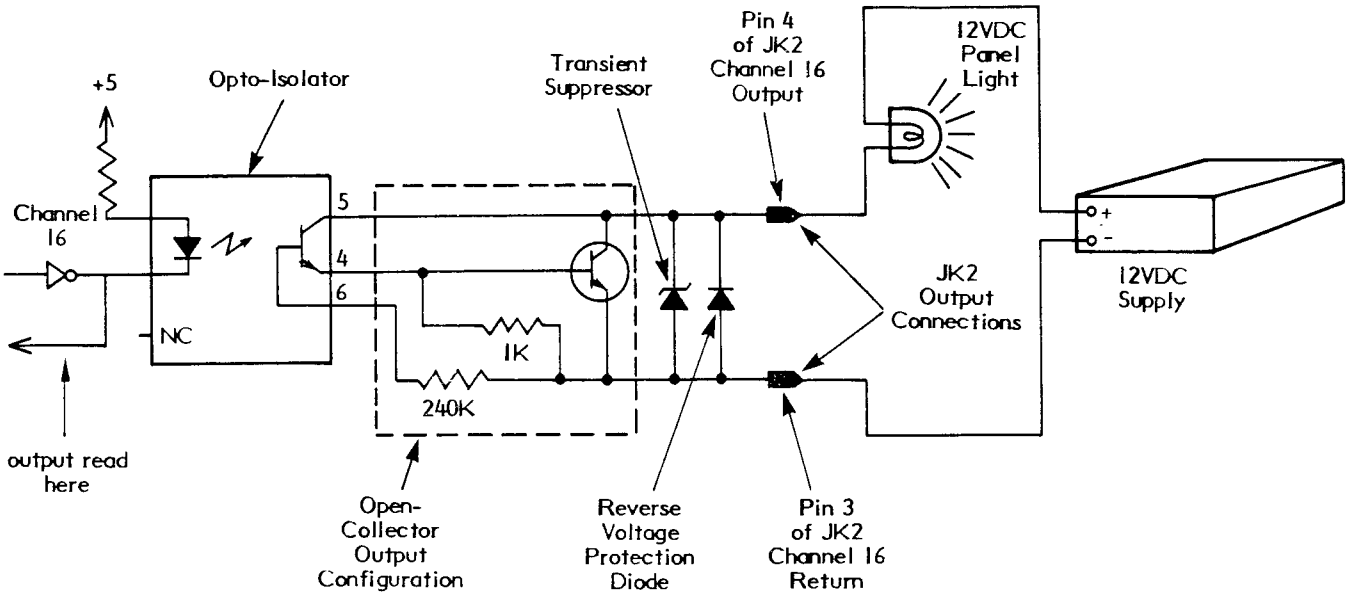


Figure 2-6. Output Controlling an Indicator Lamp

The application example in Figure 2-6 shows the output of channel 16 controlling a 12VDC panel indicator lamp. When a logic "1" is written to channel 16, the opto-isolator will turn on the output, complete the circuit, and thus turn on the panel indicator lamp. When a logic "0" is written to channel 16, the circuit will be broken and the panel indicator lamp will be turned off.

On system power-up or after a software reset, all opto-isolators are initialized to the off state.

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Chapter 3

USING THE DOUT MODULE

3.1 INTRODUCTION

This chapter provides the information needed to program the DOUT to perform Output data transfers and how to use the unique design features which are a part of XYCOM I/O modules. The chapter is broken into the following segments:

- Module base addressing
- The Module I/O Interface Block and how it is addressed

3.2 MODULE BASE ADDRESSING

XYCOM I/O modules are designed to be addressed within the VMEbus-defined 64K Short I/O Address space. When the DOUT module is installed it will occupy a 1K byte block of the Short I/O Address space (referred to as the module I/O Interface Block). The starting address for each I/O Interface Block must reside on a 1K boundary. Thus, the module base address will be one of the 64 - 1K boundaries available within the Short I/O Address space (refer to Chapter 2, Table 2-2 for a complete list of the 64 - 1K boundaries).

Figure 3-1 shows the module I/O Interface Block for the DOUT and how it relates to the Short I/O Address space. In this example, the module base address resides on the 1K boundary at 1000H (refer to Chapter 2, Section 2.4.1 for information on using base address switches). This means that the module would occupy the 1K block from 1000H to 1400H.

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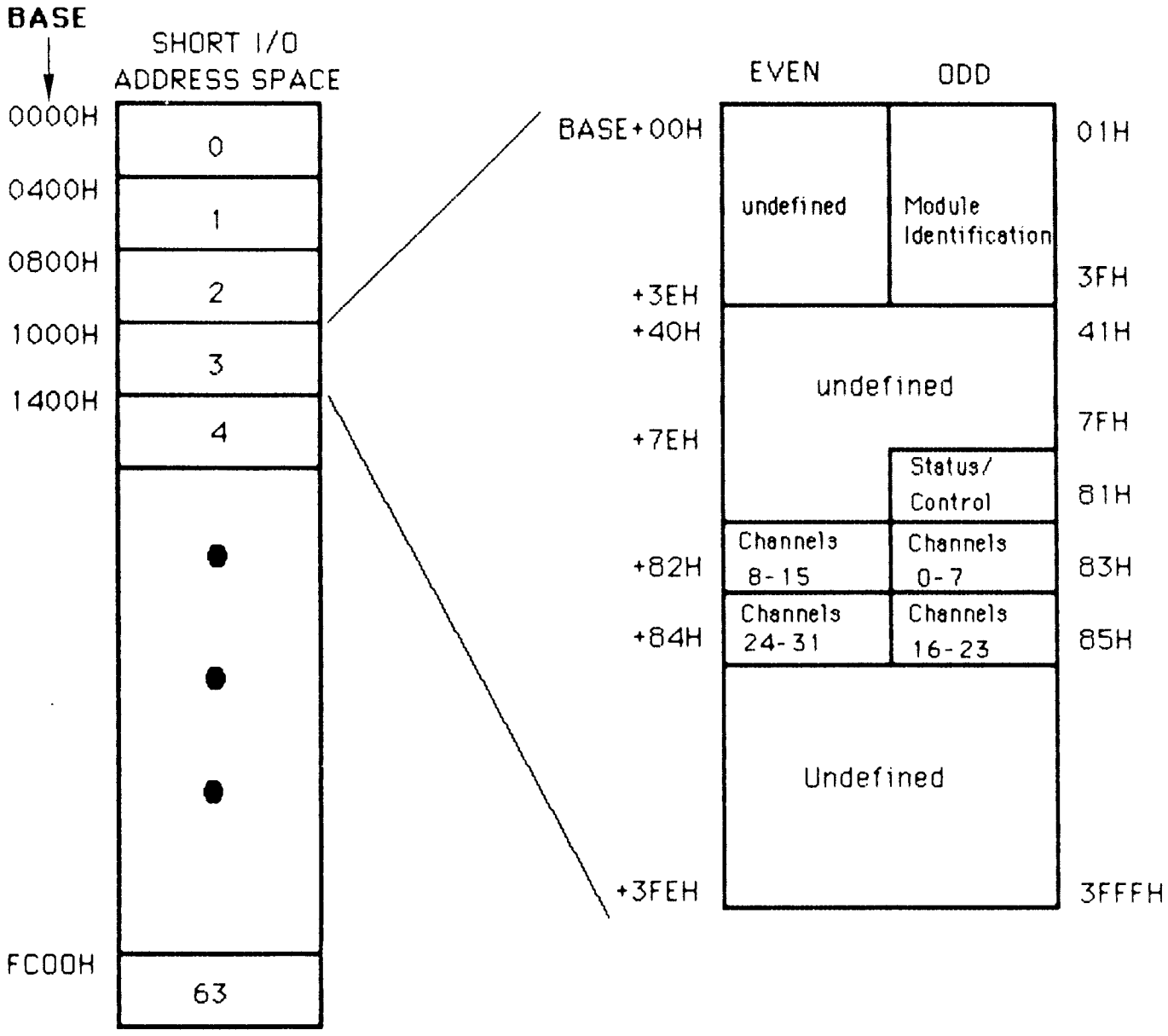


Figure 3-1. The DOUT I/O Interface Block and the Short I/O Address Space

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Any location within the DOUT's 1K I/O Interface Block can be accessed by adding the module base address to the address of the specific location within the I/O Interface Block (referred to as the I/O Interface Block offset). For example, the module Status/Control register is located at address 81H within the I/O Interface Block. If the module base address is set to a value of 1000H then the Status/Control register would be accessed at address 1081H.

(Module Base Address)		(I/O Interface Block Offset)		(Status/Control Register)
1000H	+	081H	=	1081H

For memory-mapped CPU modules (such as 68000 CPU modules), the Short I/O Address Space is memory-mapped to begin at a specific address. For such modules the I/O Interface Block offset is an offset from the start of this memory-mapped Short I/O Address space. For example, if the Short I/O space of a 68000 CPU module starts at F90000H and if the base address of the DOUT is jumpered to 1000H, the actual module base address would be F91000H.

3.3 THE DOUT I/O INTERFACE BLOCK

The 1K block of Short I/O Address space allotted to the DOUT (see Figure 3-1) is divided into specific areas which are dedicated to performing the following functions:

- Module identification data for the DOUT
- Module status and control
- Data output ports

NOTE

Reading from or writing to undefined addresses may make the user software incompatible with future versions of this module.

3.3.1 Module Identification Data (Base+01H to 3FH - odd byte locations only)

The XYCOM module identification scheme provides a unique method of registering module-specific information in an ASCII encoded format. The I.D. data is provided as thirty-two ASCII encoded characters consisting of the board type, manufacturer identification, module model number, number of 1K byte blocks occupied by the module, and module functional revision level information. This information can be read by the system processor on power-up to verify the system configuration and operational status. Table 3-1 defines the Identification information locations.

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Table 3-1. Identification Data

Offset Relative to Module Base	Contents	ASCII Encoding (in hex)	Descriptions
1	V	56	
3	M	4D	ID PROM identifier,
5	E	45	always "VMEID"
7	I	49	(5 characters)
9	D	44	
B	X	58	Manufacturer's I.D.,
D	Y	59	always "XYC" for XYCOM
F	C	43	modules (3 characters)
11	2	32	
13	2	32	Module Model Number
15	0	30	(3 characters and
17		20	4 trailing blanks)
19		20	
1B		20	
1D		20	
1F	1	31	Number of 1K byte blocks of I/O space occupied by this module (1 character)
21		20	Major functional revision
23	1	31	level with leading blank (if single digit)
25	1	30	Minor functional revision
27		20	level with trailing blank (if single digit)
29	Undefined		
2B	"		
2D	"		
2F	"		
31	"		
33	"		
35	"		Manufacturer
37	"		Dependent Information,
39	"		Reserved for future use
3B	"		
3D	"		
3F	"		

The module has been designed so that it is only necessary to use odd backplane addresses to access the I.D. data. Thus, each of the 32 bytes of ASCII data have been assigned to the first 32 odd I/O Interface Block bytes (i.e., odd bytes 1H - 3FH).

Thus, I.D. information can be accessed by addressing the module base, offset by the specific address for the character(s) needed. For example, if the base address of the board is jumpered to 1000H, and if you wish to access the module model number (I/O interface block locations 11H, 13H, 15H, 17H, 19H, 1BH, and 1DH), you will individually add the offset addresses to the base addresses to read the hex coded ASCII value at each location. Thus, in this example, the ASCII values which make up the module model number are found sequentially at locations 1011H, 1013H, 1015H, 1017H, 1019H, 101BH, and 101DH.

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3.3.2 Module Status/Control Register (Base Address+081H)

A major feature of the XYCOM Standard I/O Architecture is the inclusion of an 8-bit status and control register on all intelligent and non-intelligent I/O modules. On the DOUT module (a non-intelligent module) this register provides the user with two indicator bits which control the current status of the self-test LEDs on the front panel, a module software reset bit, and three read/write flag bits which can be employed by the user as software flags. The Status/Control register is accessed at the module base address + offset 081H. Figure 3-2 shows the register bit definitions for the DOUT Status/Control byte.

STATUS/CONTROL REGISTER (Base Address + 081H)

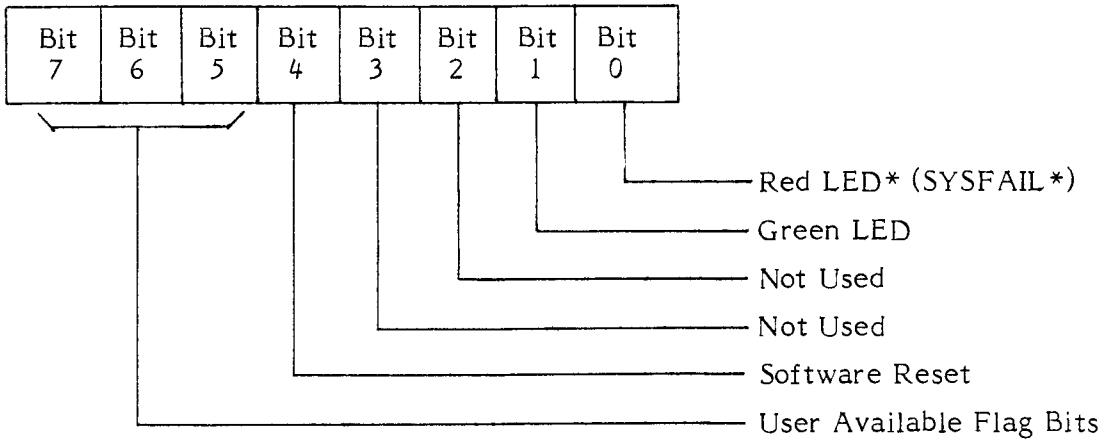


Figure 3-2. Status/Control Register

The following list defines the individual bit positions in the Status/Control register:

Bit 7,Bit 6, Bit 5: Read/Write — These bits are available to the user to be employed as general purpose flags. The setting and clearing of these bits has no effect on the operation of the DOUT module. These bits are cleared by the VME system Reset signal (SYSRESET*) but are not cleared by toggling the Software Reset bit (bit 4).

Bit 4: Read/Write — This bit is for a software module reset. If it is "toggled" between a logic "0" and a "1" (i.e., if it is set from 0 to 1 and then back to 0) the module will reset in the following fashion:

1) All registers (except the Status/Control Register) are cleared to "zeroes", which turns all outputs off.

Bit 3: Not Used, will always return a logic 0 when read.

Bit 2: Not Used, will always return a logic 0 when read.

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Bit 1,Bit 0: Read/Write These bits control the red LED and green LED. The red and green LEDs provide a visual indication of module status.

- o A logic "0" turns on the red LED (bit D0).
- o A logic "1" turns on the green LED (bit D1).

The LEDs will work with user-provided diagnostic software to indicate module operational status in the following manner:

Status Bits 1	0	LEDs Green	Red	SYSFAIL*	Status
0	0	OFF	ON	ON	Module failed, or not yet tested
0	1	OFF	OFF	OFF	Inactive module
1	0	ON	ON	ON	Module undergoing test
1	1	ON	OFF	OFF	Module passed test

NOTE

The DOUT is a non-intelligent module so all diagnostics and configuration checking must be performed by the system host.

3.3.3 Module Output Ports (Base Address + 82H to 85H)

The 32 output channels used by the DOUT module are divided into 4 ports with 8 channels to a port. Figure 3-1 shows that the module output ports are addressed consecutively within the module I/O Interface Block from 82H to 85H. Table 3-2 lists the I/O Interface Block addresses assigned to each group of output channels.

Table 3-2. Relationship of I/O Interface Block Addresses to Output Channels

I/O Interface Block Address	Output Channels
82H	8 - 15
83H	0 - 7
84H	24 - 31
85H	16 - 23

Any output port can be accessed by adding the module base address to the particular I/O Interface Block offset for that port. For example, output channels 0-7 are located at address 83H in the I/O Interface Block, and if the base address of the module is set at 1000H, then Channels 0-7 can be accessed at 1083H.

(Module Base Address)		(I/O Interface Block Offset)		(channels 0-7)
1000H	+	83H	=	1083H

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Figure 3-3 shows a small memory map of the 4 (byte-wide) output ports, the offset (from the base address) for each port, and the output channels which correspond to each port.

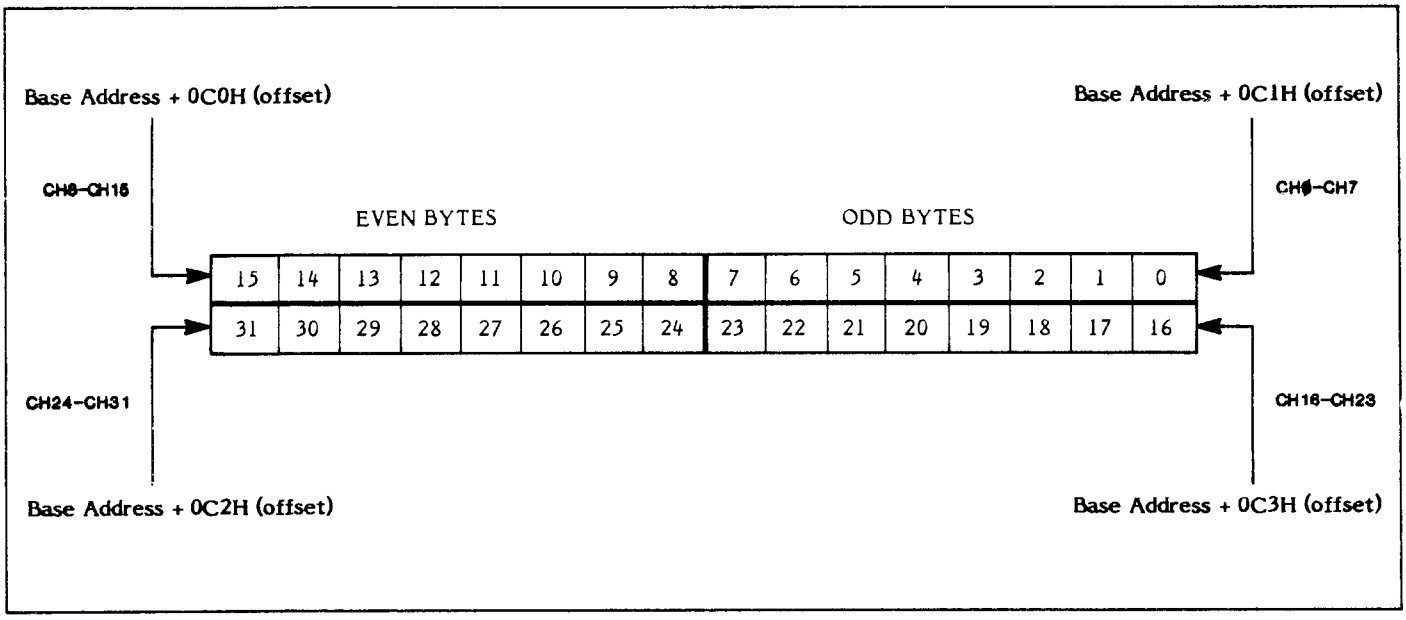


Figure 3-3. Output Ports

An output channel is activated (turned on) when a logic "1" is written to the corresponding offset plus the module base address. An output channel is deactivated (turned off) when a logic "0" is written to the corresponding offset plus base address. On power-up or after a software reset, the outputs are all deactivated (i.e., all outputs are turned off).

Each set of channels uses D-type flip-flops to latch data before it is passed through the opto-isolators. Thus, the digital state of each output can be read (via software) to allow for the verification of output data. Figure 2-6 illustrates the point on each output where the output state is read.

Reading from the output ports will return the status of the data written to the outputs (i.e., from the module side of the opto-isolator). Reading from the outputs will not always reflect the actual status at the output connector. For example, reading from the channel will only show whether the channel is being driven by the DOUT module. It will not indicate the electrical level status of the output pin if the power supply for an external circuit is turned off.

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Appendix A

XYCOM STANDARD I/O ARCHITECTURE

INTRODUCTION

The purpose of this Appendix is to define XYCOM's Standard I/O Architecture for XVME I/O modules. This Standard I/O Architecture has been incorporated on all XVME I/O modules in order to provide a simpler and more consistent method of programming for the entire module line. The I/O Architecture specifies the logical aspects of bus interfaces, as opposed to the "physical" or electrical aspects as defined in the VMEbus specifications. The module elements which are standardized by the XYCOM I/O Architecture are the following:

1. Module Addressing -- Where a module is positioned in the I/O address space and how software can read from it or write to it.

2. Module Identification -- How software can identify which modules are installed in a system.

3. Module Operational Status -- How the operator can (through software) determine the operational condition of specific modules within the system.

4. Interrupt Control -- How software is able to control and monitor the capability of the module to interrupt the system.

5. Communication between Modules -- How master (host) processors and intelligent I/O modules communicate through shared global memory or the dual-access RAM on the I/O modules.

6. The I/O Kernel -- How intelligent and non-intelligent "kernels" facilitate the operation of all XYCOM I/O modules.

MODULE ADDRESSING

All XYCOM I/O modules are designed to be addressed within the VMEbus-defined 64K short I/O address space. The restriction of I/O modules to the short I/O address space provides separation of program/data address space and the I/O address space. This convention simplifies software design and minimizes hardware and module cost, while at the same time, providing 64K of address space for I/O modules.

Base Addressing

Since each I/O module connected to the bus must have its own unique base address, the base addressing scheme for XYCOM VME I/O modules has been designed to be jumper-selectable. Each XVME I/O module installed in the system requires at least a 1K byte block of the short I/O memory. This divides the 64K short I/O address space into 64 1K segments. Thus, each I/O module has a base address which starts on a 1K boundary. As a result, the XYCOM I/O modules have all been implemented to decode

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base addresses in 1K (400H) increments. On an intelligent XVME module, address signals A10-A13 are decoded, while A14 and A15 must be zero. (This implies that only the lowest 16 of the possible 64 1K segments are used for intelligent modules.) On non-intelligent XVME modules, the six highest order short I/O address bits are decoded, while the remaining lower order bits are ignored. This arrangement provides the correct address configuration to allow each module address to begin on a 1K boundary. Non-intelligent XVME modules allow the use of six base address jumpers (representing bits A10-A15), and thus, they are able to reside on any of the 64 1K boundaries available in the short I/O address space. Intelligent XVME modules will only allow the use of four base address jumpers (representing bits A10-A13) which limit their selection of 1K boundaries to one of sixteen possible choices.

Figure A-1 shows an abbreviated view of the short I/O memory.

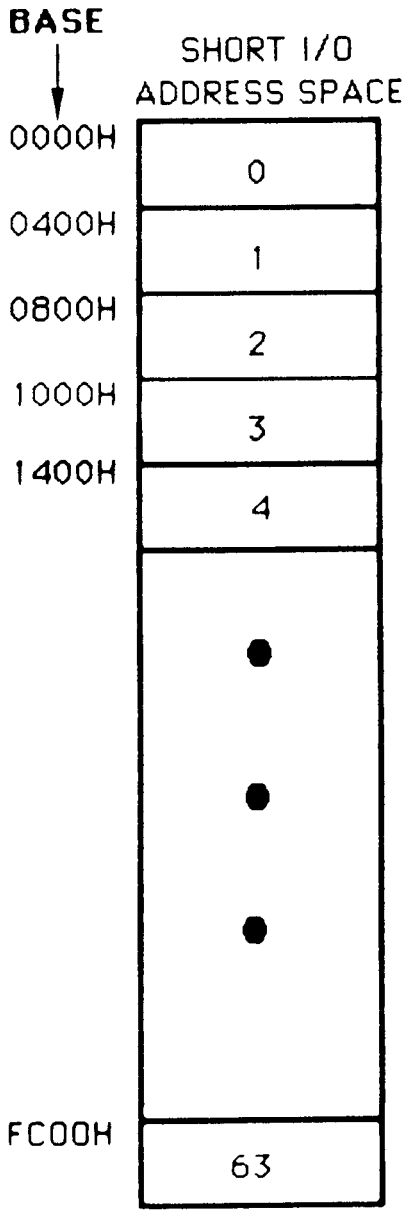


Figure A-1. 64K Short I/O Address Space

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Standardized Module I/O Map

The 1K block of short I/O addresses (called the I/O Interface Block) allocated to each XVME module is mapped with a standardized format in order to simplify programming and data access. The locations of frequently used registers and module-specific identification information are uniform. For example, the module identification information is always found in the first 32 odd bytes of the module memory block -- with these addresses being relative to the jumpered base address (i.e., Module I.D. data address = base address + odd bytes 1H - 3FH). The byte located at base address+81H on each module contains a Status/Control register which provides the results of diagnostics for verification of the module's operational condition. The next area of the module I/O Interface Block (base address + 82H - roughly 120F) is module-specific and it varies in size from one module to the next. It is in this area that the module holds specific I/O status, data, and pointer registers for use with IPC protocol. All intelligent XVME I/O modules have an area of their I/O Interface Blocks defined as "dual access RAM." This area of memory provides the space where XVME "slave" I/O modules access their command blocks and where XVME "master" modules could access their command blocks (i.e., "master" modules can also access global system memory).

The remainder of the I/O Interface Block is then allocated to various module-specific tasks, registers, buffers, ports, etc.

Figure A-2 shows an address map of an XVME I/O module interface block, and how it relates to the VMEbus short I/O address space. Notice that any location in the I/O Interface Block may be accessed by simply using the address formula:

Module Base Address + Relative Offset = Desired Location

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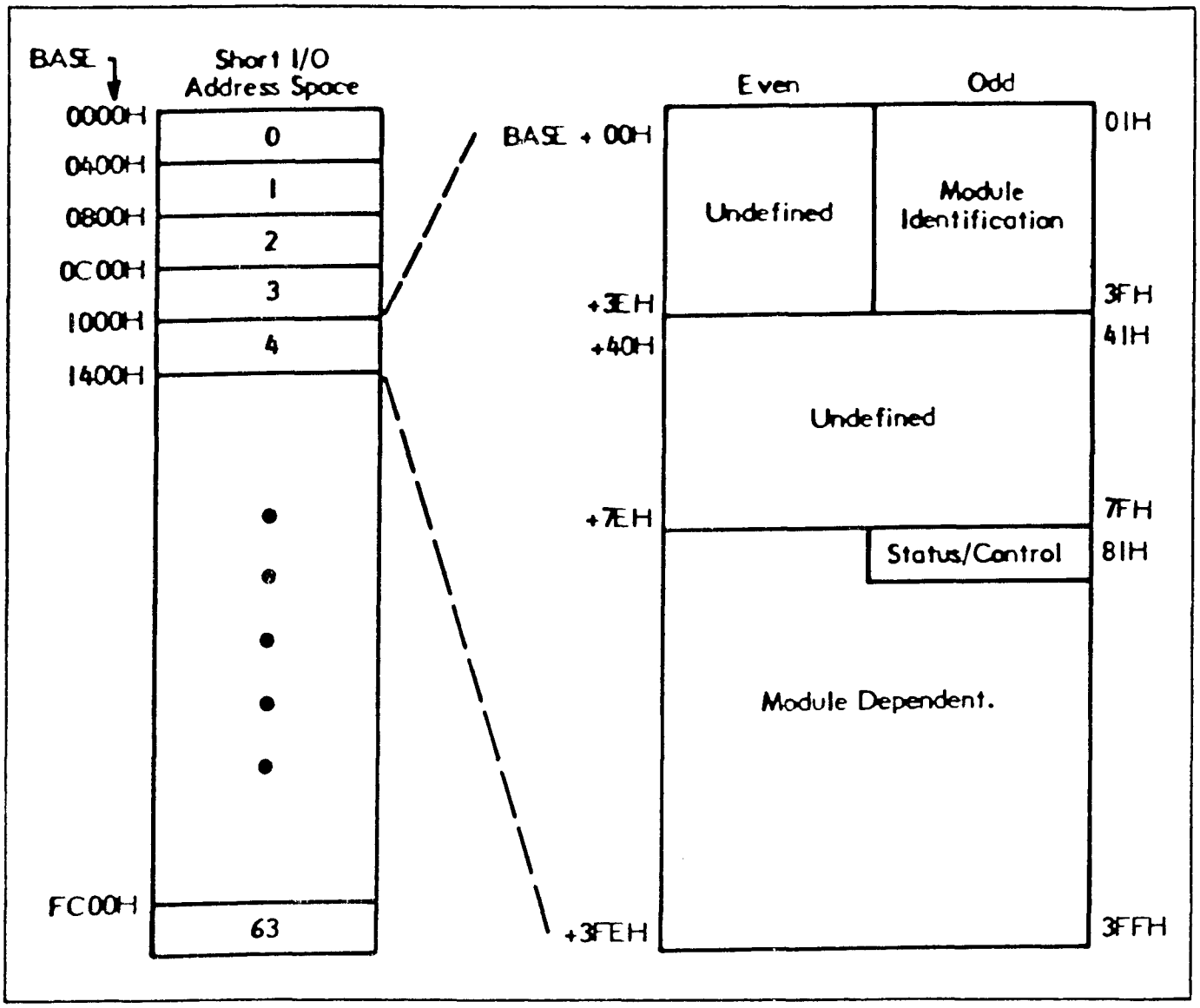


Figure A-2. XVME I/O Module Address Map

MODULE SPECIFIC IDENTIFICATION DATA

The module identification scheme provides a unique method of registering module specific information in an ASCII encoded format. The I.D. data is provided as thirty-two ASCII encoded characters consisting of the board type, manufacturer identification, module model number, number of 1K-byte blocks occupied by the module, and model functional revision level information. This information can be studied by the system processor on power-up to verify the system configuration and operational status. Table A-1 defines the Identification information locations.

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Table A-1. Module I.D. Data

Offset Relative to Module Base	Contents	ASCII Encoding (in hex)	Descriptions
1	V	56	
3	M	4D	ID PROM identifier, always "VMEID" (5 characters)
5	E	45	
7	I	49	
9	D	44	
B	X	58	Manufacturer's I.D., always "XYC" for XYCOM modules (3 characters)
D	Y	59	
F	C	43	
11	2	32	
13	2	32	Module Model Number (3 characters and 4 trailing blanks)
15	0	30	
17		20	
19		20	
1B		20	
1D		20	
1F	1	31	Number of 1K byte blocks of I/O space occupied by this module (1 character)
21		20	Major functional revision level with leading blank (if single digit)
23	1	31	
25	1	30	Minor functional revision level with trailing blank (if single digit)
27		20	
29	Undefined		Manufacturer Dependent Information, Reserved for future use
2B	"		
2D	"		
2F	"		
31	"		
33	"		
35	"		
37	"		
39	"		
3B	"		
3D	"		
3F	"		

The module has been designed so that it is only necessary to use odd backplane addresses to access the I.D. data. Thus, each of the 32 bytes of ASCII data have been assigned to the first 32 odd I/O Interface Block bytes (i.e., odd bytes 1H-3FH).

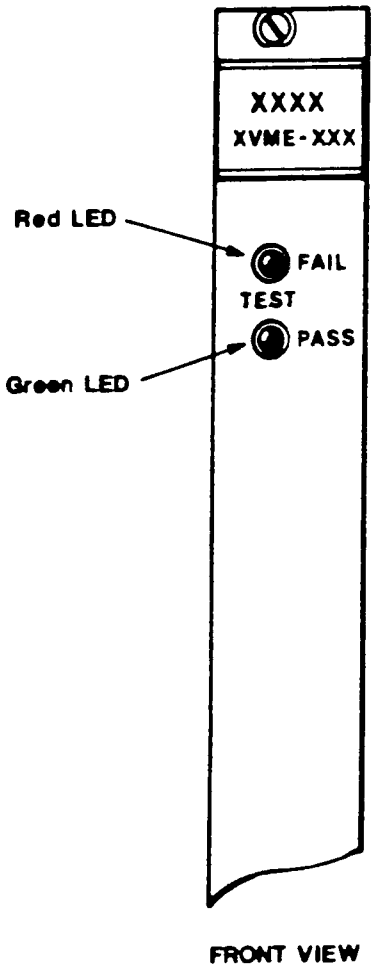
I.D. information can be accessed simply by addressing the module base, offset by the specific address for the character(s) needed. For example, if the base address of the board is jumpered to 1000H, and if you wish to access the module model number (I/O interface block locations 11H, 13H, 15H, 17H, 19H, 1BH, and 1DH), you will individually add the offset addresses to the base addresses to read the hex-coded ASCII value at each location. Thus, in this example, the ASCII values which make up the module model number are found sequentially at locations 1011H, 1013H, 1015H, 1017H, 1019H, 101BH, and 101DH within the system's short I/O address space.

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MODULE OPERATIONAL STATUS/CONTROL

All XVME intelligent I/O modules are designed to perform diagnostic self-tests on power-up or reset. For non-intelligent modules, the user must provide the diagnostic program. The self-test provision allows the user to verify the operational status of a module by either visually inspecting the two LEDs which are mounted on the module front panel (see Figure A-3), or by reading the module status byte (located at module base address + 81H).

Figure A-3 shows the location of the status LEDs on the module front panel. The two tables included with Figure A-3 define the visible LED states for the module test conditions on both the intelligent I/O modules and the non-intelligent I/O modules.



Status/Control Bits 3	2	1	0	LEDs Green	Red	SYSFAIL*	Status
0	0	0	0	OFF	ON	ON	Module not yet tested
1	0	0	0	OFF	ON	ON	Module failed test
1	0	0	1	OFF	OFF	OFF	Inactive module
0	1	1	0	ON	ON	ON	Module undergoing test
1	1	1	1	ON	OFF	OFF	Module plassed test
all others				X	X	X	Invalid and undefined

INTELLIGENT MODULE STATUS

Status/Control Bits 1	0	LEDs Green	Red	SYSFAIL*	Status
0	0	OFF	ON	ON	Module failed, or not yet tested
0	1	OFF	OFF	OFF	Inactive module
1	0	ON	ON	ON	Module undergoing test
1	1	ON	OFF	OFF	Module passed test

NON-INTELLIGENT MODULE STATUS

Figure A-3. Module LED Status

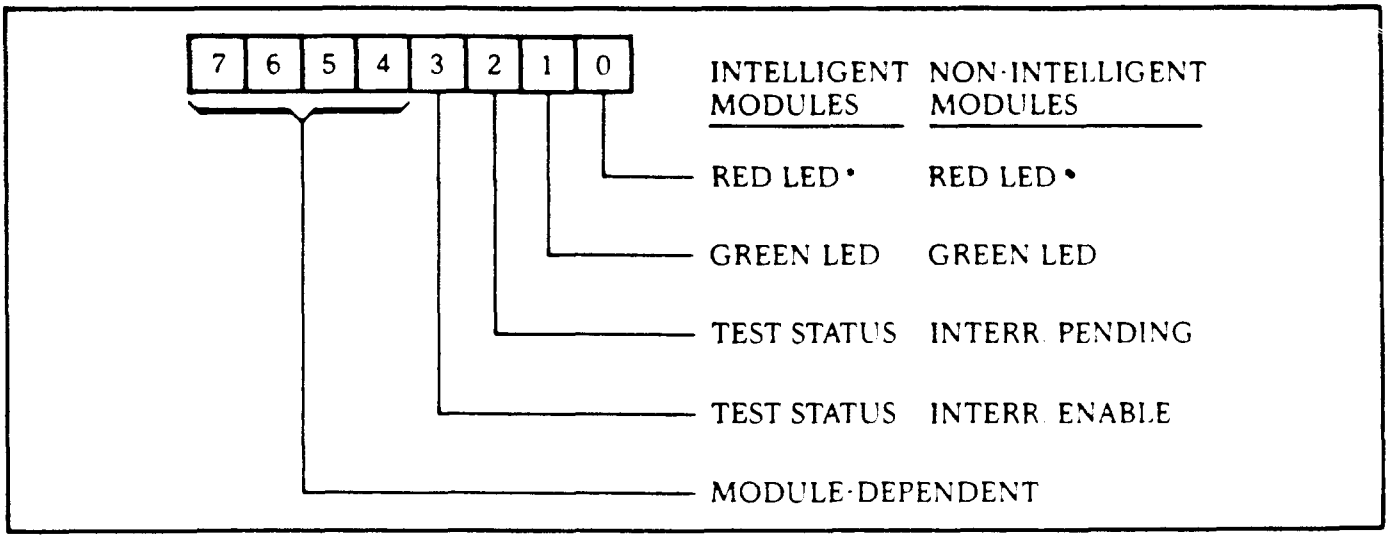
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The module status/control register (found at module base address + 81H) on intelligent XVME I/O modules provides the current status of the module self-test in conjunction with the current status of the front panel LEDs. The status register on intelligent modules is a "Read Only" register and it can be read by software to determine if the board is operating properly.

On non-intelligent XVME I/O modules, the status/control register is used to indicate the state of the front panel LEDs, and to set and verify module-generated interrupts. The LED status bits are "Read/Write" locations which provide the user with the indicators to accomodate diagnostic software. The Interrupt Enable bit is also a Read/Write location which must be written to in order to enable module-generated interrupts. The Interrupt Pending bit is a "Read Only" bit which indicates a module-generated pending interrupt.

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Figure A-4 shows the status/control register bit definitions for both intelligent and non-intelligent XVME I/O modules.



Bit	Non-Intelligent Modules	Bit	Intelligent Modules
0	Read/Write - Red LED 0 = Red LED On 1 = Red LED Off	0	Read Only - Red LED 0 = Red LED On 1 = Red LED Off
1	Read/Write - Green LED 0 = Green LED Off 1 = Green LED On	1	Read Only - Green LED 0 = Green LED Off 1 = Green LED On
2	Read Only - Interrupt Pending 0 = No Interrupt 1 = Interrupt Pending	2 & 3	Read Only - Test Status Indicators Bit 3 / Bit 2 0 / 0 = Self-test not started 0 / 1 = Self-test in progress 1 / 0 = Self-test failed 1 / 1 = Self-test passed
3	Read/Write - Interrupt Enable 0 = Interrupts Not Enabled 1 = Interrupts Enabled		
4	Module dependent	4	Module dependent
5	Module dependent	5	Module dependent
6	Module dependent	6	Module dependent
7	Module dependent	7	Module dependent

Figure A-4. Status Register Bit Definitions

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INTERRUPT CONTROL

Interrupts for non-intelligent modules can be enabled or disabled by setting/clearing the Interrupt Enable bit in the module status register. The status of pending on-board interrupts can also be read from this register. Interrupt control for intelligent modules is handled by the Interprocessor Communications Protocol.

Communications Between Processors

Communications between an intelligent "master" and an intelligent "slave" I/O module is governed by XYCOM's Interprocessor Communication (IPC) Protocol. This protocol involves the use of 20-byte Command Block data structures, which can be located anywhere in shared global RAM or dual-access RAM on an I/O module, to exchange commands and data between a host processor and an I/O module. Interprocessor Communication Protocol is thoroughly explained in Chapter 3 of this manual.

THE KERNEL

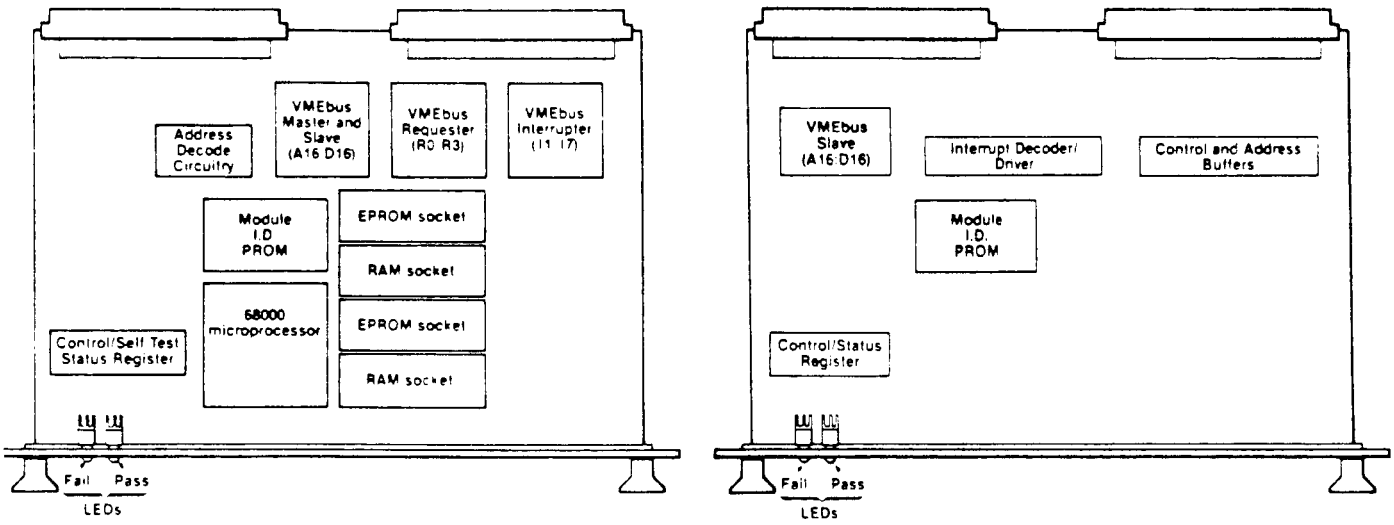
To standardize its XVME I/O modules, XYCOM has designed them around "kernels" common from module to module. Each different module type consists of a standard kernel, combined with module-dependent application circuitry. Module standardization results in more efficient module design and allows the implementation of the Standard I/O Architecture. The biggest benefit of standardization for intelligent modules is that it allows the use of a common command language or protocol (Interprocessor Communication Protocol in this case).

The intelligent kernel is based around a 68000 microprocessor. This design provides the full complement of VMEbus Requester and Interrupter options for master/slave interfacing, as well as all of the advantages provided by the various facets of the XYCOM Standard I/O Architecture (as covered earlier in this appendix).

The non-intelligent kernel provides the circuitry required to receive and generate all of the signals for a VMEbus defined 16-bit "slave" module. The non-intelligent kernel also employs the features of the XYCOM Standard I/O Architecture (as described earlier in this Appendix).

The following simplified diagrams show the features of both the intelligent and the non-intelligent kernels.

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INTELLIGENT KERNEL NON-INTELLIGENT KERNEL

Figure A-5. Intelligent and Non-Intelligent Kernels

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Appendix B

VMEbus CONNECTOR/PIN DESCRIPTION

The XVME-220 Digital Output module is physically configured as a non-expanded (NEXP), double-height, VMEbus compatible board. There is one 96 pin bus connector on the rear edge of the board labeled P1 (refer to Chapter 2, Figure 2-1 for the locations). The pin connections for P1 contain the standard address, data, and control signals necessary for the operation of NEXP modules. The following tables identify the VMEbus signals by signal mnemonic, connector and pin number, and signal characteristic.

Table B-1. P1 - VMEbus Signal Identification

Signal Mnemonic	Connector and Pin Number	Signal Name and Description
ACFAIL*	1B: 3	AC FAILURE - open-collector driven signal which indicates that the AC input to the power supply is no longer being provided or that the required input voltage levels are not being met.
IACKIN*	1A: 21	INTERRUPT ACKNOWLEDGE IN - Totem-pole driven signal. IACKIN* and IACKOUT* signals form a daisy-chained acknowledge. The IACKIN* signal indicates to the VME board that an acknowledge cycle is in progress. (Refer to Section 2.4.5.) The Interrupt Acknowledge In line is shorted directly to the Interrupt Acknowledge Out line on the digital output module. This allows the signal to by-pass the module, and thus prevents the signal from being unnecessarily tied up.
IACKOUT*	1A: 22	INTERRUPT ACKNOWLEDGE OUT - Totem-pole driven signal. IACKIN* and IACKOUT* signals form a daisy-chained acknowledge. The IACKOUT* signal indicates to the next board that an acknowledge cycle is in progress. (Refer to Section 2.4.5.) The Interrupt Acknowledge In line is shorted directly to the Interrupt Acknowledge Out line on the digital output module. This allows the signal to by-pass the module, and thus prevents the signal from being unnecessarily tied up.

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Table B-1. VMEbus Signal Identification (cont'd)

Signal Mnemonic	Connector and Pin Number	Signal Name and Description
AM0-AM5	1A: 23 1B: 16,17, 18,19 1C: 14	ADDRESS MODIFIER (bits 0-5) - Three-state driven lines that provide additional information about the address bus, such as size, cycle type, and/or DTB master identification.
AS*	1A: 18	ADDRESS STROBE - Three-state driven signal that indicates a valid address is on the address bus.
A01-A23	1A: 24-30 1C: 15-30	ADDRESS bus (bits 1-23) - Three-state driven address lines that specify a memory address.
		BBSY*1B: 1BUS BUSY - Open-collector driven signal generated by the current DTB master to indicate that it is using the bus.
BCLR*	1B: 2	BUS CLEAR - Totem-pole driven signal generated by the bus arbitrator to request release by the current DTB master in the event that a higher level is requesting the bus.
BERR*	1C: 11	BUS ERROR - Open-collector driven signal generated by a slave. This signal indicates that an unrecoverable error has occurred and the bus cycle must be aborted.
BG0IN*-BG3IN**	1B: 4,6, 8,10	BUS GRANT (0-3) IN - Totem-pole driven signals generated by the Arbiter or Requesters. Bus Grant In and Out signals form a daisy-chained bus grant. The Bus Grant In signal indicates to this board that it may become the next bus master. (Refer to Section 2.4.5.)
BG0OUT*-BG3OUT*	1B: 5,7, 9,11	BUS GRANT (0-3) OUT - Totem-pole driven signals generated by Requesters. Bus Grant In and Out signals form a daisy-chained bus grant. The Bus Grant Out signal indicates to the next board that it may become the next bus master. (Refer to Section 2.4.5.)
BR0*-BR3*	1B: 12-15	BUS REQUEST (0-3) - Open-collector driven signals generated by Requesters. These signals indicate that a DTB master in the daisy-chain requires access to the bus.

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Table B-1. VMEbus Signal Identification (cont'd)

Signal Mnemonic	Connector and Pin Number	Signal Name and Description
DS0*	1A: 13	DATA STROBE 0 - Three-state driven signal that indicates during byte and word transfers that a data transfer will occur on data bus lines (D00-D07).
DS1*	1A: 12	DATA STROBE 1 - Three-state driven signal that indicates during byte and word transfers that a data transfer will occur on data bus lines (D08-D15).
DTACK*	1A: 16	DATA TRANSFER ACKNOWLEDGE - Open-collector driven signal generated by a DTB slave. The falling edge of this signal indicates that valid data is available on the data bus during a read cycle, or that data has been accepted from the data bus during a write cycle.
D00-D15	1A: 1-8 1C: 1-8	DATA BUS (bits 0-15) - Three-state driven bi-directional data lines that provide a data path between the DTB master and slave.
GND	1A: 9,11, 15,17,19 1B: 20,23 1C: 9	GROUND
IACK*	1A: 20	INTERRUPT ACKNOWLEDGE - Open-collector or three-state driven signal from any Master processing an interrupt request. Routed via the backplane to Slot 1, where it is looped back to become Slot 1 IACKIN* to start the interrupt acknowledge daisy-chain.
IRQ1*-IRQ7*	1B: 24-30	INTERRUPT REQUEST (1-7) - Open-collector driven signals, generated by an interrupter, which carry prioritized interrupt requests. Level seven is the highest priority.
LWORD*	1C: 13	LONGWORD - Three-state driven signal to indicate that the current transfer is a 32-bit transfer.
SERCLK	1B: 21	A reserved signal which will be used as the clock for a serial communication bus protocol which is still being finalized.
SERDAT	1B: 22	A reserved signal which will be used as the transmission line for serial communication bus messages.

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Table B-1. VMEbus Signal Identification (cont'd)

Signal Mnemonic	Connector and Pin Number	Signal Name and Description
SYSCLK	1A: 10	SYSTEM CLOCK - A constant 16-MHz clock signal that is independent of processor speed or timing. This signal is used for general system timing use.
SYSFAIL*	1C: 10	SYSTEM FAIL - Open-collector driven signal that indicates that a failure has occurred in the system. This signal may be generated by any module on the VMEbus.
SYSRESET*	1C: 12	SYSTEM RESET - Open-collector driven signal which, when low, will cause the system to be reset.
WRITE*	1A: 14	WRITE - Three-state driven signal that specifies the data transfer cycle in progress to be either read or written. A high level indicates a read operation; a low level indicates a write operation.
+5V STDBY	1B: 31	+5 Vdc STANDBY - This line supplies +5 Vdc to devices requiring battery backup.
+5V	1A: 32 1B: 32 1C: 32	+5 Vdc Power - Used by system logic circuits.
+12V	1C: 31	+12 Vdc Power - Used by system logic circuits.
-12V	1A: 31	-12 Vdc Power - Used by system logic circuits.

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BACKPLANE CONNECTOR P1

The following table lists the P1 pin assignments by pin number order. (The connector consists of three rows of pins labeled rows A, B, and C.)

Table B-2. P1 Pin Assignments

Pin Number	Row A Signal Mnemonic	Row B Signal Mnemonic	Row C Signal Mnemonic
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	BG0IN*	D11
5	D04	BG0OUT*	D12
6	D05	BG1IN*	D13
7	D06	BG1OUT*	D14
8	D07	BG2IN*	D15
9	GND	BG2OUT*	GDN
10	SYSCLK	BG3IN*	SYSFAIL*
11	GND	BG3OUT*	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GND	BR3*	A23
16	DTACK*	AM0	A22
17	GND	AM1	A21
18	AS*	AM2	A20
19	GND	AM3	A19
20	IACK*	GND	A18
21	IACKIN*	SERCLK (1)	A17
22	IACKOUT*	SERDAT (1)	A16
23	AM4	GND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13
26	A05	IRQ5*	A12
27	A04	IRQ4*	A11
28	A03	IRQ3*	A10
29	A02	IRQ2*	A09
30	A01	IRQ1*	A08
31	-12V	+5V STDBY	+12V
32	+5V	+5V	+5V

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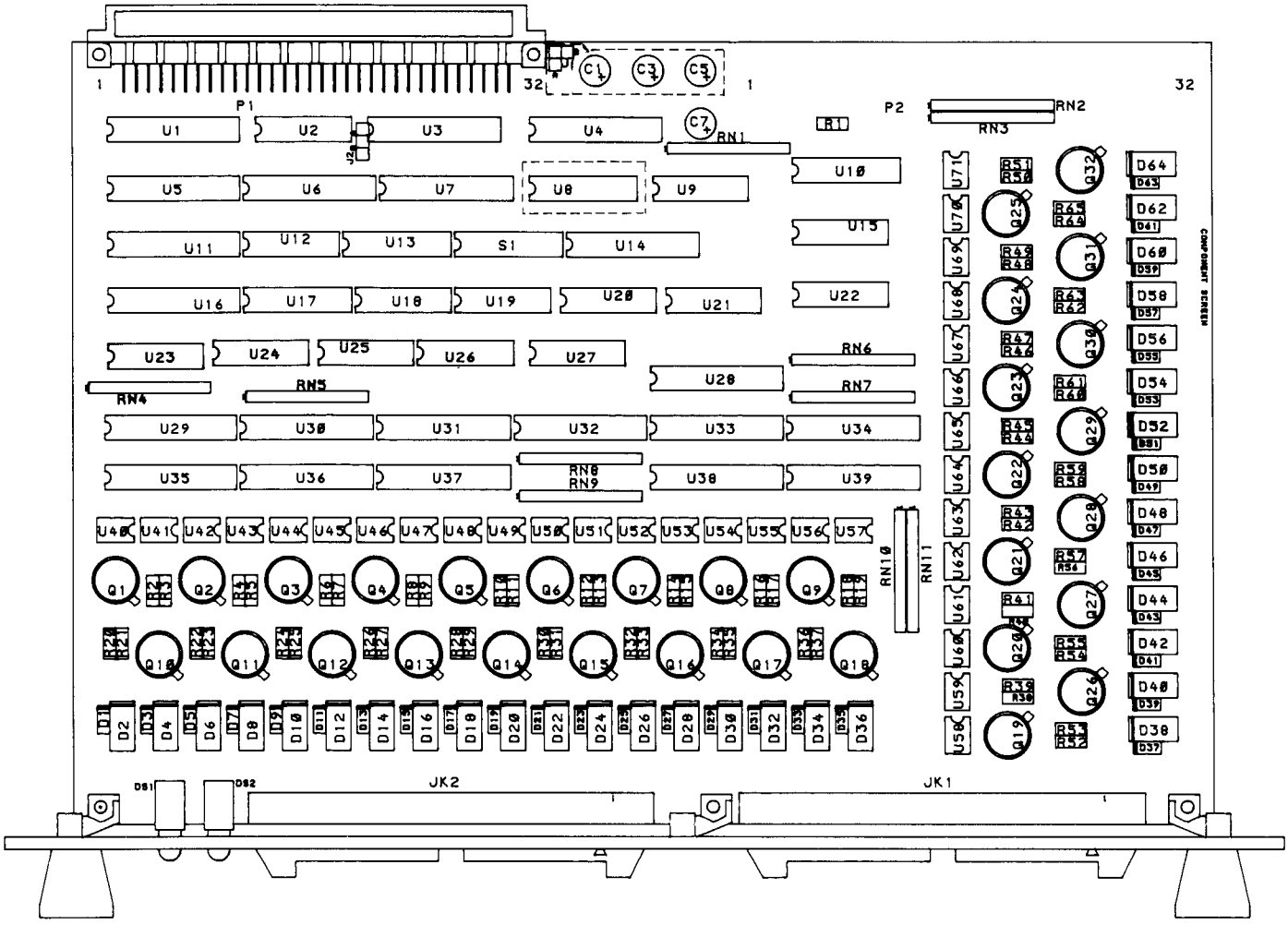
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Appendix C

SCHEMATICS AND DIAGRAMS

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Assembly Drawing



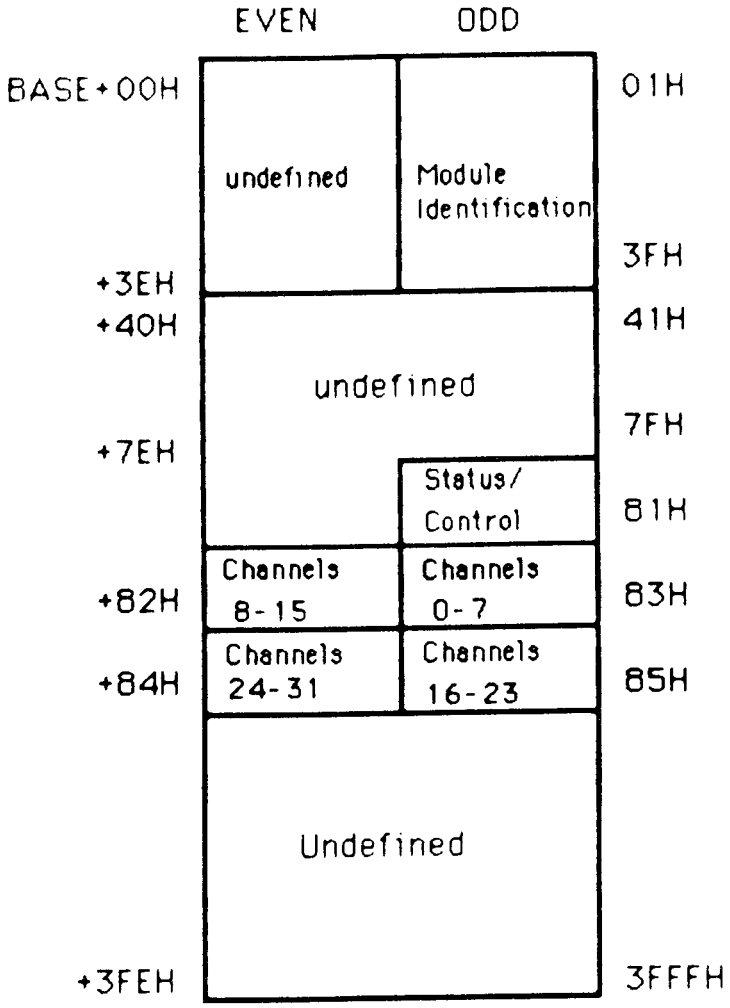
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Appendix D

QUICK REFERENCE GUIDE

NOTE

Reading from or writing to undefined addresses may make the user software incompatible with future versions of this module.



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* Reading from or writing to undefined addresses may make the user software incompatible with future versions of this module.

Jumpers/Switches

Jumper	Function
J2	Address Space selection jumper (i.e., Short I/O Address Space or Standard Address Space).

Switch Block	Function
S1 (switches 1-6)	Module Base Address Select.
S1 (switch 7)	This switch works in conjunction with jumper J2 to determine whether the board operates with address modifiers for Short I/O Address Space or those for Standard Address space.
S1 (switch 8)	This switch determines whether the module will respond to only supervisory accesses or to both supervisory and non-privileged accesses.

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Base Address Switch Options

Switches						VME base address in VME Short I/O Address space
6(A15)	5(A14)	4(A13)	3(A12)	2(A11)	1(A10)	
0	0	0	0	0	0	0000H
0	0	0	0	0	1	0400H
0	0	0	0	1	0	0800H
0	0	0	0	1	1	0C00H
0	0	0	1	0	0	1000H
0	0	0	1	0	1	1400H
0	0	0	1	1	0	1800H
0	0	0	1	1	1	1C00H
0	0	1	0	0	0	2000H
0	0	1	0	0	1	2400H
0	0	1	0	1	0	2800H
0	0	1	0	1	1	2C00H
0	0	1	1	0	0	3000H
0	0	1	1	0	1	3400H
0	0	1	1	1	0	3800H
0	0	1	1	1	1	3C00H
0	1	0	0	0	0	4000H
0	1	0	0	0	1	4400H
0	1	0	0	1	0	4800H
0	1	0	0	1	1	4C00H
0	1	0	1	0	0	5000H
0	1	0	1	0	1	5400H
0	1	0	1	1	0	5800H
0	1	0	1	1	1	5C00H
0	1	1	0	0	0	6000H
0	1	1	0	0	1	6400H
0	1	1	0	1	0	6800H
0	1	1	0	1	1	6C00H
0	1	1	1	0	0	7000H
0	1	1	1	0	1	7400H
0	1	1	1	1	0	7800H
0	1	1	1	1	1	7C00H
1	0	0	0	0	0	8000H
1	0	0	0	0	1	8400H
1	0	0	0	1	0	8800H
1	0	0	0	1	1	8C00H
1	0	0	1	0	0	9000H
1	0	0	1	0	1	9400H
1	0	0	1	1	0	9800H
1	0	0	1	1	1	9C00H
1	0	1	0	0	0	A000H
1	0	1	0	0	1	A400H
1	0	1	0	1	0	A800H
1	0	1	0	1	1	AC00H
1	0	1	1	0	0	B000H
1	0	1	1	0	1	B400H
1	0	1	1	1	0	B800H
1	0	1	1	1	1	BC00H
1	1	0	0	0	0	C000H
1	1	0	0	0	1	C400H
1	1	0	0	1	0	C800H
1	1	0	0	1	1	CC00H
1	1	0	1	0	0	D000H
1	1	0	1	0	1	D400H
1	1	0	1	1	0	D800H
1	1	0	1	1	1	DC00H
1	1	1	0	0	0	E000H
1	1	1	0	0	1	E400H
1	1	1	0	1	0	E800H
1	1	1	0	1	1	EC00H
1	1	1	1	0	0	F000H
1	1	1	1	0	1	F400H
1	1	1	1	1	0	F800H
1	1	1	1	1	1	FC00H

NOTE

Open = Logic "1"
Closed = Logic "0"

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Publication Change Notice

DATE: 1/28/85

PCN NUMBER: 088

PUBLICATION NUMBER: 74220

TITLE: XVME-220 Digital Output Module

PREVIOUS PCNs BY NUMBER:

EFFECTIVE DATE: 1/28/85

This Publication Change Notice provides changes for the publication specified above. These changes will remain in effect for subsequent releases unless specifically amended by another PCN or superseded by a publication revision.

NOTE: Please file this PCN at the back of the manual to provide a record of changes. All illustrations that change should be inserted into manual and the obsolete page destroyed.

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NOTE

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PAGE	DESCRIPTION
2-5 thru 2-8	Replace these pages with attached.

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Table 2-2. Base Address Switch Options

Switches						VME base address in VME Short I/O Address space
6(A15)	5(A14)	4(A13)	3(A12)	2(A11)	1(A10)	
0	0	0	0	0	0	0000H
0	0	0	0	0	1	0400H
0	0	0	0	1	0	0800H
0	0	0	0	1	1	0C00H
0	0	0	1	0	0	1000H
0	0	0	1	0	1	1400H
0	0	0	1	1	0	1800H
0	0	0	1	1	1	1C00H
0	0	1	0	0	0	2000H
0	0	1	0	0	1	2400H
0	0	1	0	1	0	2800H
0	0	1	0	1	1	2C00H
0	0	1	1	0	0	3000H
0	0	1	1	0	1	3400H
0	0	1	1	1	0	3800H
0	0	1	1	1	1	3C00H
0	1	0	0	0	0	4000H
0	1	0	0	0	1	4400H
0	1	0	0	1	0	4800H
0	1	0	0	1	1	4C00H
0	1	0	1	0	0	5000H
0	1	0	1	0	1	5400H
0	1	0	1	1	0	5800H
0	1	0	1	1	1	5C00H
0	1	1	0	0	0	6000H
0	1	1	0	0	1	6400H
0	1	1	0	1	0	6800H
0	1	1	0	1	1	6C00H
0	1	1	1	0	0	7000H
0	1	1	1	0	1	7400H
0	1	1	1	1	0	7800H
0	1	1	1	1	1	7C00H
1	0	0	0	0	0	8000H
1	0	0	0	0	1	8400H
1	0	0	0	1	0	8800H
1	0	0	0	1	1	8C00H
1	0	0	1	0	0	9000H
1	0	0	1	0	1	9400H
1	0	0	1	1	0	9800H
1	0	0	1	1	1	9C00H
1	0	1	0	0	0	A000H
1	0	1	0	0	1	A400H
1	0	1	0	1	0	A800H
1	0	1	0	1	1	AC00H
1	0	1	1	0	0	B000H
1	0	1	1	0	1	B400H
1	0	1	1	1	0	B800H
1	0	1	1	1	1	BC00H
1	1	0	0	0	0	C000H
1	1	0	0	0	1	C400H
1	1	0	0	1	0	C800H
1	1	0	0	1	1	CC00H
1	1	0	1	0	0	D000H
1	1	0	1	0	1	D400H
1	1	0	1	1	0	D800H
1	1	0	1	1	1	DC00H
1	1	1	0	0	0	E000H
1	1	1	0	0	1	E400H
1	1	1	0	1	0	E800H
1	1	1	0	1	1	EC00H
1	1	1	1	0	0	F000H
1	1	1	1	0	1	F400H
1	1	1	1	1	0	F800H
1	1	1	1	1	1	FC00H

NOTE

Open = Logic "1"
Closed = Logic "0"

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2.4.2 Address Space Selection

The user is given the option of placing the DOUT in VMEbus Short I/O or Standard Memory Space. The selection is made by configuring jumper J2 and Switch 8 of Switch Bank S1 (see Figure 2-3) as shown in Table 2-3 below.

Table 2-3. Addressing Options

Jumper	Switch 8	Option Selected
J2A J2B	Open Closed	Standard Data Access Operation Short I/O Access Operation

If jumper J2A is installed, Switch 8 must be set to open.

If jumper J2B is installed, Switch 8 must be set to closed.

The Standard I/O Architecture recommends that the DOUT operate within the Short I/O Address Space, in order to take advantage of the Standard I/O Architecture's various features, which are described in Appendix A.

If required, the DOUT can operate in the Standard Address Space. The user should note that in this mode, the DOUT will always reside within the last 64K byte segment of the Standard Memory Address Space (i.e., the address range FF0000H through FFFFFFH).

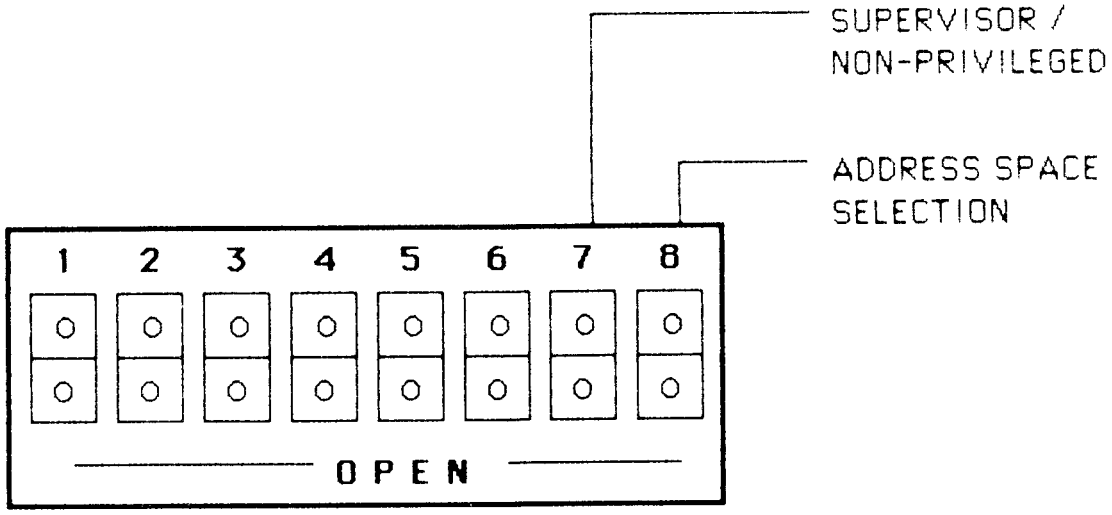


Figure 2-3. Switch Bank S1

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2.4.3 Supervisor/Non-Privileged Mode Selection

The DOUT can be configured to respond to only Supervisory access, or to both Non-Privileged and Supervisory accesses, by selecting the position of Switch 7 (located in Switch Bank S1, see Figure 2-3), as shown in Table 2-4 below.

Table 2-4. Privilege Options

Switch 7	Privilege Mode Selected
Closed	Supervisory or Non-Privileged
Open	Supervisory Only

2.4.4 Address Modifier Reference

The following table (Table 2-5) indicates the actual VMEbus Address Modifier code that the DOUT will respond to based on the position of the two options discussed in the previous two sections.

Table 2-5. Address Modifier Code Options

	Switches 7	8	Jumper J2	Address Modifier Code DOUT will respond to
Short I/O	Closed	Closed	B	29H or 2DH
	Open	Closed	B	2DH only
Standard Address	Closed	Open	A	39H or 3DH
	Open	Open	A	3DH only

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2.4.5 BGxIN*/BGxOUT* Daisy Chain

The Data Bus Arbitration signals BGxIN* and BGxOUT* (where "x" can be a number 0-3 to represent the three levels of arbitration) are not used by the DOUT, and are hardwired together on the module to allow the BGxIN*/BGxOUT* Daisy Chain to pass through the backplane slot occupied by the DOUT. In each slot of the VMEbus backplane, there are four sets of jumpers shorting the signal BGxIN* to BGxOUT* (x=0 thru 3). Since these signals are already hardwired on the DOUT, it is not necessary to insert these VMEbus jumpers on the slot occupied by the DOUT.

2.4.6 Interrupt Acknowledge Signals

The XVME-220 DOUT module is not capable of generating VMEbus interrupts. Therefore, the interrupt acknowledge signals (IACKIN* and IACKOUT*) are hardwired together on the module to allow the daisy chain to pass through the backplane slot occupied by DOUT. In each slot of the VMEbus backplane, there is a jumper shorting the signal IACKIN* to IACKOUT*. Since these signals are hardwired on the DOUT, it is not necessary to insert these VMEbus jumpers on the slot occupied by the DOUT.

2.5 FRONT PANEL CONNECTORS

There are two 50 pin dual row header connectors (labeled JK1 and JK2) located on the front panel of the DOUT module. These connectors provide the 32 output channels (arranged in 4 ports), and one module ground connection for each channel.

Figure 2-4 shows the connector pin numbering orientation from both a side view and a front view.

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NOTE

The following list of changes was prepared from readers' comments and engineering reviews.

PAGE	DESCRIPTION
2-2	In Figure 2-1, JK1 and JK2 should be interchanged (JK2 should be the top connector, JK1 the bottom connector).
3-7	Replace this page with the attached sheet.

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Figure 3-3 shows a small memory map of the 4 (byte-wide) output ports, the offset (from the base address) for each port, and the output channels which correspond to each port.

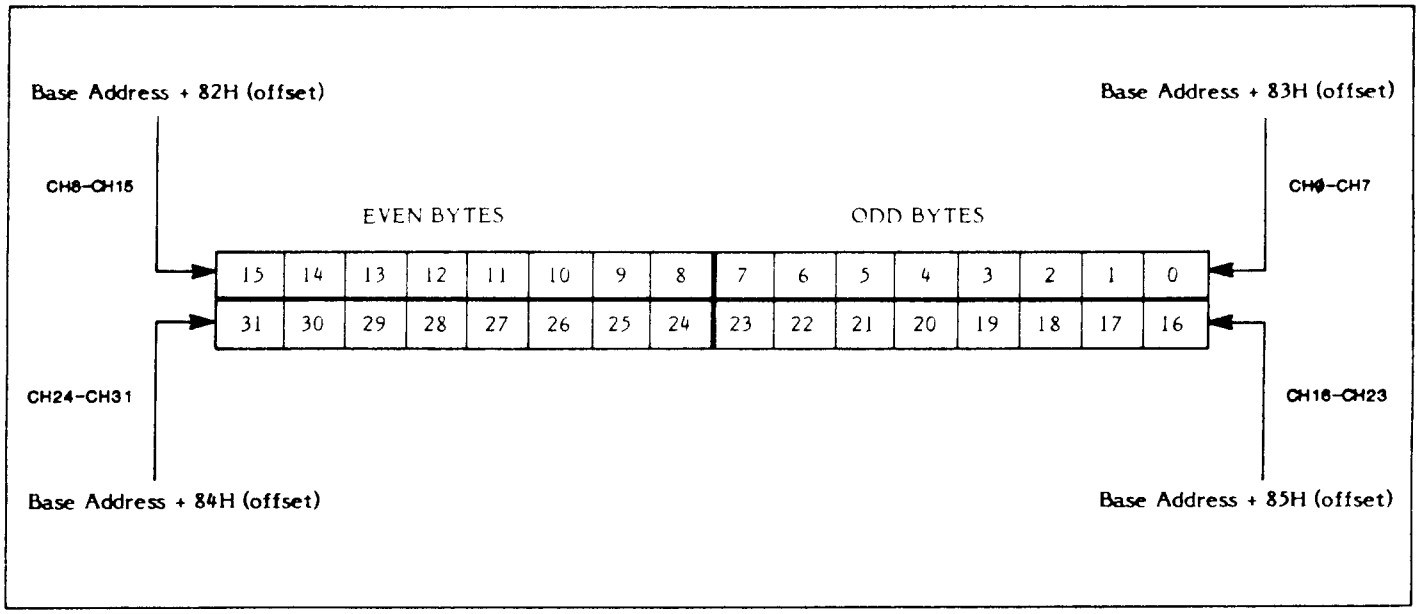


Figure 3-3. Output Ports

An output channel is activated (turned on) when a logic "1" is written to the corresponding offset plus the module base address. An output channel is deactivated (turned off) when a logic "0" is written to the corresponding offset plus base address. On power-up or after a software reset, the outputs are all deactivated (i.e., all outputs are turned off).

Each set of channels uses D-type flip-flops to latch data before it is passed through the opto-isolators. Thus, the digital state of each output can be read (via software) to allow for the verification of output data. Figure 2-6 illustrates the point on each output where the output state is read.

Reading from the output ports will return the status of the data written to the outputs (i.e., from the module side of the opto-isolator). Reading from the outputs will not always reflect the actual status at the output connector. For example, reading from the channel will only show whether the channel is being driven by the DOUT module. It will not indicate the electrical level status of the output pin if the power supply for an external circuit is turned off.

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Publication Change Notice

DATE: September 25, 1985

PCN NUMBER: 095

PUBLICATION NUMBER: 74220-001

TITLE: XVME-220 Digital Output Module

PREVIOUS PCNs BY NUMBER: 088

EFFECTIVE DATE: September 25, 1985

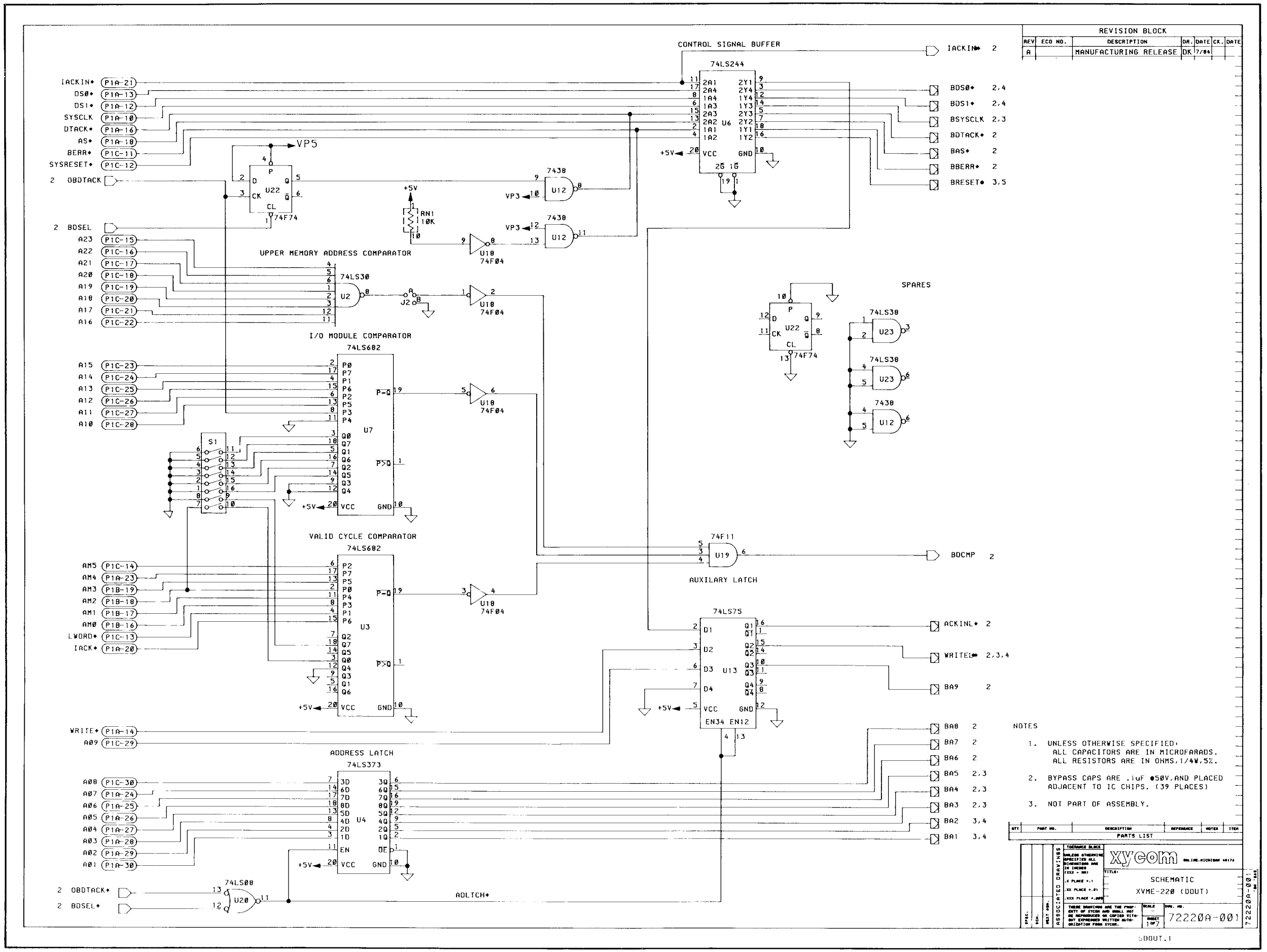
This Publication Change Notice provides changes for the publication specified above. These changes will remain in effect for subsequent releases unless specifically amended by another PCN or superseded by a publication revision.

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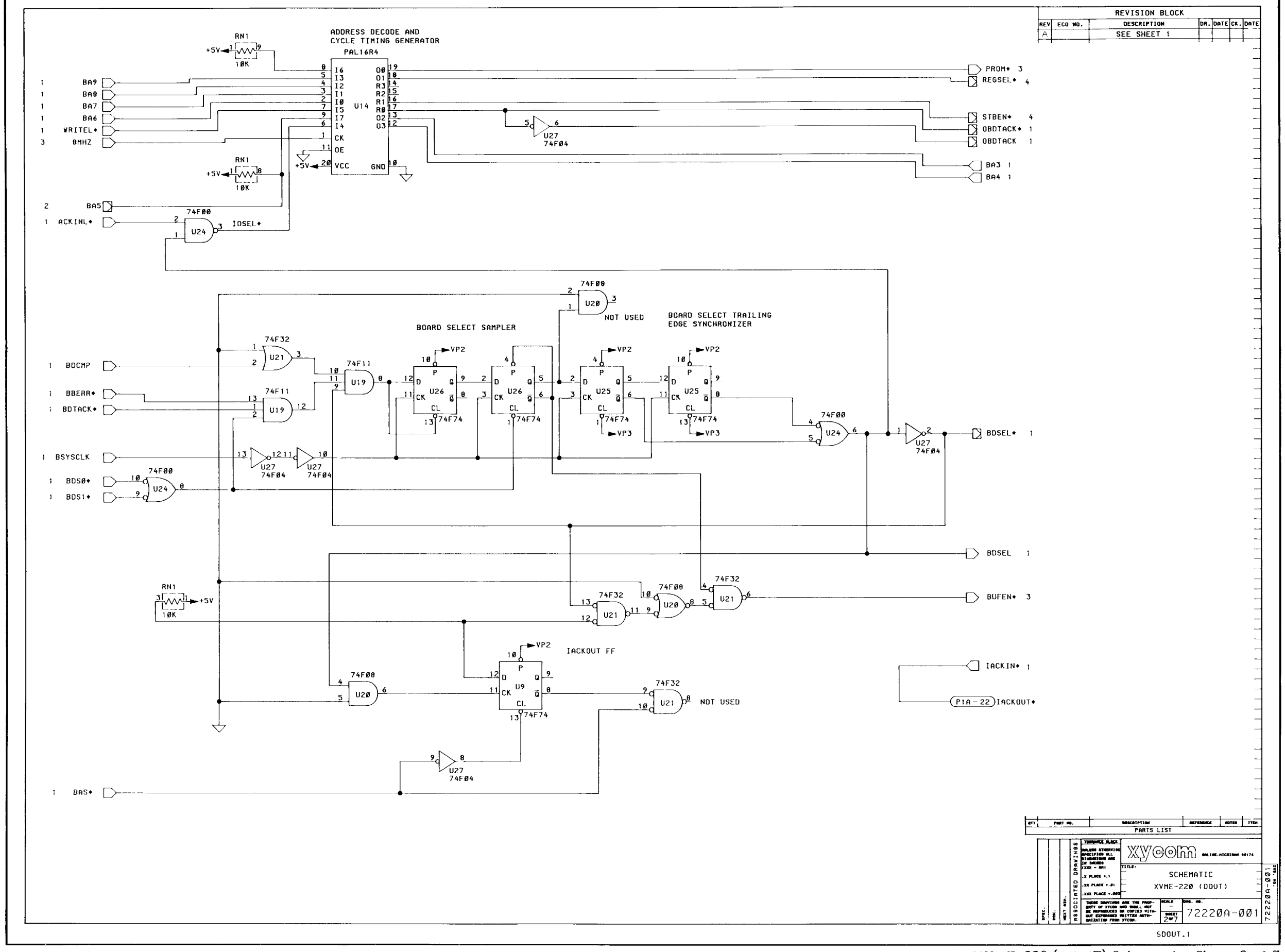
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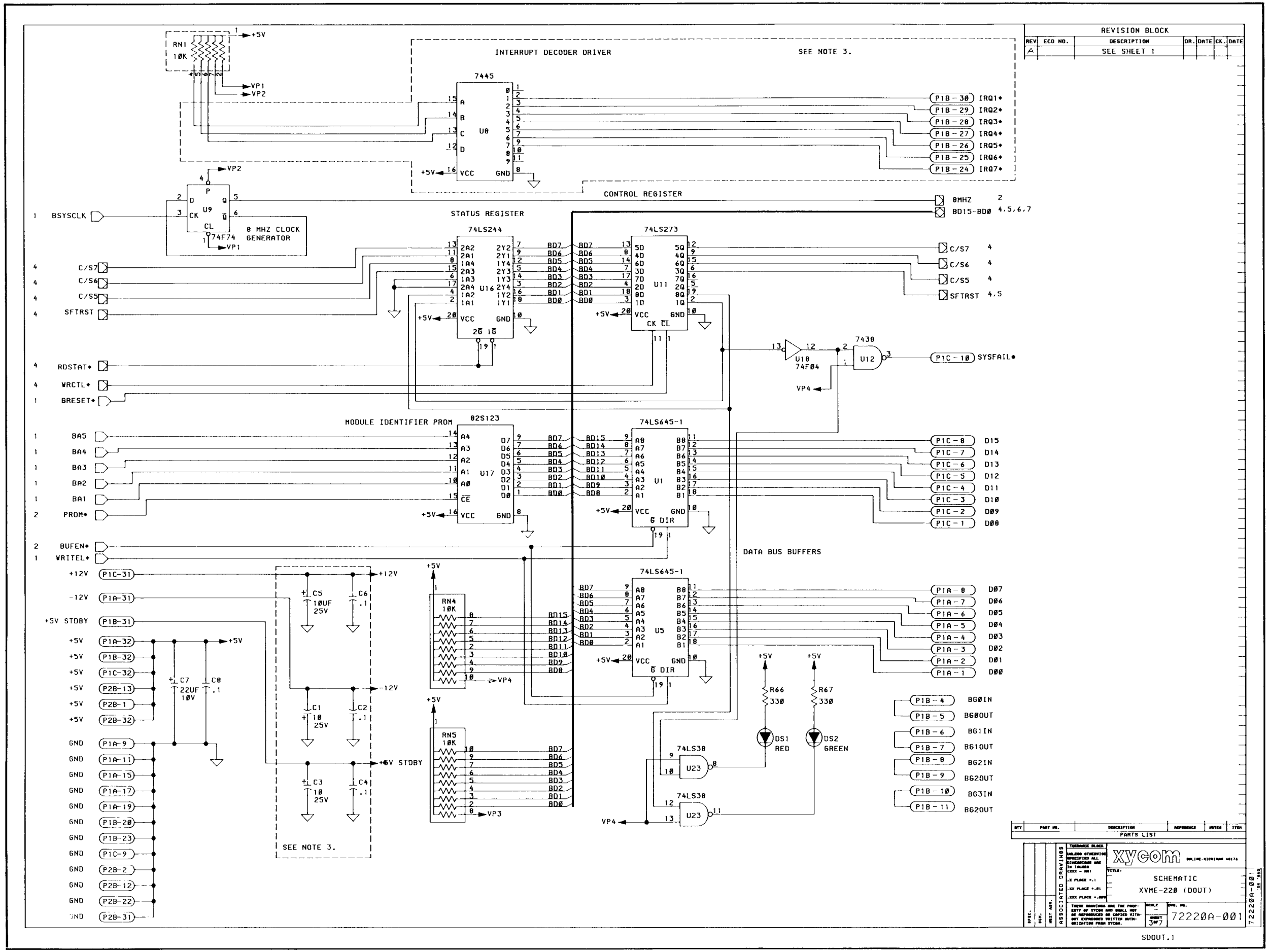


XVME-220 (DOUT) Schematic, Sheet 1 of 7

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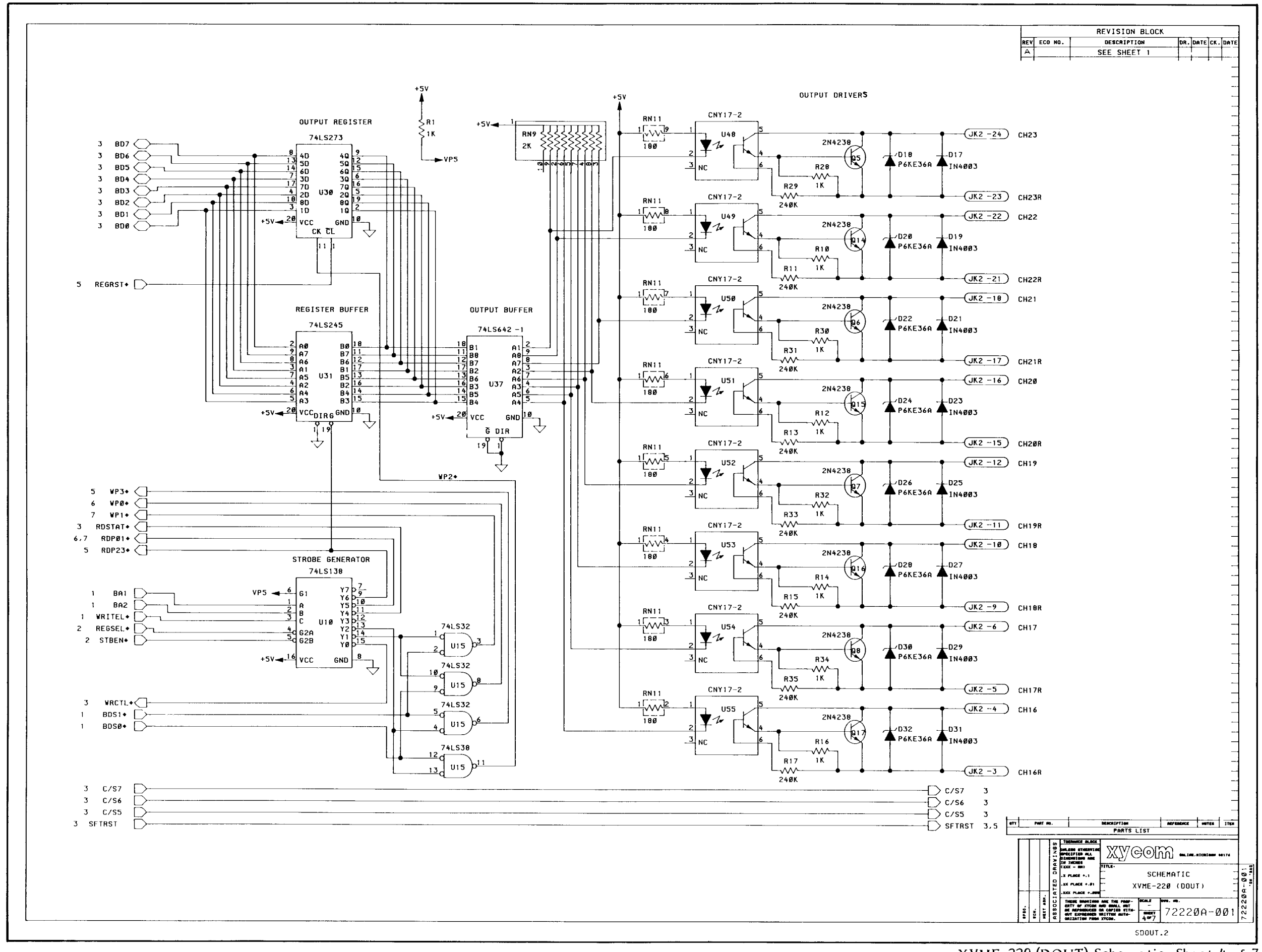
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XVME-220 (DOUT) Schematic, Sheet 3 of 7

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REVISION BLOCK						
REV	ECO NO.	DESCRIPTION	DR.	DATE	CK.	DATE
A		SEE SHEET 1				

OUTPUT DRIVERS

OUTPUT REGISTER

74LS273

3 BD15
3 BD14
3 BD13
3 BD12
3 BD11
3 BD10
3 BD9
3 BD8

4 WP3*

REGISTER BUFFER

74LS245

OUTPUT BUFFER

74LS642 -1

RN8 2K

RN10 180

CNY17-2 U40 U41 U42 U43 U44 U45 U46 U47

2N4238 Q1 Q10 Q2 Q11 Q3 Q12 Q4 Q13

P6KE36A D2 D4 D6 D8 D10 D12 D14 D16

IN4003 D1 D3 D5 D7 D9 D11 D13 D15

R20 R2 R22 R4 R24 R6 R26 R8 1K

R21 R3 R23 R5 R25 R7 R27 R9 240K

JK2 -48	CH31	
JK2 -47	CH31R	
JK2 -46	CH30	
JK2 -45	CH30R	
JK2 -42	CH29	
JK2 -41	CH29R	
JK2 -40	CH28	
JK2 -39	CH28R	
JK2 -36	CH27	
JK2 -35	CH27R	
JK2 -34	CH26	
JK2 -33	CH26R	
JK2 -30	CH25	
JK2 -29	CH25R	
JK2 -28	CH24	
JK2 -27	CH24R	

4 RDP23*

4 SFTRST
1 BRESET*
4,6,7 REGRST*

74F00 U18 74F04 U24

U27 74F04

REGISTER RESET

PARTS LIST

QTY	PART NO.	DESCRIPTION	REFERENCE	NOTES	ITEM

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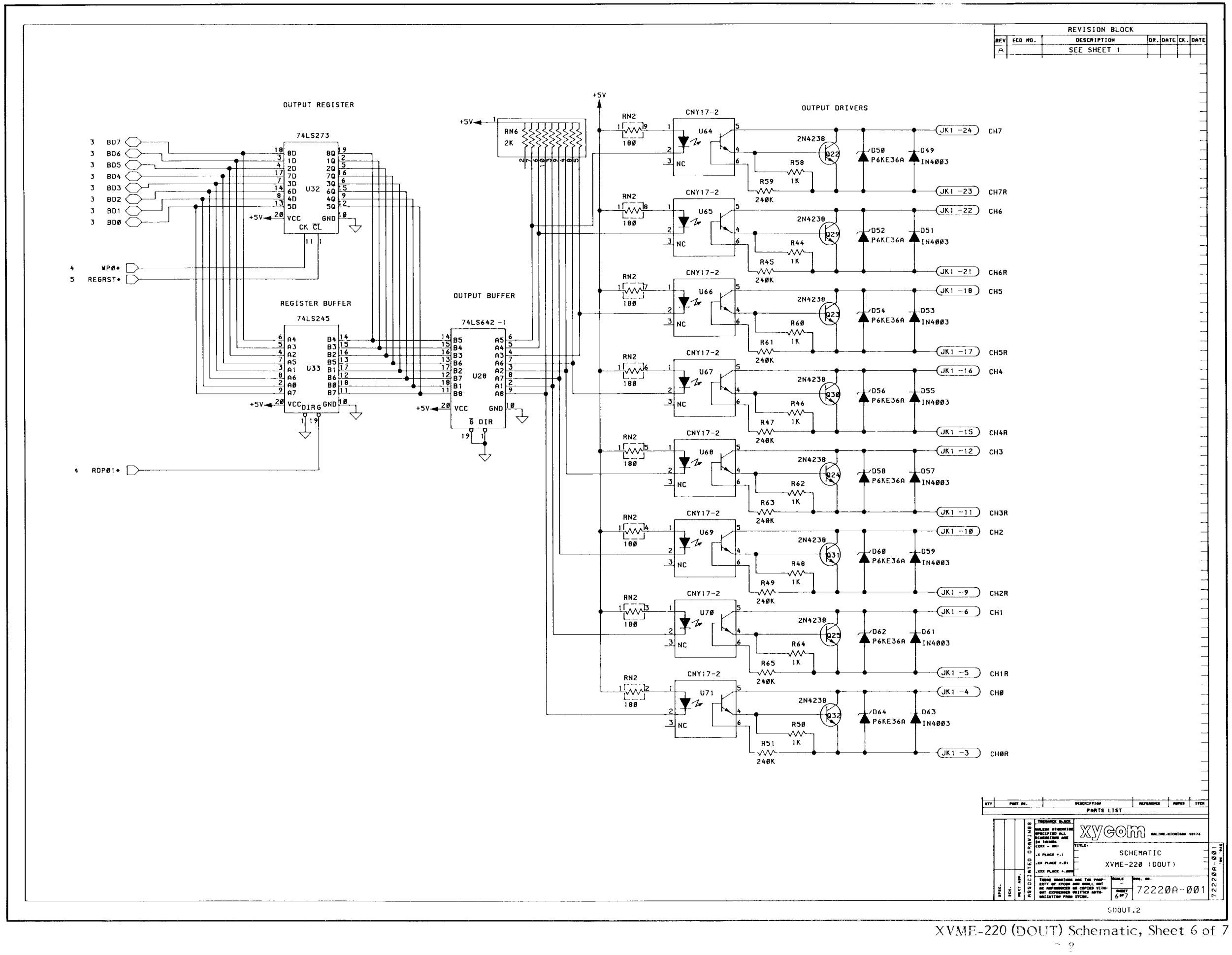
SCHEMATIC
XVME-220 (DOUT)

72220A-001

SHEET 5 of 7

72220A-00

DOUT.2



XVME-220 (DOUT) Schematic, Sheet 6 of 7

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REVISION BLOCK

REV	ECO NO.	DESCRIPTION	DR.	DATE	CK.	DATE
A		SEE SHEET 1				

OUTPUT REGISTER

74LS273

3 BD15
3 BD14
3 BD13
3 BD12
3 BD11
3 BD10
3 BD9
3 BD8

4 WP1*
5 REGRST*

REGISTER BUFFER

74LS245

4 RDP01*

OUTPUT BUFFER

74LS642 -1

+5V

RN7 2K

OUTPUT DRIVERS

RN3 1	100	CNY17-2 U56	2N4238 Q9	R36 1K / R37 240K	D34 P6KE36A / D33 IN4003	JK1 -48 CH15 / JK1 -47 CH15R
RN3 7	100	CNY17-2 U57	2N4238 Q18	R18 1K / R19 240K	D36 P6KE36A / D35 IN4003	JK1 -46 CH14 / JK1 -45 CH14R
RN3 6	100	CNY17-2 U58	2N4238 Q19	R52 1K / R53 240K	D38 P6KE36A / D37 IN4003	JK1 -42 CH13 / JK1 -41 CH13R
RN3 4	100	CNY17-2 U59	2N4238 Q26	R38 1K / R39 240K	D40 P6KE36A / D39 IN4003	JK1 -40 CH12 / JK1 -39 CH12R
RN3 3	100	CNY17-2 U60	2N4238 Q20	R54 1K / R55 240K	D42 P6KE36A / D41 IN4003	JK1 -36 CH11 / JK1 -35 CH11R
RN3 2	100	CNY17-2 U61	2N4238 Q27	R40 1K / R41 240K	D44 P6KE36A / D43 IN4003	JK1 -34 CH10 / JK1 -33 CH10R
RN3 8	100	CNY17-2 U62	2N4238 Q21	R56 1K / R57 240K	D46 P6KE36A / D45 IN4003	JK1 -30 CH9 / JK1 -29 CH9R
RN3 9	100	CNY17-2 U63	2N4238 Q28	R42 1K / R43 240K	D48 P6KE36A / D47 IN4003	JK1 -28 CH8 / JK1 -27 CH8R

PARTS LIST

QTY	PART NO.	DESCRIPTION	REFERENCE	NOTES	ITEM

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TITLE: SCHEMATIC XVME-220 (DOUT)

DWG. NO. 72220A-001

SCALE -

SHEET 7 of 7

72220A-001

SDOUT.2

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