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VMIVME-2170A

32-bit OPTICALLY COUPLED DIGITAL OUTPUT BOARD

INSTRUCTION MANUAL

DOCUMENT NO. 500-102170-000 E

Revised February 16, 1994

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RECORD OF REVISIONS

REVISION LETTER	DATE	PAGES INVOLVED	CHANGE NUMBER
A	09/24/91	Release documents	91-0247
B	12/06/91	Cover, page ii, and Appendix A	91-0299
C	06/18/92	Reformat Sections 2 and 6, and correct Figure 5.3-1	92-0175
D	04/13/93	Cover, pages ii, and 5-3	93-0207
E	02/16/94	Cover, pages ii, and 5-4	94-0218

VMIC
SAFETY SUMMARY

THE FOLLOWING GENERAL SAFETY PRECAUTIONS MUST BE OBSERVED DURING ALL PHASES OF THIS OPERATION, SERVICE, AND REPAIR OF THIS PRODUCT. FAILURE TO COMPLY WITH THESE PRECAUTIONS OR WITH SPECIFIC WARNINGS ELSEWHERE IN THIS MANUAL VIOLATES SAFETY STANDARDS OF DESIGN, MANUFACTURE, AND INTENDED USE OF THE PRODUCT. VME MICROSYSTEMS INTERNATIONAL CORPORATION ASSUMES NO LIABILITY FOR THE CUSTOMER'S FAILURE TO COMPLY WITH THESE REQUIREMENTS.

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DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the system in the presence of flammable gases or fumes. Operation of any electrical system in such an environment constitutes a definite safety hazard.

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Operating personnel must not remove product covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY SYSTEM

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to VME Microsystems International Corporation for service and repair to ensure that safety features are maintained.

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Warnings, such as the example below, precede only potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

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SAFETY SYMBOLS

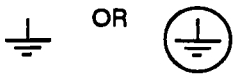
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Instruction manual symbol: the product is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the system.



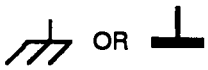
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts are so marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.



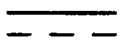
Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. Before operating the equipment, terminal marked with this symbol must be connected to ground in the manner described in the installation (operation) manual.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.



Alternating current (power line).



Direct current (power line).



Alternating or direct current (power line).

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, a practice, a condition, or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

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The CAUTION sign denotes a hazard. It calls attention to an operating a procedure, a practice, a condition, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the system.

NOTE:

The NOTE sign denotes important information. It calls attention to a procedure, a practice, a condition or the like, which is essential to highlight.

VMIVME-2170A
32-bit OPTICALLY COUPLED DIGITAL OUTPUT BOARD

TABLE OF CONTENTS

Page

SECTION 1. INTRODUCTION

1.1 FEATURES 1-1
1.2 FUNCTIONAL DESCRIPTION 1-1
1.3 REFERENCE MATERIAL LIST 1-1

SECTION 2. PHYSICAL DESCRIPTION AND SPECIFICATIONS

SECTION 3. THEORY OF OPERATION

3.1 THEORY OF OPERATION 3-1
3.2 BOARD ADDRESSING 3-1
3.3 LOGIC DESCRIPTION 3-1
3.4 OUTPUT REGISTER LOGIC 3-6
3.5 OPTICAL ISOLATOR AND OUTPUT DRIVER 3-6
3.5.1 Low Current Option 3-6
3.5.2 High Current Option 3-6

SECTION 4. PROGRAMMING

4.1 OPERATIONAL OVERVIEW 4-1
4.2 REGISTER MAP 4-1

SECTION 5. CONFIGURATION AND INSTALLATION

5.1 UNPACKING PROCEDURES 5-1
5.2 PHYSICAL INSTALLATION 5-1
5.3 JUMPER LOCATIONS 5-1
5.4 EXTERNAL PULL-UP VOLTAGE 5-3
5.5 ADDRESS MODIFIERS 5-3
5.6 ADDRESS SELECTION JUMPERS 5-3
5.7 USER-INSTALLED PULL-UP RESISTORS 5-4
5.8 I/O CABLE AND FRONT PANEL CONNECTOR CONFIGURATION .5-4

TABLE OF CONTENTS (Continued)

Page

SECTION 6. MAINTENANCE AND WARRANTY

6.1 MAINTENANCE 6-1
6.2 MAINTENANCE PRINTS 6-1
6.3 WARRANTY 6-1
6.4 OUT-OF-WARRANTY REPAIR POLICY 6-2
6.4.1 Repair Category 6-3
6.4.2 Repair Pricing 6-3
6.4.3 Payment 6-3
6.4.4 Shipping Charges 6-4
6.4.5 Shipping Instructions 6-4
6.4.6 Warranty on Repairs 6-4
6.4.7 Exclusions 6-4

LIST OF FIGURES

Figure Page

3.1-1 VMIVME-2170A Functional Block Diagram 3-2
3.2-1 Address Section Block Diagram 3-3
3.3-1 Control Section Block Diagram 3-4
3.3-2 VMEbus Signal Lines Used by the VMIVME-2170A 3-5
3.4-1 Output Register Logic 3-7
3.5-1 Optical Isolator Output Stage Block Diagram 3-8
5.3-1 Location of Jumpers and Address Switches 5-2
5.6-1 Address Select Jumpers 5-3
5.8-1 Cable Connector Configuration 5-5
5.8-2 P3 Connector Pin Layout 5-6

LIST OF TABLES

Table Page

4.2-1 Register Map 4-1
4.2-2 Register Bit Definitions 4-2
5.8-1 P2 Connector 5-7

TABLE OF CONTENTS (Concluded)

APPENDIX

A Assembly Drawing, Parts List, and Schematic

SECTION 1

INTRODUCTION

1.1 FEATURES

The VMIVME-2170A is a VMEbus compatible 32-bit optically coupled digital output board. Its features include:

a. 32 bits of optically isolated digital outputs
b. 8- or 16-bit data transfers
c. Inverting or noninverting data options
d. Optional pull-up resistors
e. 2.5 or 300 mA options
f. Nonprivileged or supervisory short I/O transfers

1.2 FUNCTIONAL DESCRIPTION

The VMIVME-2170A Optically Coupled Digital Output Board consists of VMEbus compatibility logic, data output control logic, four 8-bit output registers, and 32 bits of optically isolated outputs. The VMEbus compatibility logic contains address decoding logic, and data transfer control logic which provides for 8- or 16-bit data transfers in the short I/O address space. The data output control logic, in conjunction with four 8-bit registers, selects byte or word transfers to the 32 optically isolated output channels. The thirty-two optically coupled output channels convert the TTL output data into optically coupled digital outputs, whose output state either matches or is inverted from the data written to the board.

1.3 REFERENCE MATERIAL LIST

The reader should refer to "The VMEbus Specification" for a detailed explanation of the VMEbus. "The VMEbus Specification" is available from the following source:

VITA
VMEbus International Trade Association
10229 N. Scottsdale Road
Scottsdale, AZ 85253
(602) 951-8866

The following Application and Configuration Guides are available from VMIC to assist the user in the selection, specification, and implementation of systems based on VMIC's products:

TITLE	DOCUMENT NO.
Digital Input Board Application Guide	825-000000-000
Change-of-State Application Guide	825-000000-002
Digital I/O Products (with Built-in-Test) Product Line Description	825-000000-003
Connector and I/O Cable Application Guide	825-000000-006

SECTION 2

PHYSICAL DESCRIPTION AND SPECIFICATIONS

REFER TO 800-102170-000 SPECIFICATION

SECTION 3

THEORY OF OPERATION

3.1 THEORY OF OPERATION

The VMIVME-2170A consists of five primary functional building blocks as illustrated in Figure 3.1-1. The five sections of the VMIVME-2170A are, (1) Address Logic, (2) Control Logic, (3) Data Logic, (4) Output Data Registers, and (5) Output Buffers. Each section of the design is illustrated in further detail as shown in Figures 3.2-1 through 3.5-1.

3.2 BOARD ADDRESSING

The VMIVME-2170A is designed to support data transfers in supervisory or nonprivileged short I/O memory space. A jumper (JA1) is provided as shown in Figure 3.2-1 (Address Section Block Diagram) to allow user-selection of either I/O access type. The jumper (JA) is shown on logic diagram 141-102170-000 in Appendix A to this manual. The VMIVME-2170A is factory configured (jumper JA1 is not installed) to respond to short supervisory I/O access.

The VMIVME-2170A is designed with 14 address select jumpers and decode logic as shown in Figure 3.2-1. This circuitry is used to establish the base address of the board. A jumper installed requires a logic "zero" for that address bit; otherwise, a logic "one" is needed. This topology provides an efficient memory address map for I/O addresses. This feature allows the user to map the I/O addresses into contiguous memory locations when configuring subsystems that require more than one board.

3.3 LOGIC DESCRIPTION

Typical VMEbus transceivers, receivers, and control logic are shown in Figure 3.3-1. The VMEbus signal lines used by the VMIVME-2170A are shown in Figure 3.3-2. This logic steers data to the proper output registers based on the signals controlling this logic.

To perform data transfers with the VMIVME-2170A, data is written to the output data registers labeled R0 and R1. The appropriate outputs are selected by address bit A01. It is used to select one of two banks of 16 bits for data outputs. The two data strobes DS0 and DS1 allow the 16-bit banks to be accessed as words or bytes.

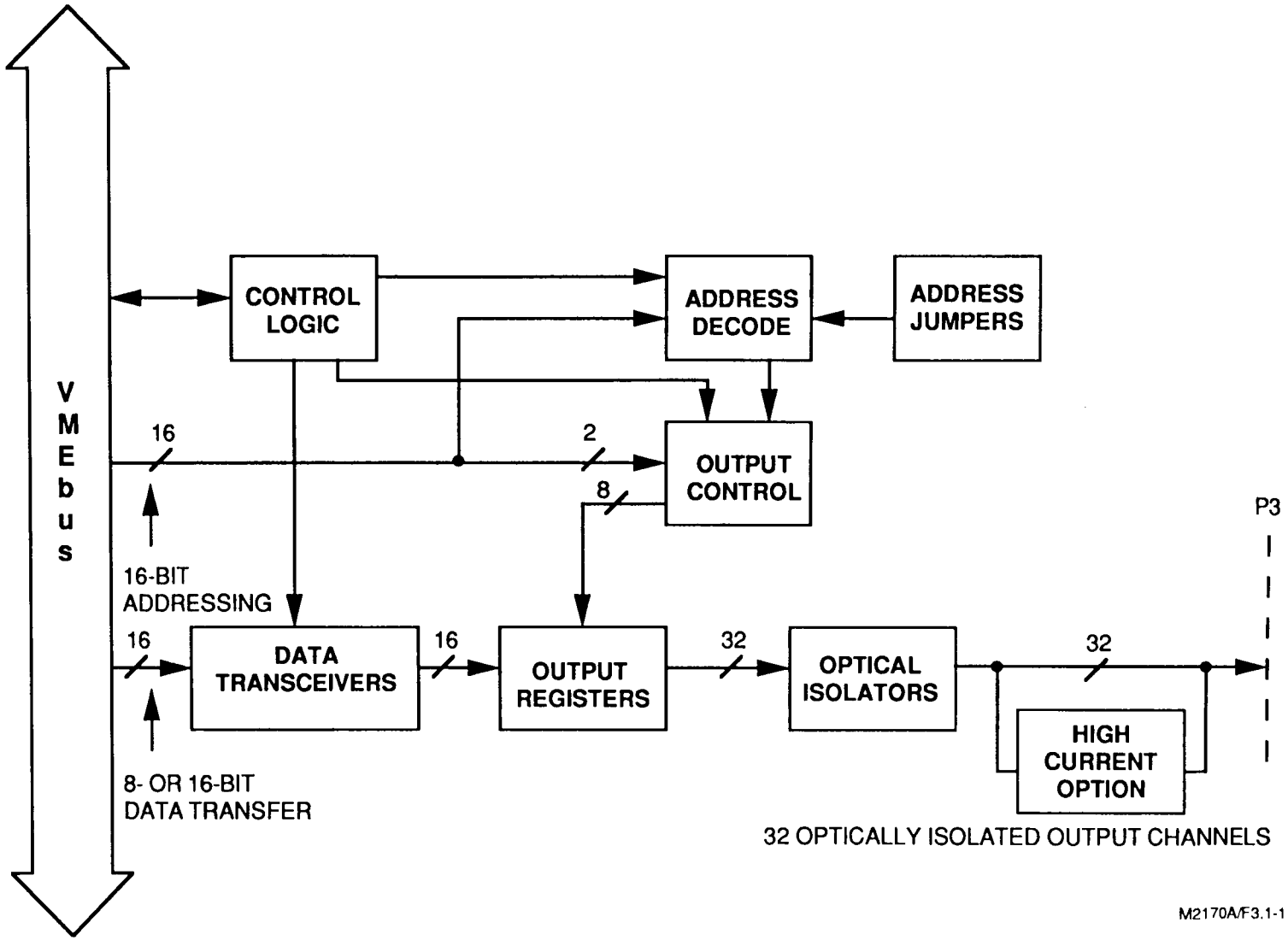


Figure 3.1-1. VMIVME-2170A Functional Block Diagram

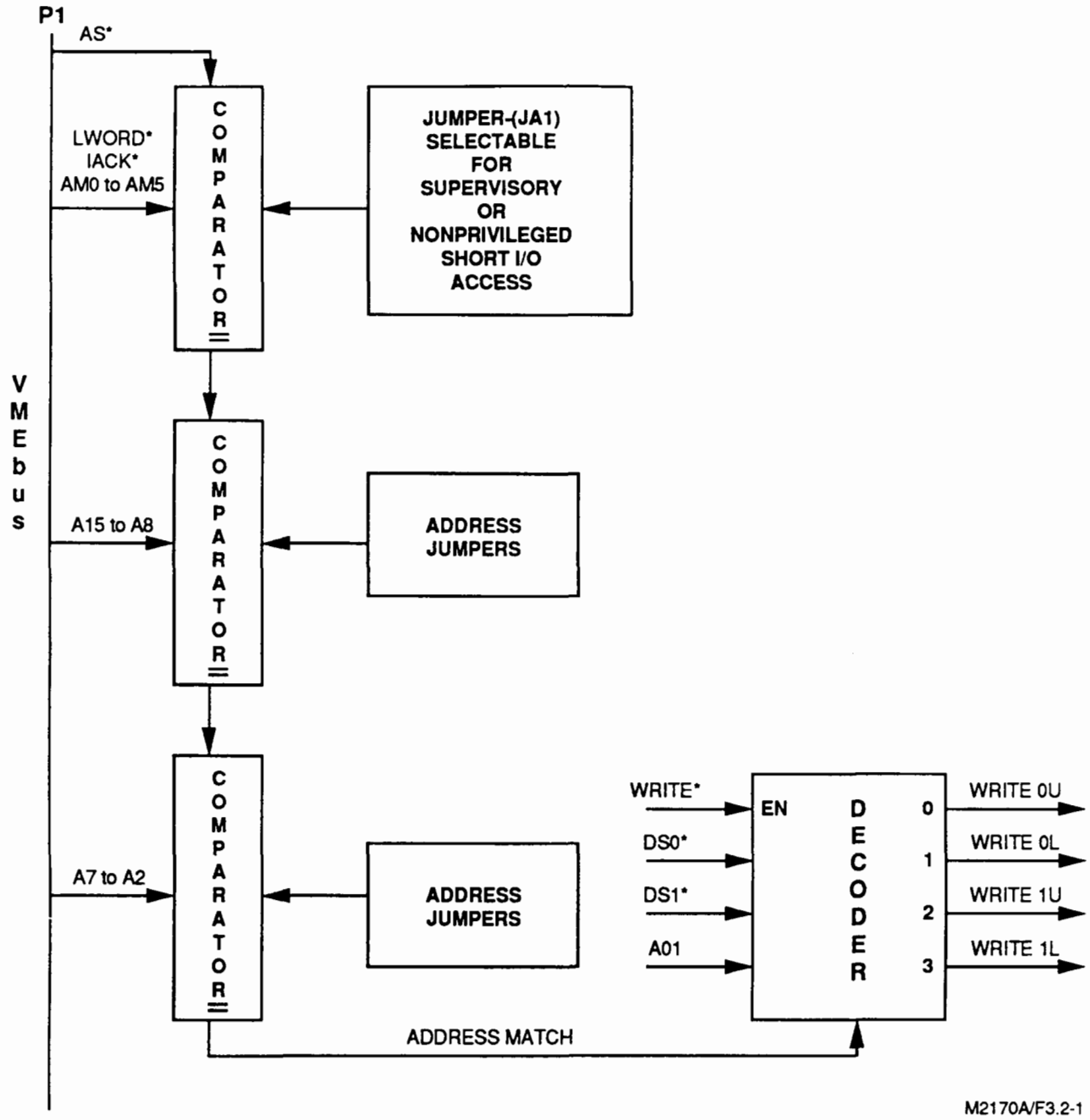


Figure 3.2-1. Address Section Block Diagram

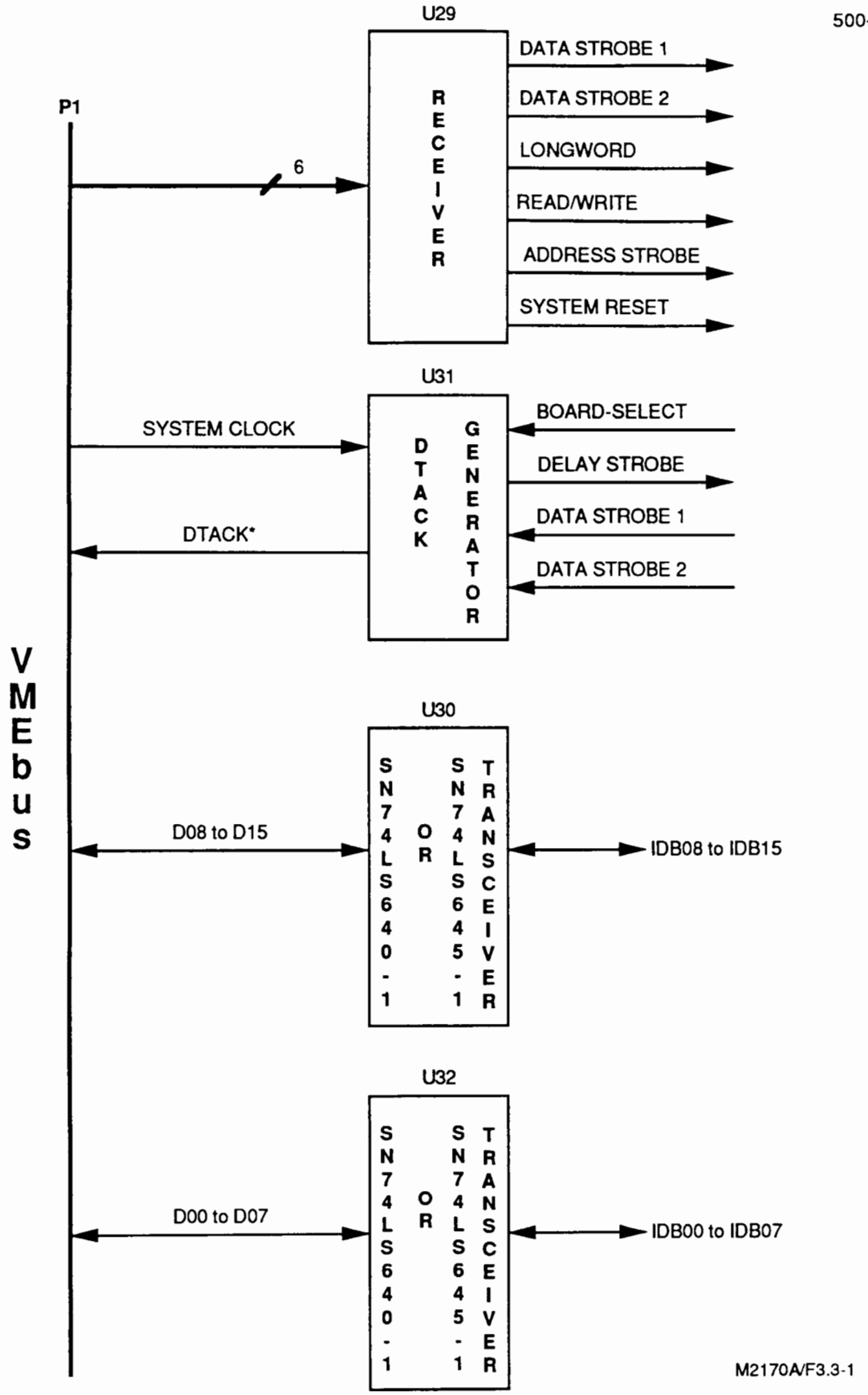


Figure 3.3-1. Control Section Block Diagram

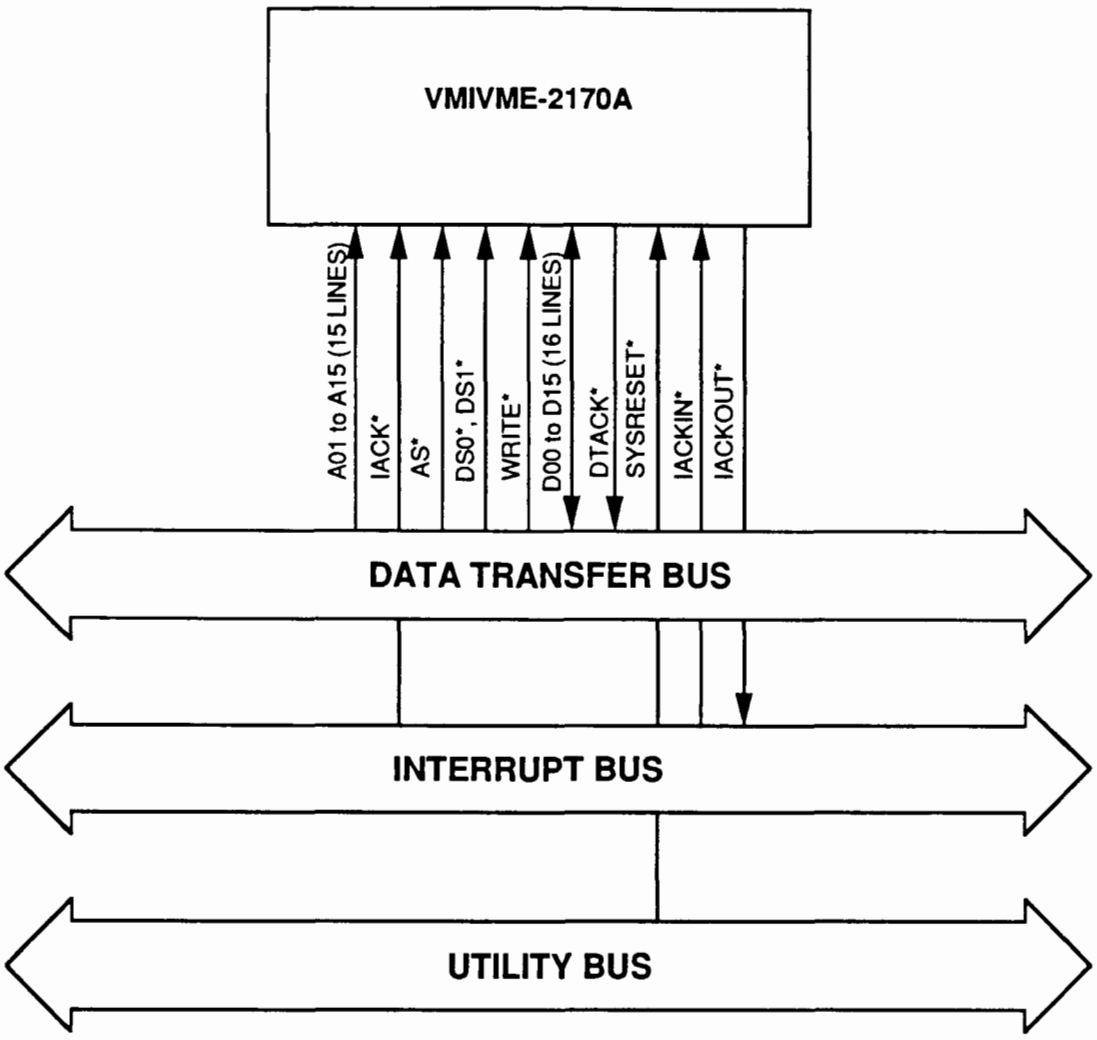


Figure 3.3-2. VMEbus Signal Lines Used by the VMIVME-2170A

The address match signal shown in Figure 3.2-1 is logically gated with DS0 and DS1 to produce active signals for data transfer. These gated signals clock data into the output registers, which store the output data from the VMEbus and hold it for the output drivers.

3.4 OUTPUT REGISTER LOGIC

The VMIVME-2170A is designed with four 8-bit Output Registers, which are controlled by four flip-flops as shown in Figure 3.4-1. These flip-flops are initialized at power-up or after a system reset such that all output registers are in the tri-state mode. This effectively disables the output ports until the first write strobe is sent to each register. The register outputs are routed to optical couplers whose outputs are connected to the front panel output connector.

3.5 OPTICAL ISOLATOR AND OUTPUT DRIVER

A typical output stage is shown in Figure 3.5-1. A jumper is shown but it really just replaces the 330 Ω resistor. When the low current option is ordered, the 330 Ω resistor is replaced with the jumper. The two transistors and the 680 Ω resistor are not installed. Thus, the opto-isolator's collector and emitter go to the output connector.

For users who require higher output current, an optional transistor buffer may be installed during manufacturing. An optional pull-up resistor is also shown in Figure 3.5-1. The signal VEXT is provided by the user and is available on pin A28 of connector P2. The maximum value for VEXT is determined by the option ordered. The low current VEXT should not exceed 30 V, and the high current VEXT should not exceed 50 V. The current drawn by this line should not exceed 1 A to prevent damage to the VMEbus and/or the connector pin. However, using the pull-up resistor degrades the isolation between channels because it is part of a DIP resistor package.

3.5.1 Low Current Option

The low current option provides up to six thousand volts (6,000 V) of isolation (for one second) between all outputs, and between the VMEbus and all outputs. The saturation voltage for this option is 0.7 V at 2.5 mA of output current. Please refer to Section 2 for more details about this option. The installation of DIP resistors will degrade the isolation between channels.

3.5.2 High Current Option

The high current option provides up to six thousand volts (6,000 V) of isolation (for one second) between the VMEbus and all outputs. The saturation voltage for this option is 1.25 V maximum at 300 mA of output current. Please refer to Section 2 for more details about this option. The installation of DIP resistors will degrade the isolation between channels.

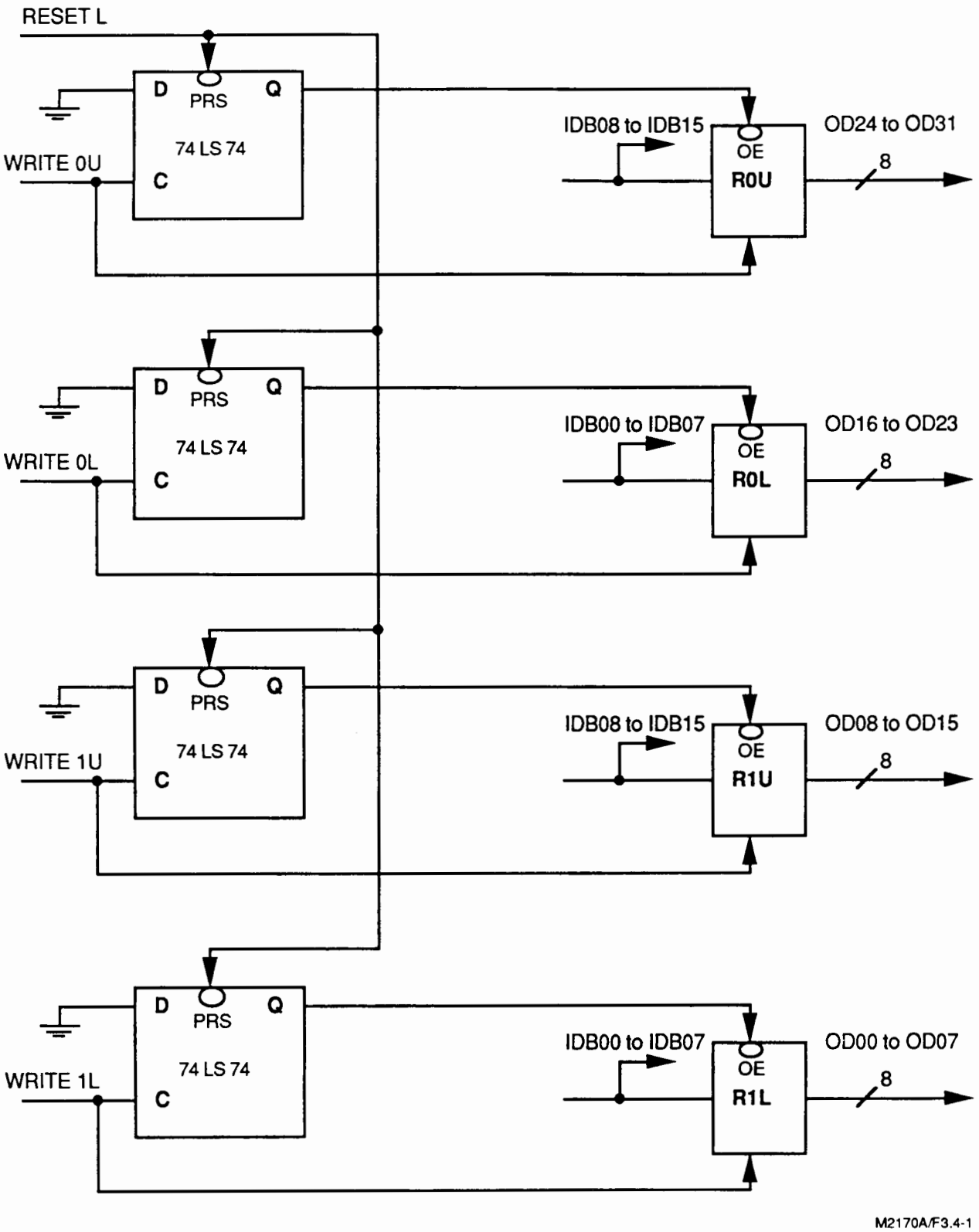
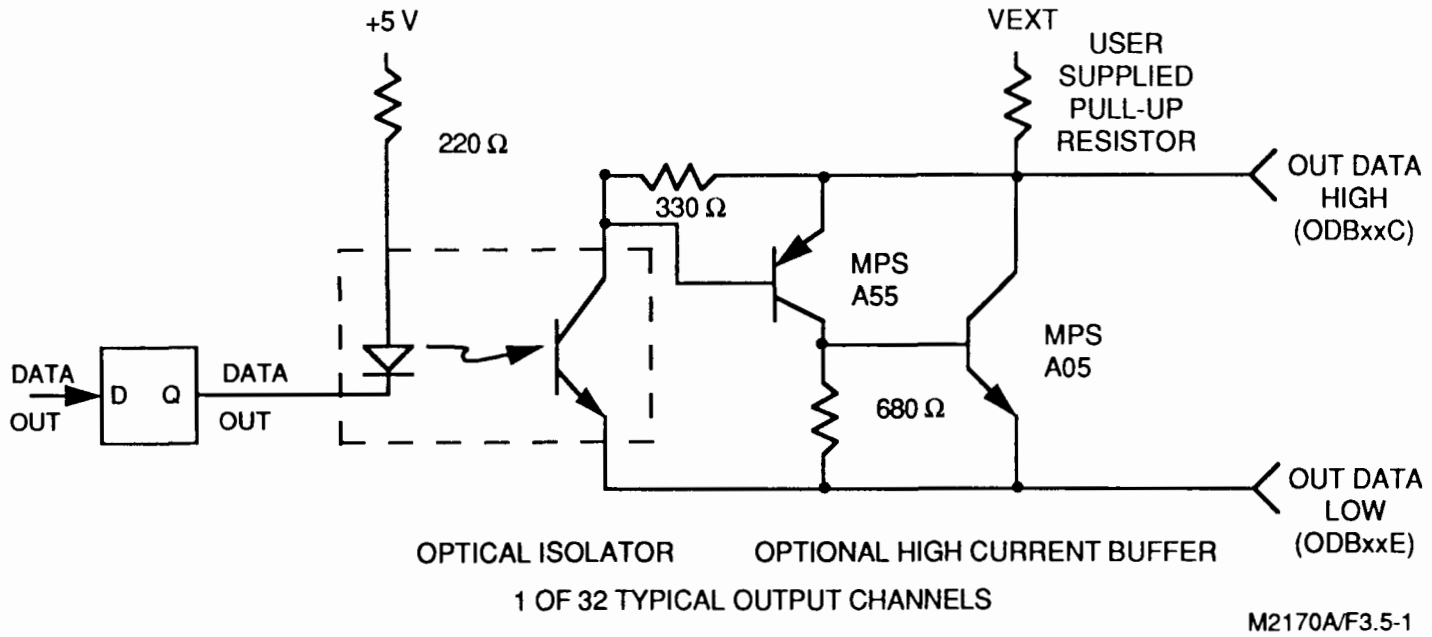


Figure 3.4-1. Output Register Logic



* Install only a wire in the 330 Ω position for the Low Current Option.
Install the Resistors and Transistors for the High Current Option.

Figure 3.5-1. Optical Isolator Output Stage Block Diagram

SECTION 4

PROGRAMMING

4.1 OPERATIONAL OVERVIEW

The four 8-bit Output Data Registers are accessed as two 16-bit words, or as four 8-bit bytes. Bit A01 is used to select each register word, when the board has been selected for a data transfer, and the data strobes select the byte or bytes for data transfer. Fourteen address bits, A15 through A02, are used for decoding the board's base address. When a valid data transfer is decoded, a board-select signal is generated, which activates the board for a data transfer. The reader should refer to Section 5 for details concerning board addressing. The VMIVME-2170A supports only 8- or 16-bit data transfers. If a longword access is attempted, the VMIVME-2170A will not respond, and a bus time-out error will occur.

4.2 REGISTER MAP

Address bits A15 through A2 are selected by address select jumpers; therefore, the XXX in the relative address represents the part of the address that is jumper-selectable. Section 5 describes how to set up this base address. A register map is shown in Table 4.2-1. Detailed register bit definitions are shown in Table 4.2-2.

Table 4.2-1. Register Map

RELATIVE ADDRESS	MNEMONIC	NAME/FUNCTION
$XXX0	DR0	DATA REGISTER 0
$XXX1	DR1	DATA REGISTER 1
$XXX2	DR2	DATA REGISTER 2
$XXX3	DR3	DATA REGISTER 3

M2170A/T4.2-1

Table 4.2-2. Register Bit Definitions

$XXX0 DATA REGISTER 0

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8
OUTPUT DATA							
OD31	**OD30**	**OD29**	**OD28**	**OD27**	**OD26**	**OD25**	**OD24**

$XXX1 DATA REGISTER 1

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
OUTPUT DATA							
OD23	**OD22**	**OD21**	**OD20**	**OD19**	**OD18**	**OD17**	**OD16**

$XXX2 DATA REGISTER 2

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8
OUTPUT DATA							
OD15	**OD14**	**OD13**	**OD12**	**OD11**	**OD10**	**OD9**	**OD8**

$XXX3 DATA REGISTER 3

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
OUTPUT DATA							
OD7	**OD6**	**OD5**	**OD4**	**OD3**	**OD2**	**OD1**	**OD0**

M2170A/T4.2-2

SECTION 5

CONFIGURATION AND INSTALLATION

5.1 UNPACKING PROCEDURES

CAUTION

SOME OF THE COMPONENTS ASSEMBLED ON VMIC's PRODUCTS MAY BE SENSITIVE TO ELECTROSTATIC DISCHARGE AND DAMAGE MAY OCCUR ON BOARDS THAT ARE SUBJECTED TO A HIGH ENERGY ELECTROSTATIC FIELD. UNUSED BOARDS SHOULD BE STORED IN THE SAME PROTECTIVE BOXES IN WHICH THEY WERE SHIPPED. WHEN THE BOARD IS TO BE LAID ON A BENCH FOR CONFIGURING, ETC., IT IS SUGGESTED THAT CONDUCTIVE MATERIAL BE INSERTED UNDER THE BOARD TO PROVIDE A CONDUCTIVE SHUNT.

Upon receipt, any precautions found in the shipping container should be observed. All items should be carefully unpacked and thoroughly inspected for damage that might have occurred during shipment. The board(s) should be checked for broken components, damaged printed circuit board(s), heat damage, and other visible contamination. All claims arising from shipping damage should be filed with the carrier and a complete report sent to VMIC together with a request for advice concerning the disposition of the damaged item(s).

5.2 PHYSICAL INSTALLATION

CAUTION

DO NOT INSTALL OR REMOVE BOARDS WHILE POWER IS APPLIED.

De-energize the equipment and insert the board into an appropriate slot of the chassis. While ensuring that the board is properly aligned and oriented in the supporting card guides, slide the board smoothly forward against the mating connector until firmly seated.

5.3 JUMPER LOCATIONS

Refer to Figure 5.3-1 for the locations of the jumpers described in this section.

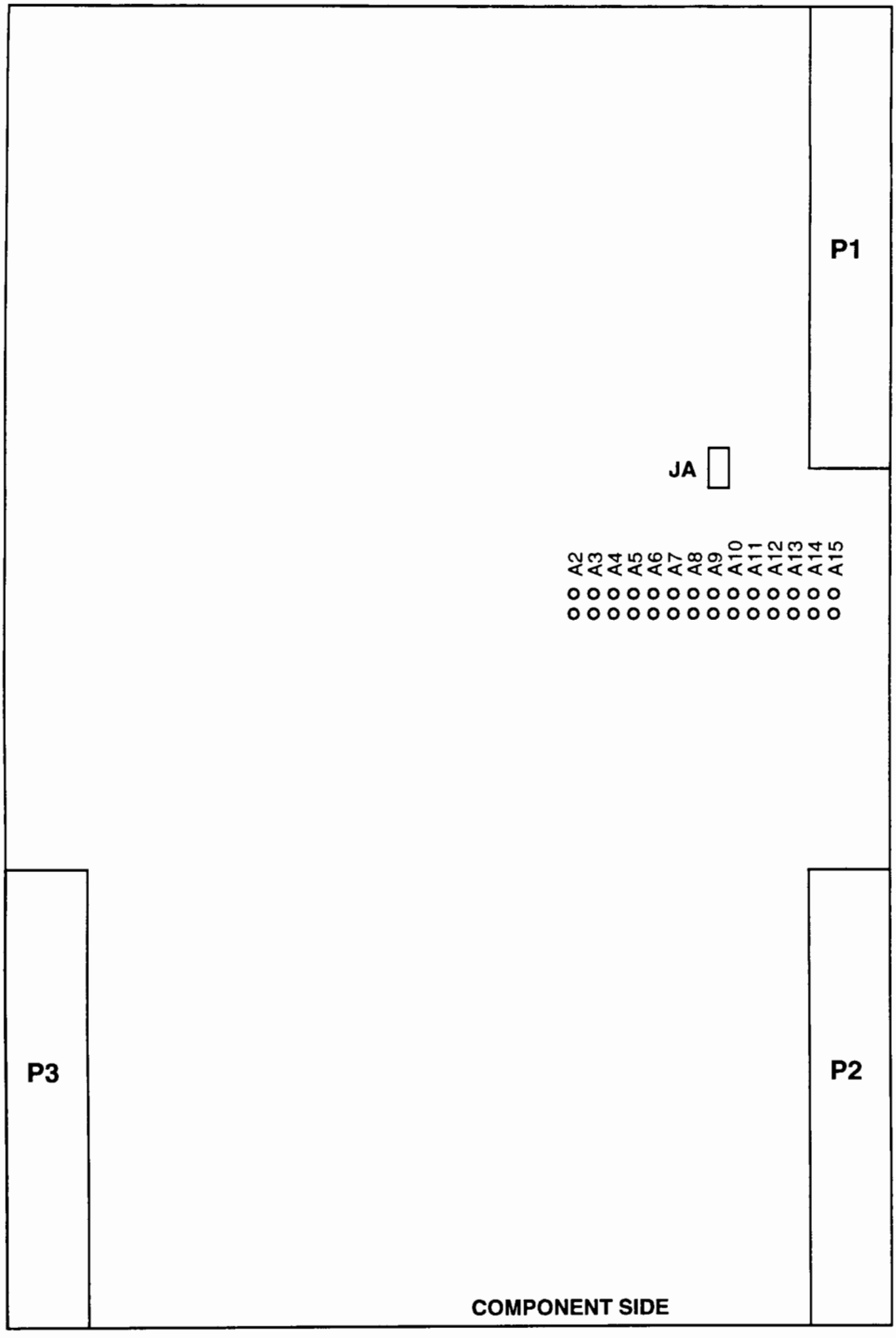


Figure 5.3-1. Location of Jumpers and Address Switches

5.4 EXTERNAL PULL-UP VOLTAGE

External voltage is connected through the P2 connector on pin A28. The current drawn from this pin should not exceed 1 A, to prevent damaging the VMEbus backplane or the pin.

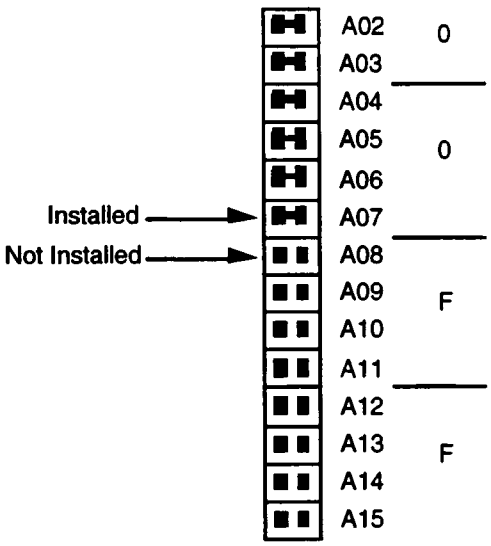
The External voltage return should not be connected to the VMEbus ground. Instead, it should be connected to the applicable C row of the P3 connector. Refer to Section 5.8 for pinout information on the P3 connector.

5.5 ADDRESS MODIFIERS

The VMIVME-2170A is configured at the factory to respond to short supervisory I/O access. This configuration can be changed by installing jumper JA1. With a jumper installed at JA1, the board will respond to short nonprivileged I/O access.

5.6 ADDRESS SELECTION JUMPERS

Figure 5.6-1 shows the addressing jumpers on board the VMIVME-2170A and their use in the addressing scheme. The board is factory configured to respond to a base address of HEX $0000. This means that all of the address jumpers are installed. Figure 5.6-1 is an example of another base address.



Example: For the VMIVME-2170A to respond to a base address of (HEX $FF00) the jumpers should be installed as shown in Figure 5.6-1.

Figure 5.6-1. Address Select Jumpers

5.7 USER-INSTALLED PULL-UP RESISTORS

DIP sockets are provided so that the user may install resistor DIPs RP1 through RP4, as necessary. The ohmic value of the resistor is left to the expertise of the user; however, lower resistor values may limit the effective output voltage due to a .1 W limit on resistor power dissipation. The user should also refer to Table 2.1-1 for the maximum value VEXT can be. Using these resistors will degrade the isolation between channels. For the location of these resistors on the board, refer to engineering drawing no. 132-102170-000, in Appendix A to this manual.

WARNING

THE POWER RATING OF THE DIP PULL-UP RESISTOR IS 0.1 W. EXCEEDING THIS RATING WILL DAMAGE THE DIP.

5.8 I/O CABLE AND FRONT PANEL CONNECTOR CONFIGURATION

The output connector (P3) on the VMIVME-2170A is a 64-pin DIN standard and was selected by VMIC because of its high quality. Although these connectors are generally used with flat-ribbon cables, a variety of cables and mating connectors are available for most user requirements. The user should refer to VMIC's Connector and I/O Cable Application Guide (VMIC Publication No. 825-000000-006) for additional information concerning the variety of possible cabling and connector types available.

Details concerning the output connections are shown in Figure 5.8-1. This figure has Conductor No. 1 shown at the bottom of the connector as it plugs into the header due to Pin No. 1 of P3 being mounted as shown. Figure 5.8-2 shows the P3 connector pin assignment for the 32 output channels of the VMIVME-2170A. Connector pin configurations are also shown in Figure 5.8-2. The output channel names ending in "C" go to the appropriate output channel's collector lead, while the names ending with "E" are for the appropriate channel's emitter lead. Compatible connector information is provided in Section 2. Details concerning the connection of an external voltage are shown in Table 5.8-1.

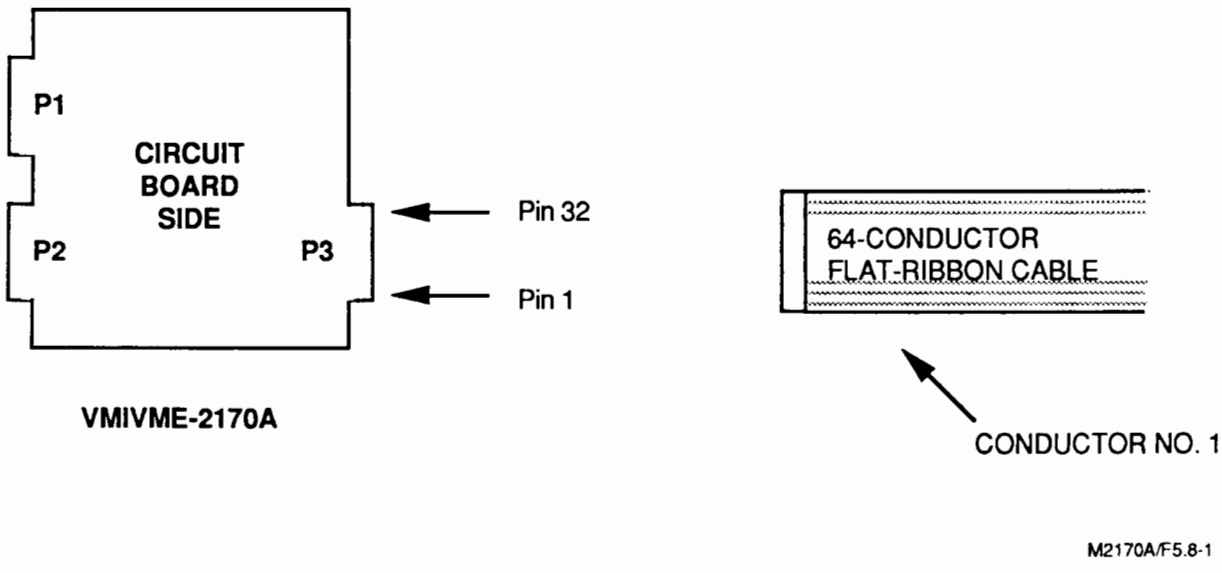


Figure 5.8-1. Cable Connector Configuration

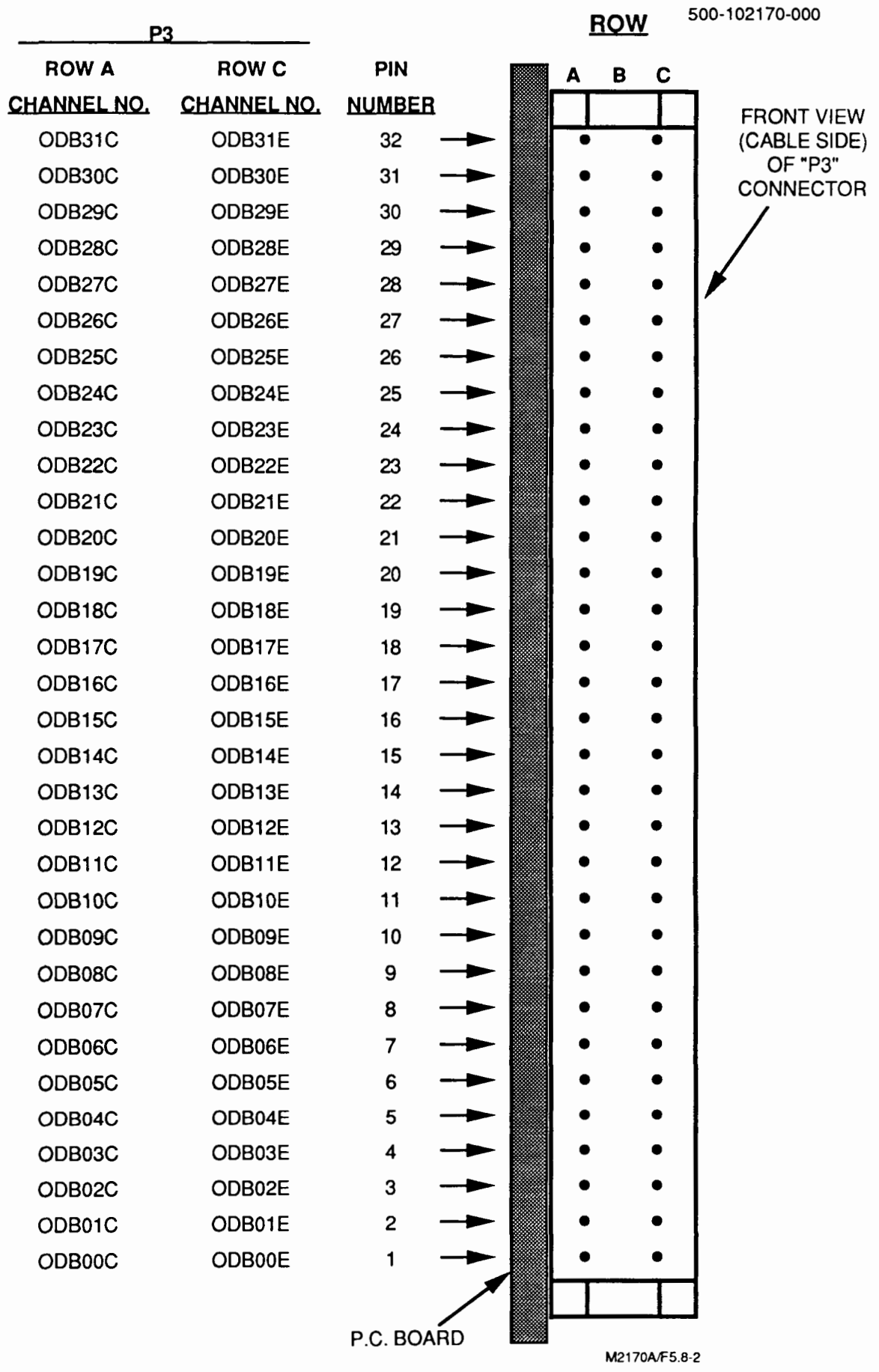


Figure 5.8-2. P3 Connector Pin Layout

Table 5.8-1. P2 Connector

PIN NO.	ROW A (1)	ROW B (2)	ROW C
1		+5 V	
2		GND	
3			
4			
5			
6			
7			
8			
9			
10			
11			
12		GND	
13		+5 V	
14			
15			
16			
17			
18			
19			
20			
21			
22		GND	
23			
24			
25			
26			
27			
28	EXT V		
29			
30			
31		GND	
32		+5 V	

M2170A/T5.8-1

Notes: 1. External Reference Voltage is supplied by the user.
2. Inputs to the Board - not required.

SECTION 6

MAINTENANCE AND WARRANTY

6.1 MAINTENANCE

This section of the technical manual provides information relative to the care and maintenance of VMIC's products. Should the products malfunction, the user should verify the following:

a. Software
b. System configuration
c. Electrical connections
d. Jumper or configuration options
e. Boards fully inserted into their proper connector location
f. Connector pins are clean and free from contamination
g. No components of adjacent boards are disturbed when inserting or removing the board from the VMEbus card cage
h. Quality of cables and I/O connections

User level repairs are not recommended. Contact VMIC for a Return Material Authorization (RMA) Number. This RMA Number must be obtained prior to any return.

6.2 MAINTENANCE PRINTS

The appendix(ices) to this manual contain(s) drawings and diagrams for reference purposes.

6.3 WARRANTY

VMIC's Standard Products are warranted to be free from defects in material and workmanship for a period of two years (24 months) from the date of shipment. In discharge of this warranty, VMIC, at its option, agrees to either repair or replace, at VMIC's facility and at VMIC's discretion, any part, component, subassembly accessory, or any hardware, software, or system product, which under proper and normal use proves defective in material and workmanship.

The customer shall provide notice to VMIC of each such defect within a reasonable time after the customer's discovery of such defect.

In order to return the defective product(s) or part(s), the customer must contact VMIC's Customer Service Department to obtain a Call Ticket Number. The

defective product(s) or part(s) must also be properly boxed and weighed. After a VMIC Call Ticket Number and RMA Number have been obtained, the defective product(s) or part(s) may be returned (transportation collect for surface UPS) to VMIC. Any replaced or repaired product(s) or part(s) will be shipped back to the customer's at the expense of VMIC (also UPS surface).

The customer should be aware that the above process can sometimes take up to eight (8) days for the shipment to reach VMIC. The customer has the option to ship the defective product(s) or part(s) at the customer's own expense if the customer cannot afford this possible delay.

There shall be no warranty or liability on any VMIC product(s) or part(s) that is (are) damaged or subjected to accident(s), perils of nature, negligence, overtemperature, overvoltage, misapplication of electrical power, insertion or removal of boards from backplanes and/or I/O connectors with power applied by the customer(s), appointee(s), or any other person(s) without the expressed approval of VMIC.

Final determination of warranty eligibility shall be made by VMIC, and if a warranty claim is considered invalid for any reason, the customer will be charged for services performed and expenses incurred by VMIC in repair, handling and shipping the returned product or part. Determination as to whether the item is within warranty, coverage shall not be unreasonably withheld.

The warranty period of the replacement or repaired product(s) or part(s) shall terminate with the termination of the warranty period with respect to the original product(s) or part(s) for all replacement parts supplied or repairs made during the original warranty period.

THE FOREGOING WARRANTY AND REMEDY ARE EXCLUSIVE AND VMIC SHALL HAVE NO OTHER OR ADDITIONAL LIABILITY TO BUYER OR TO ANYONE CLAIMING UNDER BUYER (THIRD PARTY) UNDER ANY OTHER AGREEMENT OR WARRANTY, EXPRESS OR IMPLIED EITHER IN FACT OR BY OPERATION OF THE LAW, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS, STATUTORY, OR OTHERWISE. VMIC SHALL HAVE NO LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR FROM ANY CAUSE ARISING OUT OF THE INSTALLATION OR USE OF ANY PRODUCT FURNISHED HEREUNDER.

6.4 OUT-OF-WARRANTY REPAIR POLICY

The following sections describe VMIC's policy on repairs and warranties on repaired products.

6.4.1 Repair Category

VMIC's repair policy of standard products is divided into two categories, depending on the item to be repaired. These categories are:

a. Product Exchange
b. Fixed Price Repair

Category 1 (product exchange) represents the fastest turn around of the two categories. In this case, the customer sends the malfunctioning product to VMIC. VMIC will return an operational product to the customer within 72 hours of receipt provided VMIC has the product in stock.

Provided that the returned product is repairable customers should contact VMIC prior to returning products for repair to determine stocking status.

Category 2 (Fixed Price Repair) applies to products returned to VMIC for repair and subsequent return to the customer.

Return authorizations are required on all product repairs, and all purchase orders should refer to VMIC's RMA Number which is assigned by VMIC's Customer Service Department.

6.4.2 Repair Pricing

Contact your factory representative for repair pricing. Current pricing can be found in the Repair and Replacement Policy in the most current Standard Conditions of Sales Document (F0109-91). Refer to exclusions (Section 6.4.7).

6.4.3 Payment

Payment is due upon delivery or at VMIC's option, net thirty (30) days from the date of delivery. Payment should be made to:

VME Microsystems International Corporation
12090 South Memorial Parkway
Huntsville, Alabama 35803-3308
Attention: Accounts Receivable

VMIC allows a one (1) percent discount for payment made within ten (10) days of invoice date or a two (2) percent discount on payment made prior to shipment of order. This payment discount, however, does not apply to freight.

6.4.4 Shipping Charges

Shipping charges are the customer's responsibility, with the exception of warranty repairs, whereby VMIC will pay the return to customer shipping charges.

6.4.5 Shipping Instructions

The type of packaging used to ship the product depends on whether the product is shipped singly, in a chassis, or packaged with other boards. The shipper should carefully pack the product(s), using the same precautions listed in the "unpacking procedures". The user should utilize the same (or equivalent) protective packaging container for re-shipment as provided by VMIC. Approved ESD procedures are recommended when handling VMIC's products.

6.4.6 Warranty on Repairs

Products repaired by VMIC are warranted against defects in workmanship and material for a period of ninety (90) days from date of shipment to the customer for all products that were repaired out of warranty. See Standard Conditions of Sale for products repaired within the warranty.

6.4.7 Exclusions

Repair rates may not apply to products which have received unusual physical or electrical damage. In such cases, VMIC will provide an estimated price for product repair or replacement. The customer may then choose to have the product repaired at the estimated price, returned unrepaired at no charge, or replaced at VMIC's current list price.

APPENDIX A

ASSEMBLY DRAWING, PARTS LIST, AND SCHEMATIC

NOTES:

OPTION TABLE

OPTION	REFERENCE	PART NO.
1BC	U23,U25	74ALS640-1
2BC	U23,U25	74ALS645-1
A0C	R2,R4,R6...,R64	WIRE JUMPERS
A1C	Q1->Q32	MPS A05
	Q33->Q64	MPS A55
	R2,R4,R6...,R64	330 OHMS
	R1,R3,R5...,R63	680 OHMS
A80	NONE	NONE

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPR.
A	RELEASE PER ECO 91-0247	E.M.GREEN	11/20/91	K.PURTLE
B	EDIT Q1 THRU Q64 SYMBOL PER ECO 91-0299	E.M.GREEN	11/20/91	K.PURTLE
C	MODIFY U22 PER ECO 94-0500	S.E.O'NEAL	7/29/94	

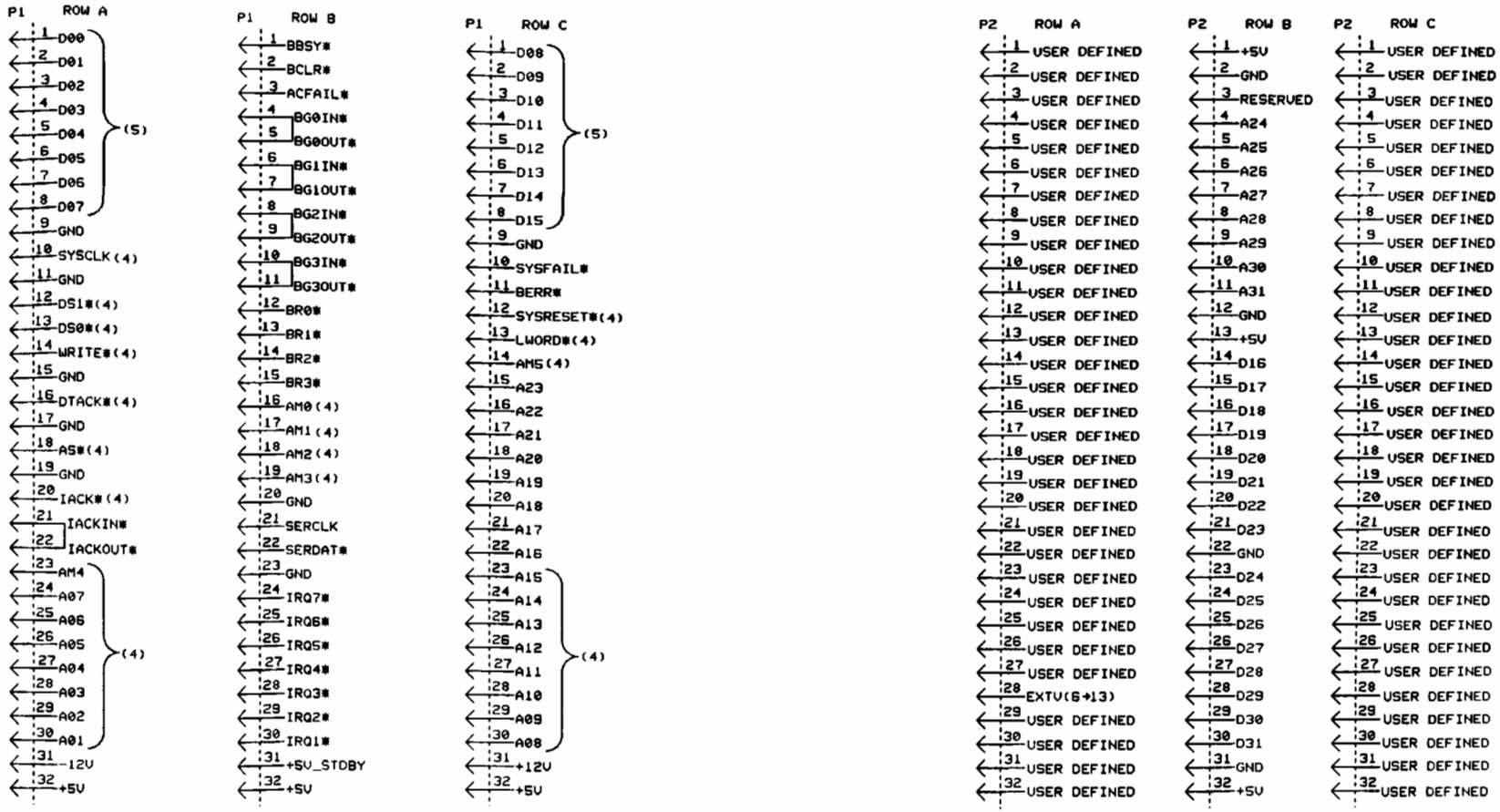
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SIGNATURES	DATE
DRAWN E.M.GREEN	6/5/91
PROJ. ENG. M. SPANGLER	7/9/91
ENG. MGR. GEORGE MEARES	7/9/91
PROD. DENNIS FOWLER	10/2/91
Q.A. SHARON KEAGLE	10/2/91

VMIC®
12090 SO. MEM. PKWY.
HUNTSVILLE, AL. 35803-3308
VME MICROSYSTEMS INTERNATIONAL CORPORATION

VMIVME-2170A

SIZE		DWG NO.	REV.
B	0BPH5	141-102170-000	C
SCALE			SHEET 1

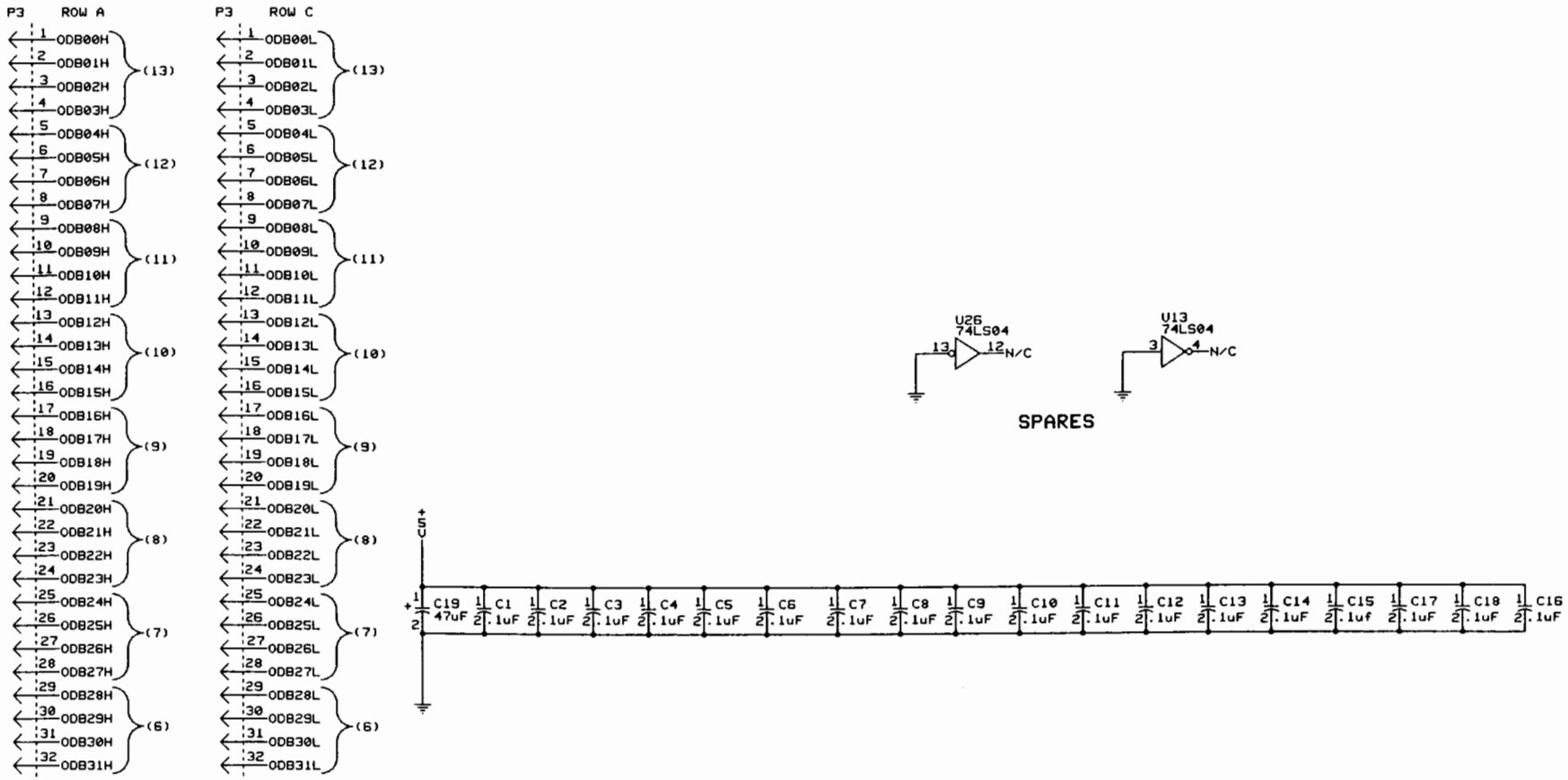


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SIZE	DWG NO.	REV.
B	0BPH5 141-102170-000	C
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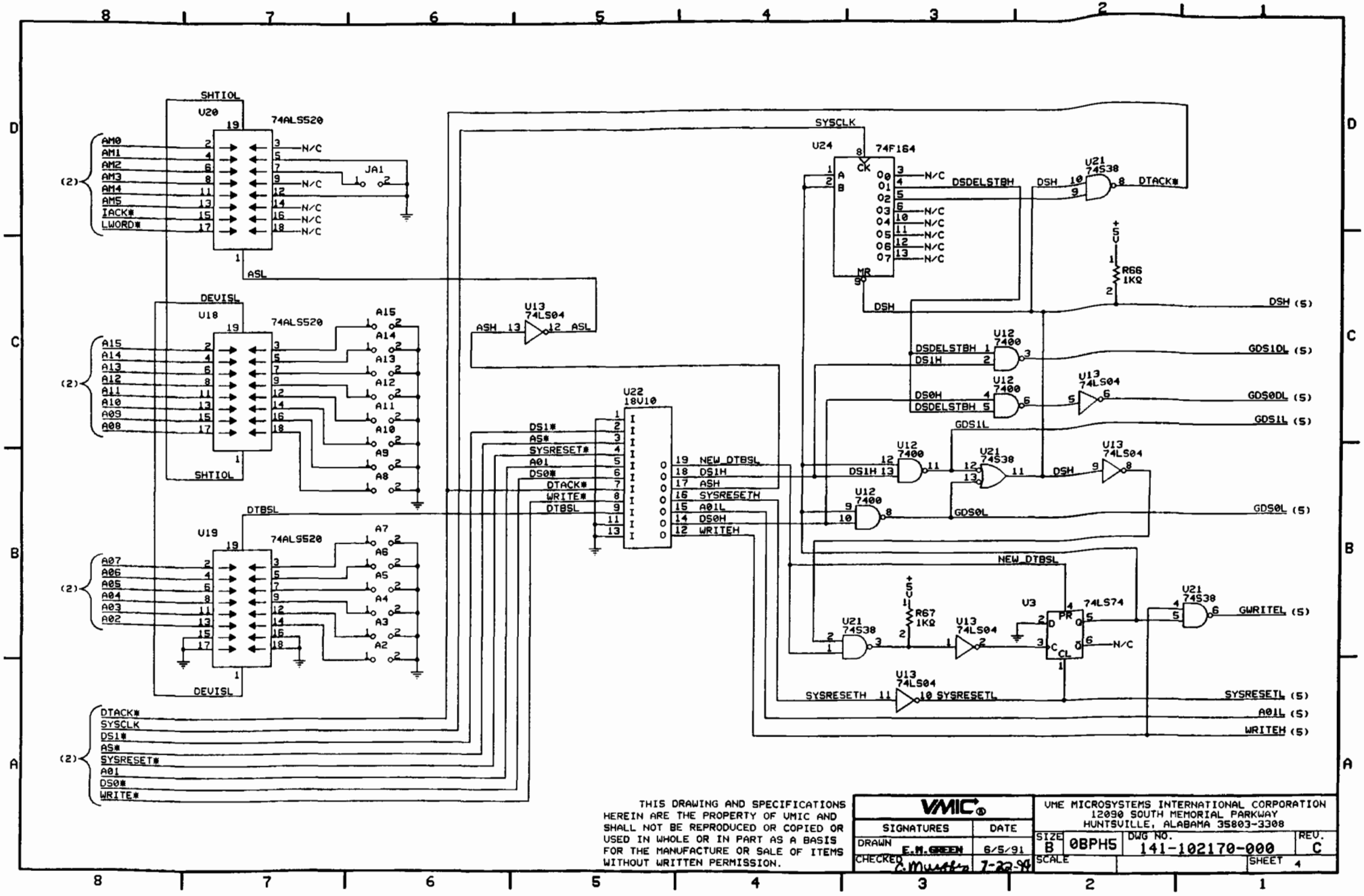
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SIZE	DWG NO.	REV.
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SCALE | SHEET 3



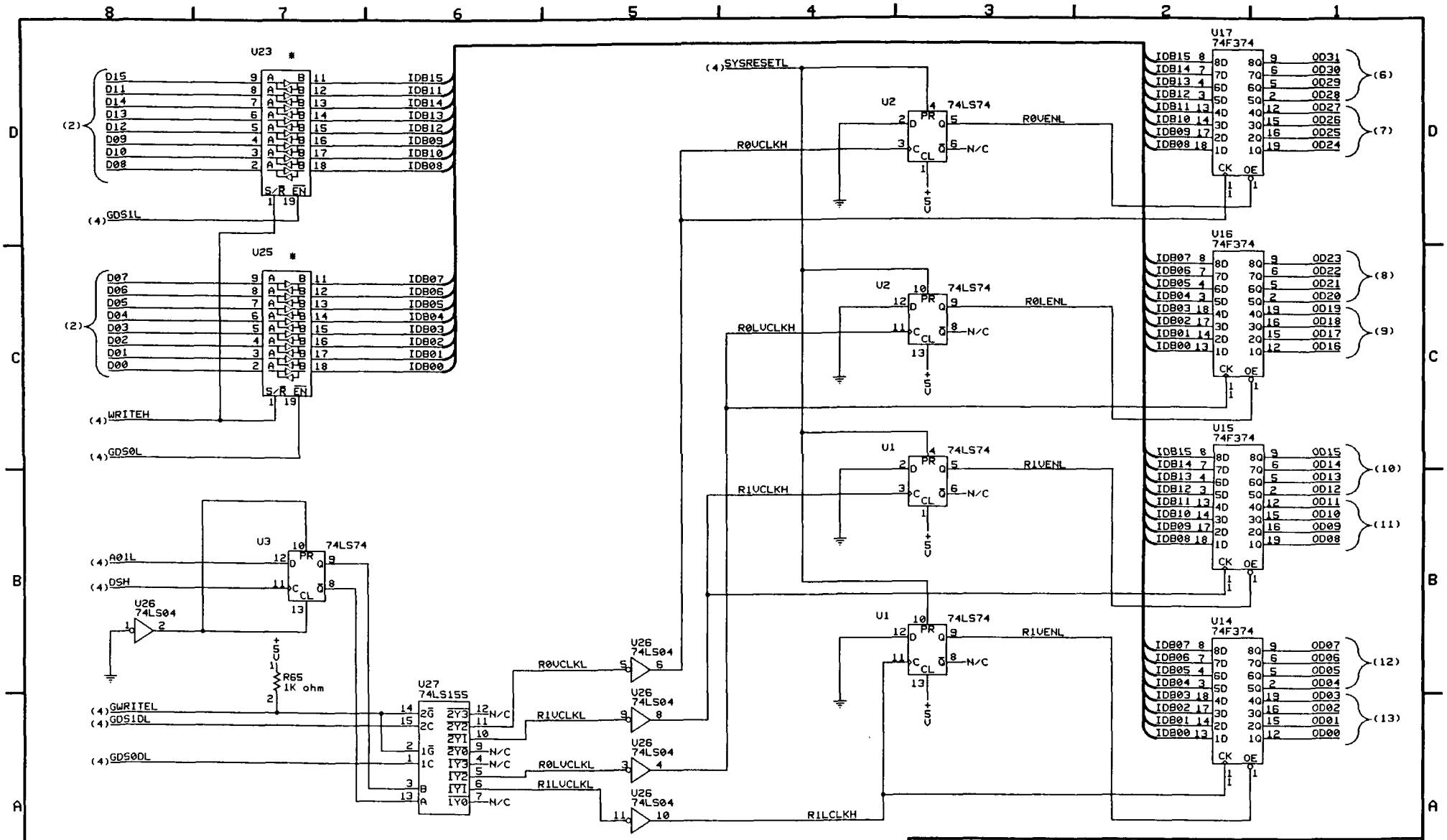
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SIZE	DWG NO.	REV.
B	0BPH5 141-102170-000	C
SCALE		SHEET 4



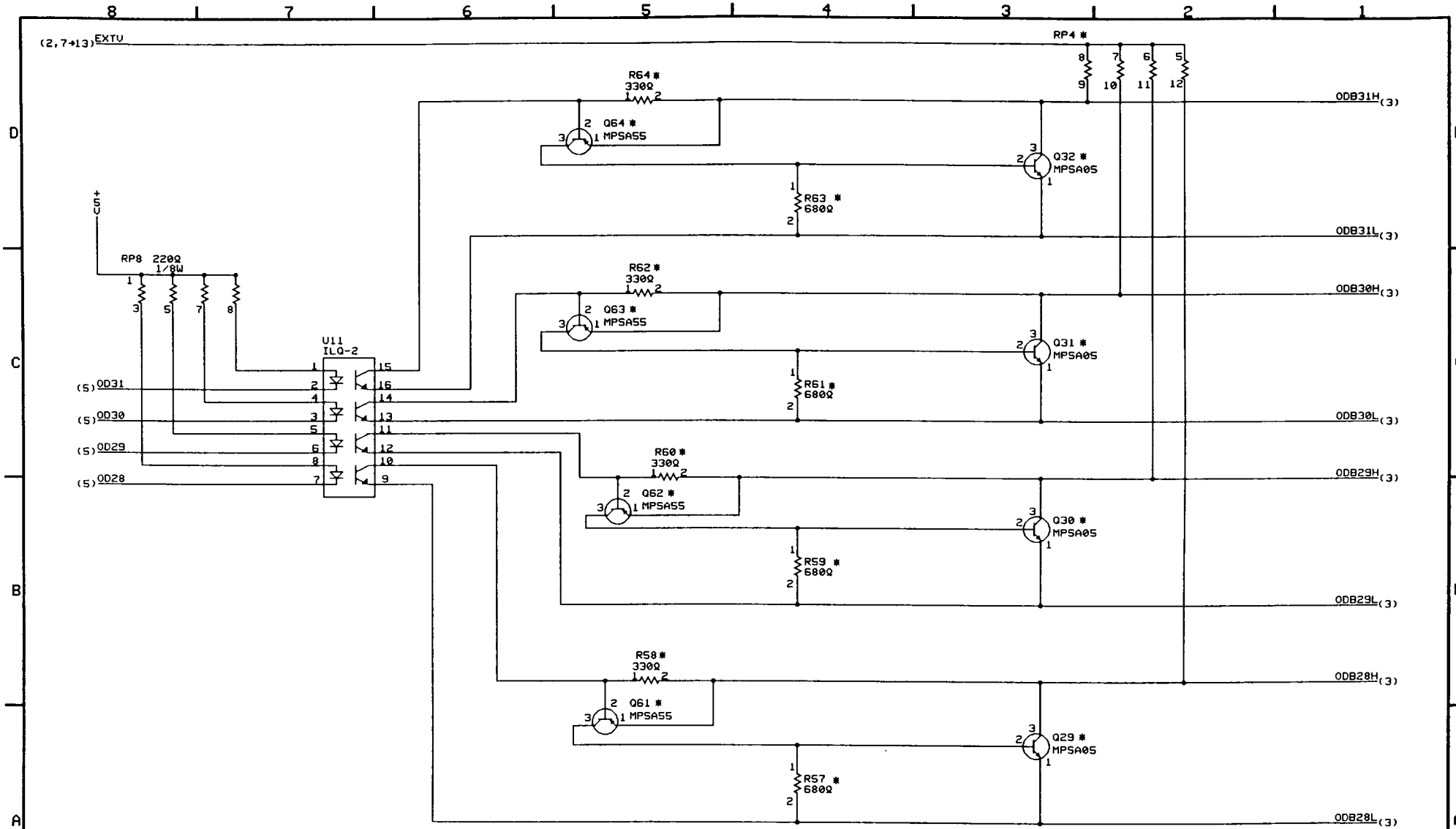
*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

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	CHECKED C. Mussey	7-22-94

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SIZE	DWG NO.	REV.
B	0BPH5 141-102170-000	C
SCALE		SHEET 5



*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

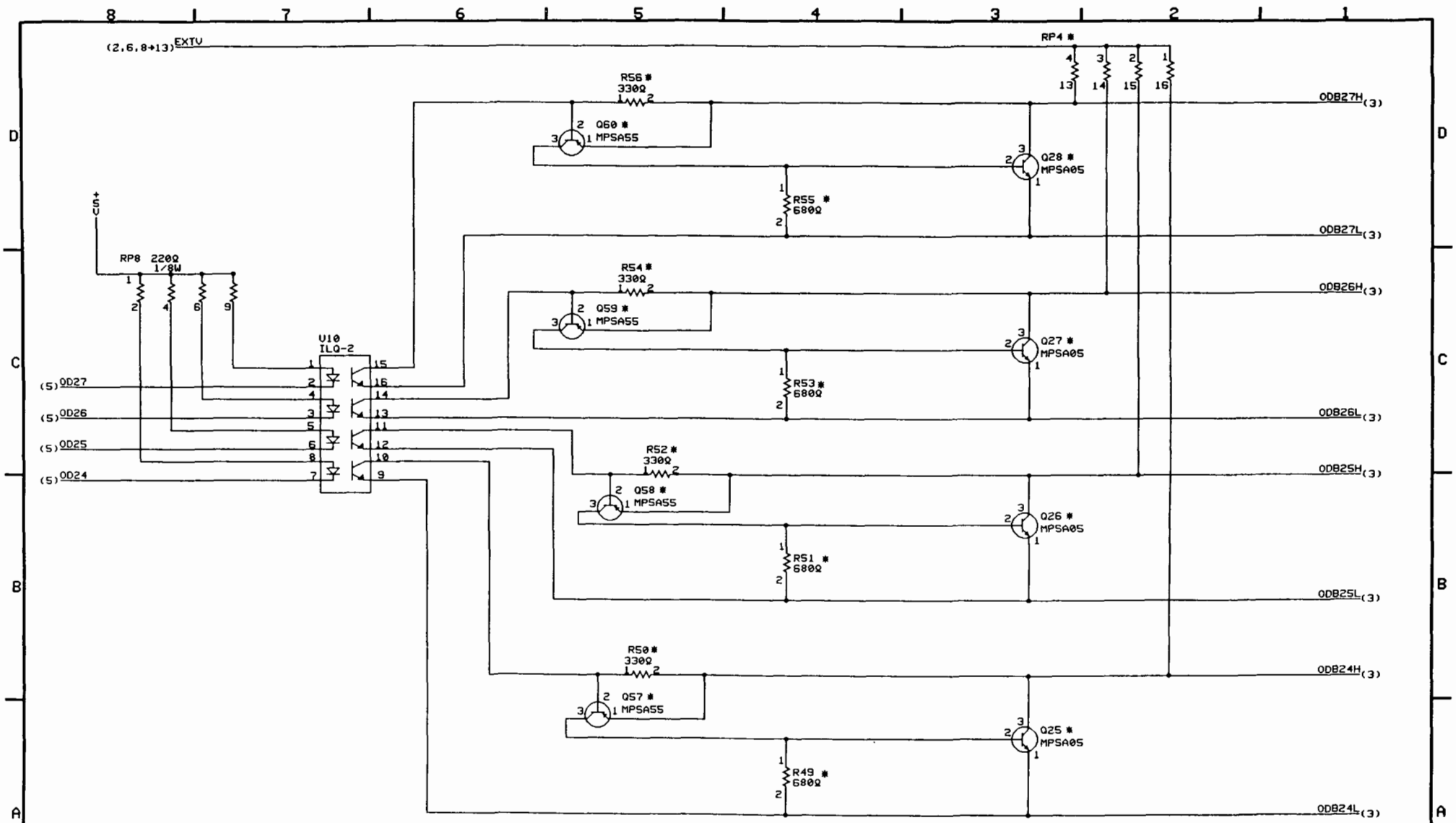
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CHECKED C.Mu[illegible]	7-22-94

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SIZE	DWG NO.	REV.
B	0BPH5 141-102170-000	C
SCALE		SHEET 6



*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

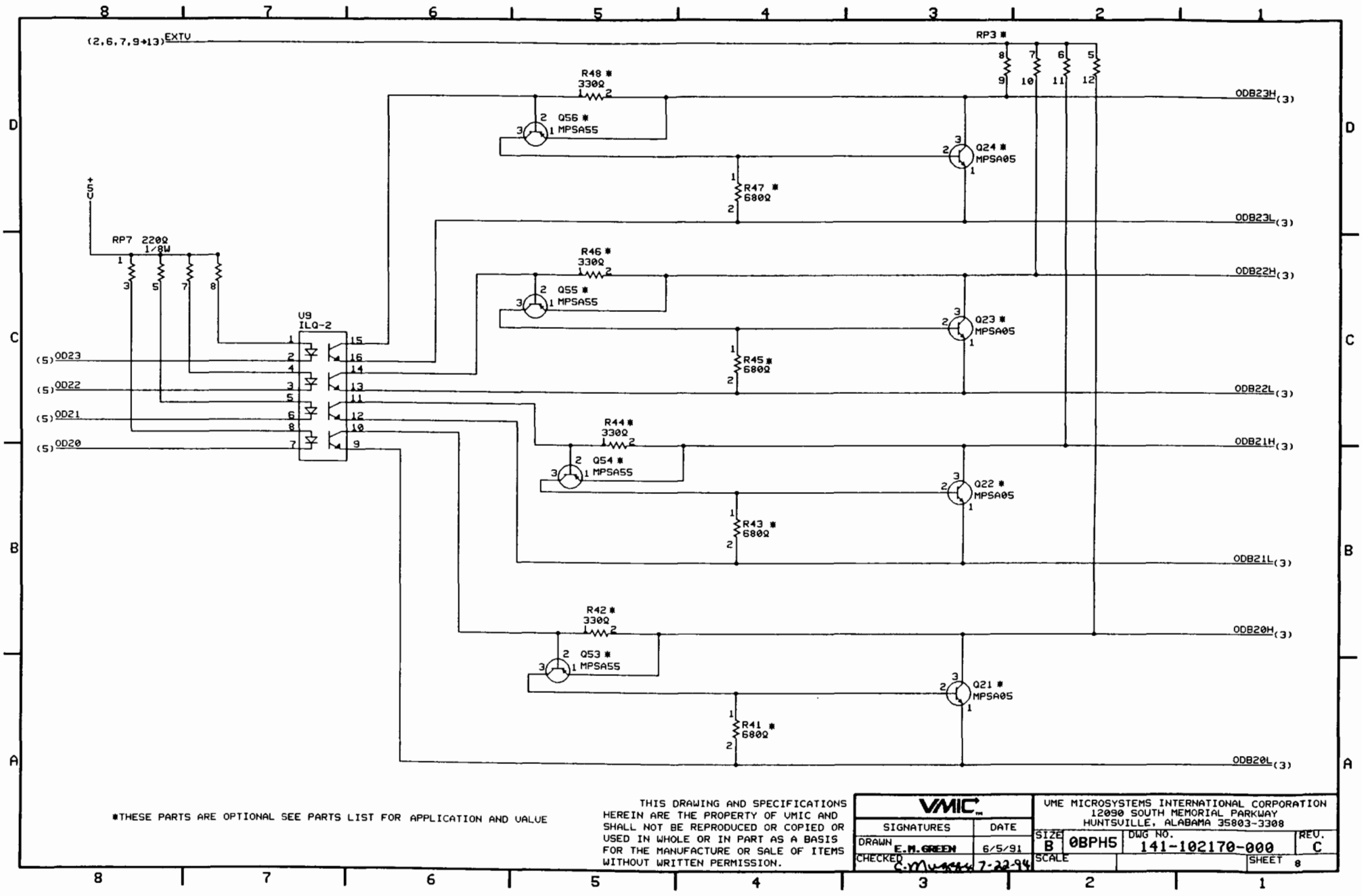
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SIGNATURES	DATE
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CHECKED E.Mu...	7-22-94

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HUNTSVILLE, ALABAMA 35803-3308

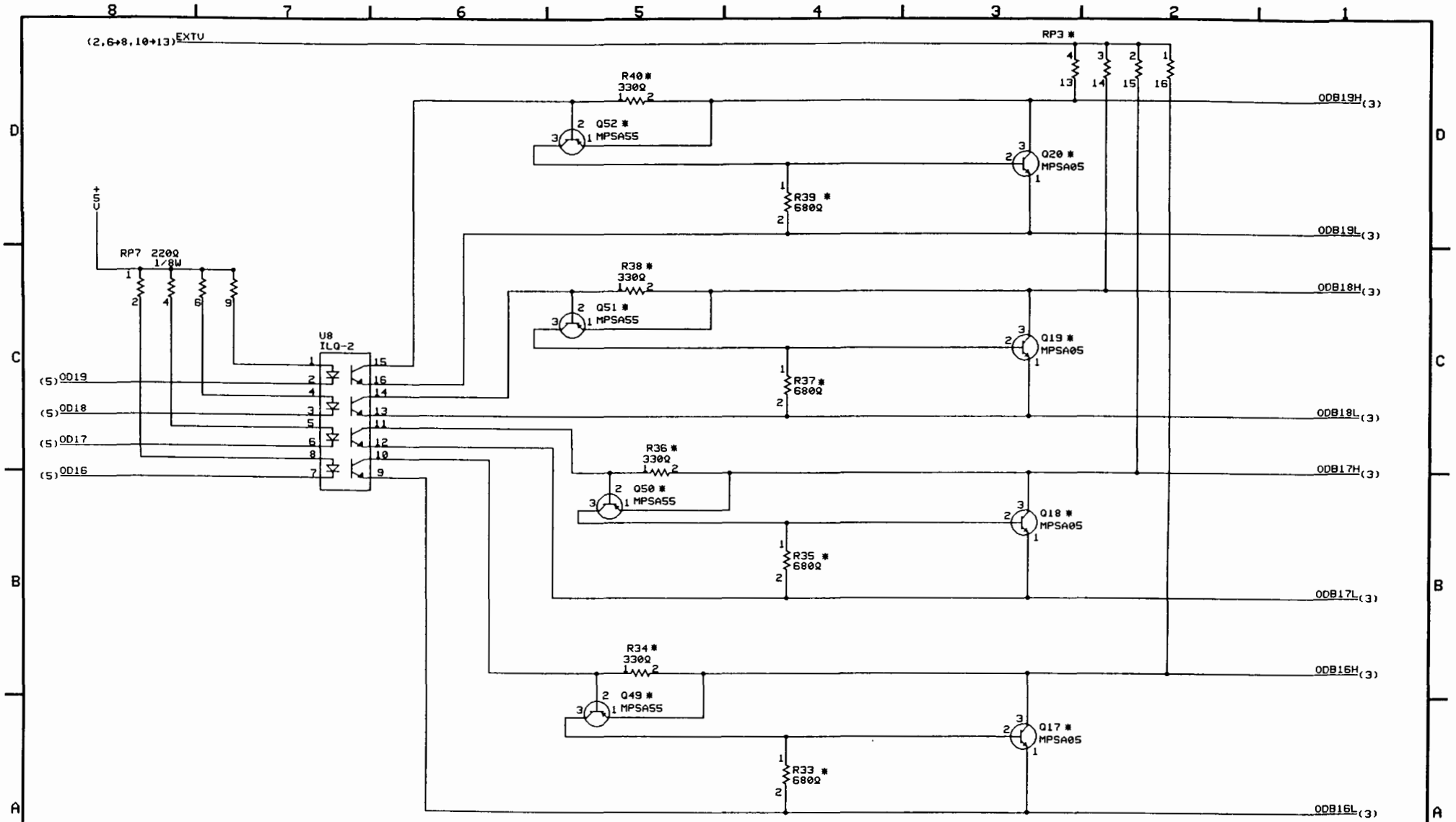
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SCALE		SHEET 7



*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

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SIGNATURES	DATE	SIZE	DWG NO.	REV.
DRAWN E.M.GREEN	6/5/91	B	0BPH5 141-102170-000	C
CHECKED C.Murray	7-22-94	SCALE		SHEET 8



*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

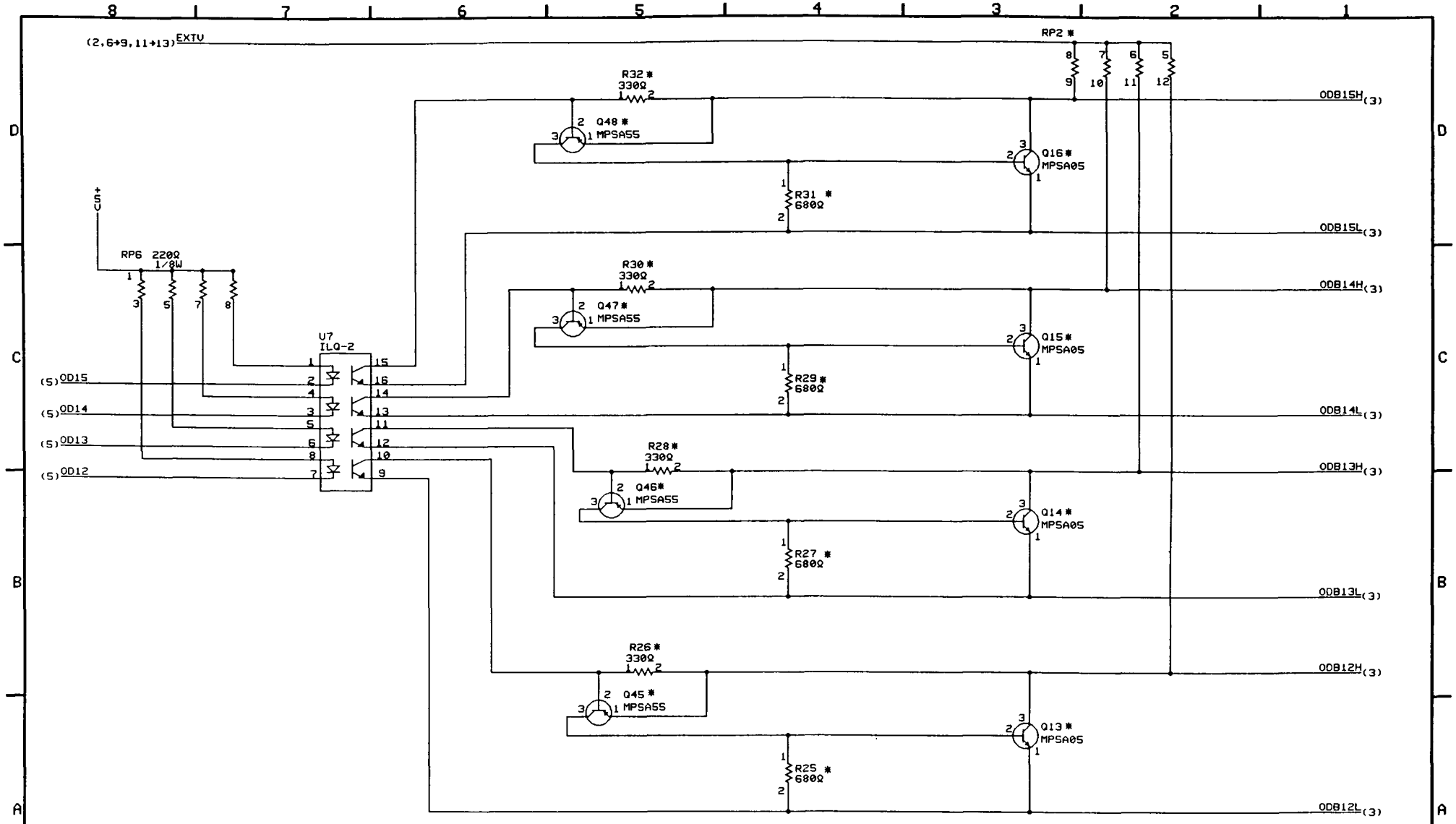
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SIGNATURES	DATE
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CHECKED C. Mueller	7-22-94

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SIZE	DWG NO.	REV.
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SCALE		SHEET 9



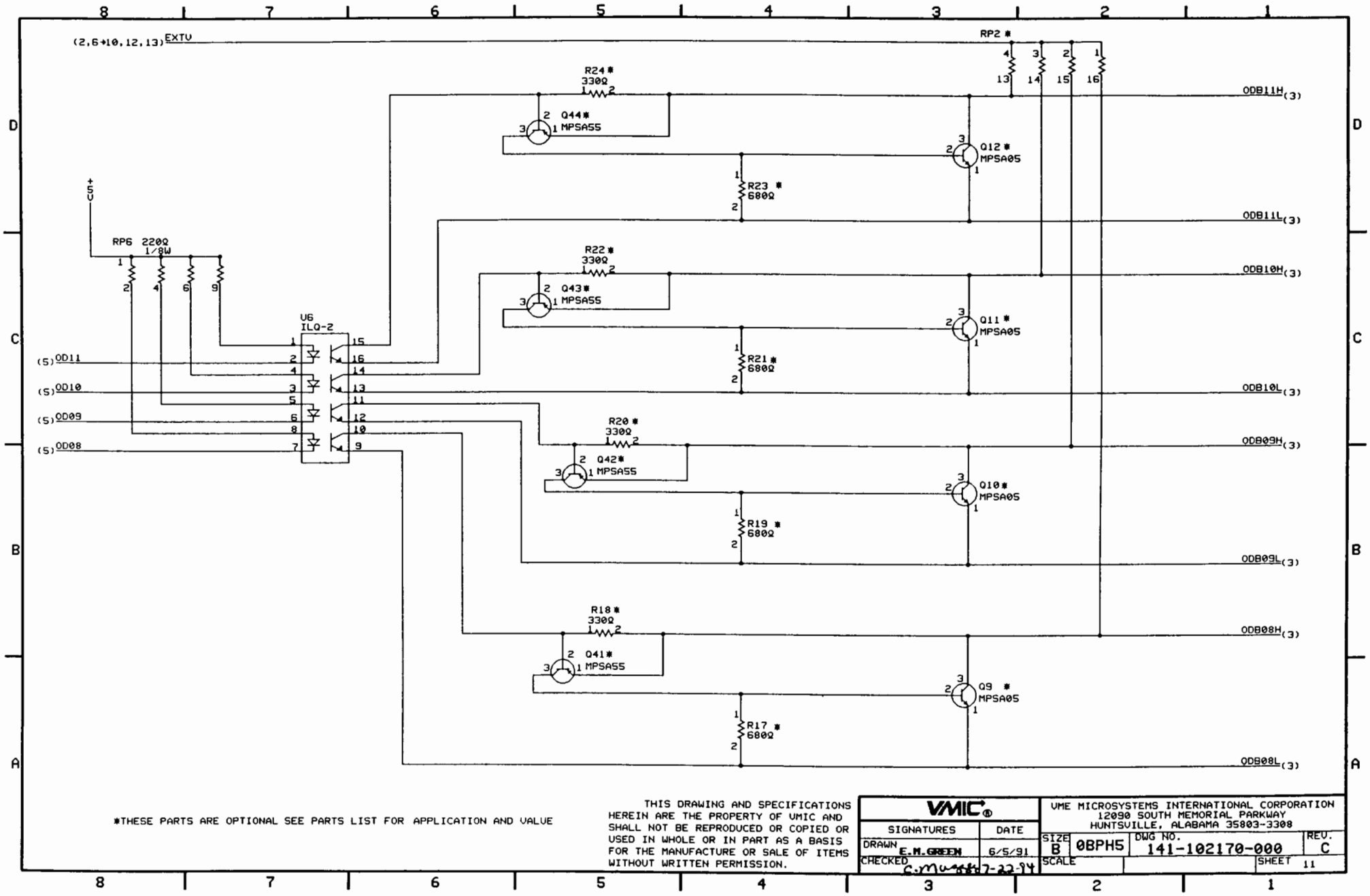
*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

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CHECKED	S.Murphy	7-22-94

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SIZE	DWG NO.	REV.
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SCALE		SHEET 10



*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

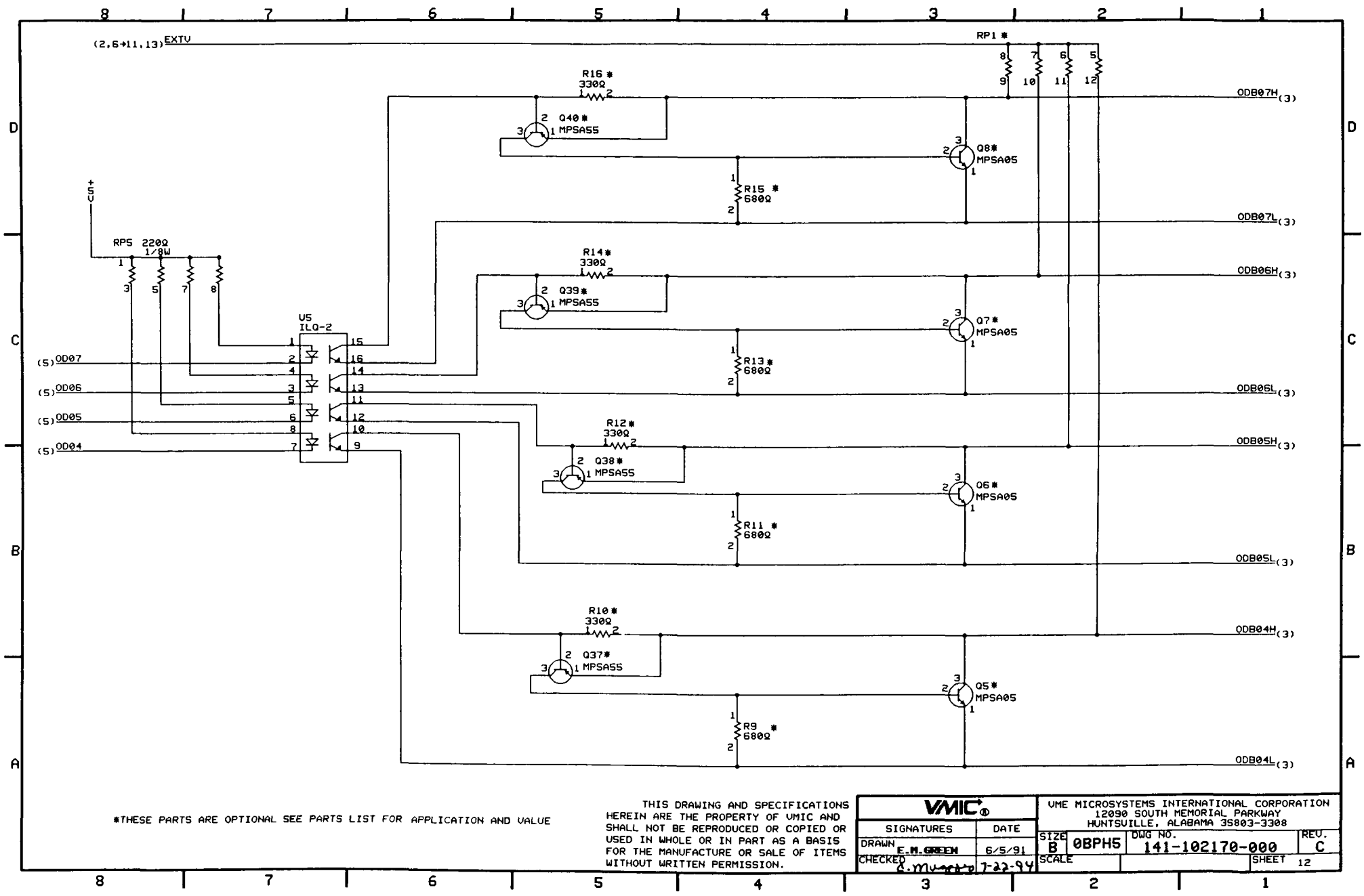
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SIGNATURES	DATE
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CHECKED C.Muse	7-22-94

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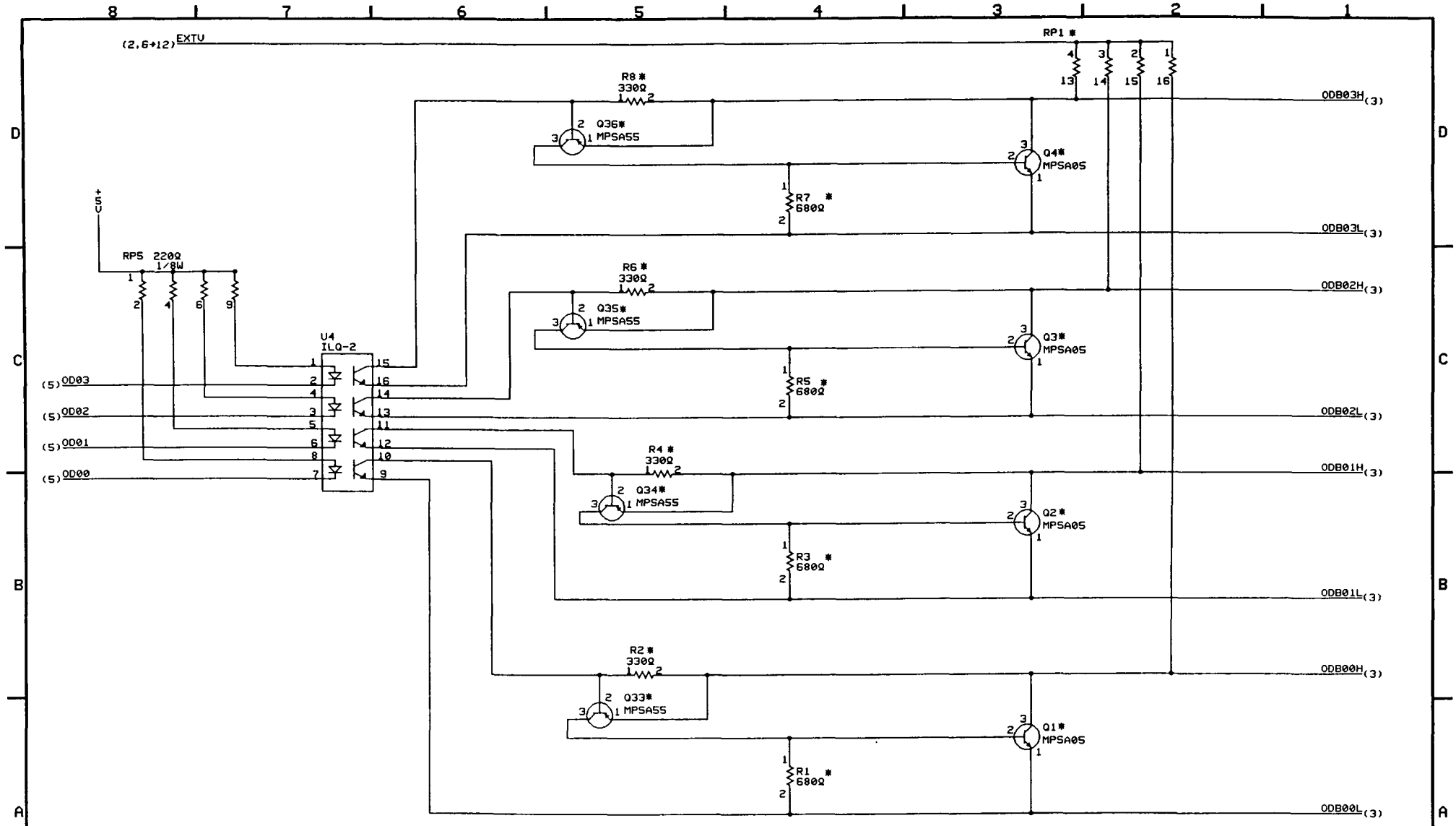
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SCALE		SHEET 11



*THESE PARTS ARE OPTIONAL SEE PARTS LIST FOR APPLICATION AND VALUE

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SIGNATURES	DATE		
DRAWN E.M.GREEN	6/5/91	SIZE B / 0BPH5 / DWG NO. 141-102170-000	REV. C
CHECKED A. Murphy	7-22-94	SCALE	SHEET 12



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SIGNATURES	DATE
DRAWN E.M.GREEN	6/5/91
CHECKED C.Mungeam	7-22-94

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SIZE	DWG NO.	REV.
B	0BPH5 141-102170-000	C
SCALE		SHEET 13 OF 13

SIZE	DWG NO	REV
A	132-102170-000	F

NOTES:

1. FOR SCHEMATIC DIAGRAM SEE 141-102170-000.
2. FOR TEST PROCEDURE SEE 510-102170-000.
3. FOR DOCUMENT SET SEE 110-102170-000.

REVISION STATUS OF 332
A
B
B
C
D
D

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	RELEASE PER ECO 91-0247	11/20/91	K.A.P.
B	CHANGES PER ECO 91-0299	11/20/91	K.A.P.
C	ADD EXTRUDED FP PER ECO 94-0055	5/12/94	D.F.
D	CHANGE PER ECO 94-0500	7/21/94	A.J.
E	REVISE PER ECO 95-0585	11/14/95	A.J.
F	CHANGE TERM TO CORRECT QTY PER ECO 97-0091	3/5/97	

UNLESS OTHERWISE SPECIFIED	SIGNATURES		DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL. DECIMALS ± 3 PL. DECIMALS ± ANGLES ± FRACTIONS ±	DRAWN:	E.M. GREEN	5/21/91
	PROJ.ENG.:	M. SPANGLER	6/13/91
	ENG.MGR.:	G. MEARES	6/13/91
	PROD.:	D. FOWLER	10/3/91
	Q.A.:	S. KEAGLE	10/3/91

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MAGNETIC MEDIA FILENAME FOR PACKAGE: A102170F.EXE

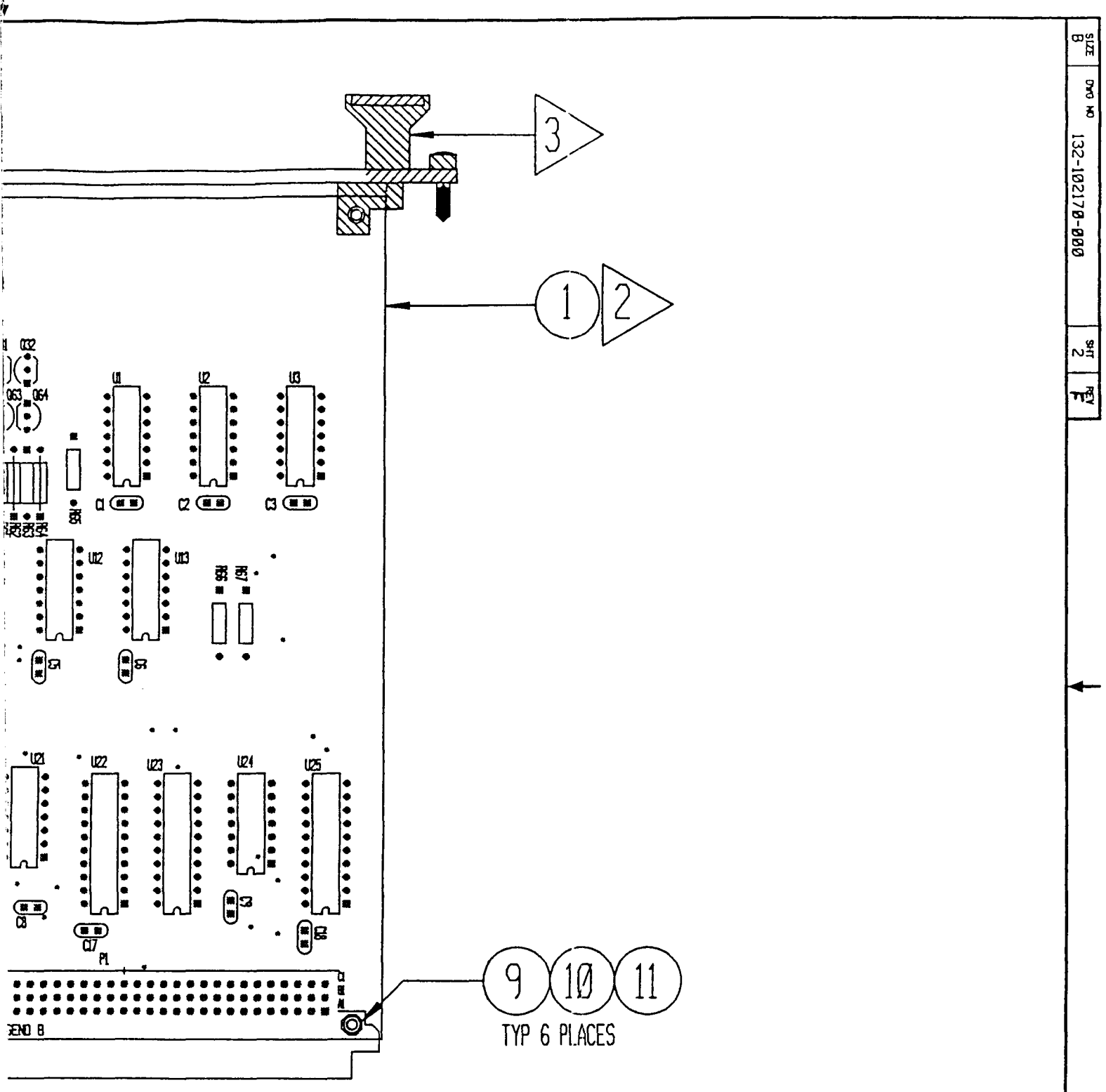
VMIC® HUNTSVILLE, ALABAMA 35803-3308
VME MICROSYSTEMS INTERNATIONAL CORPORATION

ASSEMBLY DRAWING
VMIVME-2170A

SIZE	FSCM NO.	DWG NO.
A	0BPH5	132-102170-000

SCALE		SHEET
NONE		1 OF 6

VMIVME MODEL 2178A
ASSY,MOD332-02178-
VMIC
RP1
RP2
RP3
RP4
P3
P2
JA1
1



SIZE B | DWG NO 132-102170-000 | SHT 2 | REV F

VMIC® Huntsville, Alabama 35803-3308 VME Microsystems International Corporation	SIZE: B	FORM NO.: 0BPH5	DWG NO.: 132-102170-000
DRAWN: K.COWAN			
CHECKED: C. Muzzey 2-26-97	SCALE: NONE		SHEET: 2

REWORK LEGEND:

A. REWORK INSTRUCTIONS SHALL BE ACCOMPLISHED ON THE COPPER REVISION(S) INDICATED AND WILL BECOME A PART OF THE ASSEMBLED BOARD.

B. REWORK INSTRUCTION SYMBOLS:

1. PIN ONE DOT ■
2. DRILL HOLE ●
3. DISCONNECT TRACE ×
4. TRACE ON INTERNAL LAYER ------
5. TRACE ON EXTERNAL LAYER ———

INSTRUCTIONS:

NOTES:

1> A. ALL ASSEMBLED BOARDS SHALL BE IDENTIFIED WITH THE ASSEMBLED BOARD PART NUMBER. THIS NUMBER INCLUDES THE CURRENT REVISION LETTER LISTED IN THE "REVISION STATUS OF 332" BLOCK (SEE SHEET 1). THE RESULTING PART SHALL BECOME A 332-102170-ABC (REV).

B. THE PART NUMBER FIELDS "ABC" WILL COINCIDE WITH THE OPTIONAL PARTS INSTALLED IN THE COMPLETED ASSEMBLY. IF NO OPTIONAL PARTS ARE USED IN A FIELD, THAT FIELD WILL DEFAULT TO "0".

C. IF NECESSARY, REMOVE AND REPLACE 332 REVISION LETTER WITH CURRENT REVISION LETTER USING A REMOVABLE NON-SMEARING BLACK INK.

2> SOLDER COMPOSITION COMPLIES WITH MIL-STD-2000.

3> SEE DRAWING 150-000022-000 FOR THE ASSEMBLY AND INSTALLATION OF THE FRONT PANEL.

4> WHEN USING A 333-002170-000 PC BOARD TO BUILD THIS PRODUCT, FOLLOW THE REWORK INSTRUCTIONS OF DCO I-2170A. WHEN USING A 333-102170-000 PC BOARD FOLLOW THE NORMAL BUILDING PROCEDURE.

5> FOR 333-102170-000 REV A AND EARLIER, REWORK SOCKET U22 PER ECO 94-0500 BEFORE INSTALLING.

VMIC HUNTSVILLE, AL 35803-3308 VME MICROSYSTEMS INTERNATIONAL CORP.	SIZE A	FSCM NO. 0BPH5	DWG NO. 132-102170-000
DRAWN: E. JORY			
CHECKED: C. Murray 2-26-97	SCALE		SHEET 3

EFFECTIVITY: DCO I-2170A (333-002170-000 REV C)

INSTRUCTIONS: REWORK

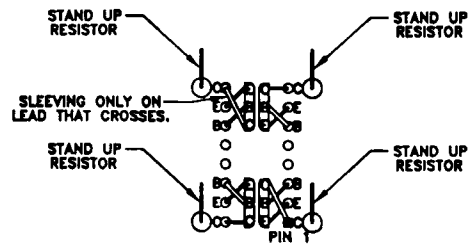
WHEN USING TO 002170 RAW PC BOARD TO BUILD THIS PRODUCT USE THE FOLLOWING REWORKS:

STEP 1

IF OPTION -X00 IS TO BE BUILT, FOLLOW THE ASSEMBLY DRAWING INSTRUCTIONS AND PARTS LIST. NO SPECIAL INSTRUCTIONS ARE REQUIRED.

STEP 2

FOR OPTION -X10, REPLACE J0 THRU J31 WITH R4 THRU R35. THESE PARTS WILL BE INSTALLED IN A STAND UP MANNER, ALSO REPLACE U1 THRU U8 WITH Q1 THRU Q32 AS SHOWN.



EFFECTIVITY: ECO 91-0299 (333-102170-000 REV N/R)

INSTRUCTIONS: REWORK

STEP 1

REMOVE Q1 THRU Q64 (Q1-Q32=>P/N 348-000006-001) AND (Q33-Q64=>P/N 348-000006-003) UNLESS NOT PRESENT.

STEP 2

RETRIEVE FROM STOCK A QUANTITY OF 32 OF P/N 348-000006-001 AND A QUANTITY OF 32 P/N 348-000006-003.

STEP 3

PLACE Q1 THROUGH Q32, P/N 348-000006-001, REVERSED FROM SILKSCREEN BY PLACING PIN 1 OF TRANSISTOR IN BOARD PIN HOLE 3 AND PIN 3 OF TRANSISTOR IN BOARD PIN HOLE 1.

STEP 4

PLACE Q33 THROUGH Q64, P/N 348-000006-003, REVERSED FROM SILKSCREEN BY PLACING PIN 1 OF TRANSISTOR IN BOARD PIN HOLE 3 AND PIN 3 OF TRANSISTOR IN BOARD PIN HOLE 1.

EFFECTIVITY: ECO 94-0500 (332-102170-000 REV B & EARLIER)

INSTRUCTIONS: REWORK

STEP 1

REMOVE U22, 74LS240, P/N 331-304240-600.

STEP 2

RETRIEVE FROM STOCK A 20 PIN SOCKET, P/N 321-001320-081. (THIS PART IS TO BE USED IN REWORK STEP 5 BELOW.)

EFFECTIVITY: ECO 94-0500 (333-102170-000 REV A & EARLIER)

INSTRUCTIONS: REWORK

STEP 1 (COMPONENT SIDE)

DISCONNECT U22 PIN 17 FROM FEED-THROUGH THAT CONNECTS TO P1 PIN A18.

STEP 2 (COMPONENT SIDE)

DISCONNECT U22 PIN 15 FROM FEED-THROUGH THAT CONNECTS TO P1 PIN A30.

STEP 3 (COMPONENT SIDE)

DISCONNECT U22 PIN 5 FROM FEED-THROUGH THAT CONNECTS TO U3 PIN 12.

STEP 4 (COMPONENT SIDE)

DISCONNECT U22 PIN 3 FROM U13 PIN 13.

STEP 5

TRIM PIN 19 OF 20 PIN SOCKET, P/N 321-001320-081, SO THAT WHEN INSTALLED IN U22, PIN 19 DOES NOT TOUCH THE PC BOARD.

STEP 6

CONNECT A MOD WIRE TO TRIMMED PIN 19 OF U22 SOCKET. ROUTE WIRE THROUGH U22 PIN 19 HOLE OF THE PC BOARD AND CONNECT TO U21 PIN 1 ON THE SOLDER SIDE.

STEP 7 (COMPONENT SIDE)

DISCONNECT U19 PIN 19 FROM FEED-THROUGH THAT CONNECTS TO U21 PIN 1 AND U3 PIN 4.

STEP 8 (SOLDER SIDE)

CONNECT U19 PIN 19 TO U22 PIN 9.

STEP 9 (SOLDER SIDE)

CONNECT U21 PIN 8 TO U22 PIN 7.

STEP 10 (SOLDER SIDE)

CONNECT P1 PIN A18 TO U22 PIN 3.

STEP 11 (SOLDER SIDE)

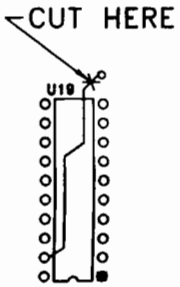
CONNECT P1 PIN A30 TO U22 PIN 5.

STEP 12 (SOLDER SIDE)

CONNECT U22 PIN 15 TO U3 PIN 12.

STEP 13 (SOLDER SIDE)

CONNECT U22 PIN 17 TO U13 PIN 13.



STEP 7

EFFECTIVITY: ECO 94-0500 (332-102170-000 REV B & EARLIER)

INSTRUCTIONS: REWORK

STEP 1

INSERT PAL 2170A22A.JED, P/N 303-001149-000, INTO LOCATION U22 OF PC BOARD.

END OF REWORK INSTRUCTIONS

VMIC HUNTSVILLE, AL 35803-3308 VME MICROSYSTEMS INTERNATIONAL CORP.	SIZE A	FSCM NO. 0BPH5	DWG NO. 132-102170-000
DRAWN: E. JORY			
CHECKED: C. Mussey 2-26-97	SCALE		SHEET 3B

ITEM	ABC	REF. DES.	QTY.	PART NO:	DESCRIPTION	MANUFACTURER
1			1	333-102170-000	BOARD: PC, RAW, 6 LAYERS (VMIVME-2170A) (SEE NOTE 4)	
2			1	317-000119-000	F/P ASSY: EXTRUDED EJECTOR, ONE LOWER POSITION 64 PIN CUTOUT (SEE NOTE 3)	
3				DELETED		
4			1	324-102170-100	LABEL: ID, 2170A, FRONT PANEL (SEE NOTE 3)	
5				DELETED		
6				DELETED		
7				DELETED		
8				DELETED		
9		P1-3	6	328-250000-010	SCREW: M2.5, PAN HEAD, PHILLIPS, CROSS RECESSED SS, 10MM LENGTH	OPEN SOURCE
10		P1-3	6	328-250001-025	NUT: METRIC, 2.5MM, HEX, SS	OPEN SOURCE
11		REF. P1-3	A/R	316-000002-000	LOCTITE: SMALL SCREW THREADLOCKER 222	
12				DELETED		
13		C1-18	18	315-205000-104	CAP: .1uF, .100 LEAD SPACE, 20%, 50V, Z5U CERAMIC MONOLYTHIC	C3(15,20)C104M5U5CA (KEMET)
14		C19	1	315-902001-476	CAP: 47uF, 20%, 35V, RADIAL, ALUMINUM ELECTROLYTIC	ECEA1VU470 (PANASONIC)
15		P3	1	321-000013-105	CONNECTOR: FLAT CABLE, 64 PIN, RIGHT ANGLE MALE W/ EJECTOR LATCHES, TYPE C, SERIES 120	120-964-033A (PANDUIT)
16		JA1	1	321-000015-001	JUMPER: PC BOARD, 2 POSITION, FEMALE GOLD PLATED CONTACT, BLACK	MSB-2360-G-C-STP (McKENZIE)

ITEM	ABC	REF. DES.	QTY.	PART NO:	DESCRIPTION	MANUFACTURER
17		A2-15	1	321-000017-141	TERMINAL: PC BOARD, DUAL ROW, .025 THICK, 14 POST	PEG14DS-(T,F)BR (CRANE)
18		P1	1	321-000054-001	CONNECTOR: DIN, 96 PIN, WAVE SOLDER, ANGLED TYPE C, MALE	100-096-033 (PANDUIT)
19		P2	1	321-000054-002	CONNECTOR: DIN, 96 PIN, WAVE SOLDER, ANGLED TYPE C, MALE	100-096-033 (PANDUIT)
20		RP1-4	4	321-001316-001	SOCKET: DIP, 16 PIN, .300 ROW, STAMPED & FORMED	2-641600-(3,1,5) (AMP)
21		U12	1	331-300400-000	IC: DIGITAL, QUAD 2-INPUT NAND GATE, PLASTIC DIP	SN7400N (TI)
22		U13,26	2	331-300404-600	IC: DIGITAL, HEX INVERTER, PLASTIC DIP	SN74LS04N (TI)
23		U21	1	331-300438-700	IC: DIGITAL, QUAD 2-INPUT NAND BUFFER, PLASTIC DIP	SN74S38N (TI)
24		U1-3	3	331-300474-600	IC: DIGITAL, DUAL D FLIP FLOP, PLASTIC DIP	SN74LS74AN (TI)
25		U27	1	331-304155-600	IC: DIGITAL, DUAL 1 OF 4 DECODER, PLASTIC DIP	SN74LS155N (TI)
26		U24	1	331-304164-400	IC: DIGITAL, 8-BIT GATED SERIAL-IN, PARALLEL-OUT, FAST, PLASTIC DIP	MC74F164P (MOTOROLA)
27		U22	1	303-001149-000	PROGRAMMED PAL: FILE: 2170A22A.PLD A PROGRAMMED 18V10 (331-300132-200)	
28		U14-17	4	331-304374-400	IC: DIGITAL, OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOP THREE-STATE, PLASTIC DIP	SN74F374N (TI)
29		U18-20	3	331-304520-100	IC: DIGITAL, 8-BIT IDENTITY COMPARATOR, PLASTIC DIP	SN74ALS520N (TI)
30		U4-11	8	337-000000-300	TRANSISTOR: PHOTO, QUAD CHANNEL, 16 PIN	ILQ-2 (SIEMENS)
31		R65-67	3	347-000000-102	RESISTOR: 1K OHM, 1/4W, 5%, CARBON FILM	OPEN SOURCE
32		RP5-8	4	347-001002-221	SIP: 220 OHM, BUSSED, 10 PIN, LOW PROFILE	4610X-101-221 (BOURNS)

ITEM	ABC	REF. DES.	QTY.	PART NO:	DESCRIPTION	MANUFACTURER
33		JA1	1	321-000017-011	TERMINAL: PC BOARD, DUAL ROW, .025 THICK, GOLD PLATED, ONE POST	PEG02DS-(T,F)BR (CRANE)
34		U22	1	321-001320-001	SOCKET: DIP, 20 PIN, .300 ROW, STAMPED & FORMED (SEE NOTE 5)	2-641602-(3,1,5) (AMP)
35						
36						
37						
38	1B0	U23,25	2	331-304640-110	IC: DIGITAL, OCTAL BUS TRANSCEIVER, 20 PIN PLASTIC DIP	SN74ALS640A-1N (TI)
39	2B0	U23,25	2	331-304645-110	IC: DIGITAL, OCTAL BUS TRANSCEIVER, PLASTIC DIP	SN74(ALS,AS)645A-1N (TI)
40						
41	A00	R2,4,6,8,10,12,14,16 R18,20,22,24,26,28, R30,32,34,36,38,40, R42,44,46,48,50,52, R54,56,58,60,62,64	32	321-000003-005	JUMPER: WIRE, 22 AWG, .5 INCHES, GREEN (SEE NOTE 4)	923345-05 (AP PRODUCTS)
42	A10	R2,4,6,8,10,12,14,16 R18,20,22,24,26,28, R30,32,34,36,38,40, R42,44,46,48,50,52, R54,56,58,60,62,64	32	347-000000-331	RESISTOR: 330 OHM, 1/4W, 5%, CARBON FILM (SEE NOTE 4)	OPEN SOURCE
43	A10	R1,3,5,7,9,11,13,15, R17,19,21,23,25,27, R29,31,33,35,37,39, R41,43,45,47,49,51, R53,55,57,59,61,63	32	347-000000-681	RESISTOR: 680 OHM, 1/4W, 5%, CARBON FILM	OPEN SOURCE
44	A10	Q1-32	32	348-000006-001	TRANSISTOR:NPN,4Vdc EMITTER-BASE,500mADC COLLECTOR CURRENT, 60Vdc COLLECTOR-EMITTER VOLTAGE, TO-92 (SEE NOTE 4)	MPSA05 (MOTOROLA)
45	A10	Q33-64	32	348-000006-003	TRANSISTOR:PNP,4Vdc EMITTER-BASE,500mADC COLLECTOR CURRENT, 60Vdc COLLECTOR-EMITTER VOLTAGE, TO-92	MPSA55 (MOTOROLA)

SIZE	DWG NO		REV
A	132-102170-000	1	G

NOTES:

1. FOR SCHEMATIC DIAGRAM SEE 141-102170-000.
2. FOR TEST PROCEDURE SEE 510-102170-000.
3. FOR DOCUMENT SET SEE 110-102170-000.

REVISION STATUS OF 332
A
B
B
C
D
D
E

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	RELEASE PER ECO 91-0247	11/20/91	K.A.P.
B	CHANGES PER ECO 91-0299	11/20/91	K.A.P.
C	ADD EXTRUDED FP PER ECO 94-0055	5/12/94	D.F.
D	CHANGE PER ECO 94-0500	7/21/94	A.J.
E	REVISE PER ECO 95-0585	11/14/95	A.J.
F	CHANGE TERM TO CORRECT QTY PER ECO 97-0091	3/5/97	R.G.
G	ADD RIVET MOUNTING TO P1, P2 PER ECO 00-0413	8/3/00	TLT

UNLESS OTHERWISE SPECIFIED	SIGNATURES		DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL. DECIMALS ± 3 PL. DECIMALS ± ANGLES ± FRACTIONS ±	DRAWN:	E.M. GREEN	5/21/91
	PROJ.ENG.:	M. SPANGLER	6/13/91
	ENG.MGR.:	G. MEARES	6/13/91
	PROD.:	D. FOWLER	10/3/91
	Q.A.:	S. KEAGLE	10/3/91

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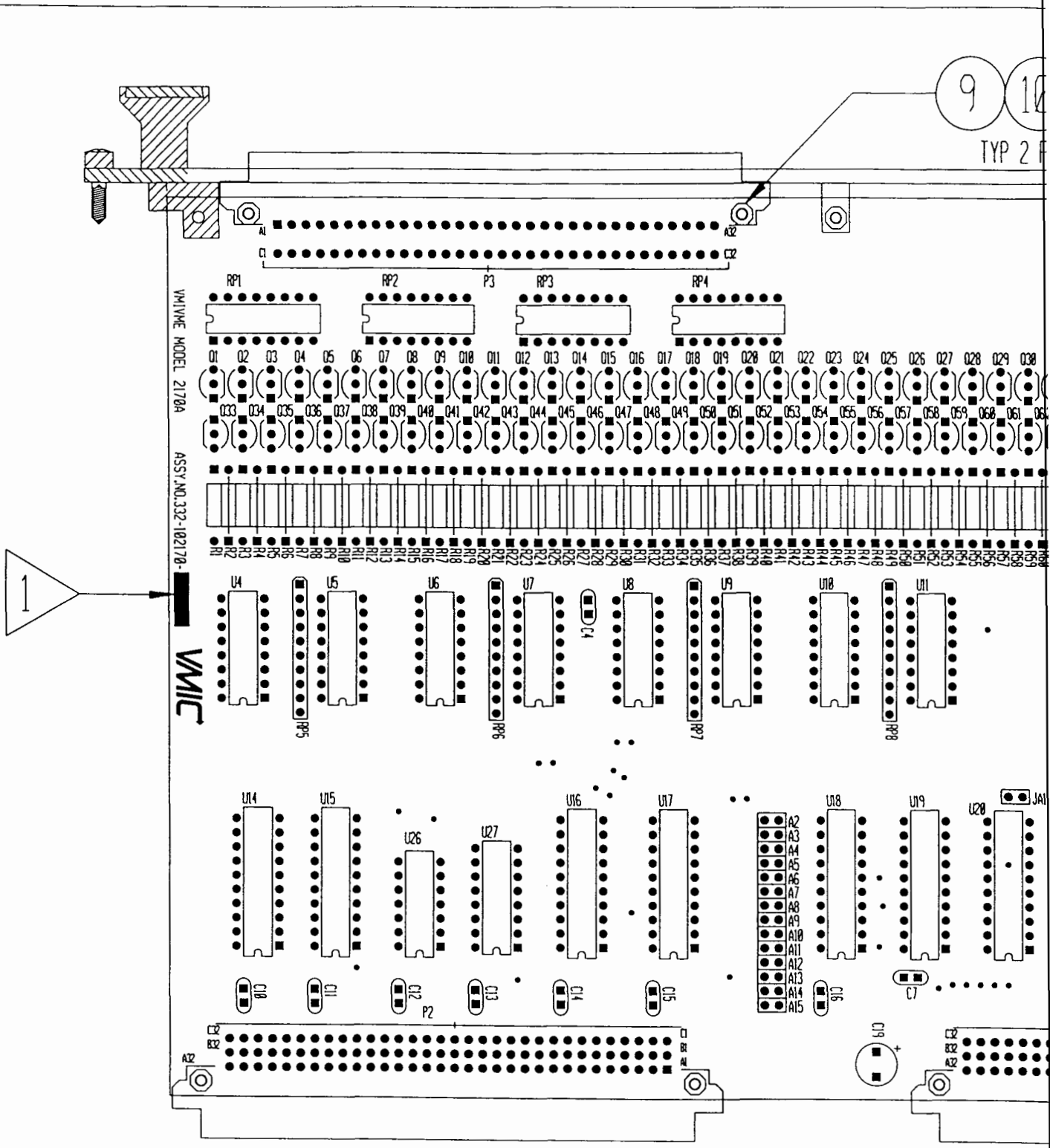
MAGNETIC MEDIA FILENAME FOR PACKAGE:
132-102170-000-G.EXE

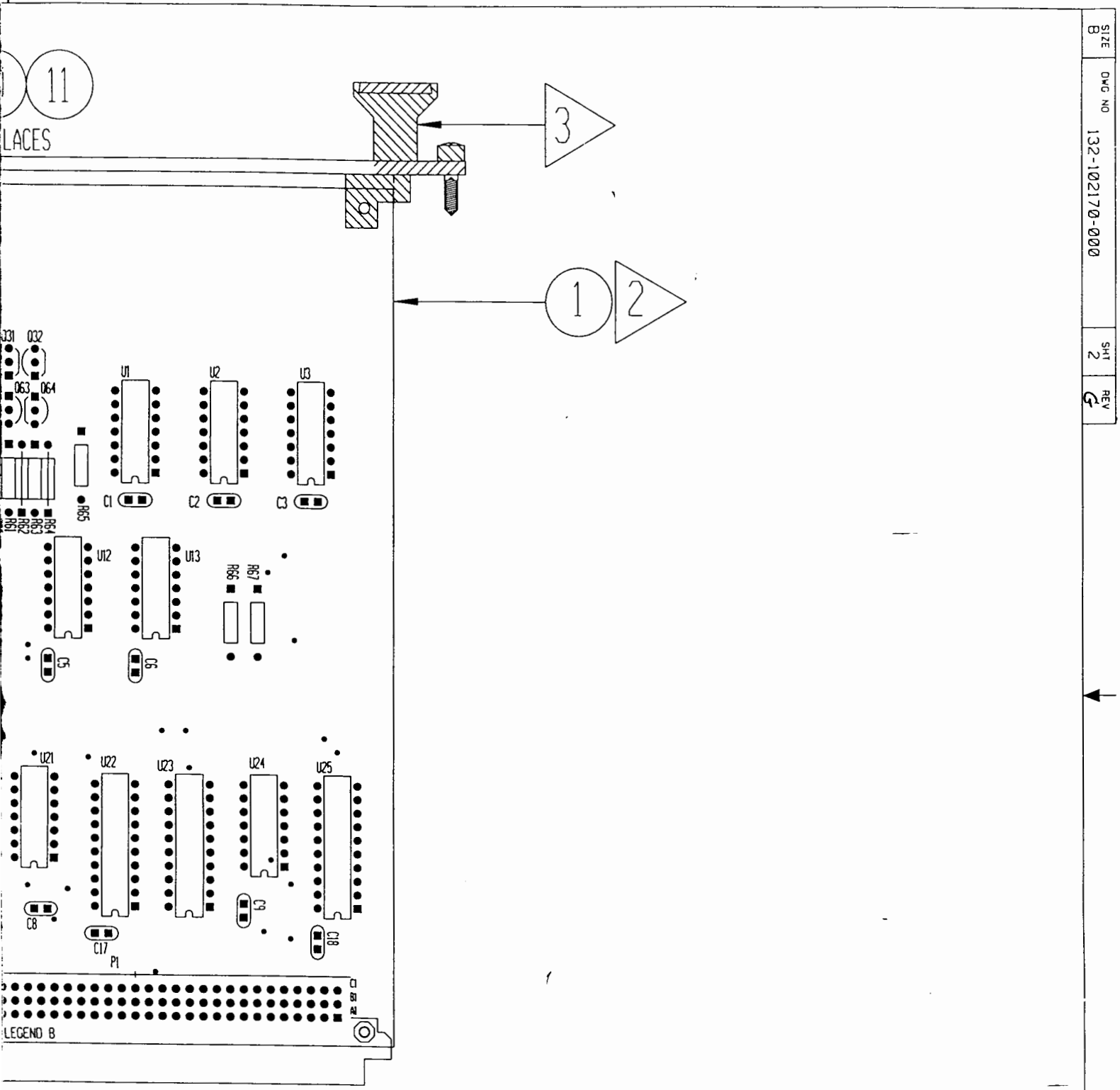
VMIC HUNTSVILLE, ALABAMA 35803-3308
VME MICROSYSTEMS INTERNATIONAL CORPORATION

ASSEMBLY DRAWING
VMIVME-2170A

SIZE	FSCM NO.	DWG NO.
A	OBPH5	132-102170-000

SCALE		SHEET
NONE		1 OF 7


9
TYP 2 P
VMIVME MODEL 2170A
ASSY.NO.332-102170-
1
VMIC
P1
P2
P3
RP1
RP2
RP3
RP4
A1
A32
C1
C32
U4
U5
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A15



SIZE B | DWG NO 132-102170-000 | SHT 2 | REV G

VMIC® VME Microsystems International Corporation, Huntsville, Alabama 35803-3308	SIZE B	FORM NO. ØBPH5	DWG NO. 132-102170-000
DRAWN: K.COWAN			
CHECKED: C. Muzzey 7-28-00	SCALE NONE		SHEET 2

EFFECTIVITY: DCO I-2170A (333-002170-000 REV C)

INSTRUCTIONS: REWORK

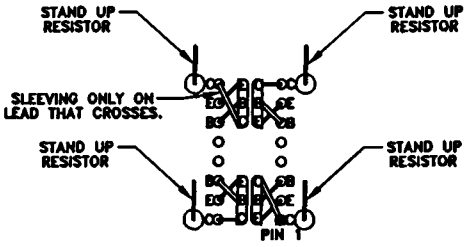
WHEN USING TO 002170 RAW PC BOARD TO BUILD THIS PRODUCT USE THE FOLLOWING REWORKS:

STEP 1

IF OPTION -X00 IS TO BE BUILT, FOLLOW THE ASSEMBLY DRAWING INSTRUCTIONS AND PARTS LIST. NO SPECIAL INSTRUCTIONS ARE REQUIRED.

STEP 2

FOR OPTION -X10, REPLACE J0 THRU J31 WITH R4 THRU R35. THESE PARTS WILL BE INSTALLED IN A STAND UP MANNER, ALSO REPLACE U1 THRU U8 WITH Q1 THRU Q32 AS SHOWN.



EFFECTIVITY: ECO 91-0299 (333-102170-000 REV N/R)

INSTRUCTIONS: REWORK

STEP 1

REMOVE Q1 THRU Q64 (Q1-Q32=>P/N 348-000006-001) AND (Q33-Q64=>P/N 348-000006-003) UNLESS NOT PRESENT.

STEP 2

RETRIEVE FROM STOCK A QUANTITY OF 32 OF P/N 348-000006-001 AND A QUANTITY OF 32 P/N 348-000006-003.

STEP 3

PLACE Q1 THROUGH Q32, P/N 348-000006-001, REVERSED FROM SILKSCREEN BY PLACING PIN 1 OF TRANSISTOR IN BOARD PIN HOLE 3 AND PIN 3 OF TRANSISTOR IN BOARD PIN HOLE 1.

STEP 4

PLACE Q33 THROUGH Q64, P/N 348-000006-003, REVERSED FROM SILKSCREEN BY PLACING PIN 1 OF TRANSISTOR IN BOARD PIN HOLE 3 AND PIN 3 OF TRANSISTOR IN BOARD PIN HOLE 1.

EFFECTIVITY: ECO 00-0413 (332-102170-000 REV D & EARLIER)

INSTRUCTIONS: REWORK

STEP 1

PROCESS IMPROVEMENTS, NO REWORK REQUIRED. (INSTALLATION OF RIVET IN P1 & P2 CONNECTOR).

END OF REWORK INSTRUCTIONS

ITEM	ABC	REF. DES.	QTY.	PART NO.	DESCRIPTION	MANUFACTURER
14		C19	1	315-902001-476	CAP: 47uF, 20%, 35V, RADIAL, ALUMINUM ELECTROLYTIC	OPEN SOURCE
15		P3	1	321-000013-105	CONNECTOR: FLAT CABLE, LEVEL II, 64 PIN, RIGHT ANGLE MALE, W/ EJECTOR LATCHES, 30u" GOLD, WAVE SOLDER, TYPE C, SERIES 120	120-964-033A (PANDUIT)
16		JA1	1	321-000015-001	JUMPER: PC BOARD, 2 POSITION, FEMALE, GOLD PLATED CONTACT, BLACK	MSB-2360-G-C-STP (McKENZIE)
17		A2-15	1	321-000017-141	TERMINAL: PC BOARD, DUAL ROW, .100" SPACING, .094" (+/-.005") THICK, TIN FINISH, 14 POST	OPEN SOURCE
18		P1	1	321-000054-001	CONNECTOR: DIN, 96 PIN, WAVE SOLDER, ANGLED, TYPE C P1, MALE	100-096-033 (PANDUIT)
19		P2	1	321-000054-002	CONNECTOR: DIN, 96 PIN, WAVE SOLDER, ANGLED, TYPE C P2, MALE	100-096-033 (PANDUIT)
20		RP1-4	4	321-001316-001	SOCKET: DIP, 16 PIN, .300 ROW, STAMPED AND FORMED	2-641600-(3,1,5) (AMP)
21		U12	1	331-300400-000	IC: DIGITAL, QUAD 2-INPUT NAND GATE, PLASTIC DIP	SN7400N (TI)
22		U13,26	2	331-300404-600	IC: DIGITAL, HEX INVERTER, PLASTIC DIP	SN74LS04N (TI)
23		U21	1	331-300438-700	IC: DIGITAL, QUAD 2-INPUT NAND BUFFER, PLASTIC DIP	SN74S38N (TI)
24		U1-3	3	331-300474-600	IC: DIGITAL, DUAL D FLIP FLOP, PLASTIC DIP	SN74LS74AN (TI)
25		U27	1	331-304155-600	IC: DIGITAL, DUAL 1 OF 4 DECODER, PLASTIC DIP	SN74LS155N (TI)
26		U24	1	331-304164-400	IC: DIGITAL, 8-BIT GATED SERIAL-IN, PARALLEL-OUT, FAST PLASTIC DIP	MC74F164P (MOTOROLA)

ITEM	ABC	REF. DES.	QTY.	PART NO.	DESCRIPTION	MANUFACTURER
41	A00	R2,4,6,8,10,12,14,16 R18,20,22,24,26,28, R30,32,34,36,38,40, R42,44,46,48,50,52, R54,56,58,60,62,64	32	321-000003-005	JUMPER: WIRE, 22 AWG, .5 INCHES, GREEN (SEE NOTE 4)	JL-500-25-T (SAMTEC)
42	A10	R2,4,6,8,10,12,14,16 R18,20,22,24,26,28, R30,32,34,36,38,40, R42,44,46,48,50,52, R54,56,58,60,62,64	32	347-000000-331	RESISTOR: 330 OHM, 1/4W, 5%, CARBON FILM (SEE NOTE 4)	OPEN SOURCE
43	A10	R1,3,5,7,9,11,13,15, R17,19,21,23,25,27, R29,31,33,35,37,39, R41,43,45,47,49,51, R53,55,57,59,61,63	32	347-000000-681	RESISTOR: 680 OHM, 1/4W, 5%, CARBON FILM	OPEN SOURCE
44	A10	Q1-32	32	348-000006-001	TRANSISTOR: NPN, 4Vdc EMITTER-BASE, 500mADC COLLECTOR CURRENT, 60Vdc COLLECTOR-EMITTER VOLTAGE, TO-92 (SEE NOTE 4)	MPSA05 (MOTOROLA)
45	A10	Q33-64	32	348-000006-003	TRANSISTOR: PNP, 4Vdc EMITTER-BASE, 500mADC COLLECTOR CURRENT, 60Vdc COLLECTOR-EMITTER VOLTAGE, TO-92	MPSA55 (MOTOROLA)
46		P1,2	4	328-250570-000	FASTENER: AVTRONIC FASTENING SYSTEMS FOR DIN CONN. 9.96MM LENGTH, 2.5MM DIAMETER, ALUMINUM	1189-2510 (AVDEL CHERRY TEXTRON)

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