ISOLATED DIGITAL
INPUT CARD
MODEL 69430A

Computer Museum

OPERATING AND SERVICE MANUAL

FOR CARDS DESIGNATED RUN 1 AND ABOVE*

*For Cards above Run 1
a change page may be
included.

HP Part No. 69430-90001

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MANUAL CHANGES
Model 69430A Isolated Digital Input Card
Manual HP Part No. 69430-90001

Make all corrections in the manual according to errata below, then check the following table for your card's serial number and enter any listed change(s) in the manual.

SERIAL		MAKE CHANGES
Prefix	Number	
1636A	00772-up	1

ERRATA:

In Table 3-1 on page 3-2, change the HI logic level for Option 069 and 073 cards to 3.5 to 6 volts.

In the parts list, delete the packing carton or corrugated tray listed and add the part number of the carton with foam liner now used for shipping multiprogrammer cards. Its number is 9211-2603.

CHANGE 1:

To permit mechanized IC insertion, the IC sockets on this board have been deleted except for three 14-pin sockets (1200-0508) for Z3, Z4, and Z5.

8-2-77

SECTION I
GENERAL INFORMATION

1-1 INTRODUCTION

1-2 This instruction manual contains operating and service instructions for Isolated Digital Input Card Model 69430A. The card is designed specifically for use in the 6940A Multiprogrammer and 6941A Multiprogrammer Extender units to receive 12 separate digital inputs from a user's external device and to read this data into a computer under program control. The 12-pairs of input lines are isolated from one another and from the multiprogrammer power supply through the use of photoisolators.

1-3 The 69430A may be ordered with any one of eight options. The purpose of these options is to allow the card to be used with inputs having either ground-true or positive-true logic sense and to accommodate a wide range of logic levels. Specifications Table 1-1 defines the available options in terms of input logic sense and level.

1-4 DESCRIPTION

1-5 When installed in a Multiprogrammer System, the digital input card is programmed by a 16-bit address word originating at a remote computer or the 6940 multiprogrammer control panel. The twelve most significant bits of the programmed bits (bits 0-11) are not relevant to the input card and are not used, while the remaining four bits (bits 12-15) contain the slot address of the input card.

1-6 When the input card slot is addressed (and the applicable unit has been selected by a prior control word), the 12 data-bits currently at the input to the 69430A are transferred to the multiprogrammer backplane. The data on the backplane is transferred to the computer. Input select (ISL) should be on during this operation. The input data will be passed on to the backplane as long as the card remains addressed.

1-7 The input card is fabricated on a 4 1/2" x 11" printed circuit card. The inner edge of the card contains a dual 24 pin (48 pin total) printed circuit plug that can mate with any connector in slot 400 through 414 of a multiprogrammer unit (6940A or 6941A). A dual 15-pin (30-pin total) printed circuit plug located on the outer-edge of the card connects the 69430A to the external device.

1-8 SPECIFICATIONS

1-9 Table 1-1 provides detailed specifications for the Model 69430A.

1-10 INTERFACING

1-11 The 69430A Isolated Digital Input Card is automatically interfaced with its associated multiprogrammer unit when it is installed in a 400 series slot connector. Once it is assigned to a slot, the card assumes the address of that position and will input data only when the applicable unit and slot are addressed. All operating power and address data for the card are derived from the multiprogrammer unit.

1-12 Interfacing considerations involving the 69430A and the external device are covered in detail in Section III of this Instruction Manual.

1-13 EXTERNAL INPUT CONNECTOR ASSEMBLY

1-14 One 30-pin connector assembly (HP Part No. 5060-9658) is furnished with each isolated digital input card for interfacing the card with the external system. Additional 30-pin connector assemblies may be ordered from your local Hewlett-Packard sales office (refer to list at rear of manual for addresses).

1-15 ORDERING ADDITIONAL MANUALS

1-16 One manual is shipped with each 69430A order. Additional manuals may be purchased from your local Hewlett-Packard field office (see list at rear of this manual for addresses). Specify the card model number and HP Part Number shown on the title page.

Table 1-1. Model 69430A Specifications

DATA INPUT (From Device): 12-bit binary

GROUND-TRUE OPTIONS:

Option	Logic 1	Logic 0*
069	0 to 0.4V	3.5 to 6V
084	0 to 0.4V	6 to 12V
085	0 to 0.4V	12 to 25V
086	0 to 0.4V	25 to 50V

POSITIVE-TRUE OPTIONS:

Option	Logic 1*	Logic 0
073	3.5 to 6V	0 to 0.4V
087	6 to 12V	0 to 0.4V
088	12 to 25V	0 to 0.4V
089	25 to 50V	0 to 0.4V

(*Voltage source must be capable of sourcing 3mA, minimum, at low end of voltage span)

INPUT VOLTAGE ISOLATION:
Up to 100V difference between data input lines and multiprogrammer common.

POWER REQUIREMENTS:
+5Vdc, 250mA maximum (when card is addressed) from multiprogrammer main power supply -12Vdc, 50mA maximum from multiprogrammer main power supply.

TEMPERATURE RANGE:
0°C to +80°C operating in mainframe (allows +25°C internal rise when operating in mainframe at up to +55°C ambient); -40°C to +80°C storage.

OPERATING POSITION:
Any (no restrictions).

INPUT CONNECTOR:
One 15-pin dual (30-pin total) edge connector. Mating female connector assembly supplied (HP Part No. 5060-7934).

DIMENSIONS:
4.5" x 11.0" nominal

SECTION II
INSTALLATION

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2-1 INITIAL INSPECTION

2-2 Before shipment, the 69430A Isolated Digital Input Card was inspected and found to be free of mechanical and electrical defects. As soon as the card is received, proceed as instructed in the following paragraphs.

2-3 MECHANICAL CHECK

2-4 If external damage to the shipping carton is evident, ask the carrier' s agent to be present when the card is unpacked. Check the card for signs of physical damage. If it is damaged, file a claim with the carrier' s agent and notify Hewlett-Packard Sales and Service Office as soon as possible. If it appears to be undamaged, perform the electrical check specified in the following paragraph.

2-5 ELECTRICAL CHECK

2-6 Check the electrical performance of the input card as soon as possible after receipt. Section V of this manual contains checkout procedures which will verify operation of the card. Refer to the inside front cover of this manual for Certification and Warranty statements.

2-7 REPACKING FOR SHIPMENT

2-8 When shipping an input card, it is recommended that the package designed for it be used. The original packaging material is reusable. If it is not available, contact your local Hewlett-Packard field office to obtain the materials. This office will also furnish the address of the nearest service office to which the input card can be shipped. Be sure to attach a tag to the card specifying the owner, model number, and service required, or a brief description of the trouble.

2-9 INPUT CARD INSTALLATION

2-10 Input cards are installed in slots 400 through 414 of a Multiprogrammer unit. To install an input card, proceed as follows:

a. Open the hinged front panel of the Multiprogrammer unit by turning the recessed screw within the knurled handle counterclockwise.

b. With the extractor handle on the top and the card components on the right, slide the card into the desired multiprogrammer slot (400 through 414). Note that all input cards are slotted between pins 4 and 5 and all 400 series connectors of the Multiprogrammer are keyed between the same points. This makes it virtually impossible to plug an input card in upside down or into any slot other than a 400 series slot.

c. Route all wiring from the input cards through the false-bottom channel and out the back of the unit to the external system.

d. As physical installation and wiring are completed for the input card, carefully note and record the following types of information on the installation record card located on the rear of the hinged front panel of the multiprogrammer.

(1) Input card type
(2) Application in external system
(3) Input logic sense, level, etc.

SECTION III
OPERATING INSTRUCTIONS

3-1 MULTIPROGRAMMER CONNECTIONS

3-2 The Isolated Digital Input Card is controlled by the multiprogrammer unit in which it is installed. All dc operating power and address bits are supplied to the input card through multiprogrammer mainframe connectors in slots 400 through 414. Figure 3-1 illustrates the signals present on all multiprogrammer 400-series connectors. Notice that several signals (i.e. SYE, $\overline{DTE}$, $\overline{CTF}$, etc.) are not utilized by the Isolated Digital Input Card.

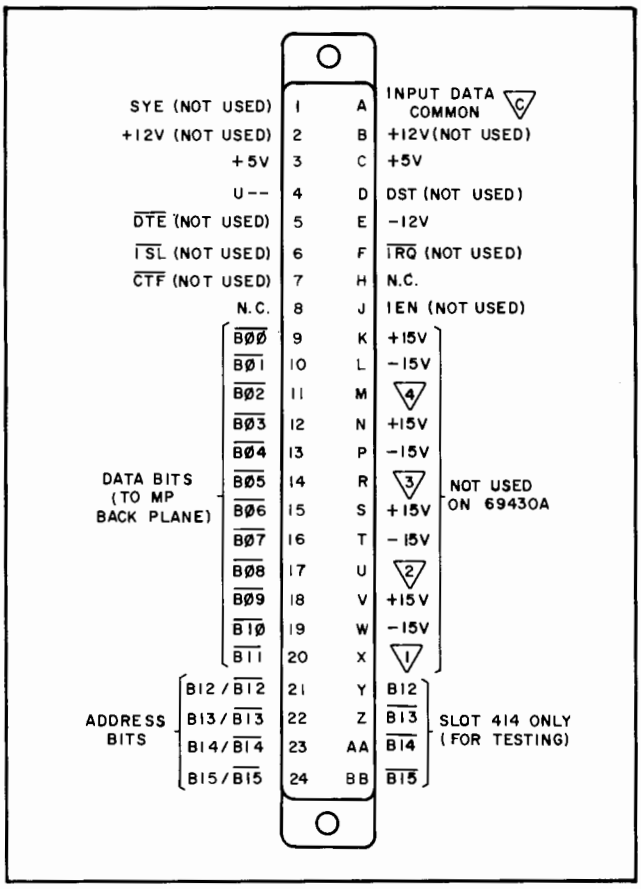

Figure 3-1. Multiprogrammer 400 Series Slot Connector

3-3 PROGRAMMING

3-4 The information presented here defines the basic programming steps involved in reading data present at the 12-input lines of 69430A into a computer. Complete system programming instructions are given in the operating and service manual for the 6940A Multiprogrammer.

3-5 ADDRESSING

3-6 Addressing is accomplished in two programming steps. In the first step, a control word, containing the four-bit address of the multiprogrammer unit housing the desired 69430A card, together with any mode selections, is programmed. For input modes, ISL should be programmed on. The unit and mode selections are stored in the multiprogrammer master unit and will remain in effect until programmed off by a later control word.

3-7 In the second programming step, the address of the slot containing the desired input card is programmed. The slot and unit addresses are logically ANDed on the selected card, with the resulting output of the AND-gate enabling a set of 12 readback gates. A delay circuit connected between the address gate output and the read gate inputs sequences the transfer of data on to the multiprogrammer backplane over a period of approximately 2μ seconds. This avoids the possibility of noise spikes being generated if all data bits were placed on the backplane at one time. The enabled readback gates pass the input data bits on to the multiprogrammer backplane, and through the multiprogrammer system to the computer.

3-8 EXTERNAL DATA REQUIREMENTS

3-9 The input data bits to the 69430A are scaled and inverted (as necessary) to make the logic level and sense of the input data compatible with that of the Multiprogrammer System. A simplified diagram of one input data bit channel is given in Figure 3-2.

3-10 SCALING

3-11 Resistor R1 in the data input circuit serves as a current limiter. Its value is selected (according to option) to limit the current at the upper end of a Hl logic level input to a safe level for the photo isolators, while still allowing a minimum

3mA input at the lower end of a Hl input logic level. Table 3-1 summarizes the value of Rl for the various options of the 69430A.

3-12 PHOTO ISOLATOR PROTECTION

3-13 Diode CRl in each data bit input circuit protects the photo isolator by limiting input negative voltages to approximately -0.7V. Therefore, logic inputs with below-ground LO-levels are acceptable to the 69430A.

3-14 LOGIC SENSE

3-15 Digital inputs with either ground-true or positive-true logic sense are accommodated by employing either a non-inverting stage (AND-gate) or an inverting stage (NAND-gate) in each data-bit channel. Table 3-1 lists the type of stage utilized with each option of the 69430A.

3-16 Ground-True Options. For ground-true options, an inverting stage is used. This stage introduces an even number of inversions in each data-bit channel, thus retaining the ground-true identity of the input, which is compatible with the ground-true logic sense of the multiprogrammer system.

3-17 Positive-True Options. Positive-true options use a non-inverting stage, thus providing an odd number of inversions. This converts the positive-true logic sense of the input to the ground-true logic sense required by the multiprogrammer system.

TABLE 3-1. MODEL 69430A OPTIONS

OPTIONS		LO-LOGIC LEVEL (VOLTS)	HI-LOGIC LEVEL (VOLTS)	VALUE OF SCALING RESISTOR Rl
GRD.-TRUE NAND GATE	POS.-TRUE AND GATE			
069	073	0 to 0.4V	2.5 to 6	390Ω
084	087	0 to 0.4V	6 to 12	1.5KΩ
085	088	0 to 0.4V	12 to 25	3.6KΩ
086	089	0 to 0.4V	25 to 50	8.2KΩ

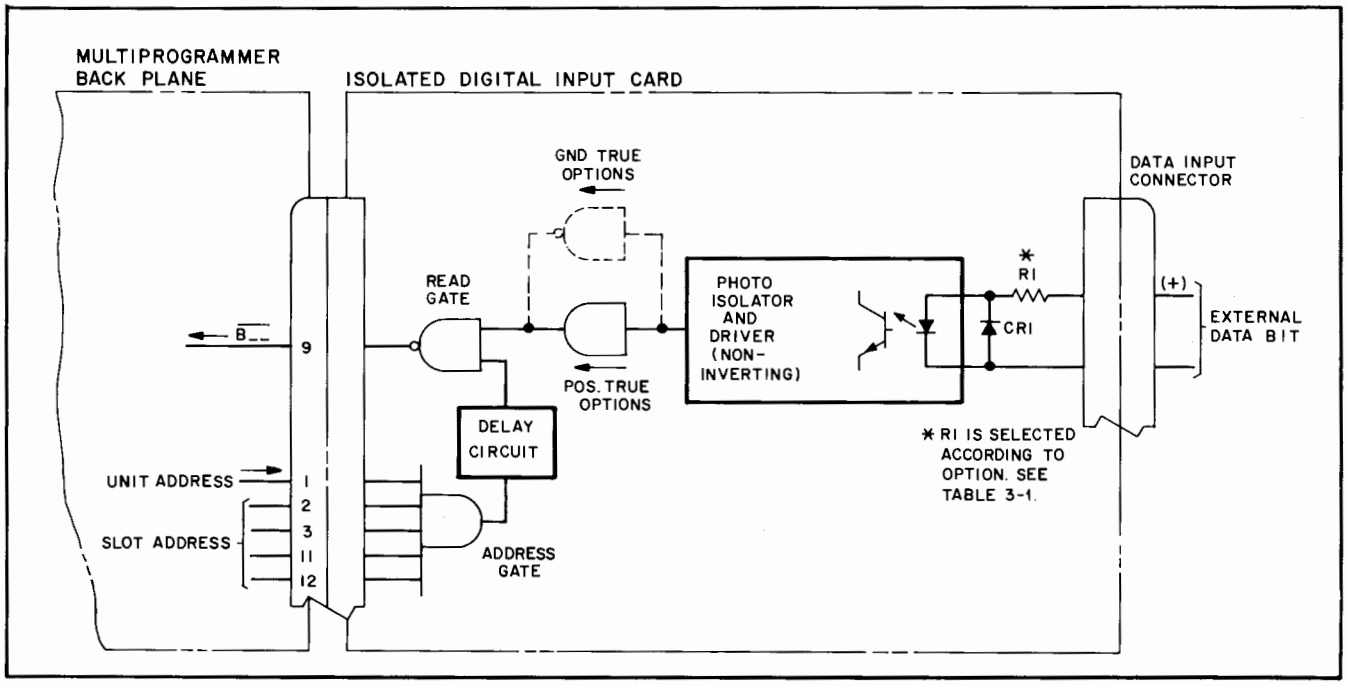

Figure 3-2 Isolated Digital Input Card, Functional Diagram

3-18 CABLE FABRICATION

3-19 Since the Isolated Digital Input Card may be used to interface with various external devices, an interconnecting cable must be prepared for the particular device being used. A 30-pin connector is furnished with each 69430A for this purpose. Figure 3-3 illustrates the signals and associated connector pin numbers of the Isolated Digital Input Card. A 30-conductor cable (28 gauge max. wire) may be used to interconnect the card and the external device. The cable length should be kept as short as possible.

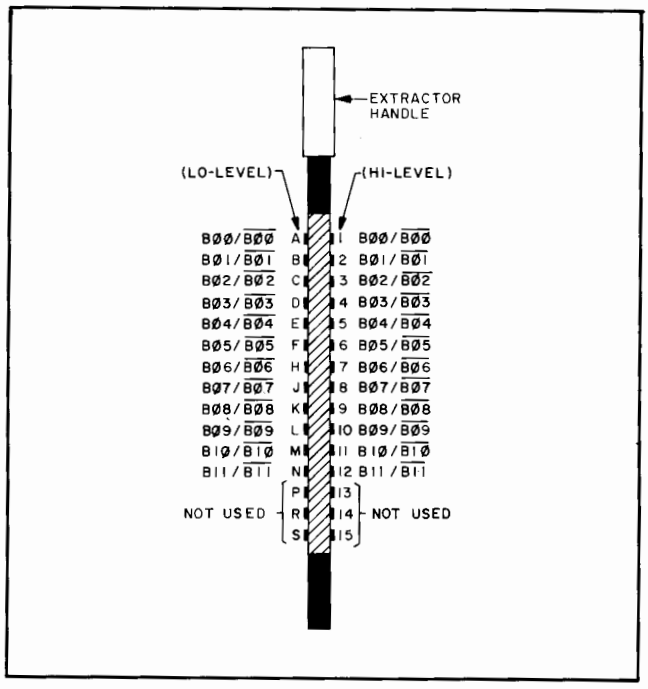

Figure 3-3 69430A External Data Input Connector

SECTION IV
PRINCIPLES OF OPERATION

4-1 INTRODUCTION

4-2 This section contains principles of operation for Isolated Digital Input Card, Model 69430A. Because of the relative simplicity of the circuit functions on this card, only detailed circuit theory is provided.

4-3 DETAILED CIRCUIT ANALYSIS

4-4 The 69430A is comprised of an 8-Input NAND gate (address decoder) and associated delay circuit, and 12 identical input bit processing circuits. Each of the bit processing circuits consists of an input photo isolator and driver circuit, intermediate buffer stage (either inverting or non-inverting, depending on the option), and an output NAND-gate.

4-5 INPUT BIT PROCESSING

4-6 Input data bits from the external device are applied to input connector P2, with the Hl-level side connected to the numbered pins and the LO-level side connected to the lettered pins. When an input bit switches to the Hl-level, the resulting current through limiting resistor Rl energizes the photo diode in isolator package Zl. Diode CRl is connected across the photo diode to provide reverse-bias protection. When the photo diode is energized, the associated photo transistor in the isolator package conducts current. This causes common-base amplifier Ql to also conduct and common-emitter amplifier Q2 to cut off. The Hl-output level of Q2 is now connected to either an AND-gate (for positive-true options) or a NAND-gate (for negative-true options). The output of the selected gate is applied to an output NAND gate, which drives the multiprogrammer backplane. The second input to the NAND gates is from delay circuit Z9-Z10 which is driven by the output of address decoder Z2.

4-7 ADDRESSING

4-8 When the card is properly addressed, NAND gate Z2 is enabled and its output goes LO. This level is applied to the delay circuit which generates six separate enable signals for the read gates. Each of the six enable signals occurs approximately 200n seconds after the previous enable signal, and controls two read gates. The purpose of these delays is to sequence the transfer of input data on to the multiprogrammer backplane over a period of approximately 2·1 seconds. This technique avoids the possibility of noise spikes being generated (and coupled to the address bit lines) which could occur if all input data bits were allowed to switch simultaneously.

4-9 Each segment of the delay circuit consists of a 200 n second R-C circuit situated between an input and an output inverter stage (Z9 and Z10). When the address gate is enabled, the output of each segment switches to a Hl level following the applicable 200n second delays.

SECTION V
MAINTENANCE

5-1 INTRODUCTION

5-2 This section contains preventive maintenance instructions, checkout procedures, and troubleshooting procedures for Isolated Digital Input Card, Model 69430A.

5-3 TEST EQUIPMENT REQUIRED

5-4 The 6940A Multiprogrammer provides most signal inputs necessary for testing the isolated digital input card. It is assumed that the 6940A, as well as all other test instruments, are functioning properly at the outset of testing. The general purpose test instruments required for maintenance of the Model 69430A are listed in Table 5-1.

5-5 PREVENTIVE MAINTENANCE

5-6 The only preventive maintenance necessary is to keep the printed-circuit connector contact fingers clean. A nonabrasive eraser, such as a "Pink Pearl" or a plastic eraser, should be lightly rubbed over the contact fingers to remove any film or foreign material.

5-7 CHECKOUT AND TROUBLESHOOTING PROCEDURES

5-8 These procedures, Table 5-2, can be used to check operation of 69430A cards when they are initially received, and as an aid in isolating trouble if a malfunction is noted during operation. The procedures are performed with the card plugged into an extender card and the extender card plugged into a multiprogrammer unit. It is suggested that the procedures for manually programming the 6940A be reviewed, as necessary, before proceeding.

5-9 If the card fails a test, make certain that it was programmed correctly before starting troubleshooting.

Table 5-1. Test Equipment Required

TYPE	REQUIRED CHARACTERISTICS	USE	RECOMMENDED MODEL
Digital Multi-Function Meter	Voltage Accuracy: ±0.003% of reading. Resistance Accuracy: ±0.01% of reading + 0.01% of range.	Voltage and resistance measurements.	HP Model 3450A with Option 002.
Logic Probe	Impedance: 10 kilohms. Trigger Threshold: +1.4V nominal. Min. Pulse Width: 30 nanoseconds.	Logic circuit troubleshooting	HP 10525A

Table 5-2. Checkout and Troubleshooting Procedures

TEST	PROGRAMMING	INSTRUCTIONS	NORMAL INDICATION	EVALUATION
1 Address And Read	At the 6940A Switch Register, program the following: a. Control word (bits 15-12, on) b. Unit address c. ISL on; all other modes off d. Touch LOAD OUTPUT e. Card slot address	a. While observing switch register lamp 0, connect a logic "1" across data input connector pins 1(+) and A. (For positive-true options, pin 1 should be a +Hl level; for ground-true options pin 1 should be a LO-level) b. Repeat the above procedure for each input bit-pair while observing the related switch register lamp.	a. Switch register lamp 0 lights b. Switch register lamp lights when corresponding input bit is at a logic "1"	ALL BITS FAIL 1. Check programming 2. Check address decoder gate 3. Check delay circuit Z9-Z10 INDIVIDUAL BITS FAIL Check the input and output of each stage related to the failure. Replace any stage having a normal input but an abnormal output.

SECTION VI
REPLACEABLE PARTS

6-1 INTRODUCTION

6-2 This section contains information for ordering replacement parts. Table 6-4 lists parts in alphanumeric order by reference designators and provides the following information:

a. Reference Designators. Refer to Table 6-1.

b. Description. Refer to Table 6-2 for abbreviations.

c. Total Quantity (TQ). Given only the first time the part number is listed except in instruments containing many sub-modular assemblies, in which case the TQ appears the first time the part number is listed in each assembly.

d. Manufacturer's Part Number or Type.

e. Manufacturer's Federal Supply Code Number. Refer to Table 6-3 for manufacturer's name and address.

f. Hewlett-Packard Part Number.

g. Recommended Spare Parts Quantity (RS) for complete maintenance of one instrument during one year of isolated service.

h. Parts not identified by a reference designator are listed at the end of Table 6-4 under Mechanical and/or Miscellaneous. The former consists of parts belonging to and grouped by individual assemblies; the latter consists of all parts not immediately associated with an assembly.

6-3 ORDERING INFORMATION

6-4 To order a replacement part, address order or inquiry to your local Hewlett-Packard sales office (see lists at rear of this manual for addresses). Specify the following information for each part: Model, complete serial number, and any Option or special modification (J) numbers of the instrument; Hewlett-Packard part number; circuit reference designator; and description. To order a part not listed in Table 6-4, give a complete description of the part, its function, and its location.

Table 6-1. Reference Designators

A	= assembly	E	= miscellaneous electronic part
B	= blower (fan)	F	= fuse
C	= capacitor	J	= jack, jumper
CB	= circuit breaker	K	= relay
CR	= diode	L	= inductor
DS	= device, signaling (lamp)	M	= meter

Table 6-1. Reference Designators (Continued)

P	= plug	V	= vacuum tube, neon bulb, photocell, etc.
Q	= transistor		
R	= resistor		
S	= switch	VR	= zener diode
T	= transformer	X	= socket
TB	= terminal block	Z	= integrated circuit or network
TS	= thermal switch		

Table 6-2. Description Abbreviations

A	= ampere	mfr	= manufacturer
ac	= alternating current	mod.	= modular or modified
assy.	= assembly	mtg	= mounting
bd	= board	n	= nano = 10^{-9}
bkt	= bracket	NC	= normally closed
°C	= degree Centigrade	NO	= normally open
		NP	= nickel-plated
cd	= card	Ω	= ohm
coef	= coefficient	obd	= order by description
comp	= composition		
CRT	= cathode-ray tube	OD	= outside diameter
CT	= center-tapped	p	= pico = 10^{-12}
dc	= direct current	P.C.	= printed circuit
DPDT	= double pole, double throw	pot.	= potentiometer
		p-p	= peak-to-peak
DPST	= double pole, single throw	ppm	= parts per million
elect	= electrolytic	pvr	= peak reverse voltage
encap	= encapsulated		
F	= farad	rect	= rectifier
°F	= degree Farenheit	rms	= root mean square
fxd	= fixed	Si	= silicon
Ge	= germanium	SPDT	= single pole, double throw
H	= Henry		
Hz	= Hertz	SPST	= single pole, single throw
IC	= integrated circuit	SS	= small signal
ID	= inside diameter	T	= slow-blow
incnd	= incandescent	tan.	= tantulum
k	= kilo = 10^{3}	Ti	= titanium
m	= milli = 10^{-3}	V	= volt
M	= mega = 10^{6}	var	= variable
μ	= micro = 10^{-6}	ww	= wirewound
met.	= metal	W	= Watt

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Table 6-3. Code List of Manufacturers

CODE NO.	MANUFACTURER	ADDRESS
00629	EBY Sales Co., Inc.	Jamaica, N.Y.
00656	Aerovox Corp.	New Bedford, Mass.
00853	Sangamo Electric Co. S. Carolina Div.	Pickens, S.C.
01121	Allen Bradley Co.	Milwaukee, Wis.
01255	Litton Industries, Inc.	Beverly Hills, Calif.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.
01295	Texas Instruments, Inc. Semiconductor-Components Div.	Dallas, Texas
01686	RCL Electronics, Inc.	Manchester, N.H.
01930	Amerock Corp.	Rockford, Ill.
02107	Sparta Mfg. Co.	Dover, Ohio
02114	Ferroxcube Corp.	Saugerties, N.Y.
02606	Fenwal Laboratories	Morton Grove, Ill.
02660	Amphenol Corp.	Broadview, Ill.
02735	Radio Corp. of America, Solid State and Receiving Tube Div.	Somerville, N.J.
03508	G.E. Semiconductor Products Dept.	Syracuse, N.Y.
03797	Eldema Corp.	Compton, Calif.
03877	Transitron Electronic Corp.	Wakefield, Mass.
03888	Pyrofilm Resistor Co. Inc.	Cedar Knolls, N.J.
04009	Arrow, Hart and Hegeman Electric Co.	Hartford, Conn.
04072	ADC Electronics, Inc.	Harbor City, Calif.
04213	Caddell & Burns Mfg. Co. Inc.	Mineola, N.Y.
04404	*Hewlett-Packard Co. Palo Alto Div.	Palo Alto, Calif.
04713	Motorola Semiconductor Prod. Inc.	Phoenix, Arizona
05277	Westinghouse Electric Corp. Semiconductor Dept.	Youngwood, Pa.
05347	Ultronix, Inc.	Grand Junction, Colo.
05820	Wakefield Engr. Inc.	Wakefield, Mass.
06001	General Elect. Co. Electronic Capacitor & Battery Dept.	Irmo, S.C.
06004	Bassik Div. Stewart-Warner Corp.	Bridgeport, Conn.
06486	IRC Div. of TRW Inc. Semiconductor Plant	Lynn, Mass.
06540	Amatom Electronic Hardware Co. Inc.	New Rochelle, N.Y.
06555	Beede Electrical Instrument Co.	Penacook, N.H.
06666	General Devices Co. Inc.	Indianapolis, Ind.
06751	Semcor Div. Components, Inc.	Phoenix, Arizona
06776	Robinson Nugent, Inc.	New Albany, Ind.
06812	Torrington Mfg. Co., West Div.	Van Nuys, Calif.
07137	Transistor Electronics Corp.	Minneapolis, Minn.
07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N.Y.
07263	Fairchild Camera and Instrument Corp. Semiconductor Div.	Mountain View, Calif.
07387	Birtcher Corp., The	Los Angeles, Calif.
07397	Sylvania Electric Prod. Inc. Sylvania Electronic Systems Western Div.	Mountain View, Calif.
07716	IRC Div. of TRW Inc. Burlington Plant	Burlington, Iowa
07910	Continental Device Corp.	Hawthorne, Calif.
07933	Raytheon Co. Components Div. Semiconductor Operation	Mountain View, Calif.
08484	Breeze Corporations, Inc.	Union, N.J.
08530	Reliance Mica Corp.	Brooklyn, N.Y.
08717	Sloan Company, The	Sun Valley, Calif.
08730	Vemaline Products Co. Inc.	Wyckoff, N.J.
08806	General Elect. Co. Miniature Lamp Dept.	Cleveland, Ohio
08863	Nylomatic Corp.	Norrisville, Pa.
08919	RCH Supply Co.	Vernon, Calif.
09021	Airco Speer Electronic Components	Bradford, Pa.
09182	*Hewlett-Packard Co. New Jersey Div.	Rockaway, N.J.
09213	General Elect. Co. Semiconductor Prod. Dept.	Buffalo, N.Y.
09214	General Elect. Co. Semiconductor Prod. Dept.	Auburn, N.Y.
09353	C & K Components Inc.	Newton, Mass.
09922	Burndy Corp.	Norwalk, Conn.
11115	Wagner Electric Corp. Tung-Sol Div.	Bloomfield, N.J.
11236	CTS of Berne, Inc.	Berne, Ind.
11237	Chicago Telephone of Cal. Inc.	So. Pasadena, Calif.
11502	IRC Div. of TRW Inc. Boone Plant	Boone, N.C.
11711	General Instrument Corp Rectifier Div.	Newark, N.J.
12136	Philadelphia Handle Co. Inc.	Camden, N.J.
12615	U.S. Terminals, Inc.	Cincinnati, Ohio
12617	Hamlin Inc.	Lake Mills, Wisconsin
12697	Clarostat Mfg. Co. Inc.	Dover, N.H.
13103	Thermalloy Co.	Dallas, Texas
14493	*Hewlett-Packard Co. Loveland Div.	Loveland, Colo.
14655	Cornell-Dubilier Electronics Div. Federal Pacific Electric Co.	Newark, N.J.
14936	General Instrument Corp. Semiconductor Prod. Group	Hicksville, N.Y.
15801	Fenwal Elect.	Framingham, Mass.
16299	Corning Glass Works, Electronic Components Div.	Raleigh, N.C.

*Use Code 28480 assigned to Hewlett-Packard Co., Palo Alto, California

Table 6-3. Code List of Manufacturers (Continued)

CODE NO.	MANUFACTURER	ADDRESS
16758	Delco Radio Div. of General Motors Corp.	Kokomo, Ind.
17545	Atlantic Semiconductors, Inc.	Asbury Park, N.J.
17803	Fairchild Camera and Instrument Corp Semiconductor Div. Transducer Plant	Mountain View, Calif.
17870	Daven Div. Thomas A. Edison Industries McGraw-Edison Co.	Orange, N.J.
18324	Signetics Corp.	Sunnyvale, Calif.
19315	Bendix Corp. The Navigation and Control Div.	Teterboro, N.J.
19701	Electra/Midland Corp.	Mineral Wells, Texas
21520	Fansteel Metallurgical Corp.	No. Chicago, Ill.
22229	Union Carbide Corp. Electronics Div.	Mountain View, Calif.
22753	UID Electronics Corp.	Hollywood, Fla.
23936	Pamotor, Inc.	Pampa, Texas
24446	General Electric Co.	Schenectady, N.Y.
24455	General Electric Co. Lamp Div. of Consumer Prod. Group	Nela Park, Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
24681	LTV Electrosystems Inc Memcor/Components Operations	Huntington, Ind.
26982	Dynacool Mfg. Co. Inc.	Saugerties, N.Y.
27014	National Semiconductor Corp.	Santa Clara, Calif.
28480	Hewlett-Packard Co.	Palo Alto, Calif.
28520	Heyman Mfg. Co.	Kenilworth, N.J.
28875	IMC Magnetics Corp. New Hampshire Div.	Rochester, N.H.
31514	SAE Advance Packaging, Inc.	Santa Ana, Calif.
31827	Budwig Mfg. Co.	Ramona, Calif.
33173	G.E. Co. Tube Dept.	Owensboro, Ky.
35434	Lectrohm, Inc.	Chicago, Ill.
37942	P.R. Mallory & Co. Inc.	Indianapolis, Ind.
42190	Muter Co.	Chicago, Ill.
43334	New Departure-Hyatt Bearings Div. General Motors Corp.	Sandusky, Ohio
44655	Ohmite Manufacturing Co.	Skokie, Ill.
46384	Penn Engr. and Mfg. Corp.	Doylestown, Pa.
47904	Polaroid Corp.	Cambridge, Mass.
49956	Raytheon Co.	Lexington, Mass.
55026	Simpson Electric Co. Div. of American Gage and Machine Co.	Chicago, Ill.
56289	Sprague Electric Co.	North Adams, Mass.
58474	Superior Electric Co.	Bristol, Conn.
58849	Syntron Div. of FMC Corp.	Homer City, Pa.
59730	Thomas and Betts Co.	Philadelphia, Pa.
61637	Union Carbide Corp.	New York, N.Y.
63743	Ward Leonard Electric Co.	Mt. Vernon, N.Y.

CODE NO.	MANUFACTURER	ADDRESS
70563	Amperite Co. Inc.	Union City, N.J.
70901	Beemer Engrg. Co.	Fort Washington, Pa.
70903	Belden Corp.	Chicago, Ill.
71218	Bud Radio, Inc.	Willoughby, Ohio
71279	Cambridge Thermionic Corp.	Cambridge, Mass.
71400	Bussmann Mfg. Div. of McGraw & Edison Co.	St. Louis, Mo.
71450	CTS Corp.	Elkhart, Ind.
71468	I.T.T. Cannon Electric Inc.	Los Angeles, Calif.
71590	Globe-Union Inc. Centralab Div.	Milwaukee, Wis.
71700	General Cable Corp. Cornish Wire Co. Div.	Williamstown, Mass.
71707	Coto Coil Co. Inc.	Providence, R.I.
71744	Chicago Miniature Lamp Works	Chicago, Ill.
71785	Cinch Mfg. Co. and Howard B. Jones Div.	Chicago, Ill.
71984	Dow Corning Corp.	Midland, Mich.
72136	Electro Motive Mfg. Co. Inc.	Willimantic, Conn.
72619	Dialight Corp.	Brooklyn, N.Y.
72699	General Instrument Corp.	Newark, N.J.
72765	Drake Mfg. Co.	Harwood Heights, Ill.
72962	Elastic Stop Nut Div. of Amerace Esna Corp.	Union, N.J.
72982	Erie Technological Products Inc.	Erie, Pa.
73096	Hart Mfg. Co.	Hartford, Conn.
73138	Beckman Instruments Inc. Helipot Div.	Fullerton, Calif.
73168	Fenwal, Inc.	Ashland, Mass.
73293	Hughes Aircraft Co. Electron Dynamics Div.	Torrance, Calif.
73445	Amperex Electronic Corp.	Hicksville, N.Y.
73506	Bradley Semiconductor Corp.	New Haven, Conn.
73559	Carling Electric, Inc.	Hartford, Conn.
73734	Federal Screw Products, Inc.	Chicago, Ill.
74193	Heinemann Electric Co.	Trenton, N.J.
74545	Hubbell Harvey Inc.	Bridgeport, Conn.
74868	Amphenol Corp. Amphenol RF Div.	Danbury, Conn.
74970	E.F. Johnson Co.	Waseca, Minn.
75042	IRC Div. of TRW, Inc.	Philadelphia, Pa.
75183	*Howard B. Jones Div. of Cinch Mfg. Corp.	New York, N.Y.
75376	Kurz and Kasch, Inc.	Dayton, Ohio
75382	Kilka Electric Corp.	Mt. Vernon, N.Y.
75915	Littlefuse, Inc.	Des Plaines, Ill.
76381	Minnesota Mining and Mfg. Co.	St. Paul, Minn.
76385	Minor Rubber Co. Inc.	Bloomfield, N.J.
76487	James Millen Mfg. Co. Inc.	Malden, Mass.
76493	J.W. Miiier Co.	Compton, Calif.

*Use Code 71785 assigned to Cinch Mfg. Co., Chicago, Ill.

Table 6-3. Code List of Manufacturers (Continued)

CODE NO.	MANUFACTURER	ADDRESS
76530	Cinch	City of Industry, Calif.
76854	Oak Mfg. Co. Div. of Oak Electro/Netics Corp.	Crystal Lake, Ill.
77068	Bendix Corp., Electrodynamics Div.	No. Hollywood, Calif.
77122	Palnut Co.	Mountainside, N.J.
77147	Patton-MacGuyer Co.	Providence, R.I.
77221	Phaostron Instrument and Electronic Co.	South Pasadena, Calif.
77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
77342	American Machine and Foundry Co. Potter and Brumfield Div.	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J.
77764	Resistance Products Co.	Harrisburg, Pa.
78189	Illinois Tool Works Inc. Shakeproof Div.	Elgin, Ill.
78452	Everlock Chicago, Inc.	Chicago, Ill.
78488	Stackpole Carbon Co.	St. Marys, Pa.
78526	Stanwyck Winding Div. San Fernando Electric Mfg. Co. Inc.	Newburgh, N.Y.
78553	Tinnerman Products, Inc.	Cleveland, Ohio
78584	Stewart Stamping Corp.	Yonkers, N.Y.
79136	Waldes Kohinoor, Inc.	L.I.C., N.Y.
79307	Whitehead Metals Inc.	New York, N.Y.
79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
79963	Zierick Mfg. Co.	Mt. Kisco, N.Y.
80031	Mepco Div. of Sessions Clock Co.	Morristown, N.J.
80294	Bourns, Inc.	Riverside, Calif.
81042	Howard Industries Div. of Msl Ind. Inc.	Racine, Wisc.
81073	Grayhill, Inc.	La Grange, Ill.
81483	International Rectifier Corp.	El Segundo, Calif.
81751	Columbus Electronics Corp.	Yonkers, N.Y.
82099	Goodyear Sundries & Mechanical Co. Inc.	New York, N.Y.
82142	Airco Speer Electronic Components	Du Bois, Pa.
82219	Sylvania Electric Products Inc. Electronic Tube Div. Receiving Tube Operations	Emporium, Pa.
82389	Switchcraft, Inc.	Chicago, Ill.
82647	Metals and Controls Inc. Control Products Group	Attleboro, Mass.
82866	Research Products Corp.	Madison, Wis.
82877	Rotron Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Calif.
83058	Carr Fastener Co.	Cambridge, Mass.
83186	Victory Engineering Corp.	Springfield, N.J.
83298	Bendix Corp. Electric Power Div.	Eatontown, N.J.
83330	Herman H. Smith, Inc.	Brooklyn, N.Y.
83385	Central Screw Co.	Chicago, Ill.
83501	Gavitt Wire and Cable Div. of Amerace Esna Corp.	Brookfield, Mass.
83508	Grant Pulley and Hardware Co.	West Nyack, N.Y.
83594	Burroughs Corp. Electronic Components Div.	Plainfield, N.J.
83835	U.S. Radium Corp.	Morristown, N.J.
83877	Yardeny Laboratories, Inc.	New York, N.Y.
84171	Arco Electronics, Inc.	Great Neck, N.Y.
84411	TRW Capacitor Div.	Ogallala, Neb.
86684	RCA Corp. Electronic Components	Harrison, N.J.
86838	Rummel Fibre Co.	Newark, N.J.
87034	Marco & Oak Industries a Div. of Oak Electro/netics Corp.	Anaheim, Calif.
87216	Philco Corp. Lansdale Div.	Lansdale, Pa.
87585	Stockwell Rubber Co. Inc.	Philadelphia, Pa.
87929	Tower-Olschan Corp.	Bridgeport, Conn.
88140	Cutler-Hammer Inc. Power Distribution and Control Div. Lincoln Plant	Lincoln, Ill.
88245	Litton Precision Products Inc, USECO Div. Litton Industries	Van Nuys, Calif.
90634	Gulton Industries Inc.	Metuchen, N.J.
90763	United-Car Inc.	Chicago, Ill.
91345	Miller Dial and Nameplate Co.	El Monte, Calif.
91418	Radio Materials Co.	Chicago, Ill.
91506	Augat, Inc.	Attleboro, Mass.
91637	Dale Electronics, Inc.	Columbus, Neb.
91662	Elco Corp.	Willow Grove, Pa.
91929	Honeywell Inc. Div. Micro Switch	Freeport, Ill.
92825	Whitso, Inc.	Schiller Pk., Ill.
93332	Sylvania Electric Prod. Inc. Semiconductor Prod. Div.	Woburn, Mass.
93410	Essex Wire Corp. Stemco Controls Div.	Mansfield, Ohio
94144	Raytheon Co. Components Div. Ind. Components Oper.	Quincy, Mass.
94154	Wagner Electric Corp. Tung-Sol Div.	Livingston, N.J.
94222	Southco Inc.	Lester, Pa.
95263	Leecraft Mfg. Co. Inc.	L.I.C., N.Y.
95354	Methode Mfg. Co.	Rolling Meadows, Ill.
95712	Bendix Corp. Microwave Devices Div.	Franklin, Ind.
95987	Weckesser Co. Inc.	Chicago, Ill.
96791	Amphenol Corp. Amphenol Controls Div.	Janesville, Wis.
97464	Industrial Retaining Ring Co.	Irvington, N.J.
97702	IMC Magnetics Corp. Eastern Div.	Westbury, N.Y.
98291	Sealectro Corp.	Mamaroneck, N.Y.
98410	ETC Inc.	Cleveland, Ohio
98978	International Electronic Research Corp.	Burbank, Calif.
99934	Renbrandt, Inc.	Boston, Mass.

Table 6-4 Replaceable Parts

REF. DESIG.	DESCRIPTION	TQ	MFR. PART NO.	MFR. CODE	HP PART NO.	RS
69430A-A4	Isolated Digital Input Card					
	STANDARD COMPONENTS (All Options)					
A4A1	Photo Isolater and Drivers					
CR1	Diode, Si. 250mW 200V	1		28480	1901-0033	
Q1,2	SS NPN Si.	2		28480	1854-0071	
R1	(See OPTION listings)					
R2	Fxd, comp 75Ω±5%1/4w	1	CB-7535	01121	0683-7535	
R3	Fxd, comp 10KΩ±5%1/4w	1	CB-1035	01121	0683-1035	
Z1	Photo-Isolator, IC	1		28480	1990-0407	
A4A2-A4A12	Same as A4A1					
A4C1-C3	Fxd, elect. 1.0μF 35Vdc	3	150 Dio 5x90 35A2	56289	0180-0291	
C4-C9	Fxd, mylar .001μF 200Vdc	6	292P10292-PTS	56289	0160-0153	
R4-R9	Fxd, comp 200Ω±5%1/4w	6	CB-1035	01121	0683-2015	
Z2	8-Input NAND gate, IC	1		28480	1820-0070	
Z3-5	(See OPTION listings)					
Z6-8	Open Collector Quad. 2-Input NAND gate, IC	3		28480	1820-0621	
Z9,10	Hex Inverter (Low Pwr.), IC	2		28480	1820-0586	
	MECHANICAL (All Options)					
	IC Socket, Z2-Z10	9	314-AG5 D-3R	91506	1200-0768	2
	Extractor Handle	1		28480	5081-4947	
	Connector Assembly, Data Input	1		28480	5060-9658	
	Connector, 30-Pin	1	251-15-30-261	71785	1251-0159	
	Hood. Left	1		28480	4040-0232	
	Hood Assembly, Right	1		28480	5060-7081	
	Clamp, Cable	1		28480	1400-0714	
	Box, Corrugated	1		28480	0211-0418	
	OPTION 073 ONLY					
69430A	Isolated Digital Input Card (Positive-true sense; 2.5 to 6V level)					
A4A1 R1	Fxd, comp 390Ω±5%1/2w	1	EB-3915	01121	0686-3915	
Z3-Z5	Quad. 2-Input AND gate, IC	3		28480	1820-0511	
	OPTION 087 ONLY					
69430A-A4	Isolated Digital Input Card (Positive-true sense; 6 to 12V level)					

Table 6-4 Replaceable Parts

REF. DESIG.	DESCRIPTION	TQ	MFR. PART NO.	MFR. CODE	HP PART NO.	RS
A4A1 R1 Z3-Z5	Fxd, comp 1.5KΩ±5%1/2w Quad 2-Input AND gate, IC	1 3	EB-1525	01121 28480	0686-1525 1820-0511	
69430A-A4	OPTION 088 ONLY Isolated Digital Input Card (Positive-true sense; 12 to 25V level)					
A4A1 R1 Z3-Z5	Fxd, comp 3.6KΩ±5%1/2w Quad. 2-Input AND gate, IC	1 3	EB-3625	01121 28480	0686-3625 1820-0511	
69430A-A4	OPTION 089 ONLY Isolated Digital Input Card (Positive-true sense; 25 to 50V level)					
A4A1 R1 Z3-Z5	Fxd, comp 8.2KΩ±5%1/2w Quad. 2-Input AND gate, IC	1 3	EB-8225	01121 28480	0686-8225 1820-0511	
69430A-A4	OPTION 069 ONLY Isolated Digital Input Card (Ground-true sense; 2.5 to 6V level)					
A4A1 R1 Z3-Z5	Fxd, comp 390Ω±5%1/2w Quad. 2-Input NAND gate, IC	1 3	EB-3915	01121 28480	0686-3915 1820-0054	
69430A-A4	OPTION 084 ONLY Isolated Digital Input Card (Ground-true sense; 6 to 12V level)					
A4A1 R1 Z3-Z5	Fxd, comp 1.5KΩ±5%1/2w Quad. 2-Input NAND gate, IC	1 3	EB-1525	01121 28480	0686-1525 1820-0054	
69430A-A4	OPTION 085 ONLY Isolated Digital Input Card (Ground-true sense; 12 to 25V level)					
A4A1 R1 Z3-Z5	Fxd, comp 3.6KΩ±5%1/2w Quad. 2-Input NAND gate, IC	1 3	EB-3625	01121 28480	0686-3625 1820-0054	
69430A-A4	OPTION 086 ONLY Isolated Digital Input Card (Ground-true sense; 25 to 50V level)					
A4A1 R1 Z3-Z5	Fxd, comp 8.2KΩ±5%1/2w Quad. 2-Input NAND gate, IC	1 3	EB-8225	01121 28480	0686-8225 1820-0054	

Computer Museum

SECTION VII
CIRCUIT DIAGRAMS

7-1 COMPONENT LOCATION ILLUSTRATION

7-2 The component location illustration for the Model 69430A is given in Figure 7-1. The illustration shows the physical location and reference designations for parts mounted on the printed circuit card.

7-3 SCHEMATIC DIAGRAM

7-4 The schematic diagram of the Model 69430A is also presented on Figure 7-1. The reference designations shown on the schematic diagram coincide with those on the component location illustration.

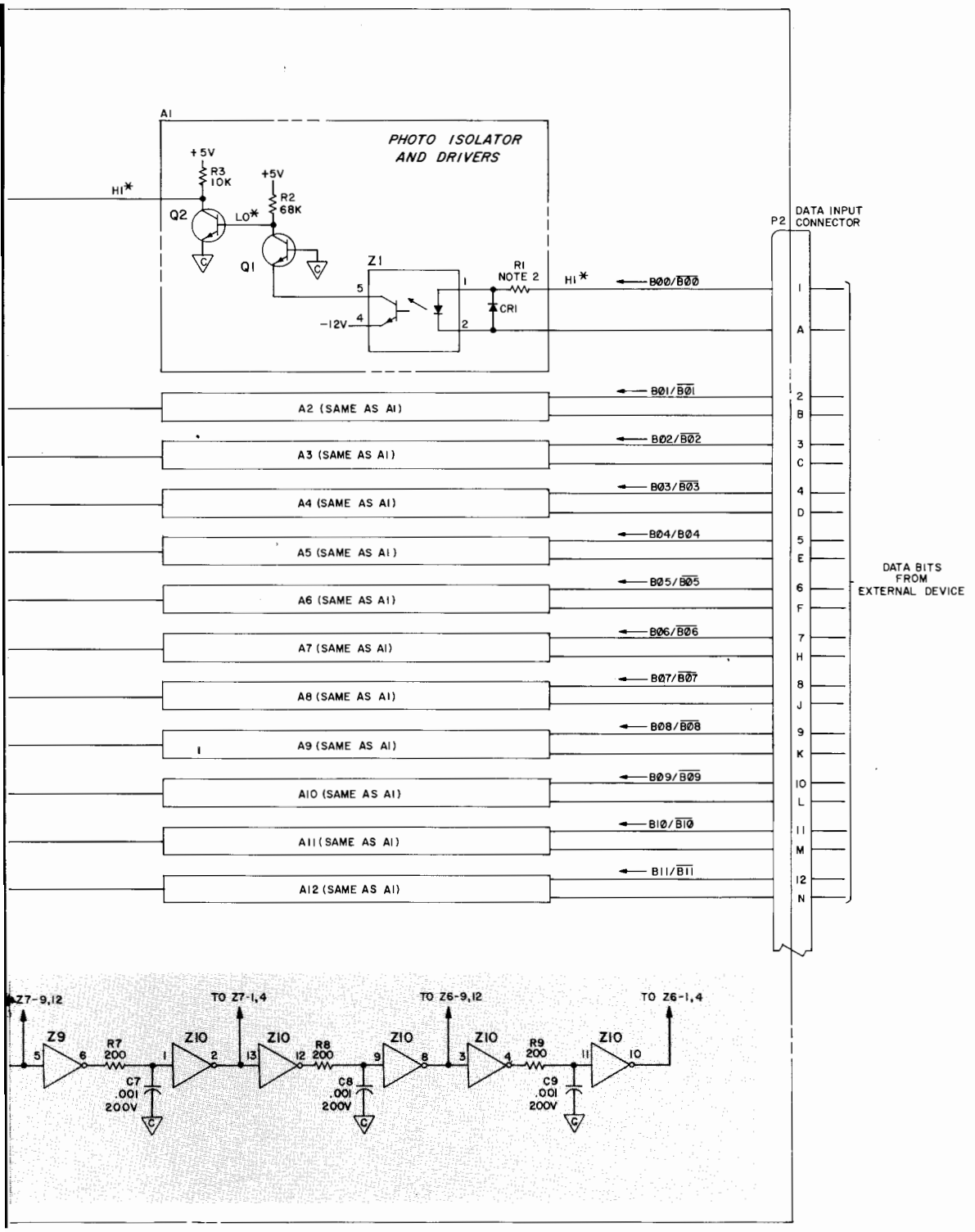
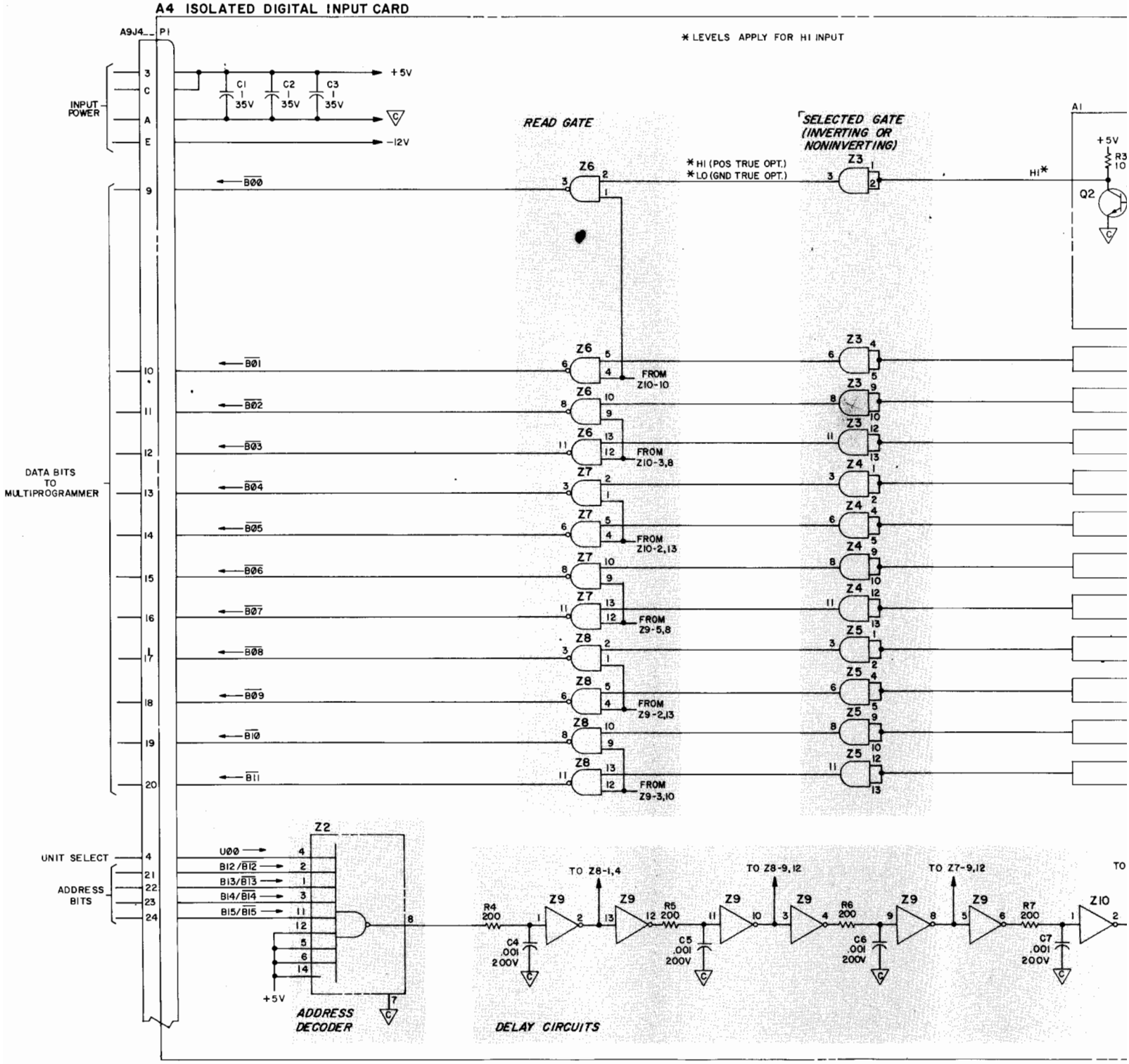
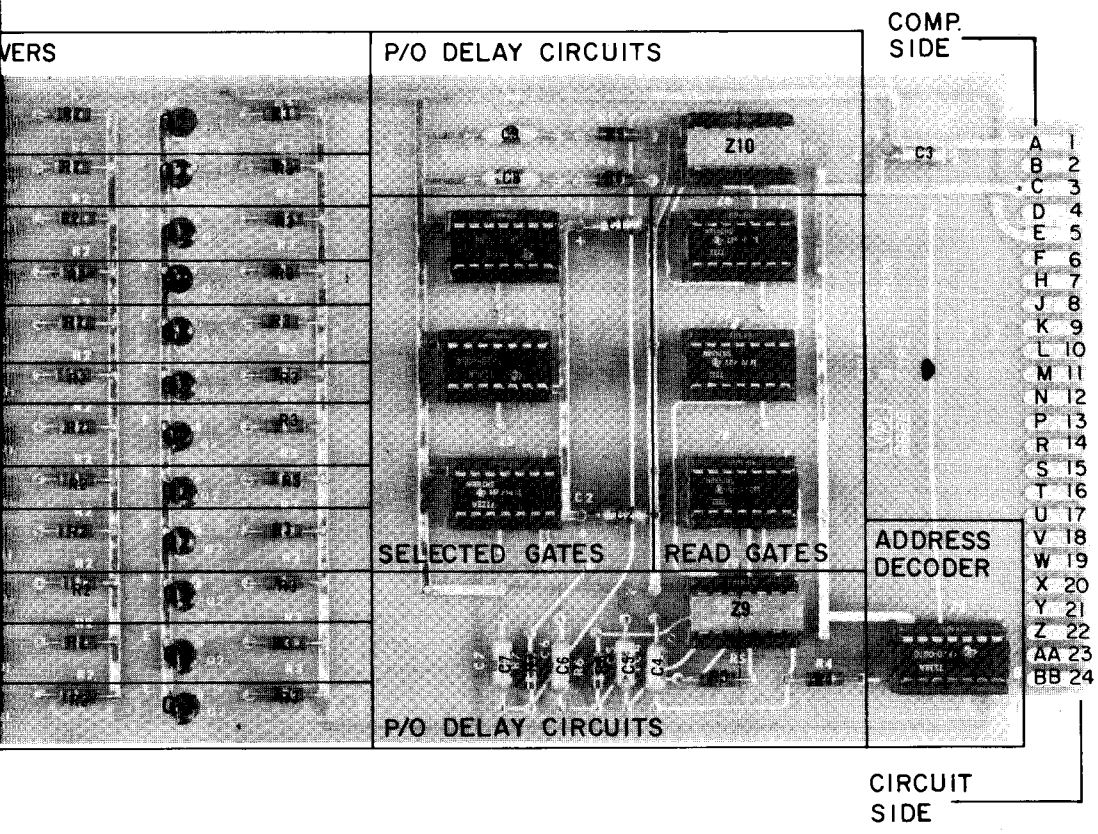


Figure 7-1. Isolated Digital Input Card, Schematic Diagram


A4 ISOLATED DIGITAL INPUT CARD
A9J4__ P1
* LEVELS APPLY FOR HI INPUT
INPUT POWER
+5V
-12V
C1 35V
C2 35V
C3 35V
READ GATE
SELECTED GATE (INVERTING OR NONINVERTING)
* HI (POS TRUE OPT.)
* LO (GND TRUE OPT.)
HI*
A1
+5V
R3 10
Q2
B00
B01
B02
B03
B04
B05
B06
B07
B08
B09
B10
B11
FROM Z10-10
FROM Z10-3,8
FROM Z10-2,13
FROM Z9-5,8
FROM Z9-2,13
FROM Z9-3,10
DATA BITS TO MULTIPROGRAMMER
UNIT SELECT
ADDRESS BITS
U00
B12/B12
B13/B13
B14/B14
B15/B15
+5V
ADDRESS DECODER
DELAY CIRCUITS
TO Z8-1,4
TO Z8-9,12
TO Z7-9,12
TO
R4 200
R5 200
R6 200
R7 200
C4 .001 200V
C5 .001 200V
C6 .001 200V
C7 .001 200V



Isolated Digital Input Card
Component Locations

DATA BIT
TO
MULTIPROGRA

EITHER AND GATES (AS SHOWN) OR NAND GATES,
OPTION IN USE.
,084,085 AND 086 ACCOMODATE "GROUND-TRUE"
LEVELS AND EMPLOY NAND-GATES.
087, 088, AND 089 ACCOMODATE "POSITIVE-TRUE"
LEVELS AND EMPLOY AND GATES.

UGH AI2RI MAY BE ANY OF FOUR VALUES, DEPENDING
SE:

VALUE OF RI
390, 1/2W
1.5K, 1/2W
3.6K, 1/2W
8.2K, 1/2W

UNIT :

1/4W, ±5%.

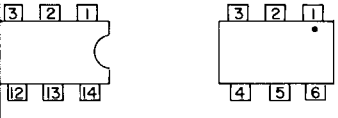
AD

IN MICROFARADS.

TRANSISTORS ARE SHOWN BELOW:

PL-5
(TOP VIEW)

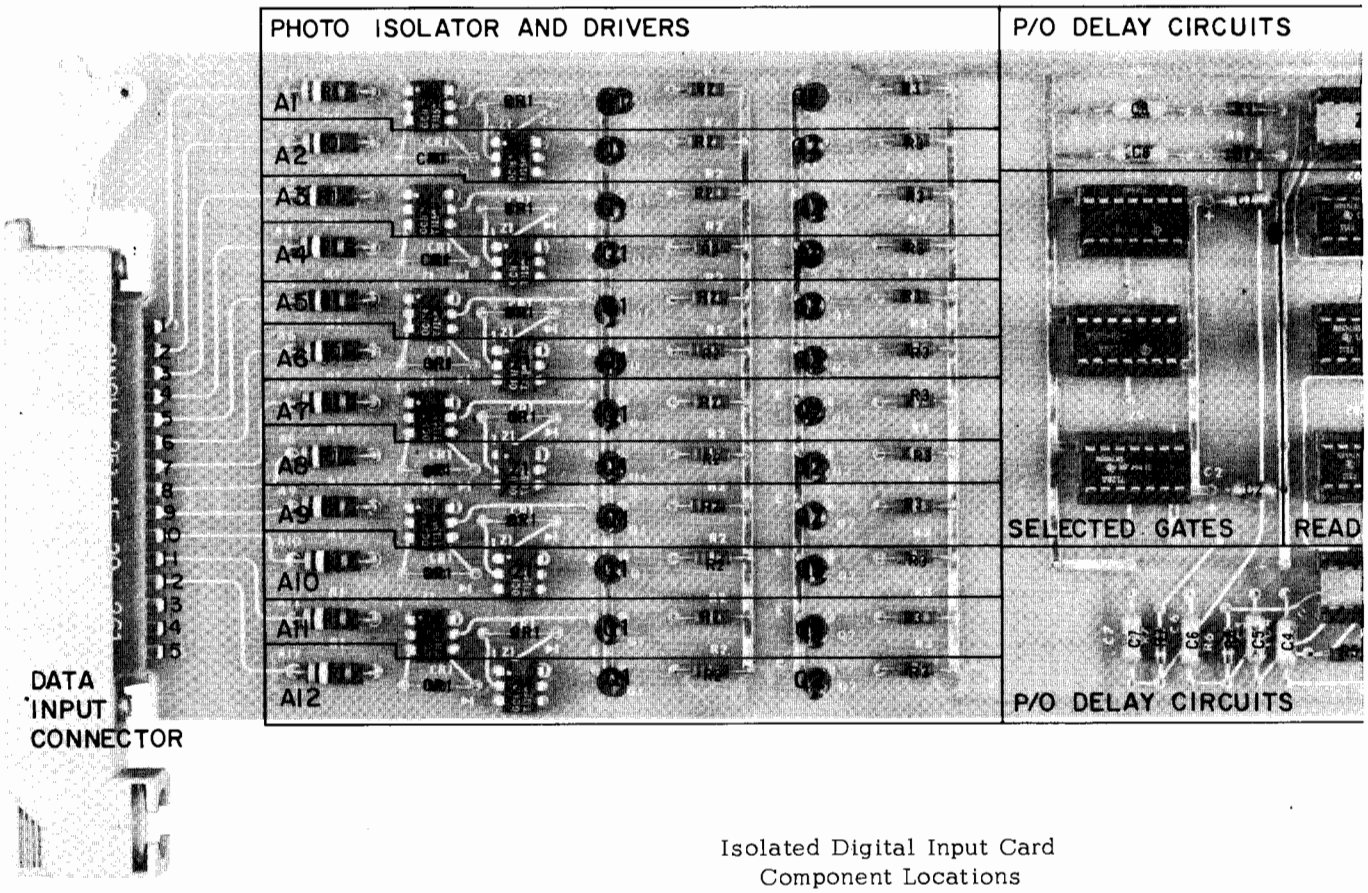
INTEGRATED CIRCUITS USED ON THIS CARD ARE SHOWN



U Z10

Z1

(TOP VIEWS)



Isolated Digital Input Card
Component Locations

NOTES:

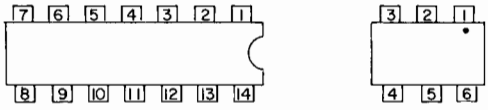
1. Z3 THROUGH Z5 ARE EITHER AND GATES (AS SHOWN) OR NAND GATES, DEPENDING ON THE OPTION IN USE.
   A. OPTIONS 069, 084, 085 AND 086 ACCOMODATE "GROUND-TRUE" INPUT LOGIC LEVELS AND EMPLOY NAND-GATES.
   B. OPTIONS 073, 087, 088, AND 089 ACCOMODATE "POSITIVE-TRUE" INPUT LOGIC LEVELS AND EMPLOY AND GATES.
2. RESISTORS A1R1 THROUGH A12R1 MAY BE ANY OF FOUR VALUES, DEPENDING ON THE OPTION IN USE:

OPTION	VALUE OF R1
069/073	390, 1/2W
084/087	1.5K, 1/2W
085/088	3.6K, 1/2W
086/089	8.2K, 1/2W

3. ALL RESISTORS ARE 1/4W, ±5%.
4. ALL CAPACITORS ARE IN MICROFARADS.
5. PIN LOCATIONS FOR TRANSISTORS ARE SHOWN BELOW:

PL-5
(TOP VIEW)

6. PIN LOCATIONS FOR INTEGRATED CIRCUITS USED ON THIS CARD ARE SHOWN BELOW:



Z2 THRU Z10 Z1

(TOP VIEWS)