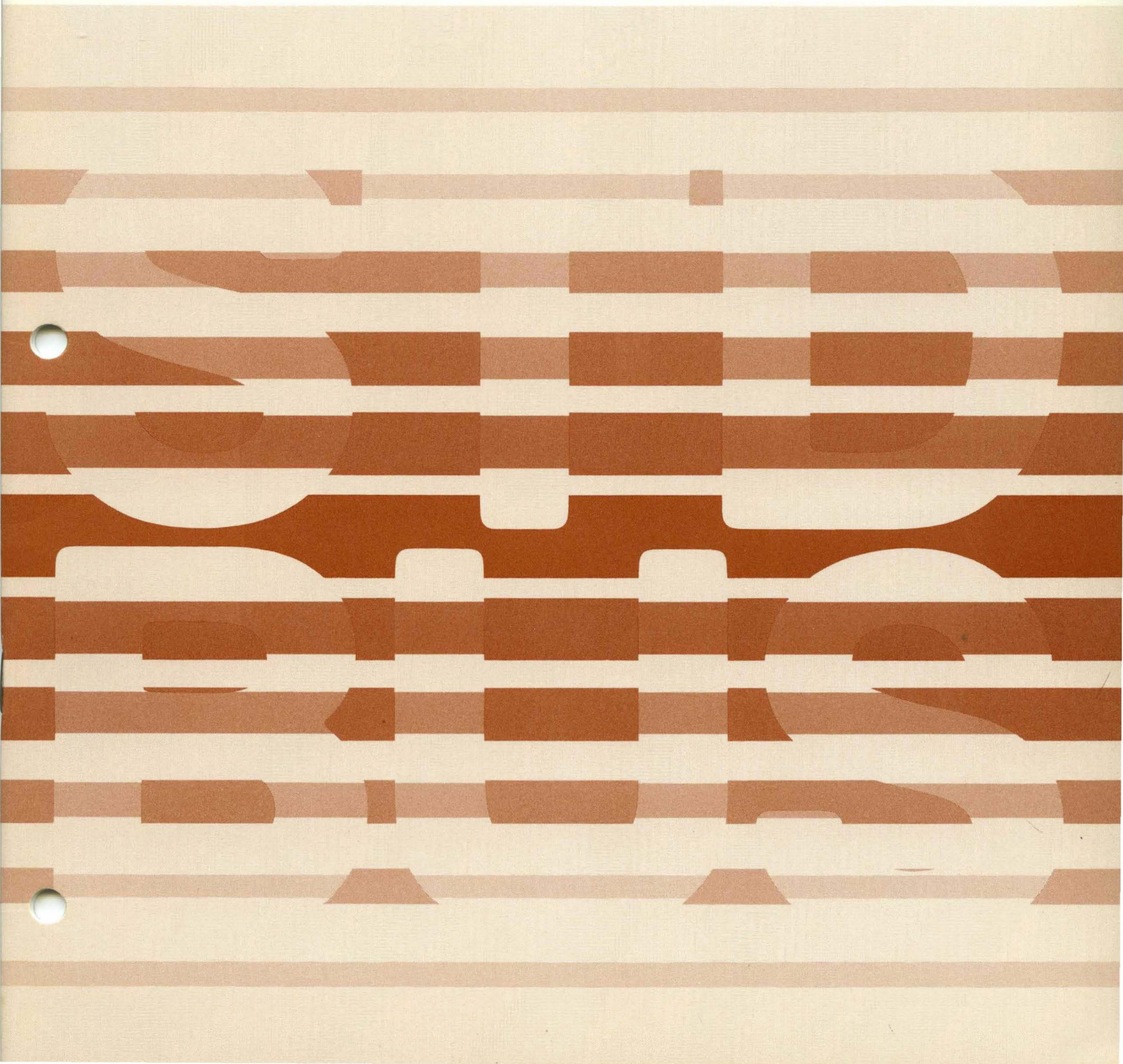
PRO-LOG
CORPORATION

STD 7000

7502
SPST Relay Output Card

USER'S MANUAL



7502
SPST Relay Output Card
USER'S MANUAL

PRELIMINARY

PRO-LOG CORPORATION

9/81

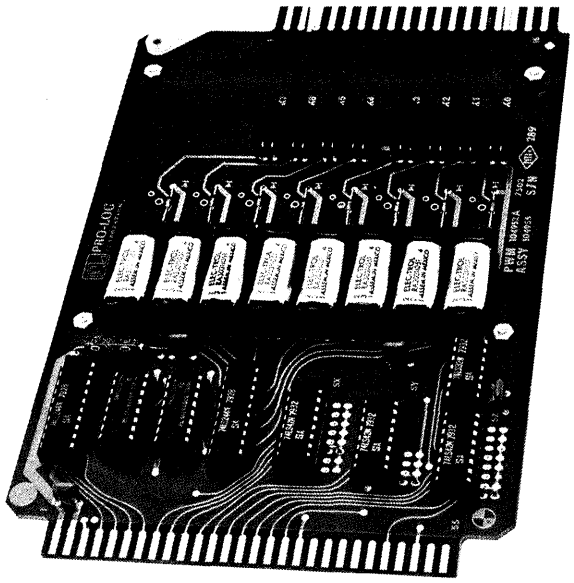
TABLE OF CONTENTS

7000 STD BUS

PRELIMINARY 7502

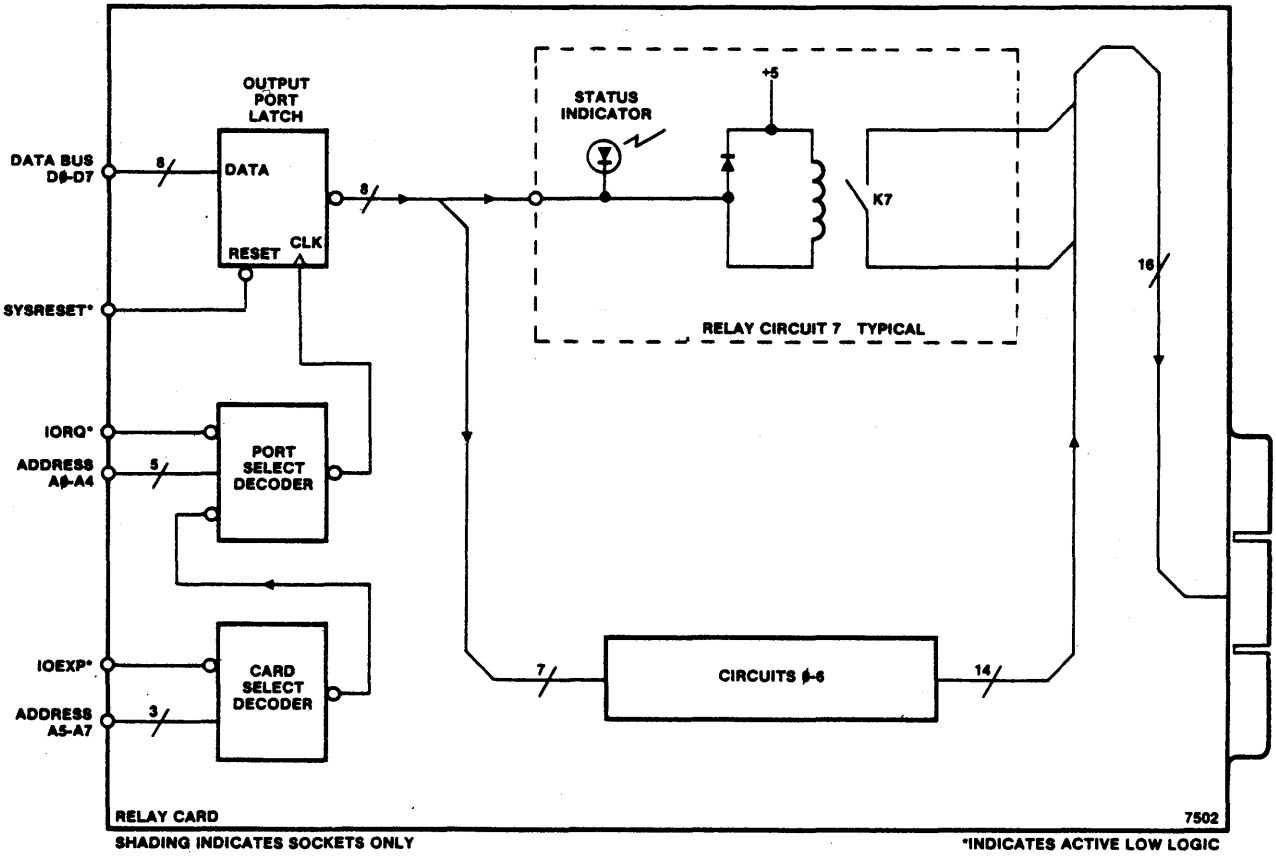
SPST RELAY OUTPUT CARD

The 7502 consists of eight independent SPST dry reed relays controlled by a fully decoded, latched 8-bit output port. Each 7502 allows the processor direct control of eight additional reed relay switches.



FEATURES

- Eight Independent SPST Dry Reed Relays (Normally open 0.5A/200V)
- On-card LED Display of Relay Driver Status
- User-selected Port Address
- Keyed Front-edge connector for Relay Outputs
- Socketed ICs
- Single +5V Operation
- Pads for User Provided Transient Suppression
- Provisions for Resistive Current Limiting



PRO-LOG CORPORATION

2. FUNCTIONAL DESCRIPTION

A relay contact (normally-open) is assigned to each of the eight bits of the assigned output port. Upon system reset the relays are de-energized and contacts are open. With an output command to the designated relay card, each relay state will latch the contents of the CPU accumulator. The LED indicators display the latched state of each relay.

(ACCUMULATOR BIT)	RELAY COIL	RELAY CONTACT	LED INDICATOR
Set	Activated	Closed	On
Clear	De-Activated	Open	Off

The output port is implemented with an octal flip-flop (74LS273). Relay drive is provided with an octal buffer (74LS240). Damping diodes and LED status indicators are in parallel with each relay coil.

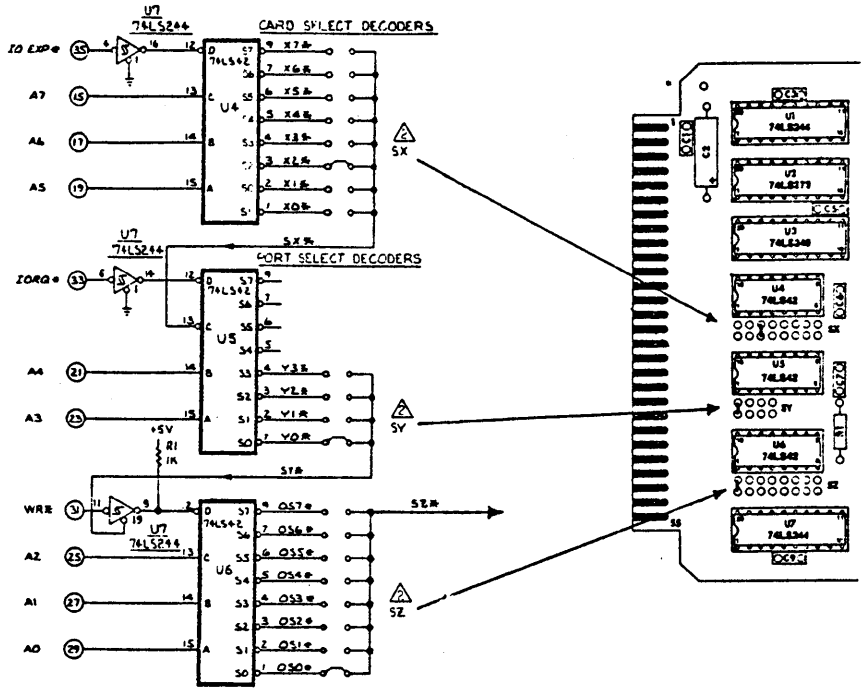
PARAMETER	MIN	MAX	UNIT	COMMENT
Contact Current		0.5	Amp	Combined DC and peak transient currents during contact opening or closure.
Contact Voltage		200	Volt	DC and peak voltage across open relay contacts.
Breakdown Voltage	300		Volt	DC and peak voltage between relay contact sets, and between the relay interface edge connector and the STD BUS edge connector.
Contact Resistance		0.2	Ohm	Initial contact resistance.
		1.0	Ohm	At end of life
Contact Lifetime	10^7		Operations	At 0.5 Amp load
Switching Time		0.5	msec	Open or close
Bounce Time		0.5	msec	After open or close

Reed Relay Contact Characteristics

3. MAPPING

The 7502 card is shipped with the card mapped at Hex port address 40. On-board jumpers (SX, SY and SZ) are provided for user selection of any output port 00 to FF. See figure below for logic diagram, physical locations of jumpers, and jumper selection table.

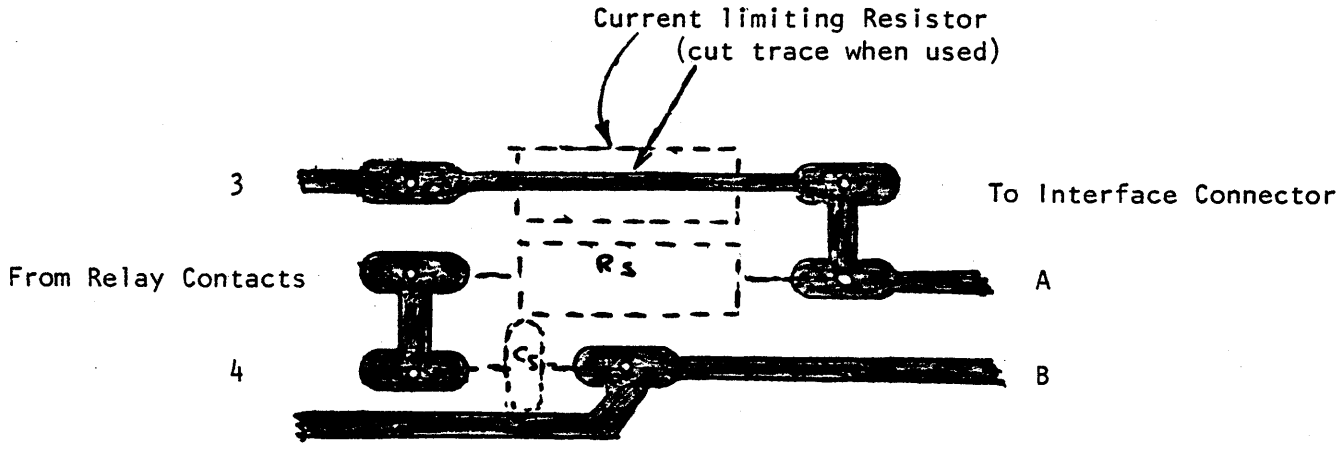
Consider standard mapping at port 40. On the selection table find the intersection of the most significant Hex digit (4-) and the least significant Hex digit (-0) read X2, Y0, and Z0. The schematic diagram is mapped at port 40 and the physical layout indicates the jumper positions for port 40.



MOST SIGNIFICANT HEX ADDRESS	LEAST SIGNIFICANT HEX ADDRESS																JUMPER SELECTION X, Y & Z
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
	Z0	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z0	Z1	Z2	Z3	Z4	Z5	Z6	Z7	← Z
0	X0 Y0								X0 Y1								X AND Y
1	X0 Y2								X0 Y3								
2	X1 Y0								X1 Y1								
3	X1 Y2								X1 Y3								
4	X2 Y0								X2 Y1								
5	X2 Y2								X2 Y3								
6	X3 Y0								X3 Y1								
7	X3 Y2								X3 Y3								
8	X4 Y0								X4 Y1								
9	X4 Y2								X4 Y3								
A	X5 Y0								X5 Y1								
B	X5 Y2								X5 Y3								
C	X6 Y0								X6 Y1								
D	X6 Y2								X6 Y3								
E	X7 Y0								X7 Y1								
F	X7 Y2								X7 Y3								

Address Mapping And Jumper Selection Table

4. USER SUPPLIED SUPPRESSION NETWORK



PAD DETAILS FOR USER SUPPLIED SUPPRESSION NETWORKS

Reed Relay Contact Considerations

Satisfactory reed reliability depends on circuit conditions when the relay is opened or closed. The 7502's reed relays can open with up to 500mA flowing across closed contacts, or close with up to 200V across opened contacts, for up to 10,000,000 repetitions. Reed lifetime will be dramatically reduced due to high contact resistance or contact welding if these "hot" values are exceeded.

Lifetime can be extended to billions of operations if reeds are switched "dry" (no more than a few microamps or millivolts present when the relay opens or closes). Moreover, the relay contacts can typically carry 2 to 3 times the rated contact current as long as such loads are not switched by the relay.

Surge-suppression components for reed relay protection are often required and typically may be placed at the load, in the cable, or on pads provided on the 7502 for each relay. These are application dependent and can take the following forms:

1. DC inductive loads: A reverse biased diode across the load.
2. AC inductive loads: A series RC network or a series resistor-thyrector diode across relay contacts. Suggested RC values:

$$R = \frac{E}{10\left[I\left(1+\frac{50}{E}\right)\right]} \text{ Ohm;} \quad C = \frac{I^2}{10} \text{ microFarad}$$

   where E is the voltage (in volts) across the open reed contacts immediately prior to closing (not to exceed 200V), and I is the current (in Amperes) flowing through the closed contacts immediately prior to opening (not to exceed 0.5A).
3. Surge loads, including capacitive loads and incandescent lamps, can be limited to a 0.5A peak with a series resistor.

5. 7502 RELAY CARD ENVIRONMENTAL SPECIFICATIONS

RECOMMENDED OPERATING LIMITS				ABSOLUTE NON-OPERATING LIMITS		
PARAMETER	MIN	TYP	MAX	MIN	MAX	UNITS
Free Air Temperature	0	25	55	-40	75	°C
Humidity	0		95 ①	0	95 ①	%RH
Shock	Not Specified			Not Specified		
Vibration	"			"		
EMI	"			"		
ESD	"			"		

① NON-CONDENSING HUMIDITY

6. 7502 RELAY CARD ELECTRICAL SPECIFICATIONS

RECOMMENDED OPERATING LIMITS				ABSOLUTE NON OPERATING LIMITS		
PARAMETER	MIN	TYP	MAX	MIN	MAX	UNITS
V_{CC}	4.75	5.00	5.25	0.0	7.00	Volt
I_{CC}	--	3.00	4.00	--	--	mA

STD/7502 EDGE CONNECTOR PIN LIST							
PIN NUMBER				PIN NUMBER			
OUTPUT (LSTTL DRIVE)					OUTPUT (LSTTL DRIVE)		
INPUT (LSTTL LOADS)						INPUT (LSTTL LOADS)	
MNEMONIC							MNEMONIC
+5 VOLTS	VCC		2	1		VCC	+5 VOLTS
GROUND	GND		4	3		GND	GROUND
-5V			6	5			-5V
D7	1		8	7		1	D3
D6	1		10	9		1	D2
D5	1		12	11		1	D1
D4	1		14	13		1	D0
A15			16	15		1	A7
A14			18	17		1	A6
A13			20	19		1	A5
A12			22	21		1	A4
A11			24	23		1	A3
A10			26	25		1	A2
A9			28	27		1	A1
A8			30	29		1	A0
RD*			32	31		1	WR*
MEMRQ*			34	33		1	IORQ*
MEMEX*			36	35		1	IOEXP*
MCSYNC*			38	37			REFRESH*
STATUS 0*			40	39			STATUS 1*
BUSRQ*			42	41			BUSAK*
INTRQ*			44	43			INTAK*
NMIRQ*			46	45			WAITRQ*
PBRESET*			48	47		1	SYSRESET*
CNTRL*			50	49			CLOCK*
PC1	IN		52	51	OUT		PC0
AUX GND			54	53			AUX GND
AUX -V			56	55			AUX +V

*Designates Active Low Level Logic

Edge Connector Pin List

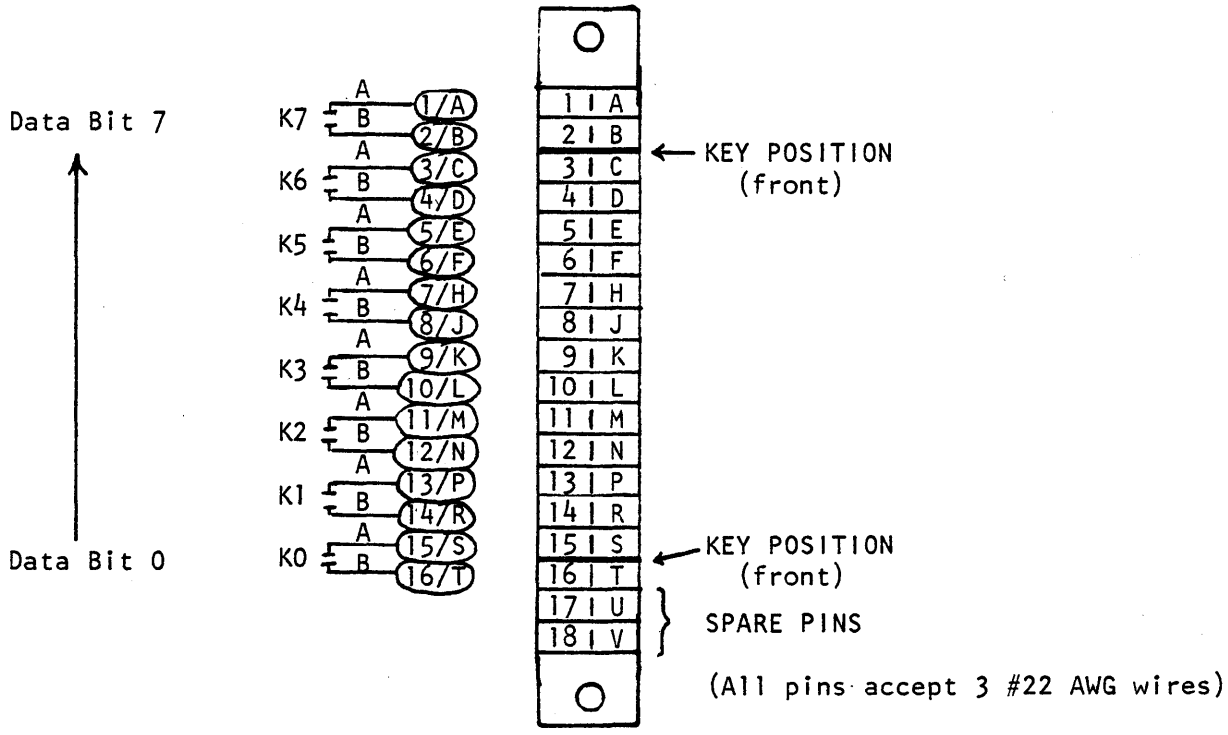
INTERFACE CONNECTOR PIN LIST 7502	
PIN NUMBER	
	SIGNAL
1/A	RELAY K7A
2/B	K7B
3/C	RELAY K6A
4/D	K6B
5/E	RELAY K5A
6/F	K5B
7/H	RELAY K4A
8/J	K4B
9/K	RELAY K3A
10/L	K3B
11/M	RELAY K2A
12/N	K2B
13/P	RELAY K1A
14/R	K1B
15/S	RELAY K0A
16/T	K0B
17/U	SPARE
18/V	SPARE

Interface Connector Pin List

7. USER INTERFACE

7502 INTERFACE CONNECTOR, CS18		
	PART NUMBER	
MANUFACTURER	EDGE CONNECTOR	POLARIZING KEY
Amp Viking Sullen TRW Cinch EDAK Inc.	582775-2 #2VH18/1AB5 EMM18SREH #250-18-30-220 306-018-500-102	583274-1 091-0024-000 PLM K1 50-PK-2 307-240-318
Pro-Log	902055 (Spec #104859)	902176 (Spec #105249)

See CB18 for alternate edge connector



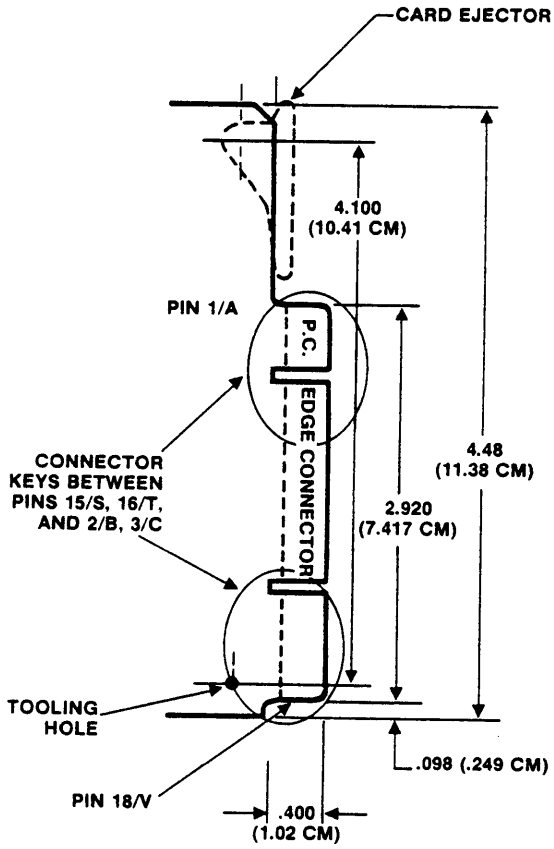
7502 INTERFACE CONNECTOR, SINGLE READ-OUT

8. MECHANICAL DETAILS

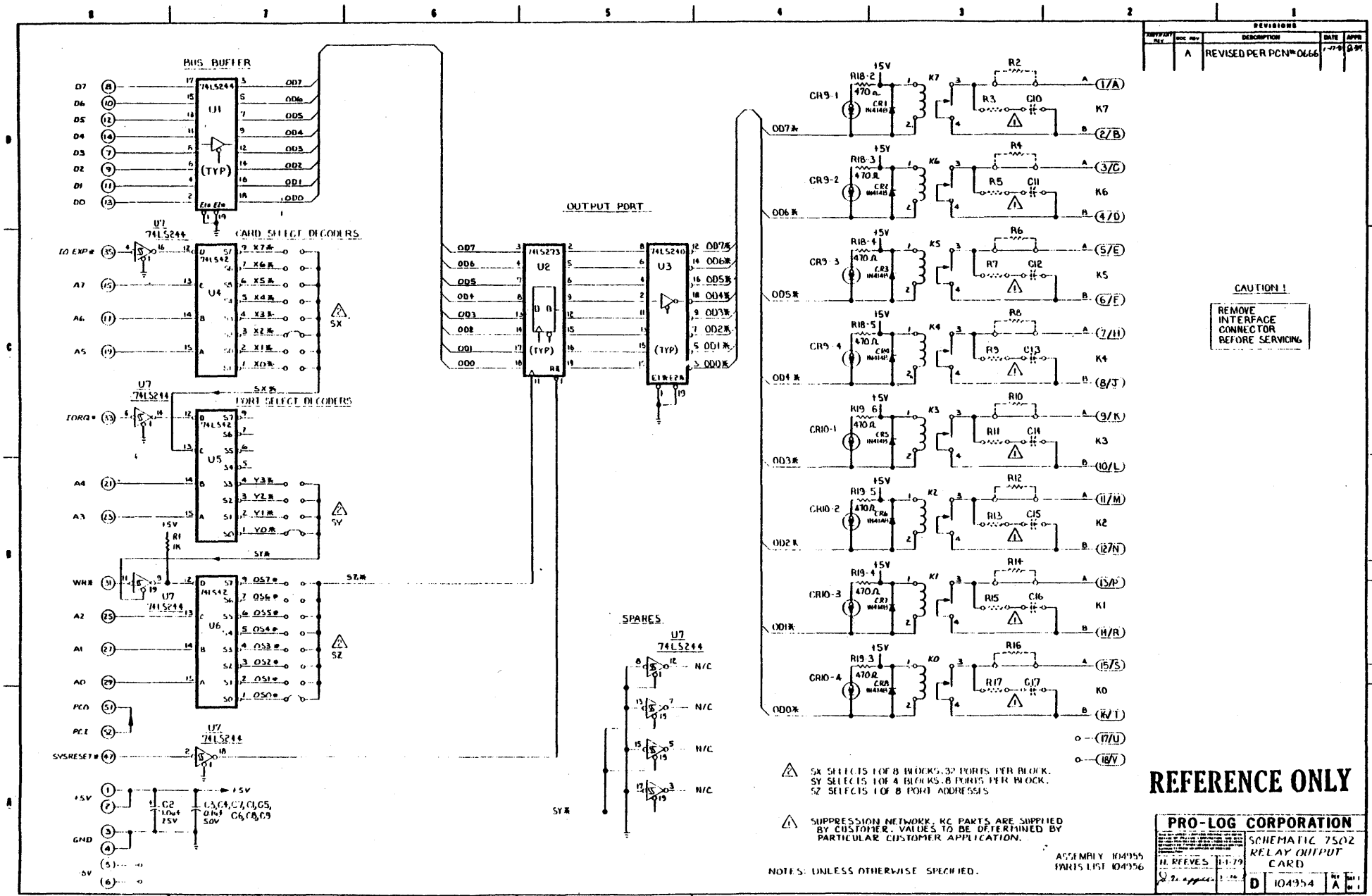
Meets all STD BUS general mechanical specifications with the following exceptions:

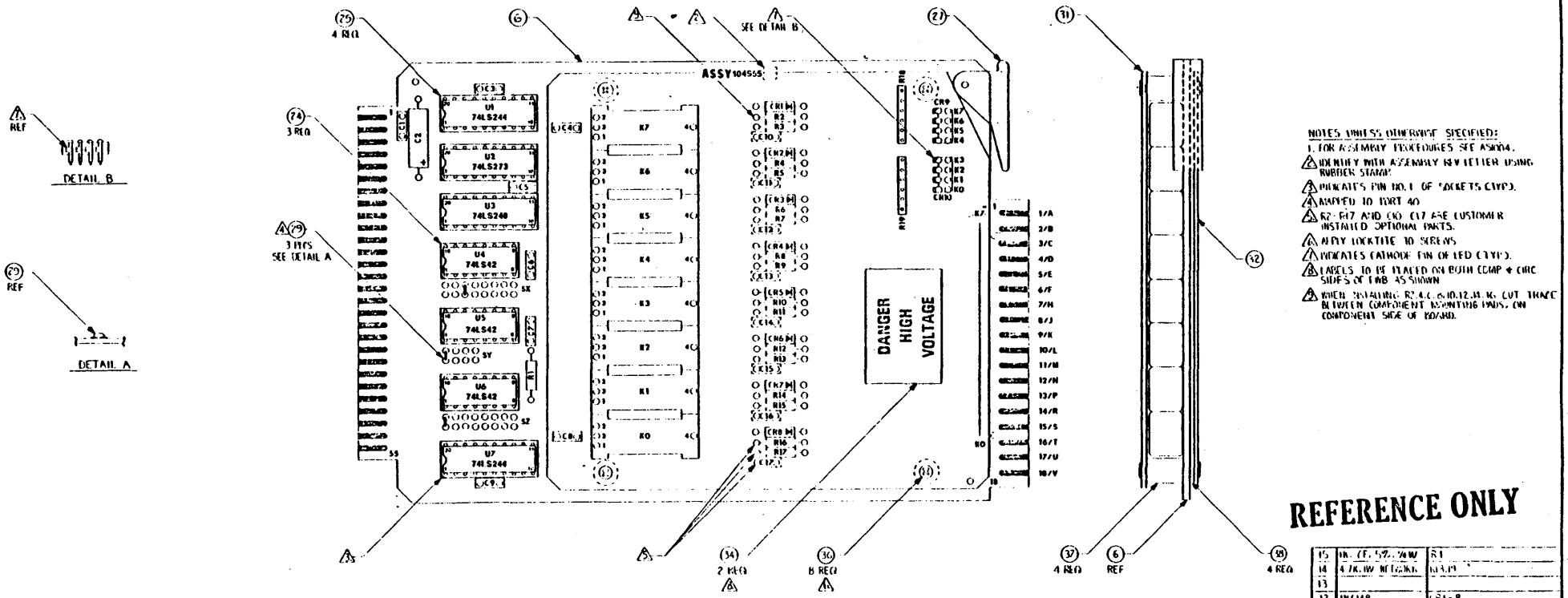
1. The I/O interface connector is a 36-pin (dual 18-pin) edge connector. Overall card length is extended to 6.90 ±0.025 inches (17.53 ±0.064 cm.). Edge connector height is 2.930 ±0.005 inches (7.442 ±0.012 cm.). Contact fingers are on 0.156 inch (0.396 cm.) centers. Opposing fingers are shorted, yielding 18 isolated contacts. Two non-reversible connector keys are provided between pins 2 and 3, and 15 and 16.
2. An LED relay status display visible from the card front is included. Each LED is illuminated by its corresponding output port bit to indicate that the relay is energized.
3. The 7502 requires one open card slot on either side for clearance of the safety shields and interface connector (three card slots total). The back shield adds 0.15 inch (0.38 cm.) to the card's profile on the wiring side. Safety shields may be removed if all potentials applied to the card are not dangerous.

Interface Connector Information
See CB18 and CS18 data sheets for compatible connector information.



Front Edge Connector
(Component - Side View)


BUS BUFFER
U1
74LS244
(TYP)
D7
D6
D5
D4
D3
D2
D1
D0
OD7
OD6
OD5
OD4
OD3
OD2
OD1
OD0
U7
74LS244
CARD SELECT DECODERS
IO EXP*
A7
A6
A5
U4
74LS42
X7*
X6*
X5*
X4*
X3*
X2*
X1*
X0*
SX
SX*
PORT SELECT DECODERS
IORQ*
A4
A3
U5
74LS42
Y3*
Y2*
Y1*
Y0*
SY
SY*
+5V
R1
1K
WR*
A2
A1
A0
U6
74LS42
OS7*
OS6*
OS5*
OS4*
OS3*
OS2*
OS1*
OS0*
SZ
SZ*
PC0
PC1
SYSRESET*
U7
74LS244
OUTPUT PORT
U2
74LS273
U3
74LS240
(TYP)
OD7*
OD6*
OD5*
OD4*
OD3*
OD2*
OD1*
OD0*
E1* E2*
SPARES
U7
74LS244
N/C
N/C
N/C
N/C
SY*
+5V
GND
-5V
C2
10uf
25V
C3,C4,C7,C1,C5,
0.1uf C6,C8,C9
50V
CR9-1
CR9-2
CR9-3
CR9-4
CR10-1
CR10-2
CR10-3
CR10-4
1N4148
R18-2
R18-3
R18-4
R18-5
R19-6
R19-5
R19-4
R19-3
470Ω
410Ω
R2
R3
C10
R4
R5
C11
R6
R7
C12
R8
R9
C13
R10
R11
C14
R12
R13
C15
R14
R15
C16
R16
R17
C17
K7
K6
K5
K4
K3
K2
K1
K0
1/A
2/B
3/C
4/D
5/E
6/F
7/H
8/J
9/K
10/L
11/M
12/N
13/P
14/R
15/S
16/T
17/U
18/V
CAUTION !
REMOVE
INTERFACE
CONNECTOR
BEFORE SERVICING
SX SELECTS 1 OF 8 BLOCKS, 32 PORTS PER BLOCK.
SY SELECTS 1 OF 4 BLOCKS, 8 PORTS PER BLOCK.
SZ SELECTS 1 OF 8 PORT ADDRESSES
SUPPRESSION NETWORK, RC PARTS ARE SUPPLIED BY CUSTOMER. VALUES TO BE DETERMINED BY PARTICULAR CUSTOMER APPLICATION.
NOTES: UNLESS OTHERWISE SPECIFIED.
ASSEMBLY 104955
PARTS LIST 104956
REVISIONS
A
REVISED PER PCN# 0666
REFERENCE ONLY
PRO-LOG CORPORATION
SCHEMATIC 7502
RELAY OUTPUT
CARD
H. REEVES
D
104954
A



NOTES UNLESS OTHERWISE SPECIFIED:

1. FOR ASSEMBLY PROCEDURES SEE A5004.
2. IDENTIFY WITH ASSEMBLY REV LETTER USING RUBBER STAMP.
3. INDICATES PIN NO. 1 OF SOCKETS (TYP.).
4. MAPPED TO PORT 40
5. R2-R17 AND C10 CUT ARE CUSTOMER INSTALLED OPTIONAL PARTS.
6. APPLY LOCKTITE TO SCREWS.
7. INDICATES CATHODE PIN OF LED (TYP.).
8. LABELS TO BE PLACED ON BOTH COMP & CIRC SIDES OF PWB AS SHOWN
9. WHEN INSTALLING R2,4,6,8,10,12,14,16 CUT TRACE BETWEEN COMPONENT MOUNTING PADS, ON COMPONENT SIDE OF BOARD.

REFERENCE ONLY

ITEM	DESCRIPTION	REF. DESIGNATION
15	RN, CF, 5%, 1/4W	R1
14	4.7K, 1W, RESISTOR	R3,9
13		
12	1N4148	CR1-8
11	LED,4C4	CR9,10
10		
9	0.01UF, 50V	C1,3,9
8	1.0UF, 25V	C2
7		
6	74LS53	U8

PRO-LOG CORPORATION

SCHEMATIC NO. - 104954
PARTS LIST NO - 104956

D 104955 REV A SHT 1 OF 1

101357

7000 STD BUS

CS18 I/O EDGE CONNECTOR

SOLDER TAIL CONNECTOR

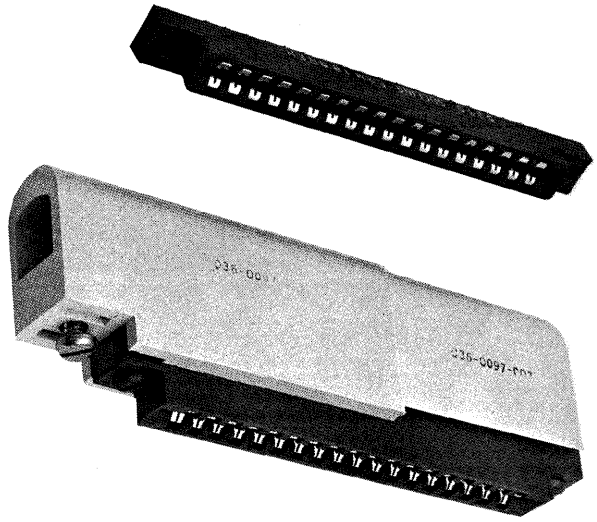
The CS18 card edge connector is used on industrial interface cards requiring more than 50VDC and/or 0.5A per contact.

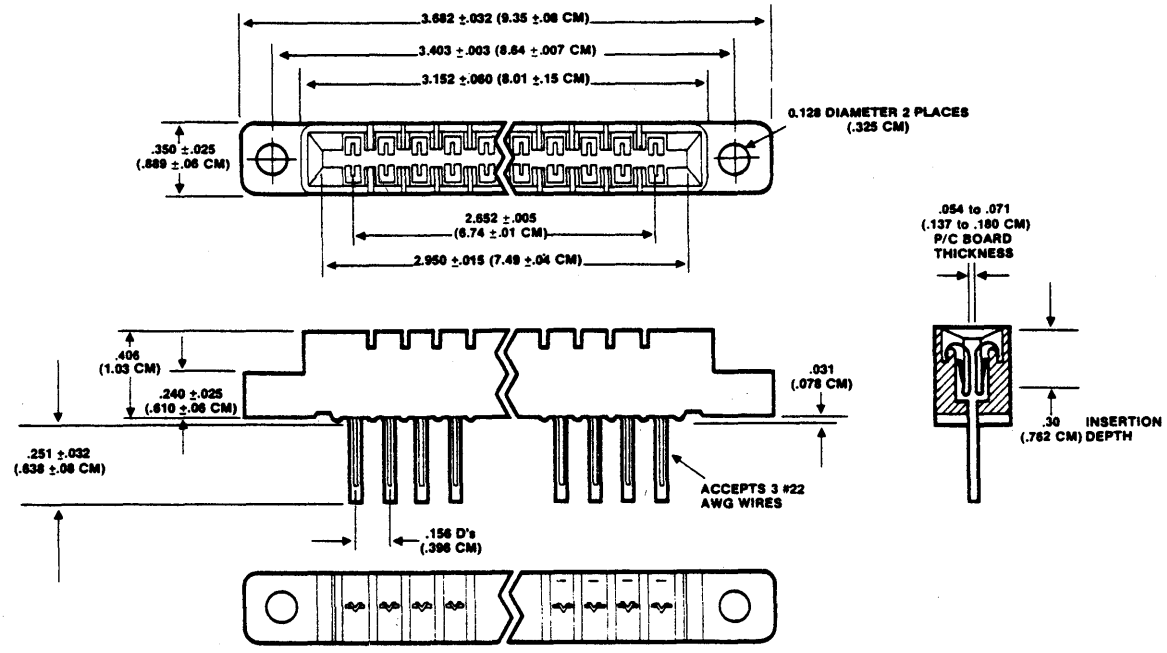
FEATURES

- **5A Maximum Per Contact**
- **Multiple Sourced**
- **Accepts PCBs of .062" Thickness**
- **Pierced Solder Tails Accept 3 #22 AWG Wires**
- **Includes Mating Hood, Hardware, and Keys**
- **UL Listed**

ELECTRICAL

- Material UL rated 94V-0 or 94V-1 (flame rating)
- Contact spacing 0.156" centers
- Contact rating: 5A
- Maximum voltage drop: 30mV at 5A
- Operating voltage: 350V at sea level
- Operating temperature: -55°C to +105°C at sea level
- PCB thickness: .054 to .071 inches
- Insertion/withdrawal forces: 2 oz. to 8 oz. per contact pair





Solder Tail Connector

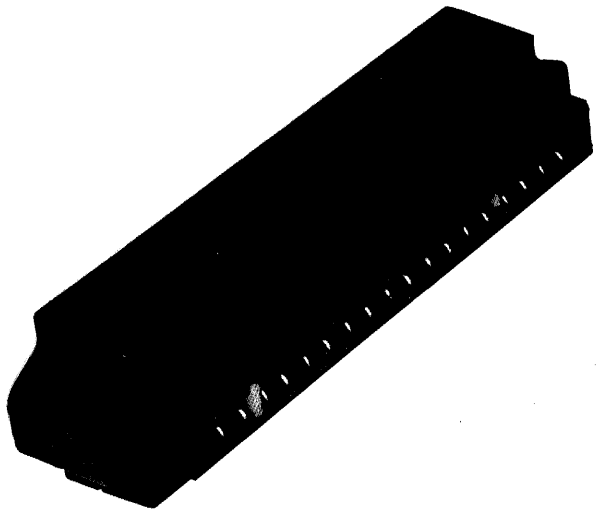
PRO-LOG CORPORATION

7000 STD BUS I/O EDGE CONNECTOR

CB18

BARRIER STRIP CONNECTOR

The CB18 card edge connector is used on industrial interface cards requiring more than 50VDC and/or 0.5A per contact.



FEATURES

- **10A Maximum Per Contact**
- **Single Sourced**
- **Accepts PCBs of .062" Thickness**
- **Tubular Contact Plate Accepts #12 to #22 AWG Wires**
- **Includes Keys**
- **UL Listed**

ELECTRICAL

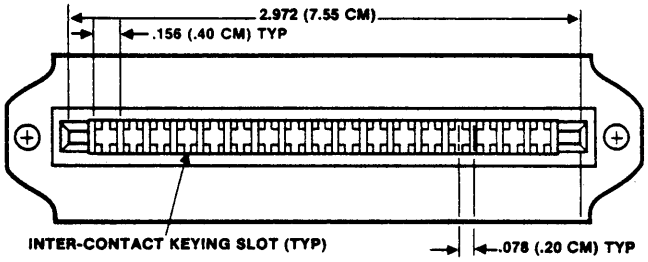
- Material UL rated 94V-0 (flame rating)
- Contact spacing: 0.156" centers
- Contact rating: 10A/circuit continuous
- Breakdown voltage: 2500V
- Operating temperature: -55°C to +105°C at sea level
- PCB thickness: .054 to .071 inches
- Not recommended for more than 20 insertion/ withdrawals

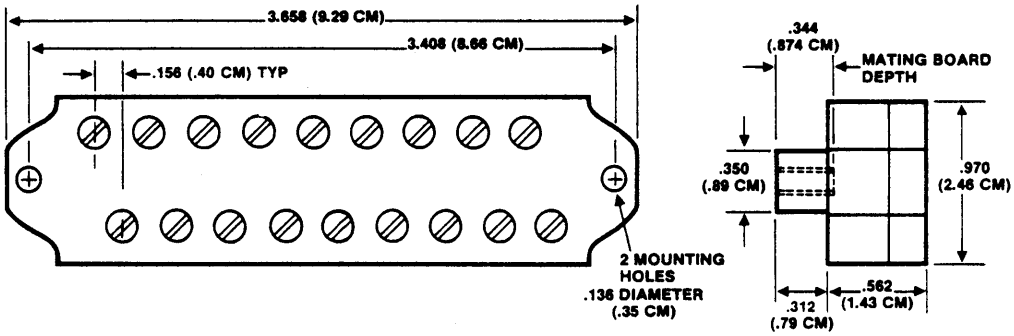
CONNECTOR ORDERING INFORMATION

The part number of various connector manufacturers is given below.

Pro-Log	CB18*
Buchanan	PCB2B Connector
	PC17 Keying plug

*Includes two keying plugs

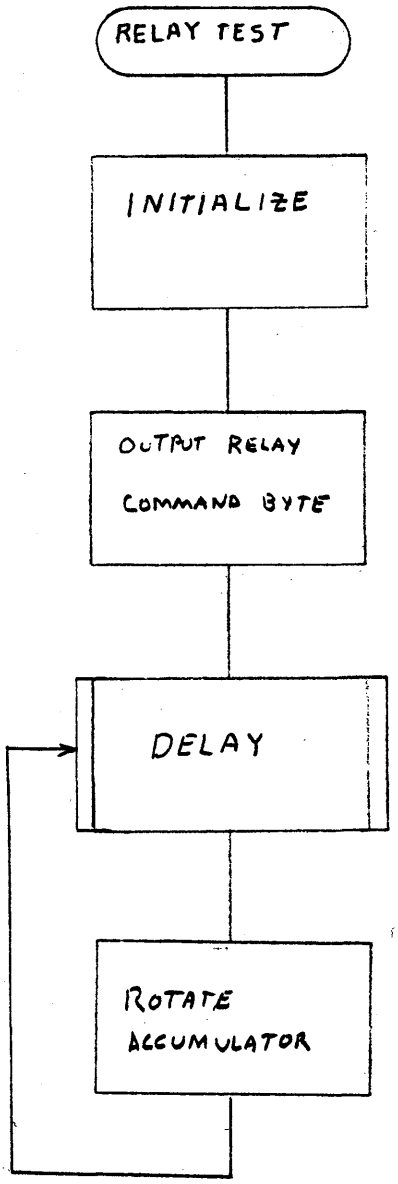


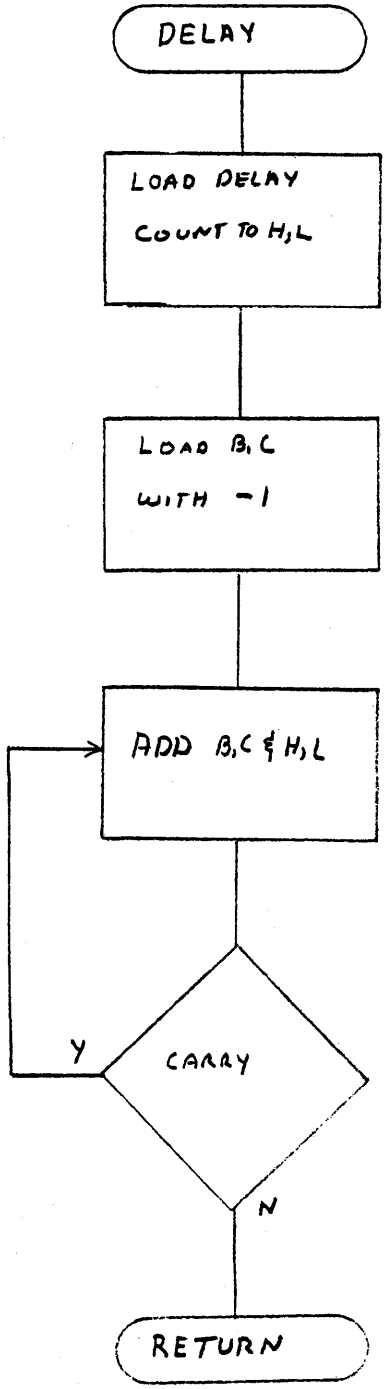


Barrier Strip Connector

PRO-LOG
CORPORATION 2411 Garden Road Monterey, California 93940 Telephone (408) 372-4593
TWX: 910-360-7082

105207A 1/80


RELAY TEST
INITIALIZE
OUTPUT RELAY
COMMAND BYTE
DELAY
ROTATE
ACCUMULATOR


DELAY
LOAD DELAY
COUNT TO H,L
LOAD B,C
WITH -1
ADD B,C & H,L
CARRY
Y
N
RETURN

PRO-LOG CORPORATION **PROGRAM ASSEMBLY FORM**

TITLE USER TEST, 1502 DATE

HEXADECIMAL PAGE ADR	HEXADECIMAL LINE ADR	HEXADECIMAL INSTR.	MNEMONIC LABEL	MNEMONIC INSTR.	MNEMONIC MODIFIER	COMMENTS
PAGE	00	AF		CLAC		ACTIVATE RELAYS IN SEQUENCE
	1	3E		LDA	I	LSD TO MSD
	2	01		—	01	
	03	D3	REPEAT	OPA		PROGRAM TO RUN ON
	4	40		—	40	280 CPU
	5	CD		JS	UN	8085 CPU
	6	10		—	(DELAY)	
	7	PAGE		—		
	8	07		RLA		
	9	C3		JP	UN	
	A	03		—	REPEAT	
	B	PAGE		—		
	C					
	D					
	E					
	F					
PAGE	10	21	(DELAY)	LDRI	HL	DELAY COUNT TO HL — DELAY SUBROUTINE
	1	10		—	2710	
	2	27		—		
	3	01		LDPI	BC	-1 TO BC
	4	FF		—	FFFF	
	5	FF		—		
	16	09	LOOP	ADP	HL, BC	DECREMENT (HL)
	7	00		NOP		
	8	DA		JP	C1	TIME OUT ?
	9	16		—	LOOP	→ NO, DECREMENT AGAIN
	A	PAGE		—		
	B	C9		RTS		→ YES, RETURN FROM SUBROUTINE
	C					
	D					
	E					
	F					

USER'S MANUAL

PRO-LOG
CORPORATION

2411 Garden Road
Monterey, California 93940
Telephone: (408) 372-4593
TWX: 910-360-7082

106646A 300 9/81