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53A-356 RELAY SWITCHING CARD

OPERATING MANUAL

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53A-356 RELAY SWITCHING CARD

OPERATING MANUAL

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53A-356 RELAY SWITCHING CARD

DESCRIPTION

The 53A-356 Relay Switching Card is a printed circuit board assembly for use in a CDS 53/63 Series System. The card provides eight independently controlled, double-pole double-throw relays which can sustain one hundred switchings per second while providing a minimum dwell time of four milliseconds. All relays are randomly opened or closed by transmitting ASCII characters from the system controller to the 53/63 System. The six contacts of each relay are brought out to the front-edge connector of the Relay Switching Card. Diagnostics are provided by LED indicators located at the front edge of the card.

CONTROLS AND INCICATORS

The following controls and indicators are provided to select and display the functions of the 53A-356 Card's operating environment.

Address Select Switch

The 53A-356 Card has a miniature 10-position switch labeled "ADDRESS" that selects the 53A-356 Card's address (0-9) in the 53/63 Series System. The switch's cover opens to allow the address to be reselected. A screwdriver with a narrow flat blade should be used to turn the cam-action wiper to the desired address position.

Power LED

The Power LED provides a valuable diagnostic tool by giving the system programmer a visual indication of action which the system is taking. Whenever the 53A-356 Card is addressed by the system controller, the Power LED goes out. The LED remains out until another function card is addressed. Since only one function card can be addressed at a time, an unlit Power LED indicates the function card with which the system controller is currently communicating. The Power LED being lit not only indicates that the 53A-356 Card is unaddressed, but that all required dc power is being supplied.

Fuse

The 5-volt dc power bus has a fuse that protects the system from overloads. If any fuse has blown, the Power LED will not light.

Function LEDs And Switches

Relay LEDs

A column of eight LEDs represents relays 0, 1, 2, 3, 4, 5, 6, and 7, from top to bottom. A lit LED indicates that the associated relay is closed.

Halt Switch

This 1-position slide switch is located near the card's backplane edge connector. It selects the state of the 53A-356 Card after an @XH (Halt) or STOP command is received by the 53/63 Series System.

a. In position C1 the relays reset to their open state after an @XH command or STOP command is received.

b. In position C2 the relays hold their present output setting after an @XH command or STOP command is received.

Appendix A discusses the system level commands @XH and STOP.

Delay Enable Switch

The Delay Enable switch is a 2-position slide switch located at the upper left of the address-select switch that can delay the processing of any command received from the system controller, following the receipt of an O or C command. The purpose of this switch is to allow the user to insure "break before make" on relay closures, or to insure that the relays are appropriately closed or opened before subsequent commands are sent by the system controller to other equipment. The amount of delay depends on the setting of the Delay Value switch. The two switch settings of the Delay Enable switch are as follows:

Switch Position	Operation
ON	Delay enabled
OFF	Delay disabled

The Delay Enable switch is normally placed in the ON position for most applications. The OFF position, delay disabled, should only be used if the test applications program itself provides a delay between commanding a relay to open/close and use of the resultant signal. An individual relay requires approximately 8 ms to open and 5 ms to close, including contact bounce.

Delay Value Switch

The Delay Value switch is a 2-position slide switch, located halfway between the Address Select switch and the relays, that sets the delay value to either 10 ms or 50 ms. This delay occurs when the Delay Enable switch is on. The purpose of this switch is to slow the maximum operating speed of the card to 100 operations per second for "break before make" applications or 20 operations per second for improved relay reliability in high-current switching applications (see Specifications section). The two switch settings are as follows:

Switch Position	Operation
ON	50-ms delay (when Delay Enable switch is enabled)
OFF	10-ms delay (when Delay Enable switch is enabled)

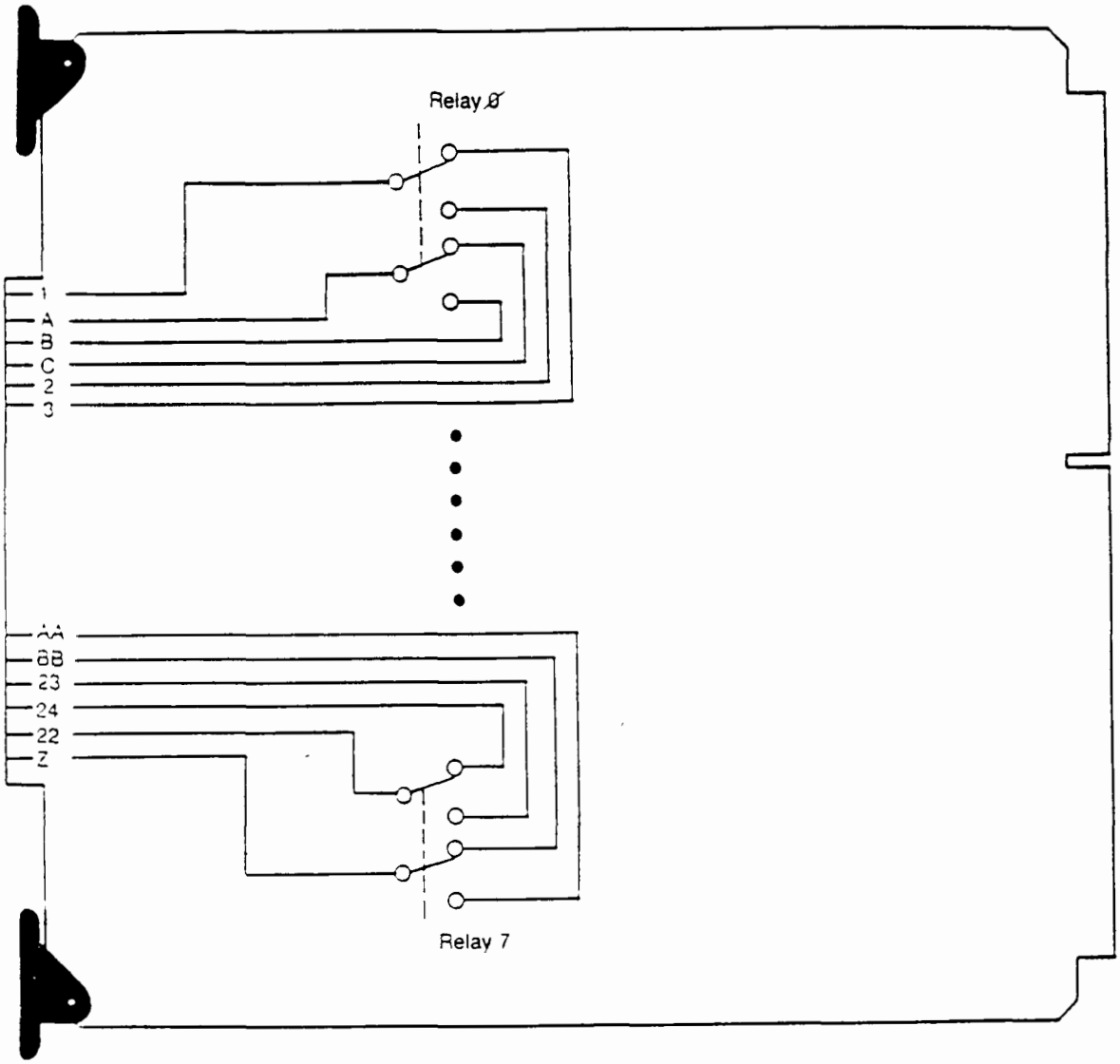


Figure 356-1: 53A-356 Card Block Diagram

SPECIFICATIONS

Configuration: Eight Form 2A-2B relays, each configured as DPDT relays.

Relay Manufacturer: Aromat Corporation Model: S2EB-5V (per CDS specification).

Contact Ratings:
Maximum switching power: 1000 VA ac, 192 W dc.
Maximum switching voltage: 250 V ac 48V dc.
Maximum switching current: 4 A (< 20 opm)

Maximum Operating Speeds: Switch-selectable for 20 ops and 100 ops. Required delays for 40 opm must be handled in software.

NOTE: ops - operations per second.
opm - operations per minute.
An operation is defined as a close or open. A close/open cycle is two operations.

Recommended Maximum Operating Conditions and Operational Life:

Operating Speed	40 opm	20 ops	100 ops
Switching voltage, dc	30 V	30 V	1.0 V
Switching current, dc	3.0 A	2.0 A	1.0 mA
Switching voltage, ac	250 V	250 V	- -
Switching current, ac	4 A	0.5 A	- -
Operational life	10^5	10^6	10^6

Duty Cycle: Continuous.

Dwell: Dwell time at maximum switching rate (100 ops) is 4 ms, minimum.

Signal-Path Specifications:
Single-line thermal offset: < 8 uV.
Differential thermal offset: < 5 uV.
Initial signal-path resistance: < 300 mOhm.
Signal-path resistance at end of full load life: < 350 mOhm.
Insulation resistance: > 10 GOhm between all insulated parts.

Cross Talk Between Relays:

1 kHz	< -95 dB
10 kHz	< -68 dB
100 kHz	< -48 dB
1 MHz	< -30 dB

Measurement was made on a closed relay with a 600-Ohm termination, and the signal applied into an adjacent channel, open or closed relay, with and without a 600-Ohm termination.

Power Up:

When power is turned on, the 53A-356 Card goes to the following known state:

Card unaddressed (Power LED - lit).
All relays open (Relay LEDs - out).

Power Down:

When power is turned off, the card goes to the following known state:

All relays open.

Power Requirements:

5V dc power is provided by the internal Power Supply in the 53/63 Series Card Cage.

Voltage:

4.75 V to 5.25 V dc.

Current:

0.30 A, maximum quiescent (all relays open).
0.75 A, peak (all relays closed).

Cooling:

Provided by the fan in the 53/63 Card Cage.

Temperature:

-10 °C to +65 °C, operating (assumes ambient temperature of 55 ° and airflow to assure less than 10 °C temperature rise).
-40 °C to +85 °C, storage.

Humidity:

Less than 95% R.H. non-condensing, -10 °C to +30 °C.
Less than 75% R.H. non-condensing, +31 °C to +40 °C.
Less than 45% R.H. non-condensing, +41 °C to +55 °C.

Dimensions:

197 mm high, 221 mm deep, 13 mm wide,
(7.75 in x 8.69 in x 0.5 in).

Dimensions, Shipping:

When ordered with a 53/63 Series Card Cage, this card is installed in one of the card cage's function-card slots.

When ordered alone the shipping dimensions are:

254 mm x 254 mm x 127 mm.
(10 in x 10 in x 11 in).

Weight:

0.4 kg. (0.9 lb).

Weight, Shipping:

When ordered with a 53/63 Series Card Cage, this card is installed in one of the card cage's function-card slots.

When ordered alone the shipping weight is:

0.8 kg. (1.8 lb).

Mounting Position:

Any orientation.

Mounting Location:	Installs in any function-card slot of a 53/63 Series Card Cage.
Relay Connection:	A 48-pin, printed-circuit type, hooded connector (53A-780) provides a connection for all relays.
Required Equipment: (Not Supplied)	A 53A-780 Hooded Connector or 53A-724 Analog Cable is required with this card.
Equipment Supplied:	53A-356 Relay Switching Card. Spare Fuse (Part #42202-52001). Operating Manual (Part #00000-13560). Service Manual (Part #00000-23560).

OPERATION

The 53A-356 Relay Switching Card is programmed by ASCII characters issued from the system controller to the 53/63 System's communications card. The 53A-356 Card is interfaced to the communications card through the 53 Series or the 63 Series Card Cage's backplane.

To address a function card for the first time, the @XY command must be issued. X is the card cage address (0-9) selected on the 53A-171 Control Card in the addressed card cage; Y is the 53A-356 Card's address (0-9) within the addressed card cage. The 53A-356 Card's address is selected using the card's Address Select switch. Once a function card is addressed, it remains addressed until the system receives another @ character. Appendix A fully discusses the @XY command and the other 53/63 Series System commands. After the 53A-356 Card is addressed, the commands listed below may be issued until another function card is addressed.

Command	Description

R — This command RESETs (open) all relays on the 53A-356 card.

Example:
The command @05R opens all relays on the 53A-356 Card with address 5 in the card cage with address 0.

Status:
Power LED - out.
Relay LEDs - all out.

S — This command SETs (closes) all relays on the 53A-356 card.

Example:
The command @05S closes all relays on the 53A-356 Card with address 5 in the card cage with address 0.

Status:
Power LED - out.
Relay LEDs - all lit.

C — This command CLOSEs a single relay on the 53A-356 Card.

Syntax: CZ

Z represents the relay number (0-7) to be closed by the C command.

Example:
Assume all relays initially open. The command @05C4 closes relay 4 of the 53A-356 Card with address 5 in the card cage with address 0.

Status:
Power LED - out.
Relay LEDs- #4 lit, all others out.

O

This command OPENs a single relay on the 53A-356 Card.

Syntax: OZ

Z represents the relay number (0-7) to be opened by the O command.

Example:
Assume relays 4 and 5 are closed and all others open. The command @05O4 opens relay 4 on the 53A-356 Card with address 5 in the card cage with address 0.

Status:
Power LED - out.
Relay LEDs - #5 lit, all others out.

Example:
Assume all relays are initially open. The command @05C0C1C2C3C4O3 closes Relays 0,1,2,3,4 and then opens relay 3. Notice that it is only necessary to address the 53A-356 Card once.

Status:
Power LED - out.
Relay LEDs - #'s 0,1,2,4, lit, all others out.

INSTALLATION

The 53A-356 Card is a function card; therefore, it may be installed in any blue card slot. Setting the Address Select switch defines the card's programming address. To avoid confusion, it is recommended that the slot number and the programming address be the same.

CAUTION:

To avoid plugging the card in backwards, observe the following:

a. Match the keyed slot on the card to the key in the backplane connector. The component side should be to the right for a 53 Series Chassis and to the top for a 63 Series Chassis.

b. There are two ejectors on the card. Make sure the ejector marked "53A-356" is at the top for a 53 Series Chassis and to the left for a 63 Series Chassis.

CAUTION:

The 53A-356 Card is a piece of electronic equipment and therefore has some susceptibility to electrostatic damage (ESD). ESD precautions must be taken whenever the module is handled.

APPENDIX A

53/63 SERIES SYSTEM COMMANDS

Command	Description
@XY	The @XY (Address) command addresses a function card in a 53/63 Series System. @ is a delimiter used by the 53/63 System. X is a card cage address (0-9) defined by the Address Select switch on the 53A-171 Control Card in the addressed card cage. Y is a function card address (0-9) defined by the Address Select switch on the function card. Once a card cage/function-card combination is addressed, it remains addressed until the 53/63 Series System detects a new @ character.
@XH	The @XH (Halt) command halts all function cards within the card cage defined by X. The command does not affect function cards in other card cages. How a function card reacts to the @XH command depends on the particular card. In all cases, an addressed function card (Power LED out) becomes unaddressed (Power LED lit). On the 53A-356 Card the position of the Halt switch causes the @XH command to have the following effect: If the Halt switch is in Position C1 the 53A-356 Card resets to its power-up state. If the Halt switch is in position C2 the 53A-356 Card is simply unaddressed.
STOP	The STOP command is not a string of ASCII characters. The command is hard-wired from the system controller to the 53/63 Series System's communications card in each card cage. When the system controller issues a STOP command, each function card, (including the 53A-356 Card) reacts as if it received the @XH command described above. How the system controller executes the STOP command depends on the communications card used. For example, when using the 53A-128 IEEE-488 Communications Card, a STOP command is executed whenever the system controller asserts the IEEE-488 bus line IFC (Interface Clear) true.

APPENDIX B
INPUT/OUTPUT CONNECTIONS

53A-356 Wire List Cable No. _____

Relay	Pin #	Contact	53A-724 Cable	Termination	
			Wire Color	Signal Name	Pin #
0	1	C-1	Black of Black/White		
	A	C-2	White of Black/White		
	2	NO-1	Brown of Brown/White		
	B	NO-2	White of Brown/White		
	3	NC-1	Red of Red/White		
	C	NC-2	White of Red/White		
1	4	C-1	Orange of Orange/White		
	D	C-2	White of Orange/White		
	5	NO-1	Yellow of Yellow/White		
	E	NO-2	White of Yellow/White		
	6	NC-1	Green of Green/White		
	F	NC-2	White of Green/White		
2	7	C-1	Blue of Blue/White		
	H	C-2	White of Blue/White		
	8	NO-1	Violet of Violet/White		
	J	NO-2	White of Violet/White		
	9	NC-1	Gray of Gray/White		
	K	NC-2	White of Gray/White		
3	10	C-1	Brown of Brown/Black		
	L	C-2	Black of Brown/Black		
	11	NO-1	Red of Red/Black		
	M	NO-2	Black of Red/Black		
	12	NC-1	Orange of Orange/Black		
	N	NC-2	Black of Orange/Black		
4	13	C-1	Yellow of Yellow/Black		
	P	C-2	Black of Yellow/Black		
	14	NO-1	Green of Green/Black		
	R	NO-2	Black of Green/Black		
	15	NC-1	Blue of Blue/Black		
	S	NC-2	Black of Blue/Black		
5	16	C-1	Violet of Violet/Black		
	T	C-2	Black of Violet/Black		
	17	NO-1	Gray of Gray/Black		
	U	NO-2	Black of Gray/Black		
	18	NC-1	Red of Red/Brown		
	V	NC-2	Brown of Red/Brown		
6	19	C-1	Orange of Orange/Brown		
	W	C-2	Brown of Orange/Brown		
	20	NO-1	Yellow of Yellow/Brown		
	X	NO-2	Brown of Yellow/Brown		
	21	NC-1	Green of Green/Brown		
	Y	NC-2	Brown of Green/Brown		
7	22	C-1	Blue of Blue/Brown		
	Z	C-2	Brown of Blue/Brown		
	23	NO-1	Violet of Violet/Brown		
	AA	NO-2	Brown of Violet/Brown		
	24	NC-1	Gray of Gray/Brown		
	BB	NC-2	Brown of Gray/Brown		

SERVICE MANUAL

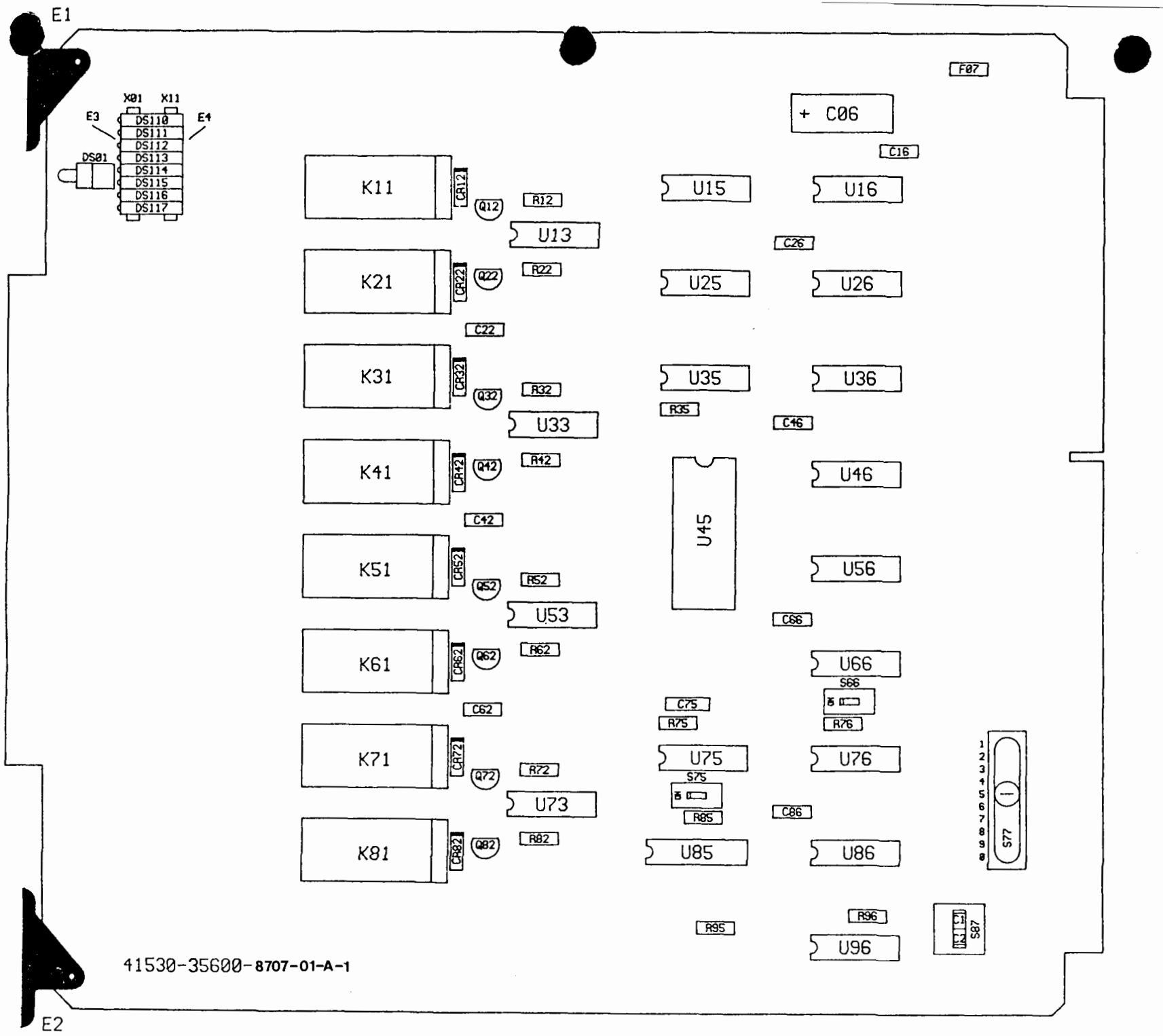
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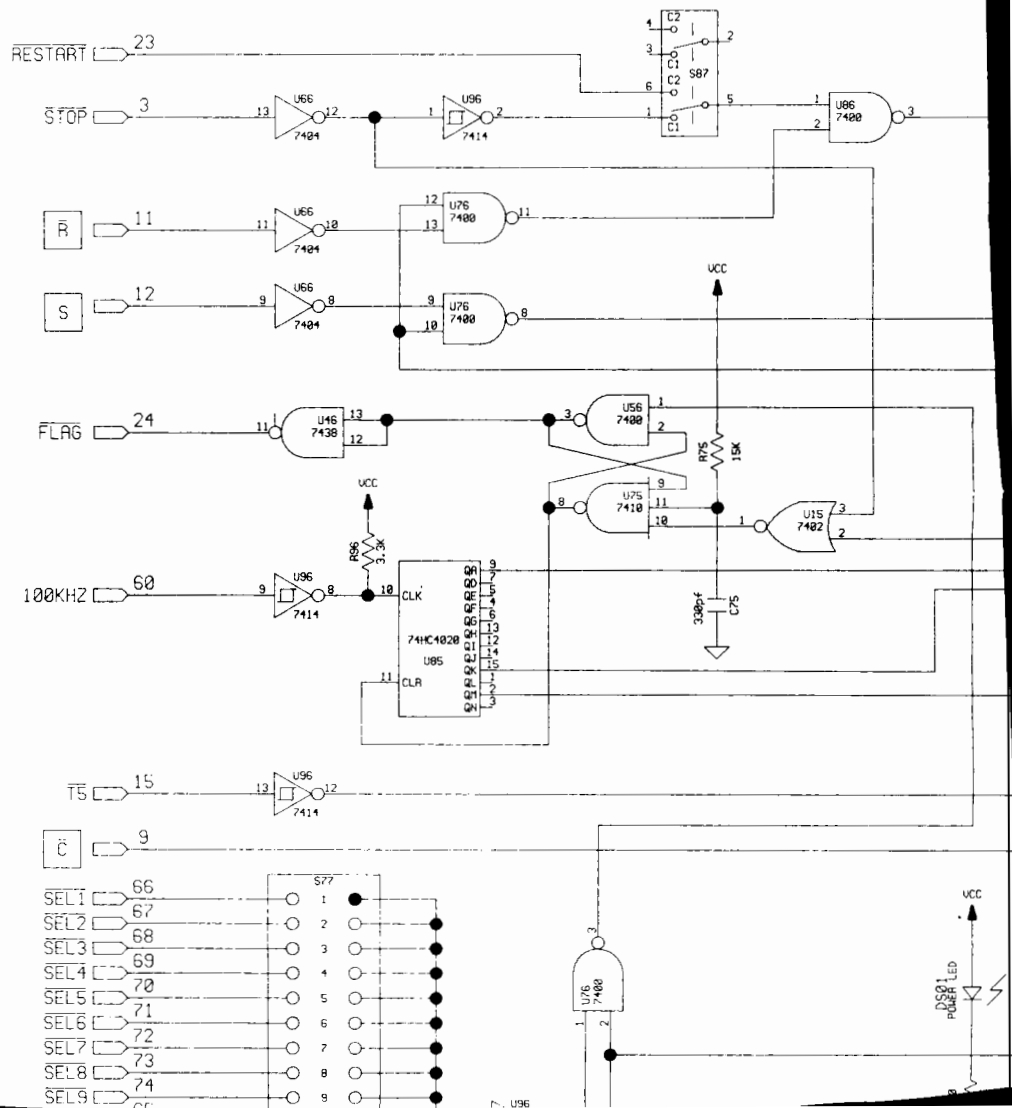
RELAY SWITCHING CARD DPDT

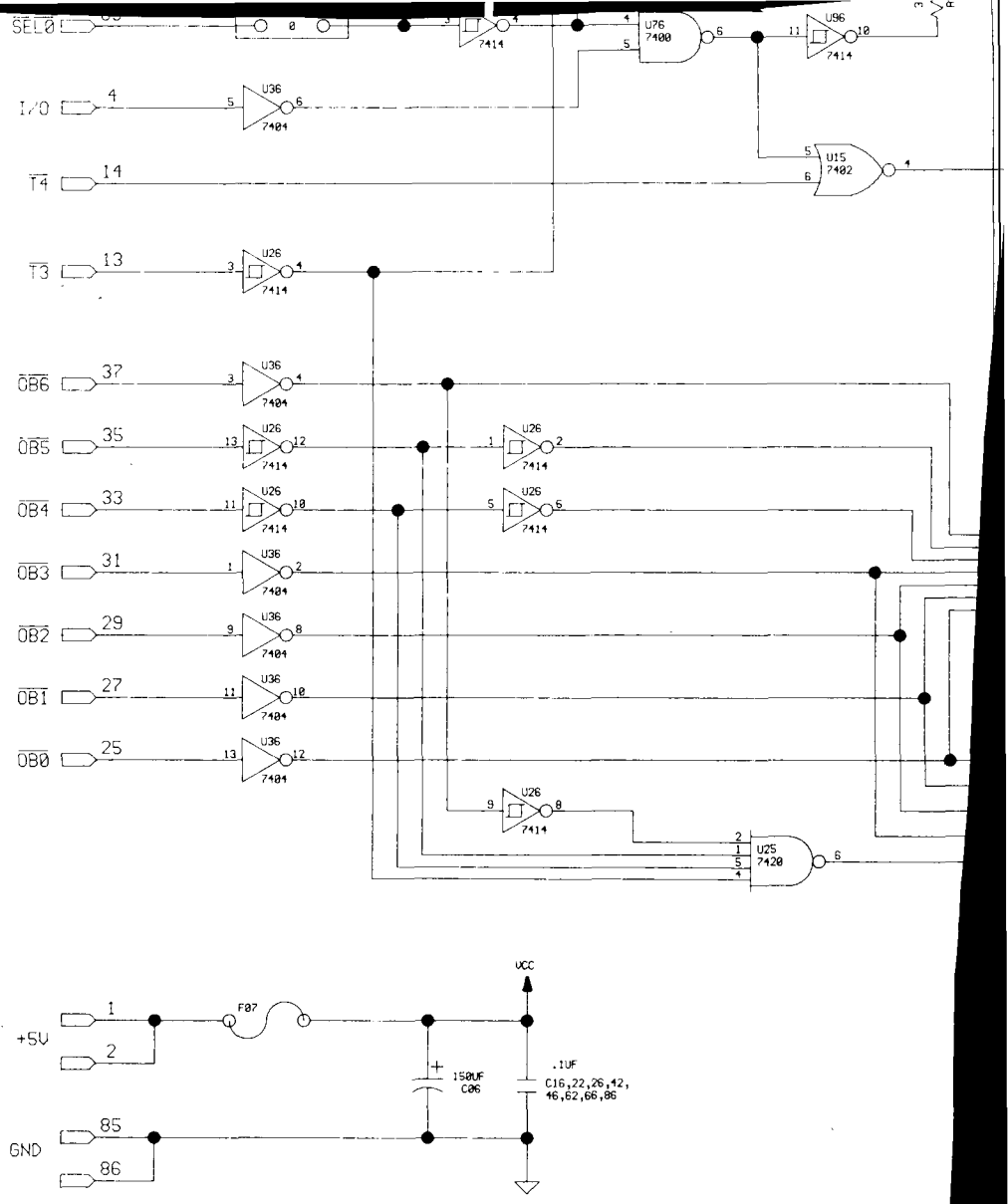
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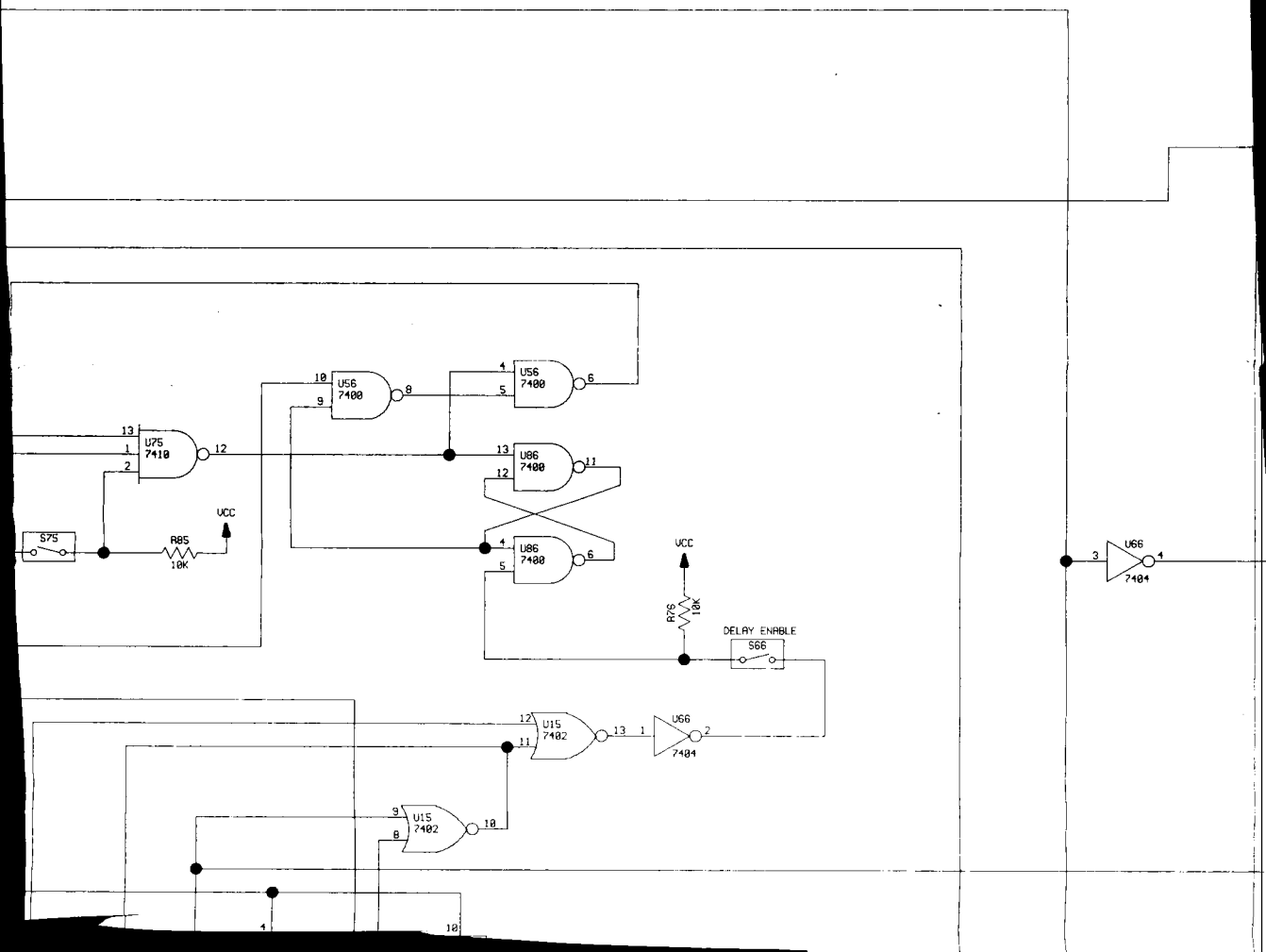
REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
C06	21018-15009	1	CAP FXD ELECT 150UF 75% -10% 16VDCW	0025	NLW 150-16
C16,22,26,42,46,62,66,86	20128-10006	8	CAP FXD CER .1UF 80% -20% 50VDCW	0106	1C20Z5U104Z050B
C75	21528-33003	1	CAP FXD MICA 330PF 5% 500VDCW	0025	CD7CA331J03
CR12,22,32,42,52,62,72,82	32000-04148	8	DIODE SILICON 75V 1A 5%	0041	1N4148
DS01	32000-00103	1	DIODE LIGHT EMITTING RED 50MA	0039	550-0103
DS110,111,112,113,114,115,116 117	32000-02003	8	DIODE LIGHT EMITTING RED WITH RESISTOR 0	0039	547-2003
E1	40401-00356	1	EJECTOR STAMP 53A-356 STYLE B BLUE	0026	40401-00356
E2	40401-10010	1	EJECTOR STAMP RELAY STYLE D BLUE	0026	40401-10010
E3	45050-03276	1	DCL LED 8POS DRW 00000-00515	0026	45050-03276
E4	45050-03236	1	DCL LED 8POS BLK DRW 00000 -00473	0026	45050-03236
F07	42202-52001	1	FUSE SUB-MIN 2AMP	0061	251002
K11,21,31,41,51,61,71,81	83500-20003	8	RELAY 2-A 2-B POLARIZED 130 OHM 5V	0013	S2EB5V
PCB	41530-35600	1	P.C. BOARD VERSION 8707	0026	41530-35600
Q12,22,32,42,52,62,72,82	51100-03646	8	TRANSISTOR NPN HIGH SPEED SWITCH	0074	MPS3646
R12,22,32,42,52,62,72,82	10117-22003	8	220 OHM RES COMP 1-4W 5%	0087	R25J-220-5%
R35	10117-10004	1	1K RES COMP 1-4W 5%	0087	R25J-1K-5%
R75	10117-15005	1	15K RES COMP 1-4W 5%	0087	R25J-15K-5%
R76,85	10117-10005	2	10K RES COMP 1-4W 5%	0087	R25J-10K-5%
R95	10117-33003	1	330 OHM RES COMP 1-4W 5%	0087	R25J-330-5%
R96	10117-33004	1	3.3K RES COMP 1-4W 5%	0087	R25J-3.3K-5%
S66,75	42050-10101	2	SWITCH DIP 1POS SPST	0093	JS-8794-01

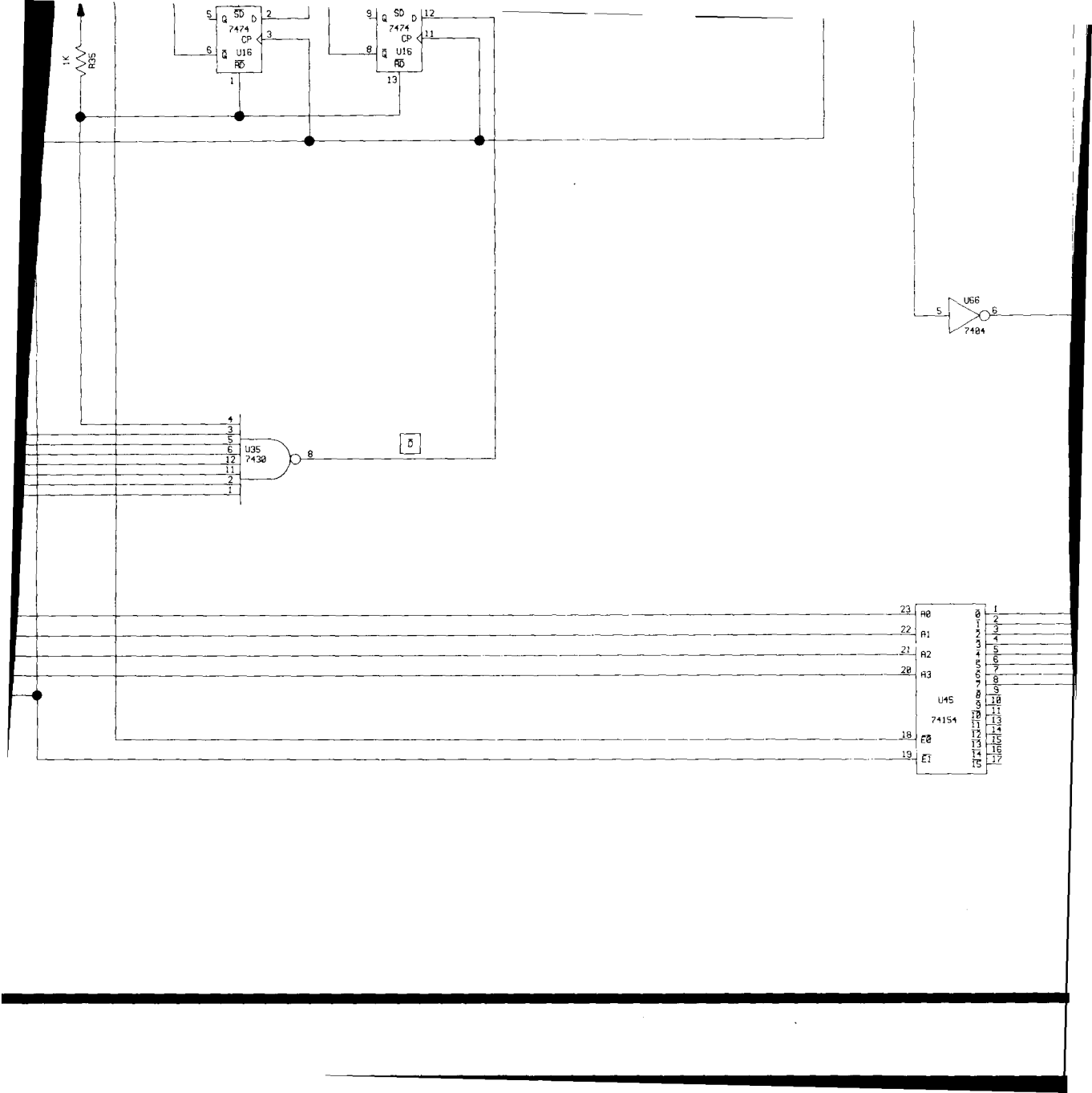
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S77	42050-10010	1	SWITCH 10POS.	0101	C42315-A61-A11
S87	42050-10121	1	SWITCH DIP 1POS DPDT	0048	76SD01S
U13,16,33,53,73	73000-07474	5	IC TTL DUAL D-TYPE EDGE-TRIG FLIP-FLOP	0107	7474
U15	76900-07402	1	IC TTL QUAD 2-INPUT NOR GATE	0107	7402
U25	76600-07420	1	IC TTL DUAL 4-INPUT NAND GATE	0107	7420
U26,96	78402-07414	2	IC TTL LS HEX SCHMITT INVERTING BUFFER	0107	74LS14
U35	76600-07430	1	IC TTL 8-INPUT NAND GATE	0107	7430
U36,66	73300-07404	2	IC TTL HEX INVERTER	0107	7404
U45	79000-09311	1	IC TTL 1-OF-16 DIGITAL DECODER	0107	9311 OR 74154
U46	76601-07438	1	IC TTL QUAD 2-INPUT NAND BUFFER W-OC	0107	7438
U56,76,86	76600-07400	3	IC TTL QUAD 2-INPUT NAND GATE	0107	7400
U75	76600-07410	1	IC TTL TRIPLE 3-INPUT NAND GATE	0107	7410
U85	73308-74020	1	IC HCMOS 14-STG BINARY COUNTER	0107	74HC4020
X01,11	45010-08100	2	SOCKET SIP 8 PIN	0032	CAS-08VSC-12B

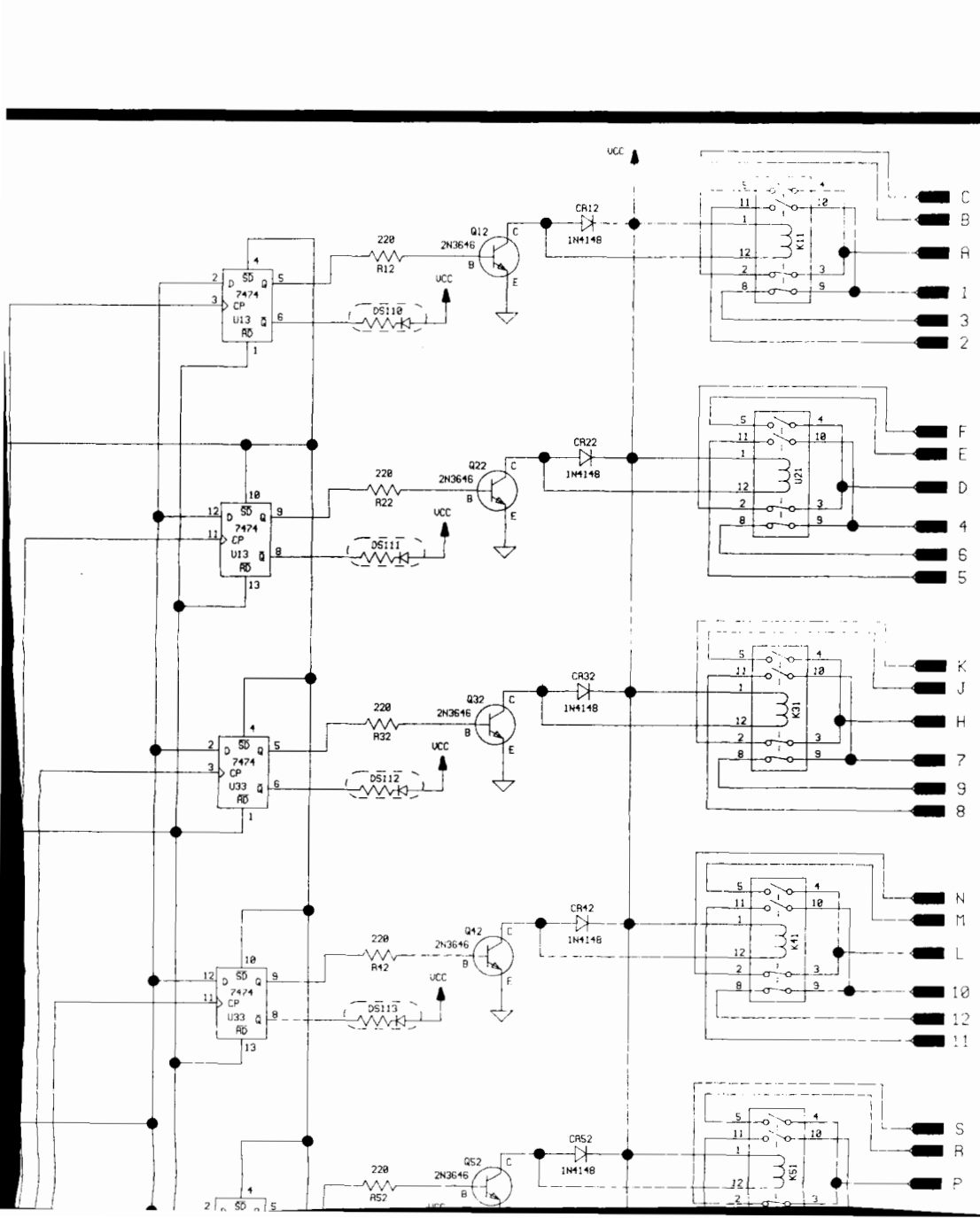

E1
X01
X11
E3
E4
DS110
DS111
DS112
DS113
DS114
DS115
DS116
DS117
DS01
F07
+ C06
C16
K11
CR12
Q12
R12
U13
U15
U16
C26
K21
CR22
Q22
R22
U25
U26
C22
K31
CR32
Q32
R32
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U45
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E2

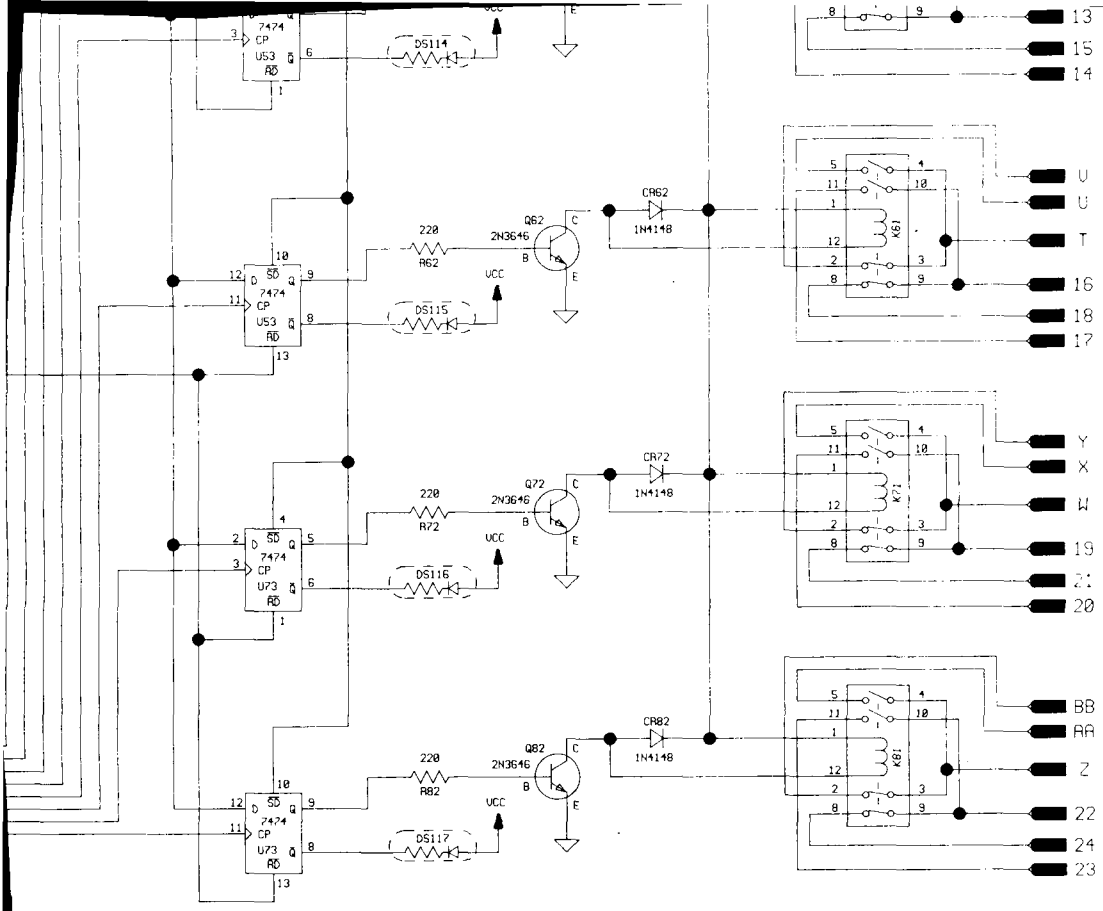

RESTART
23
STOP
3
R
11
S
12
FLAG
24
100KHZ
60
T5
15
C
9
SEL1
66
SEL2
67
SEL3
68
SEL4
69
SEL5
70
SEL6
71
SEL7
72
SEL8
73
SEL9
74
U66
7404
U96
7414
U76
7400
U46
7438
U56
7400
U75
7410
U15
7402
U86
7400
S87
S77
R96
3.3K
R75
15K
C75
330pf
74HC4020
U85
CLK
CLR
VCC
DS81
POWER LED


SEL0
I/O
4
T4
14
T3
13
OB6
37
OB5
35
OB4
33
OB3
31
OB2
29
OB1
27
OB0
25
U36
7404
U26
7414
U76
7400
U96
7414
U15
7402
U25
7420
+5V
GND
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2
85
86
F07
150UF
C06
.1UF
C16,22,26,42,
46,62,66,86
VCC


U56
7400
U56
7400
U75
7410
U86
7400
U86
7400
S75
R85
10K
VCC
VCC
R76
10K
DELAY ENABLE
S66
U15
7402
U66
7404
U15
7402
U66
7404


1K
R35
U16
7474
SD
D
CP
RD
Q
U66
7404
U35
7430
U45
74154
A0
A1
A2
A3
E0
E1


VCC
Q12
2N3646
220
R12
CR12
1N4148
DS110
U13
7474
K11
C
B
A
1
3
2
Q22
2N3646
220
R22
CR22
1N4148
DS111
U21
F
E
D
4
6
5
Q32
2N3646
220
R32
CR32
1N4148
DS112
U33
K31
K
J
H
7
9
8
Q42
2N3646
220
R42
CR42
1N4148
DS113
K41
N
M
L
10
12
11
Q52
2N3646
220
R52
CR52
1N4148
K51
S
R
P



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REVISION LEVEL	ECO #
8707-01-A	ISSUED
8707-01-A-1	608

COLORADO DATA SYSTEMS

PART NO.: 53A-356

DESCRIPTION: RELAY SWITCH CARD

P.C.B. NUMBER: 41530-35600

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