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53A-334 REED RELAY SCANNER CARD

OPERATING MANUAL

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53A-334 REED RELAY SCANNER CARD

OPERATING MANUAL

DESCRIPTION 1

CONTROLS AND INDICATORS
- Address Select Switch 2
- Power LED 2
- Fuses 2
- Function LEDs and Switches 2

SPECIFICATIONS 6

OPERATION
- Overview 9
- Card Commands 9

INSTALLATION 11

APPENDIX A
- 53B/53A/63A SYSTEM COMMANDS 12

APPENDIX B
- PIN ASSIGNMENTS FOR THE FRONT-EDGE CONNECTOR 13

APPENDIX C
- HIGH VOLTAGE SWITCHING WITH THE 53A-334 14

53A-334 REED RELAY SCANNER CARD

DESCRIPTION

The 53A-334 Reed Relay Scanner Card is a printed circuit board assembly for use in a CDS 53/63 Series Systems. The 53A-334 Card provides 32 1-wire channels of analog-signal acquisition at a maximum switching rate of 350 channels per second. Up to ten 53A-334 Cards can be plugged into one 53 Series Card Cage to allow scanning of up to 320 channels. The 63 Series Card Cage can accommodate up to five 53A-334 Cards which allows scanning of up to 160 channels. As many as ten 53/63 Series Card Cages can be configured together to provide either a 53 Series System with up to 3,200 1-wire channels, or a 63 Series System with up to 1,600 channels. The 53A-334 Card may be mixed with other 53/63 Series System scanner cards (53A-33X Series) in the same card cage.

A channel may be selected (closed) randomly by transmitting ASCII characters from the system controller to the 53/63 Series System. The on-board diagnostic features include 14 indicator LEDs and channel status readback. During channel status readback, the 53A-334 Card returns a 2-digit decimal number to the system controller indicating the number of the closed channel. The readback feature uses a third pole on each relay to provide a complete on-board self-test capability which includes testing the relay coil. If more than one relay is closed simultaneously, an error code is generated.

CONTROLS AND INDICATORS

Address Select Switch

The 53A-334 Card has a miniature 10-position switch that selects the 53A-334 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 the action which the system is currently taking. Whenever the 53A-334 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-334 Card is unaddressed, but that all required dc power (5 V dc) is being supplied.

Fuses

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

Function LEDs and Switches

Channel LEDs

The column of 14 LEDs near the front-edge connector indicate the specific scanner channel closed. If the closed channel is between 0 and 9, the 0X LED and one of the LEDs marked 0 through 9 is lit; if the closed channel is between 10 and 19, the 1X LED and one of the LEDs marked 0 through 9 is lit. For a channel between 20 and 29, the 2X LED and one of the 0 through 9 LEDs is lit. For channel 30 and 31, the 3X LED and either the 0 or 1 LEDs are lit. Any other combination of lit LEDs indicates an error.

Halt Switch

This 2-position slide switch is located near the top center of the 53A-334 Card. It selects the state of the 53A-334 Card after an @XH (Halt) or STOP command is received by the 53/63 Series System.

a. If the Halt switch is in the ON position, then the 53A-334 Card is reset to its power up state, all parameters are reset to their default values, and the Power LED is it.

b. If the Halt switch is in the OFF position, then the card becomes unaddressed, the Power LED is lit, and any command being output by the system controller is aborted. Any data capturing in progress stops. The data already in storage and the capture specifications remain unaffected.

Analog Bus Switches

These three 1-section rocker switches are located near the bottom center of the 53A-334 Card. These switches connect the common output lines of the scanner (Common High and GND or Ext Ref) to the analog backplane bus of the 53/63 Series Card Cage (Backplane High and Backplane Low).

Switch Positions:

Backplane	HI/LO	Reference	Connections
C1	C1	X	The scanned channel input line is connected to COMMON HI. The ANALOG BUS is not connected to the scanner channels.
C1	C2	C1	The scanned channel input line is not connected to any front edge or backplane pins. GND is connected to COMMON HI. The backplane is not connected to the scanner channels.
C1	C2	C2	The scanned channel input line is not connected to any front edge or backplane pins. EXT REF is connected to COMMON HI. The backplane is not connected to the scanner channels.
C2	C1	C1	The scanned channel input line is connected to both backplane H and to COMMON HI. GND is connected to backplane L.
C2	C1	C2	The scanned channel input line is connected to both backplane H and to COMMON HI. REF is connected to backplane L.
C2	C2	C1	The scanned channel input line is connected to backplane L. GND is connected to both backplane L and to COMMON HI.
C2	C2	C2	The scanned channel input line is connected to backplane L. EXT REF is connected to both backplane L and to COMMON HI.

where:

X	The connection is valid regardless of the switch position.
Backplane H	Backplane pin 45, ANALOG BUS H.
Backplane L	Backplane pin 42, ANALOG BUS L.
GND	Front edge pins 23, 24, AA and BB.
EXT REF	Front edge pins 21, 22, Y and Z.
COMMON HI	Front edge pins 18, V.

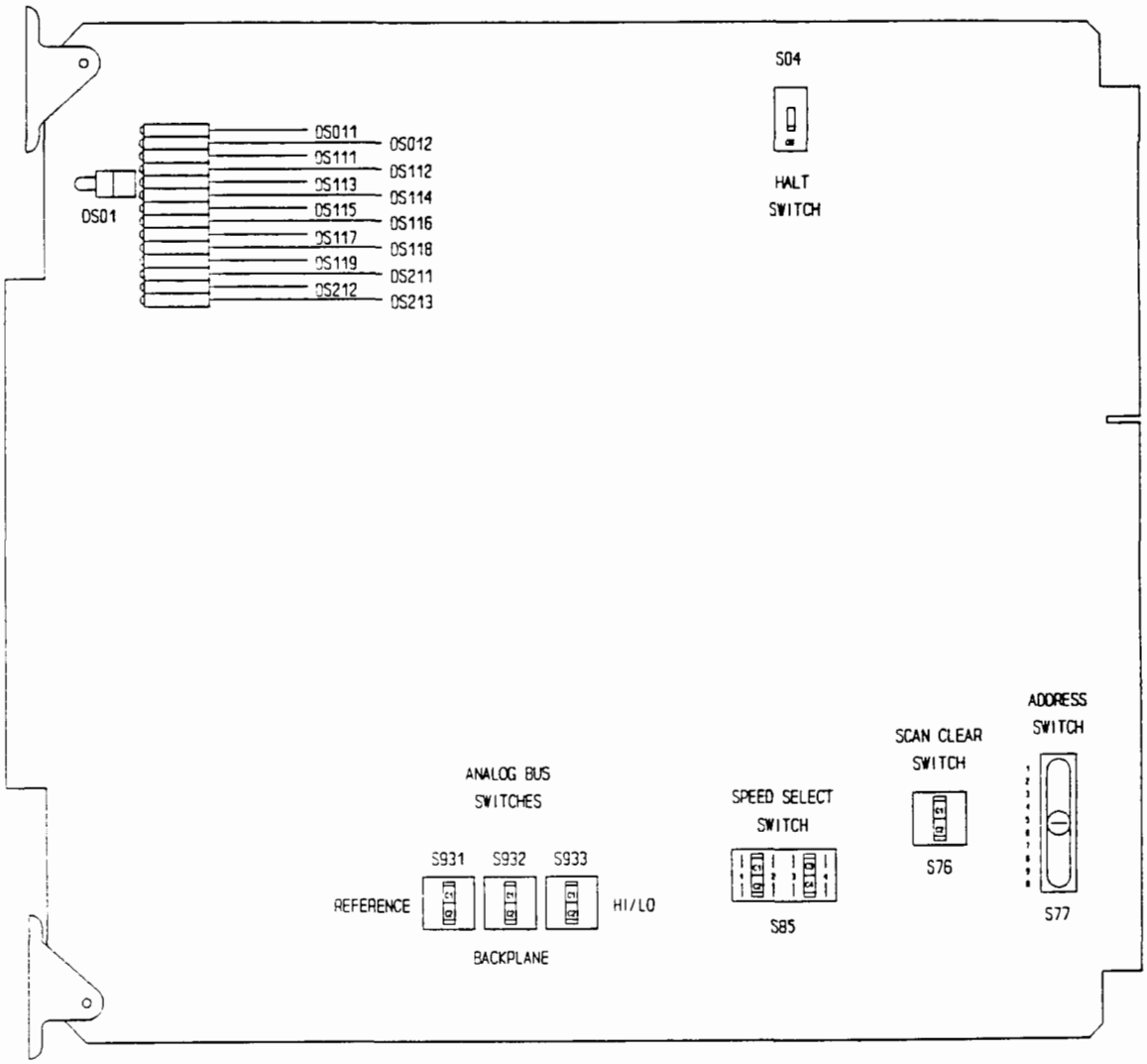


Figure 334-1: 53A-334 Card Switch Locations

Scan Clear Switch

At the back of the 53A-334 Card (see Figure 334-1) is a 1-section rocker switch, the Scan Clear switch, that determines if the card is to open all its channels when a channel is closed on another 53/63 Series System scanner card.

Rocker Position	Results
C1	A closed channel on this 53A-334 Card is opened when a channel is closed on another 53/63 Series System scanner card. Closing a channel on this card sends a scan clear pulse to all other scanner cards.
C2	Closing channels on other scanner cards has no effect on this 53A-334 Card. When a channel is closed on this card, a scan clear pulse is not sent to other scanner cards.

Speed Select Switch

At the back of the 53A-334 Card is a 2-position rocker switch, the Select switch (see Figure 334-1). This switch selects the switching rate for this card: 150 channels per second (cps) or 350 cps. It also determines if the scanner-card's slow/fast status is sent to the slow/fast line on the 53/63 System Backplane and to the front edge of the 53A-334 Card.

The purpose of the slow/fast line is to slow down operation of the card when used in a system with slower scanners, thus preventing the card from closing a relay before a relay on another slower card has opened. (To locate the slow/fast line on the Backplane and on the front edge connector, refer to Appendix B and to the Service Manual schematic.)

Rocker Position	Results
C1, C3	If the previous channel closed is on this or another high- speed scanner card, then closing a channel on this 53A-334 Card occurs immediately. Otherwise channels switch at 150 cps. Other high-speed cards will receive status from this 53A-334 Card. NOTE: The Scan Clear Switch must be in the C1 position.
C2, C3	If the previous channel closed was on this 53A-334 Card, then closing a channel on this card occurs immediately. Otherwise channels switch at 150 cps. Other high-speed cards will not receive slow/fast status from this card. *NOTE:* The Scan Clear switch may be in either C1 or C2 position.
C1, C4	Channels switch at 150 cps. Other high-speed cards will receive slow status from this card. *NOTE:* The Scan Clear switch must be in the C1 position.
C2, C4	Channels on this card will switch at 150 cps. Other high- speed cards will not receive fast or slow status from this card. *NOTE:* The Scan Clear switch may be in either C1 or C2 position.

NOTE: For most applications, the Speed Select switch should be set to position C1, C3, and the Scan Clear switch must be in the C1 position.

SPECIFICATIONS

Channel Configuration:	32 channels, single line, one signal path closed at any time.
Signal Path Low Input:	Switch selectable between 53A-334 Signal Ground and user supplied common external reference.
Relay Configuration:	16 dry-reed relays, 3-pole, form A. 2 additional dry-reed, 3-pole, form A relays to select between poles 1 and 2 of the first 16 relays. The third pole of all relays is used for read-back and self-testing.
Relay Manufacturer:	Coto model 3600-0031 or equivalent.
Contacts:	
Power:	10 W, maximum resistive.
Voltage:	200 V dc (see Appendix C). 40 V Peak ac.
Current:	0.5 A, maximum switching.
Resistance:	Initial - less than 100 milliohms. End of reed life - less than 1 ohm.
Reed Life:	At least 10^7 operations/channel at a rated load of 10 W.
Duty:	Continuous.
Dielectric Strength:	250V (between contacts).
Scanning Rate:	Random channels selected at up to 350 channels per second.

Signal Path Specifications

NOTE: These specifications include the effects of the card cage backplane; they are valid at the analog output connector on the backplane:

Single-Line Thermal Offset:	Less than 75 μV.
Initial Signal Path Resistance:	Less than 600 milliohms.
Final Signal Path Resistance: (end of reed life)	Less than 1.4 ohms.
Insulation Resistance:	Greater than 10 gigaohms between all insulated parts.

Crosstalk Between Channels:	1 kHz - less than -90 dB. 10 kHz - less than -80 dB. 100 kHz - less than -52 dB. 1 MHz - less than -37 dB. Crosstalk measurements are made at the common output with a closed channel terminated by 600 ohms; signal is applied to channels not selected.
Encode Pulse:	Issued 2.0 ms (5 ms in low speed mode) after the card is programmed to close a channel; this allows for relay settling time. The rising edge of the encode pulse typically triggers an external instrument such as a digital voltmeter.
Type Output:	TTL level, negative-going pulse, 500 mA sink capability.
Pulse Width:	500 µs, nominal.
Power-Up:	On power-up, the 53A-334 Card is unaddressed (power LED lit), and all channels are open (channel LEDs out).
Power-Down:	On power-down, the 53A-334 Card has all channels open (channel LEDs out).
Power Requirements:	5-volt dc power is provided by a 53 or 63 Series Card Cage.
Voltage (5-volt Supply):	4.75 V dc to 5.25 V dc.
Current (5-volt Supply):	0.80 A maximum quiescent. 0.85 A peak.
Cooling:	Provided by the fan in the 53/63 Series 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, 220 mm deep, 13 mm wide. (7.5 in x 8.66 in x 0.5 in).
Dimensions, Shipping:	254 mm x 254 mm x 127 mm. (10 in x 10 in x 5 in).
Weight:	0.23 kg. (0.5 lbs).

Weight, Shipping:	0.64 kg. (1.4 lbs).
Mounting Position:	Any orientation.
Mounting Location:	Installs in any function card slot of a 53 or 63 Series Card Cage.
Input Connection:	A 48-pin card-edge hooded connector connects to all front-edge input and output signals. The 53A-749 Analog Cable connects to all analog signal inputs and outputs.
Output Connection:	The analog output is accessed through either the 48-pin front-edge connector of the 53A-334 Card or the analog output connector on the 53/63 Series Card Cage backplane.
Required Equipment (not supplied):	53A-780 Hooded Connector or the 53A-749 Analog Cable.
Equipment Supplied:	1 - 53A-334 Reed Relay Scanner Card. 1 - Spare fuse (Part# 42202-52001). 1 - Operating manual (Part# 00000-13340). 1 - Service manual (Part# 00000-23340).

OPERATION

Overview

The 53A-334 Reed Relay Scanner Card is programmed by ASCII character commands sent from the system controller to the 53/63 Series System communications card. The 53A-334 Card interfaces with the communications card through the 53/63 Series Card Cage backplane.

When a command is issued to close a channel on this 53A-334 Card, all channels on all system scanner cards are automatically opened. This feature prevents accidentally connecting more than one set of scanner input lines to common output lines. Once a channel is closed, it stays closed until another channel is closed, or until an R (Reset) command is received. On each scanner card, only one channel may be closed at a time. If the user does not want all channels to automatically open when a channel on another scanner card is closed, then the Scan Clear switch, defined in the Description section, should be set to position C2.

To address the 53A-334 Card for the first time, the system command @XY must be sent. X is the mainframe address (0-9); Y is the function card address (0-9) within that mainframe. Once the 53A-334 Card is addressed, it stays addressed until the system receives a new @ command. Appendix A fully discusses the @XY command and the other 53/63 Series System commands. After the 53A-334 Card is addressed, the commands listed below may be issued until another function card is addressed.

Card Commands

Command	Action
Z1Z2	The Z1Z2 command connects the input line of a channel to the common output line. Z1Z2 represents the channel number (00-31) to be closed. When closing channels 00 to 09, the 0 characters may be optionally replaced by ASCII space characters. Examples: 1) The command @0205 opens any closed channel and then closes channel 5 of the scanner card at function-card address 2, mainframe address 0. Status: Power LED is out. Channel LEDs 0X and 5 are lit; all others are out. 2) The command @3429 opens any closed channel and then closes channel 29 of the scanner card at function-card address 4, mainframe address 3.

Status:
Power LED is out.
Channel LEDs 2X and 9 are lit; all others are out.

R

The R command resets (opens) all channels of a given scanner card.

Example:
The command @02R opens all channels on the 53A-334 Card at function card address 2, mainframe address 0.

Status:
Power LED is out.
Channel LEDs are out.

Readback Feature

The readback feature of the 53A-334 Card lets the user query the card to determine which channel, if any, is closed. When the 53A-334 Card is addressed (power LED out) and the system controller requests input from the 53/63 Series System, the card returns a 2-digit number followed by <CR><LF>. The number returned corresponds to the closed channel (00-31). If no channels are closed, then 40 is returned. If the card malfunctions (multiple relays closed), then 50 is returned. The readback feature uses a third pole on each relay to detect a closed channel in order to verify proper operation of both the drive circuitry and the relay coil.

INSTALLATION

The 53A-334 Card is a function card and, therefore, may be plugged into any blue card slot of a 53 or 63 Series Card Cage. 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-334" is at the top for a 53 Series Chassis and to the left for a 63 Series Chassis.

CAUTION:

The 53A-334 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

53B/53A/63A SYSTEM COMMANDS

Command	Description
@XY	The @XY (Address) command addresses a function card in the 53/63 Series System. @ is an addressing delimiter used by the 53/63 Series System. X is a mainframe address (0-9) defined by the address-select switch on the 53A-171 Control Card in the addressed mainframe. Y is a function-card address (0-9) defined by the address-select switch on the function card. Once a mainframe/function-card combination is addressed, it remains addressed until the 53/63 Series System detects a new @ character.
@XS	The @XS (Status) command provides the interrupt status of all function cards within the mainframe defined by X. The interrupt status of all function cards in the addressed mainframe is latched into the 53A-171 Control Card when the @XS command is issued. All function cards in all mainframes become unaddressed after the @XS command is issued. The 53A-334 Card does not have an interrupt mode and will never generate an interrupt status. The 53A-171 Control Card Operating Manual describes the @XS command in detail.
@XH	The @XH (Halt) command halts all function cards within the mainframe defined by X. This command does not affect function cards in other mainframes. How a function card reacts to the @XH command depends on the particular card. The 53A-334 Card returns to its power-up state when it is issued an @XH command. In all cases, an addressed function card (Power LED out) becomes unaddressed (Power LED lit).
STOP	The STOP command is not a string of ASCII characters. This command is hard-wired from the system controller to the 53/63 Series communications card in each mainframe. When the system controller issues a STOP command, each function card (including the 53A-334 Card) reacts as if it had 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 Card, a STOP command is executed whenever the system controller asserts the IEEE-488 bus line IFC (Interface Clear) true.

APPENDIX B

PIN ASSIGNMENTS FOR THE FRONT-EDGE CONNECTOR

Pin No.	Channel
A	16
B	17
C	18
D	19
E	20
F	21
H	22
J	23
K	24
L	25
M	26
N	27
P	28
R	29
S	30
T	31
V	COMMON HIGH
W	ENCODE
Y	EXT REF
Z	EXT REF
AA	GROUND
BB	GROUND
1	0
2	1
3	2
4	3
5	4
6	5
7	6
8	7
9	8
10	9
11	10
12	11
13	12
14	13
15	14
16	15
18	COMMON HIGH
19	SLOW/FAST
21	EXT REF
22	EXT REF
23	GROUND
24	GROUND

APPENDIX C

HIGH VOLTAGE SWITCHING WITH THE 53A-334

Because a scanning system has multiple sources that can be switched to a common bus, with each source having system-dependent amounts of capacitance, several considerations besides the 200V rating of the relay contact affect the level of voltage that can actually be switched. It is highly recommended the C3/C4 section of the Speed Select switch be set to C4 for voltages over 100V dc.

The first, and most serious, problem is caused by high voltage switching into a capacitive bus. The severity of the problem depends on current and heat limitations of the relay. The contacts on the 53A-334 are rated at 10W and 0.5 amp. Even though the currents appear to be very low in a high impedance measurement application, the bus capacitance causes extremely large inrush currents which may be enough to seriously damage or degrade the reliability of the relay contacts.

It is not easy to determine analytically the amount of voltage and capacitance that will cause enough inrush current to degrade the contacts. Tek/CDS has found the following approximation to work, though:

> The voltage times the capacitance should not exceed 10^{-8} volt-farads for a 10W contact.

(40V into a 250 pF bus, for example.) If this value is exceeded, the 53A-336 (which has a contact rating of 150W) may be used, or resistors may be placed between the scanner card common and the bus. On the 53A-334, if the backplane analog bus is used, the resistor may be installed in place of a switch on the board. If the front connector is used for a scanning bus, the resistor may be installed after cutting a current trace (consult the factory). A resistor of 20 to 200 Ohms is typically used, depending on how much series resistance can be tolerated in the application. Consult the factory for installation or resistor selection assistance.

The second problem is that the previous switched voltage may still be present on the common bus (due to the bus capacitance). A situation could occur where the previous voltage is -200V (DC or instantaneous AC) and the new voltage is +200V, placing 400V across the relay contact and exceeding the 200V rating. This problem may be relieved by placing discharge resistors on the bus. A typical discharge resistance might be 1 megohm and can typically be attached within the hood of the mating connector between the bus line and analog ground.

The selection of this resistor needs to take into consideration the required measurement impedance of the application and whether the time constant of the resistance with the bus capacitance is sufficient to discharge the voltage to the required level within the switching time of the scanning card. The bus capacitance depends on the amount of cabling. The typical capacitance of a Tek/CDS 53A-715 Cable, for example, is 15 pF per foot. The minimum time between release of one voltage and contact closure for the next voltage on a 53A-334 with the C3/C4 section of the Speed Select switch set to C4 is 3.0 msec. (See below for an example analysis.)

The scanning time can be lengthened by switching in an unused scanning channel between the two switched voltages. A time delay in the program will have no effect. Tek/CDS scanning modules automatically release the previous relay a fixed time prior to the closing of a new channel to automatically preclude two scanner sources being shorted.

The third consideration is the maximum contact breakdown of 250V DC or 1000V RMS. In DC applications particularly, the maximum difference between any two DC sources is, as a result, limited to 250V DC.

Example:

Input voltage on 2 successive 53A-334 channels	= 165V DC first channel; -165V DC second channel
Backplane analog bus capacitance	= 2000 pF
Backplane analog bus impedance	= 1 megohm
Residual voltage after 3.0 ms	= VR

$$VR = V \times e^{-(t/RC)}$$
$$= 165 \times e^{-(.003 / 1 \times 10^{8} \times 2000 \times 10^{-12})}$$
$$= 37.0$$

For this example, the next channel to be closed is at -165V. Therefore, the voltage across the relay contacts could be 37 - (-165), or 202V. Since 202V is more than 200V (the switching voltage of the 53A-334 Card), an unused channel should be closed between the closure of these two channels.

SERVICE MANUAL

53A-334

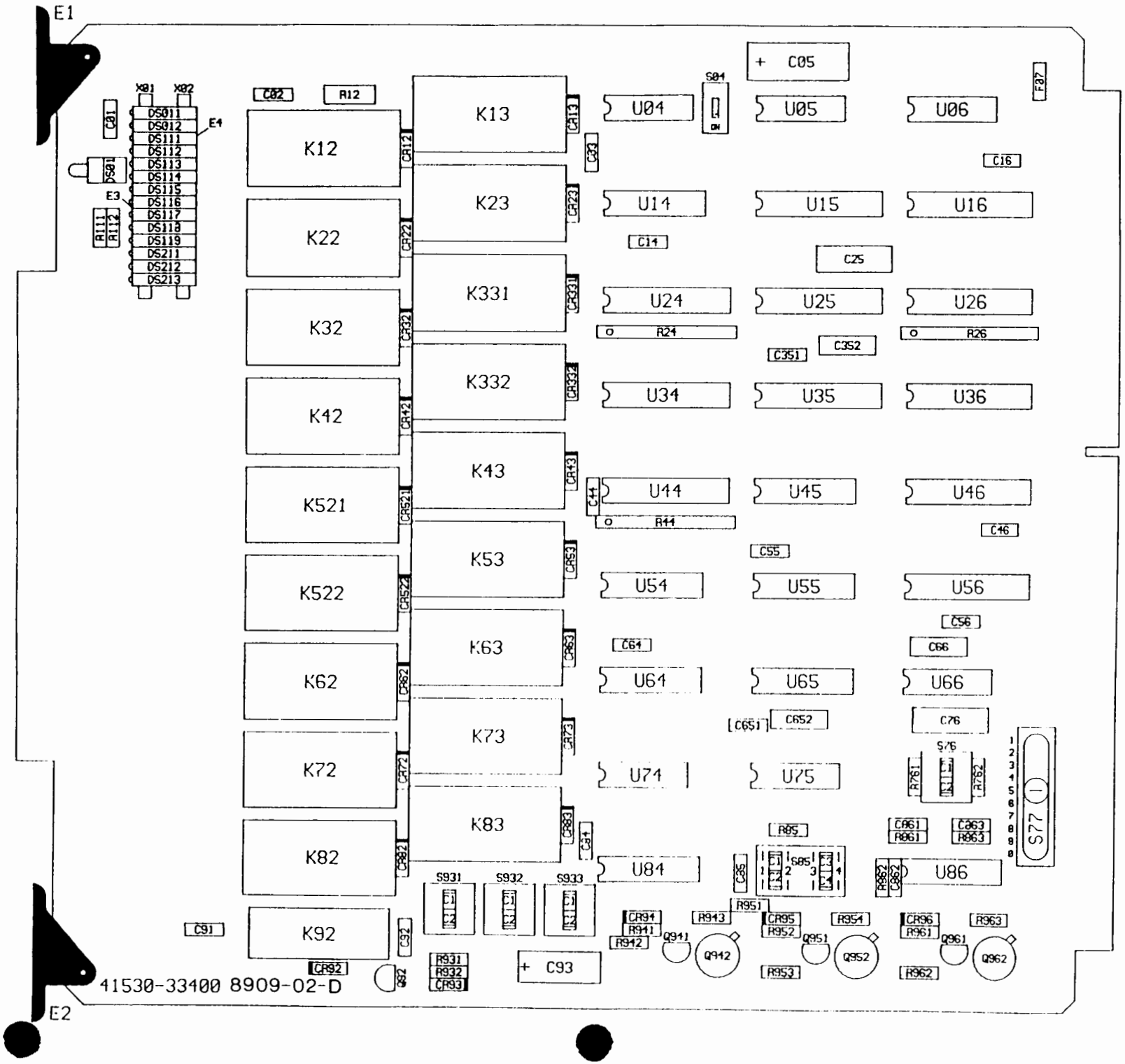
REED RELAY SCANNER WITH READBK SINGLE WIRE

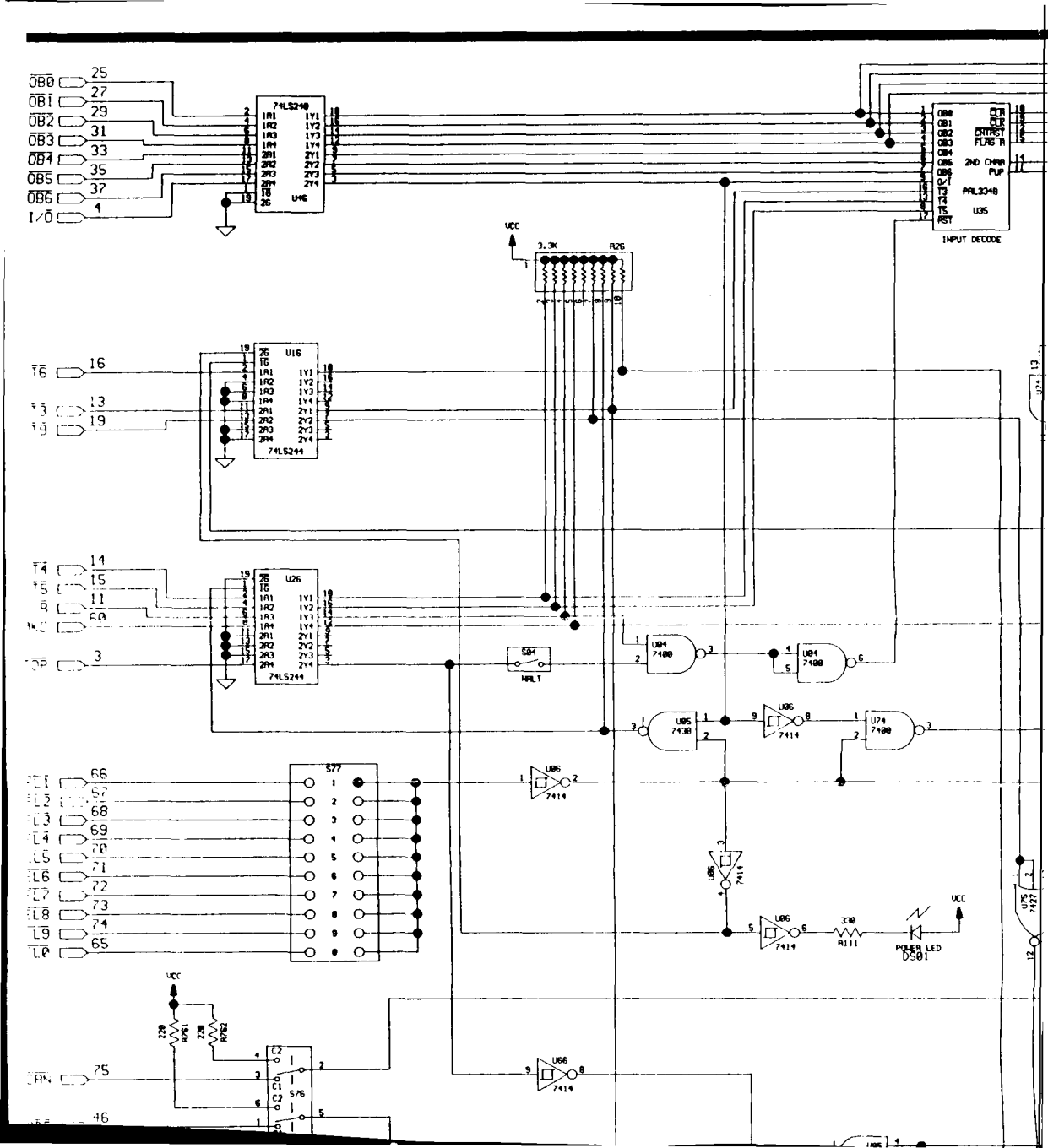
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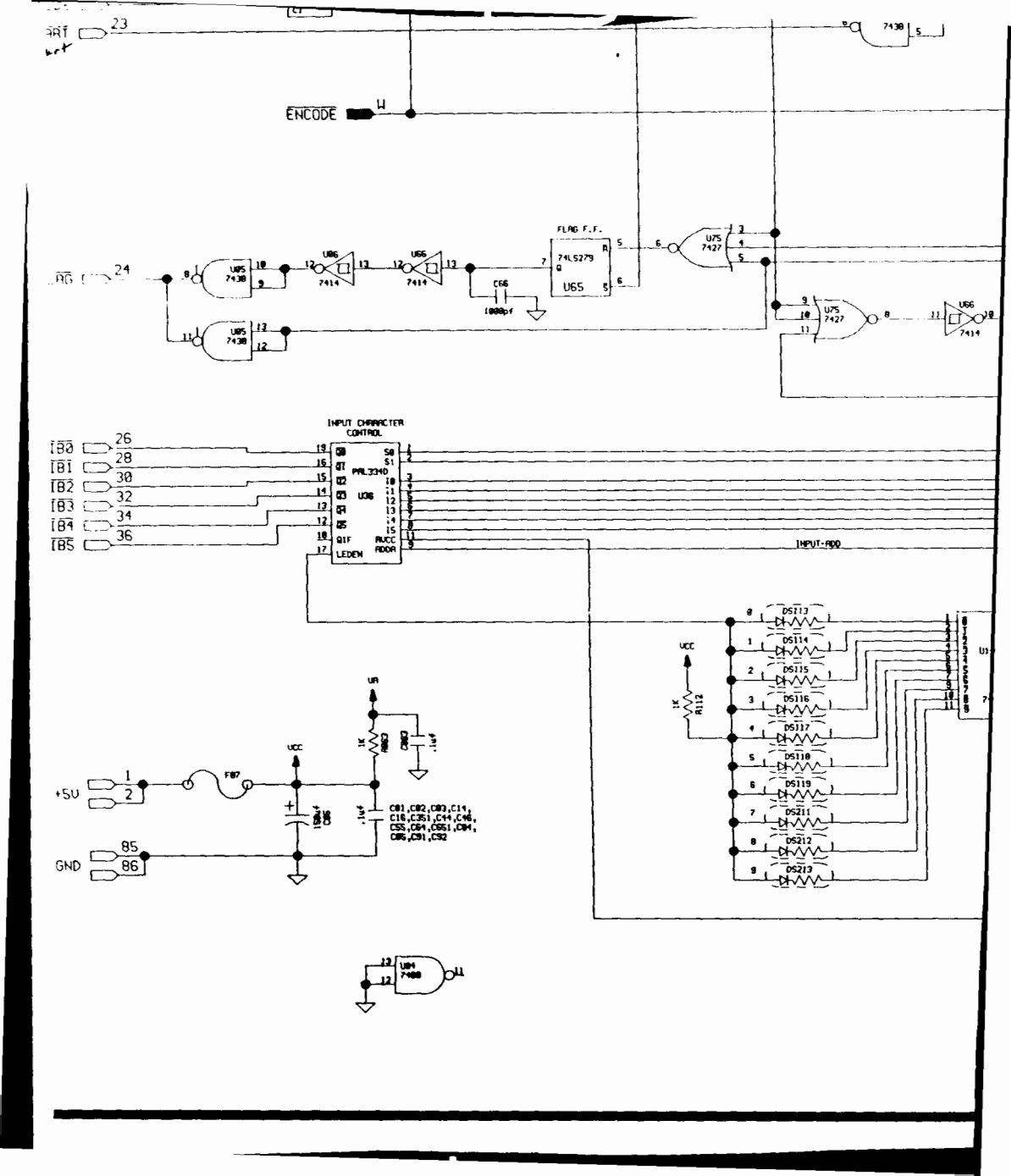
REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
C01,02,03,14,16,351,44,46,55,64 651,84,85,863,91,92	20128-10006	16	CAP FXD CER .1UF 20% 50VDCW	0058	C322C104M5U5CA
C05	21018-15009	1	CAP FXD ELECT 150UF 75% -10% 16VDCW	0025	NLW150-16
C25,76	21528-20004	2	CAP FXD MICA 2000PF 5% 500VDCW	0012	DM-19-202J
C352,66	21528-10004	2	CAP FXD MICA 1000PF 5% 100VDCW	0012	DM-15-102J
C56,862	20128-47006	2	CAP FXD CER .47UF 20% 50VDCW	0075	RPE123Z5U474M50V
C652	21528-50003	1	CAP FXD MICA 500PF 5% 500VDCW	0012	DM15-501J-500VDCW
C861	20128-47005	1	CAP FXD CER .047UF 10% STABLE 100VDCW	0058	CK06BX473K
C93	21018-30008	1	CAP FXD ELECT 30UF 75% -10% 16VDCW	0025	NLW30-16
CR12,13,22,23,32,331,332,42,43 521,522,53,62,63,72,73,82,83,92 93,94,95,96	32000-04148	23	DIODE SILICON 75V 1A 5%	0078	1N4148
DS01	32000-00103	1	DIODE LIGHT EMITTING RED 50MA	0039	550-0406
DS011,012,111,112,113,114,115 116,117,118,119,211,212,213	32000-02003	14	DIODE LIGHT EMITTING RED WITH RESISTOR 0	0039	547-2003
E1	40401-00334	1	STAMP 53A-334 STYLE B BLUE	0026	40401-00334
E2	40401-10015	1	STAMP SCANNER STYLE D BLUE	0026	40401-10015
E3	45050-03306	1	DCL LED 14POS DRW 00000-00650	0026	45050-03306
E4	45050-03257	1	DCL LED 14POS BLK DRW 00000--00499 3-81	0026	45050-03257
F07	42202-52001	1	FUSE SUB-MIN 2AMP	0061	251002
K12,13,22,23,32,331,332,42,43 521,522,53,62,63,72,73,82,83	83000-00092	18	RELAY REED 3PST 350 OHMS 5V	0138	3600-0031
K92	83000-20006	1	RELAY REED SPDT 500OHMS 3.8V	0111	220-001-5M

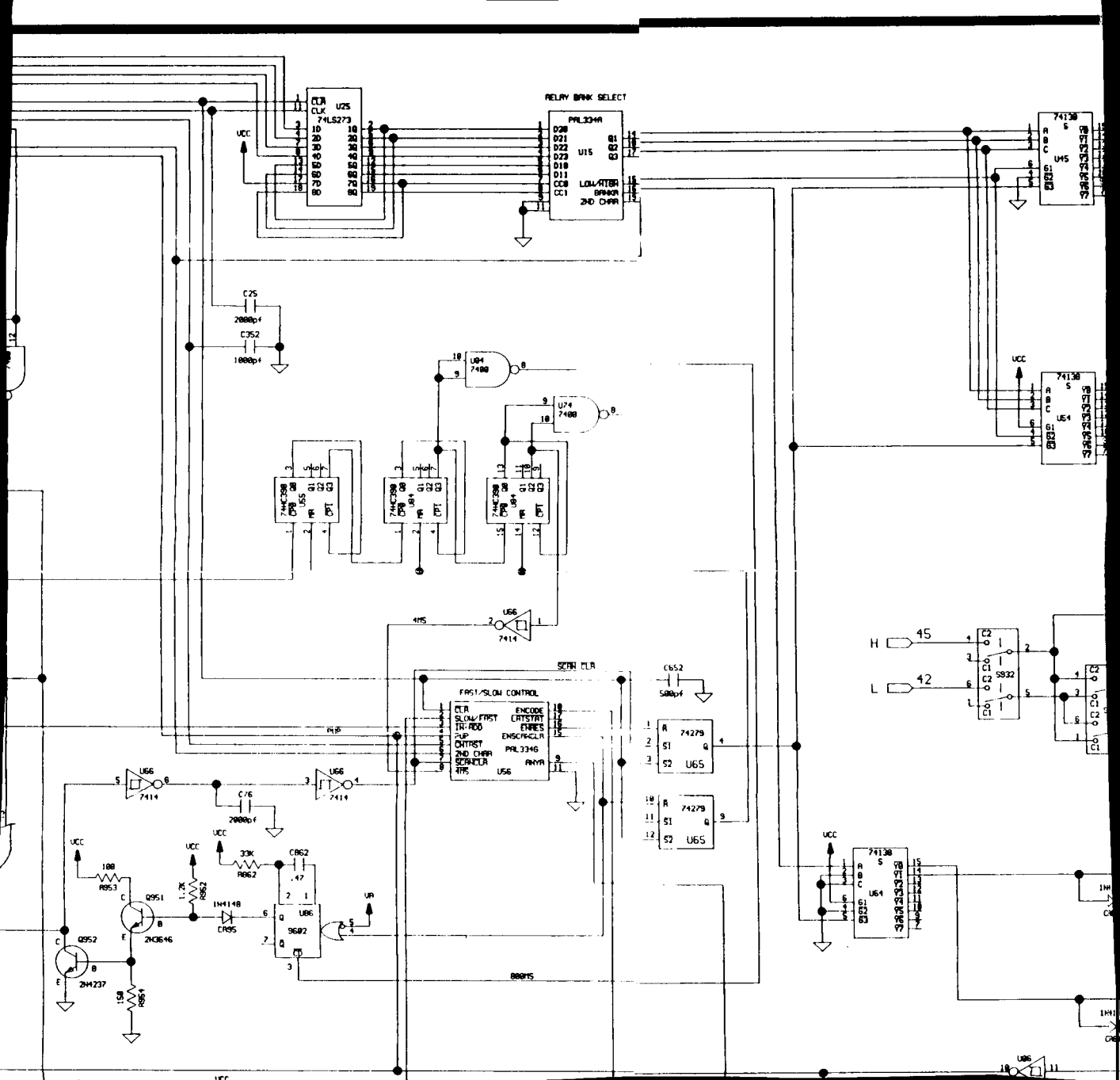
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PCB	41530-33400	1	P.C. BOARD VERSION 4L 8909	0498	41530-33400
Q92,941,951,961	51100-03646	4	TRANSISTOR NPN HIGH SPEED SWITCH	0074	MPS3646
Q942,952,962	51100-04237	3	TRANSISTOR NPN SWITCH	0074	2N4237
R111	10117-33003	1	330 OHM RES COMP 1-4W 5%	0087	R25J-330-5%
R112,85,863,951	10117-10004	4	1K RES COMP 1-4W 5%	0087	R25J-1K-5%
R12	14054-51102	1	51.1 OHM RES FILM 1-2W 1% 100PPM	0035	RN60D51R1F
R24,26,44	12008-33004	3	3.3K RES NETWORK SIP 5% 1.5W 9-PKG	0027	750-101-R3.3K
R761,762	10117-22003	2	220 OHM RES COMP 1-4W 5%	0087	R25J-220-5%
R861,862	10117-33005	2	33K RES COMP 1-4W 5%	0087	R25J-33K-5%
R931	10117-20004	1	2K RES COMP 1-4W 5%	0087	R25J-2K-5%
R932	14024-40203	1	402 OHM RES FILM 1-4W 1% 100PPM	0035	RN55D4020F
R941,952,961	10117-12004	3	1.2K RES COMP 1-4W 5%	0087	R25J-1.2K-5%
R942,953,962	10117-10003	3	100 OHM RES COMP1-4W 5%	0087	R25J-100-5%
R943,954,963	10117-15003	3	150 OHM RES COMP 1-4W 5%	0087	R25J-150-5%
S04	42050-10101	1	SWITCH DIP 1POS SPST	0093	JS-8794-01
S76,931,932,933	42050-10121	4	SWITCH DIP 1POS DPDT	0048	76SD01S
S77	42050-10010	1	SWITCH 10POS.	0101	C42315-A61-A11
S85	42050-10122	1	SWITCH DIP 2POS DPDT	0048	76SD02S
U04,74	76600-07400	2	IC TTL QUAD 2-INPUT NAND GATE	0107	7400
U05	76601-07438	1	IC TTL QUAD 2-INPUT NAND BUFFER W-OC	0107	7438
U06,66	78401-07414	2	IC TTL HEX SCHMITT INVERTING BUFFER	0107	7414
U14	79000-07442	1	IC TTL BCD-TO-DECIMAL DECODER	0107	7442
U15	79814-00110	1	PAL PROGRAMMED 16L8L REV A 53A-334	0026	79814-00110

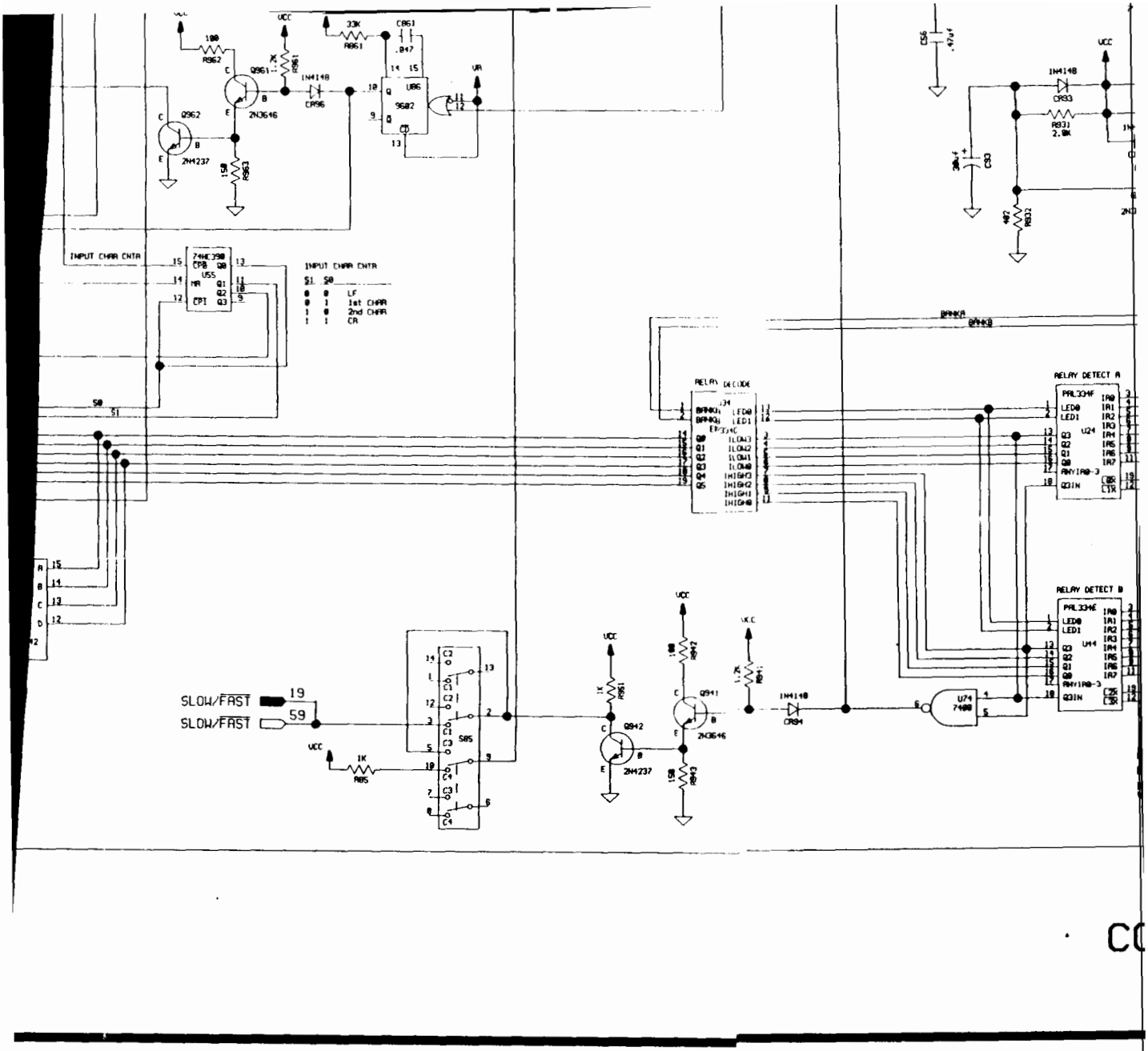
REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
U16,26	73310-74244	2	IC TTL LS OCTAL BUFFER NON-INVERTING	0107	74LS244N
U24	79814-00115	1	PAL PROGRAMMED 16L8L REV A 53A-334	0026	79814-00115
U25	73001-74273	1	IC TTL LS OCTAL D-TYPE FLIP-FLOP	0107	74LS273
U34	79814-00112	1	PAL PROGRAMMED EP310-2 REV A 53A-334	0026	79814-00112
U35	79814-00111	1	PAL PROGRAMMED 16L8L REV B 53A-334	0026	79814-00111
U36	79814-00113	1	PAL PROGRAMMED 16L8L REV A 53A-334	0026	79814-00113
U44	79814-00114	1	PAL PROGRAMMED 16L8L REV A 53A-334	0026	79814-00114
U45,54,64	79002-74138	3	IC TTL S 3-TO-8 LINE DECODER-MULTIPLEXER	0107	74S138
U46	73310-74240	1	IC TTL LS OCTAL BUFFER	0107	74LS240
U55,84	71208-74390	2	IC HCMOS DUAL 4-BIT DECADE COUNTER	0107	74HC390
U56	79814-00116	1	PAL PROGRAMMED 16L8L REV C 53A-334	0026	79814-00116
U65	73200-74279	1	IC TTL QUAD R-S LATCH	0107	74279
U75	76900-07427	1	IC TTL TRIPLE 3-INPUT NOR GATE	0107	7427
U86	74200-09602	1	IC TTL DUAL RETRIGGERABLE MONOSTABLE	0078	9602
X01,02	45010-16100	2	SOCKET SIP 16 PIN	0026	45010-16100

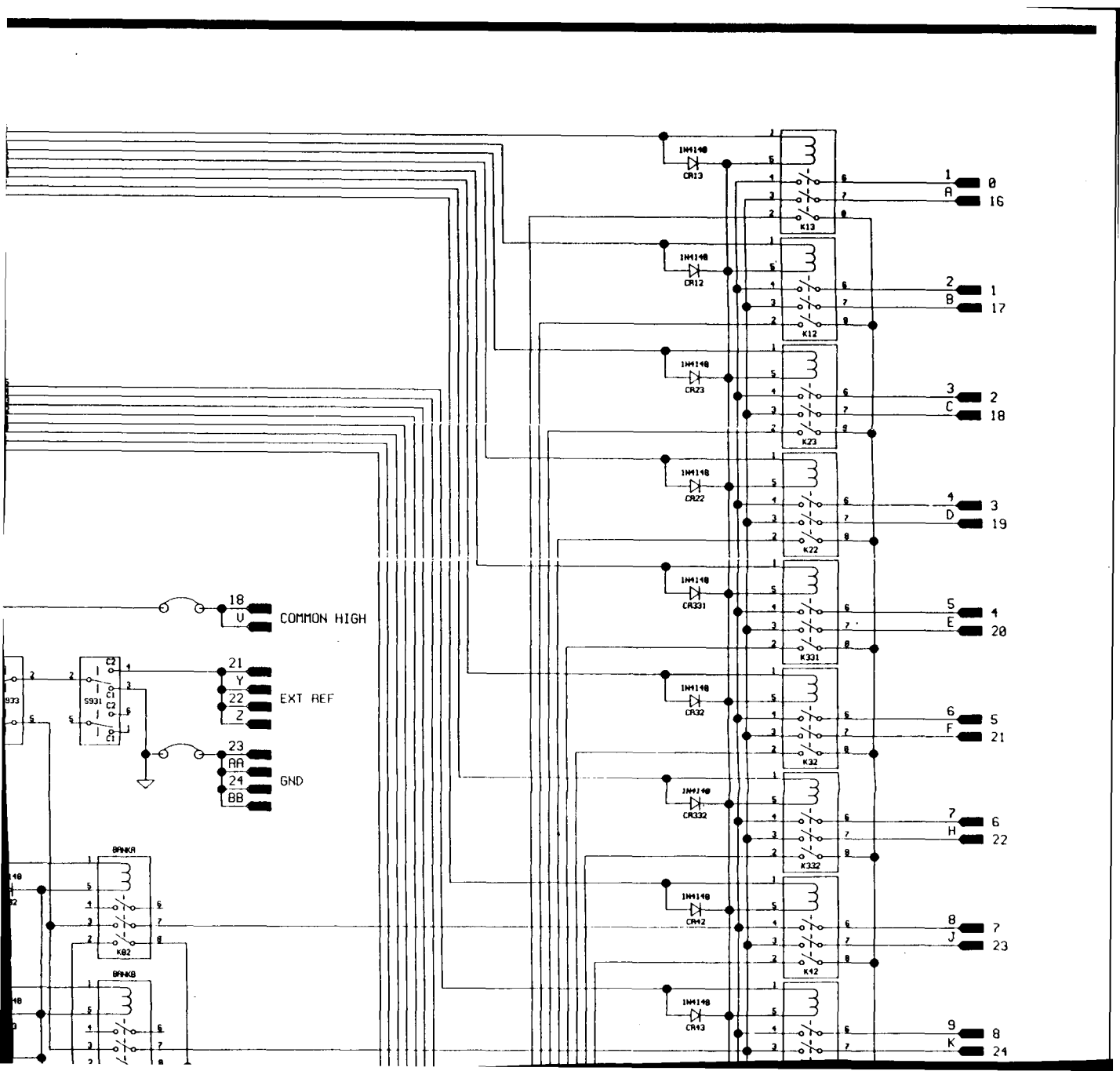

E1
E2
E3
E4
X01
X02
DS011
DS012
DS111
DS112
DS113
DS114
DS115
DS116
DS117
DS118
DS119
DS211
DS212
DS213
K12
K13
K22
K23
K331
K32
K332
K42
K43
K521
K53
K522
K63
K62
K73
K72
K83
K82
K92
U04
U05
U06
U14
U15
U16
U24
U25
U26
U34
U35
U36
U44
U45
U46
U54
U55
U56
U64
U65
U66
U74
U75
U84
U86
+ C05
S01
S76
S77
S931
S932
S933
+ C93
41530-33400 8909-02-D

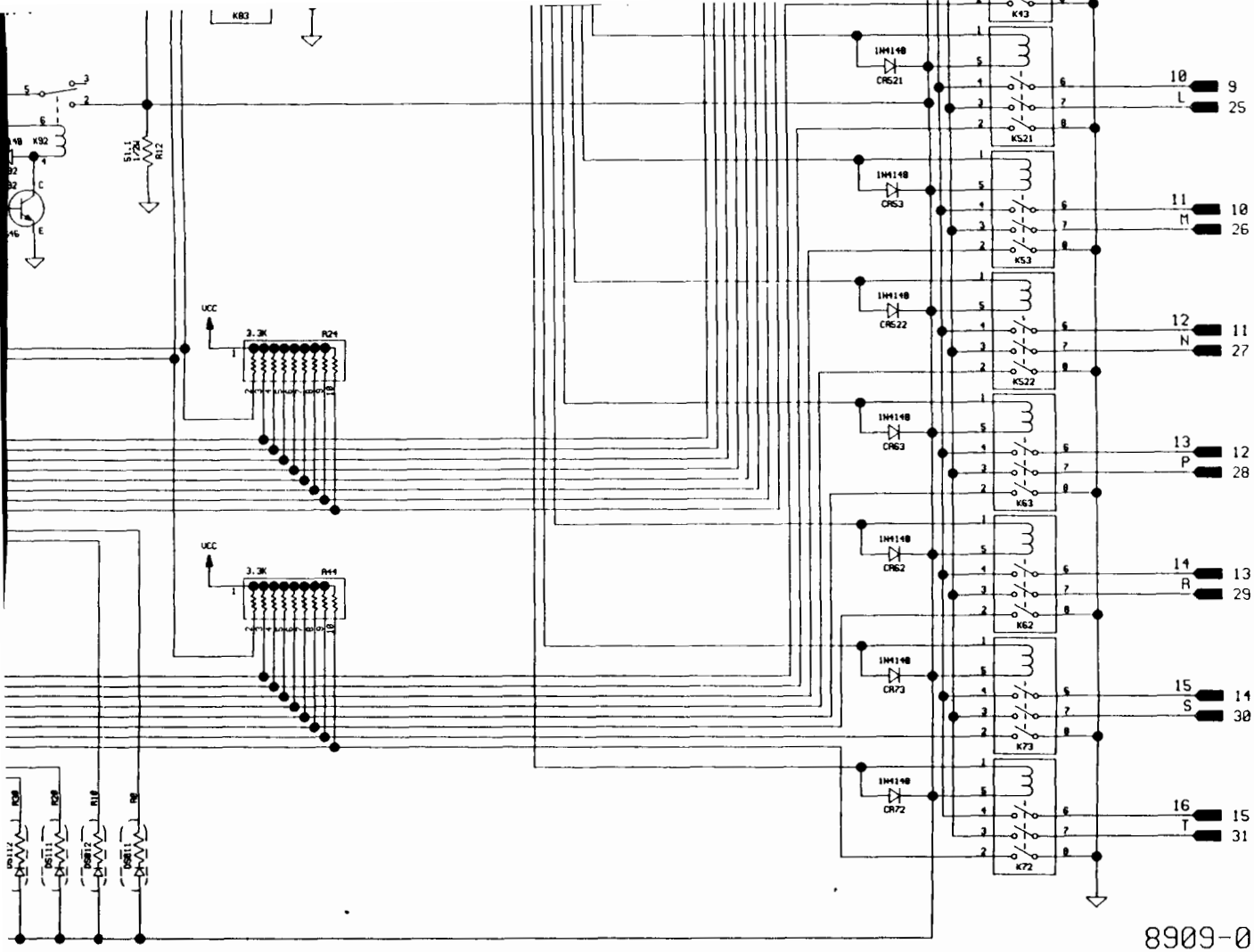

INPUT DECODE
POWER LED
D501
VCC
74LS240
74LS244
7400
7414
7430
7427
PAL3348
3.3K
330
220
NRLT


ENCODE
FLAG F.F.
74LS279
U65
U95
7438
U96
7414
U66
7414
U75
7427
C66
1000pf
INPUT CHARACTER CONTROL
PAL33H0
U36
LEDEN
ADDA
INPUT-ADD
VCC
R112
1K
DS113
DS114
DS115
DS116
DS117
DS118
DS119
DS211
DS212
DS213
+5U
GND
FB7
C81,C82,C83,C14,
C18,C351,C44,C46,
C55,C54,C851,C84,
C85,C91,C92
U84
7408


RELAY BANK SELECT
U25
74LS273
PAL334A
U15
LOW/ATBA
BANNER
2ND CHAR
74138
U45
U64
U84
7400
U74
7400
74HC390
U65
U64
U66
7414
SCAN CLR
FAST/SLOW CONTROL
ENCODE
CATSTAT
ENNES
ENSCRACLR
PAL3346
ANYA
U56
74279
U65
U64
S932
H
L
45
42
C25
2000pf
C352
1000pf
C652
500pf
C76
2000pf
C862
.47
30K
R862
100
R953
1.2K
R952
R954
150
R951
Q951
2N3646
Q952
2N4237
1N4148
CR95
9602
U86
VCC
4MS
800MS
PUP


INPUT CHAR CNTR
INPUT CHAR CNTR
S1 S0
0 0 LF
0 1 1st CHAR
1 0 2nd CHAR
1 1 CR
RELAY DECODE
RELAY DETECT A
RELAY DETECT B
SLOW/FAST
SLOW/FAST
19
59
VCC
2N3646
2N2237
1N4148
74HC390
PAL334F
7408


1N4148
CR13
K13
1
A
16
CR12
K12
2
B
17
CR23
K23
3
C
18
CR22
K22
4
D
19
CR331
K331
5
E
20
CR32
K32
6
F
21
CR332
K332
7
H
22
CR42
K42
8
J
23
CR43
9
K
24
18
V
COMMON HIGH
21
Y
22
Z
EXT REF
23
AA
24
BB
GND
5931
BANKA
K02
BANKB



8909-02-D

)MPANY PROPRIETARY

REVISION LEVEL	ECO #
8708-01-A	ISSUED
8709-02-A	575
8801-02-B	618
8801-02-B-1	652
8801-02-C	735
8909-02-D	1113

COLORADO DATA SYSTEMS

PART NO.: 53A-334

DESCRIPTION: REED RELAY SCANNER

P.C.B. NUMBER: 41530-33400

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