SERVICE MANUAL

~~POST 70~~ 9900

AUTOMATIC COMPUTING ELECTRONIC SCALE

National Controls, Inc.
A Subsidiary of SCOPE, INCORPORATED
1160 Hopper Avenue
P.O. Box 1501
Santa Rosa, Ca. 95403

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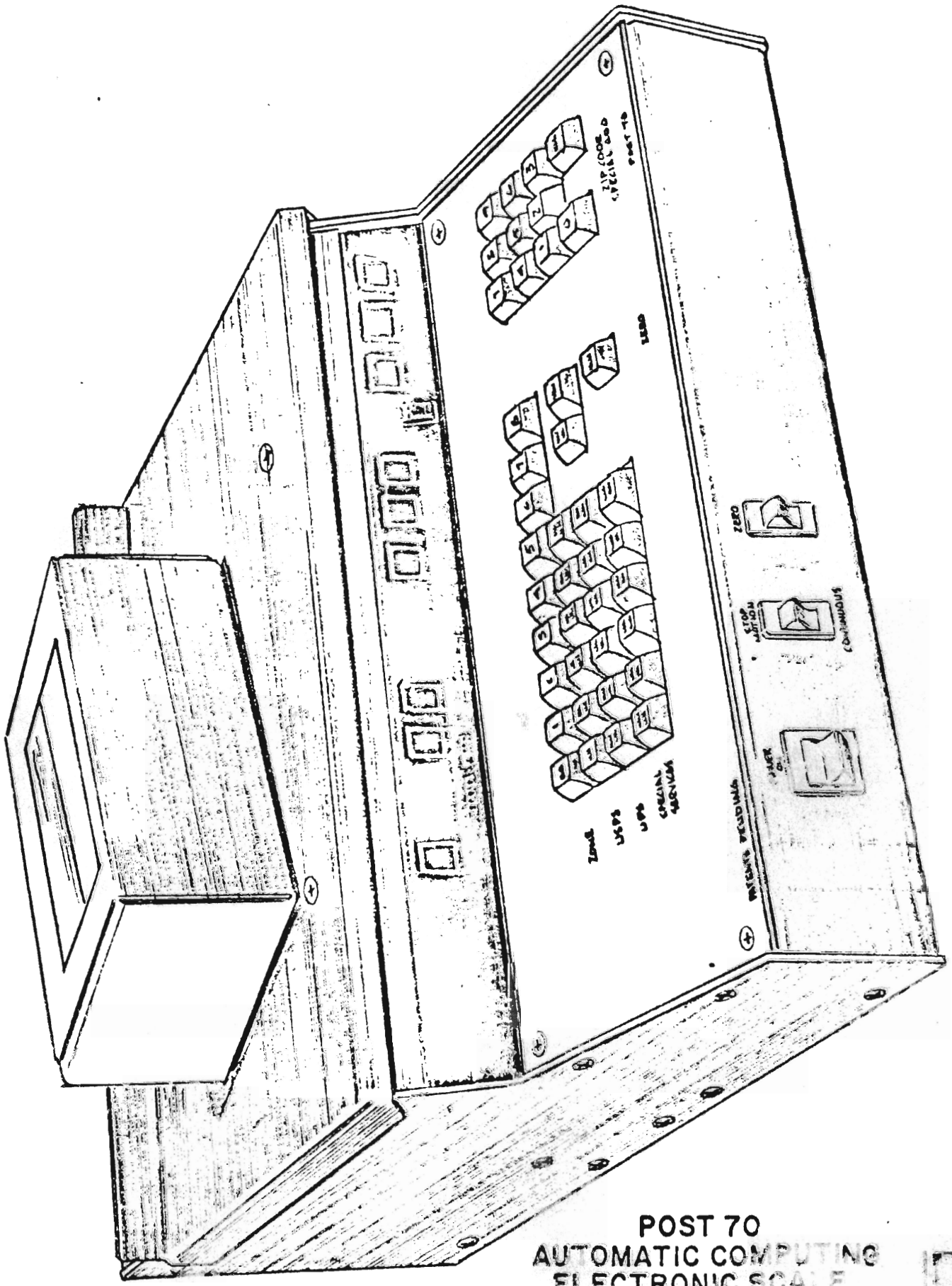


POST 70
AUTOMATIC COMPUTING
ELECTRONIC SCALE

Figure 1.1

SECTION I - INTRODUCTION

1.2 The POST 70 Electronic Computing Postal Scale is a highly accurate and versatile scale incorporating proven weighing principles and highly reliable electronic circuitry. The POST 70 combines sophisticated microcomputer technology with a rugged load cell weighing circuit to give fast and accurate postage computation. Parcels or letters weighing from 1/32 of an ounce to 70 pounds may be handled on the same scale, which allows for faster and more efficient mail handling.

The POST 70 by itself is a powerful addition to any Mailroom operation, but can be used with a variety of options to provide the end user with the kind of capability that suits his specific requirements. Some of the additional options include International Rates, Library Rates, Count Capability, Remote Display, Accumulating Printer and Postal Meter Interface.

One of the most advantageous features of the POST 70 Electronic Scale is the simplicity with which a postal rate change can be implemented. The change only requires that a small plug in electronic component or program board be removed and a new component or board be inserted. Most of the optional features can be handled in a similar manner.

Since there are no moving parts other than the fan, the maintenance of the scale will require nothing more than a periodic testing with test weights.

SECTION II - KEYBOARD OPERATION

SECTION II - KEYBOARD OPERATION

2.1 Front Panel Keyboard Operation

ON: Applies primary power to scale. 10 sec. will elapse before the digital display becomes valid.

OFF: Removes primary power to scale.

STOP MOTION - CONTINUOUS

STOP MOTION: Allows the digital display to operate statically. The digital display will change only after the applied weight has stabilized.

CONTINUOUS: Allows the digital display to operate dynamically. Changes in applied weight will be displayed immediately.

ZERO-PUSH TO OPERATE: Causes the scale to rezero itself. The zero can also be used to subtract (tare) a container weight. When used as tare control, place empty container on scale and push to tare. Zero light will light. Place parcels or parts in container. The correct weight will be displayed. If counting option is used, then weight and count will be displayed.

SECTION II - KEYBOARD OPERATION

2.2 USPS Key Operation

First Class

The scale will use the current first class rates to compute the mailing cost for any parcel weighing up to the limit for first class mail. Selection of a Zone Key is not necessary for first class. For parcels weighing more than the first class limit, the scale will use the current priority rates to compute the mailing costs. The scale will also flash the zone lights to indicate to the operator that a zone must be specified for priority mail.

Air Mail

The scale will use the current air mail rates to compute the mailing cost for any parcel weighing up to the limit for air mail. Selection of a Zone Key is not necessary for air mail.
For parcels weighing more than the air mail limit, the scale will use the current priority rates to compute the mailing costs. The scale will also flash the zone lights to indicate to the operator that a zone must be specified for priority mail.

Third/Fourth

The scale will use the current third class rates to compute the mailing cost for any parcel weighing up to the limit for third class mail. Selection of a zone is not necessary for third class.
For parcels weighing more than the third class limit, the scale will use the current parcel post (Fourth Class) rates to compute the mailing cost. The scale will also flash the zone light to indicate to the operator that a zone must be specified for parcel post.

Book Rate

The scale will use the current book rate (Special Fourth Class Rate

2.2 USPS Key Operation (Cont.)

to compute the mailing cost for any parcel up to 70 lbs. Selection of a zone is not necessary for book rate.

USPS Special Services

Registered Mail

The scale will add the current rate for registering items valued up to $100 to the computed mailing cost. Only certain USPS Services are eligible to be registered. The scale will ignore an attempt to register an ineligible service.

Certified Mail

The scale will add the current rate for certified mail to the computed mailing cost. Only certain USPS Services are eligible to be certified. The scale will ignore an attempt to certify an ineligible service.

Insurance

The scale will add the current rate for insuring items valued up to $50 to the computed mailing cost. Only certain USPS Services are eligible to be insured. The scale will ignore an attempt to insure an ineligible service.

2.3 UPS Key Operation

Intrastate

The scale will use the current UPS rates for the state where the scale is located, to compute the mailing cost for any parcel weighing up to 50 lbs.

The scale will flash the zone lights to indicate to the operator that a zone must be selected to compute an intrastate rate. If a zone is selected which doesn't exist on the rate chart, the scale will display a mailing cost of flashing zero's. This indicates to the operator a valid zone is still needed.

If no intrastate rate chart exists for the state where the scale is located, selection of a Zone Key will always display a mailing cost of flashing zero's.

Interstate

The scale will use the current UPS interstate rates to compute the mailing cost for any parcel weighing up to 50 lbs.

The scale will flash the zone lights to indicate to the operator that a zone must be selected to compute an interstate rate.

Blue Label Service

The scale will use the current UPS blue label rates, for the selected blue label service, to compute the mailing cost for any parcel weighing up to 50 lbs.

Selection of a Zone Key is not necessary for UPS blue label.

The Blue Label Service keys will depend on the scale location.

2.3 UPS Key Operation (Cont.)

Special Delivery

The scale will add the current rate for special delivery to the computed mailing cost. Special Delivery may be applied to any USPS Service.

Special Add

When an additional special charge is desired, the Special Add Key may be used. Use the following procedure to add any additional charges to the computed mailing cost:

1. Check for zero light indication.
2. Put the item to be mailed on the Postal Scale.
3. Select the desired UPS or USPS Keys.
4. The scale will display the weight and mailing cost.
5. Depress Spec./Add Key.
6. Use the Z/Z Keyboard to Key in any additional charges up to $9.99.
7. Depress Spec./Add.
8. The scale will display the weight and new mailing cost.
9. The dollars display will accumulate more than one special charge. For each additional special charge, repeat 6 and 7 above.

2.4 Zip to Zone and Miscellaneous Key Operation

Large Package

Both USPS and UPS have a minimum charge for parcels which exceed a specified size. The Large Package Key will automatically compute the minimum charge when depressed.

Print

If an external printer or postal meter is attached to the scale, use this key to activate the external device.

Zip to Zone

If the zone is known, press any of the appropriate zone keys. The Zone Key will light when depressed. If the zone is not known, enter the first three digits of the zip code in zip code keyboard. The proper zone will be selected.

2.5 Option Key Operation

Library Rate

The scale will use the current library rate to compute the mailing cost for any parcel up to 70 lbs. Selection of a zone is not necessary for library rate.

International Rate

The scale will use the current international rate for the selected country to compute the mailing cost. The following procedure should be used to compute an international rate:

1. Check for zero light indication.
2. Put item to be mailed on Postal Scale.
3. Depress International Key.

2.5 Option Key Operation (Cont.)

4. Use Z/Z keyboard to enter 3 digit international code. See APPENDIX I for code explanation.
5. Scale will display weight and mailing cost.

S = 8, Count

The scale will use the weight of 8 sample items to compute the number of items on the scale.

The following procedure should be used to count pieces with a Postal Scale:

1. Check for zero light indication.
2. Depress S=8, Count Key.
3. Put 8 sample pieces on the Postal Scale.
4. The scale will display weight and a count of 8.
5. Add pieces to be counted.
6. The scale will display weight and total count

SECTION III - CALIBRATION

SECTION III - CALIBRATION

1. Turn ON scale.
2. Allow 15 min. warm-up.
3. Remove scale deck.
4. Move Gross Test switch to ON position. In test mode, the display is read as follows:

   L O
   B XX Z XX $ XX.XX

   LB = Pounds

   OZ = 0 thru 15 Ounces

   $XX.00 = 0 thru 15, 1/16 Ounces

   $00.XX = 0 thru 15, 1/256 Ounces

   The Auto Zero switch is disabled in gross test mode.

5. Adjust R5 on the load cell amplifier card until the display reads 39 lbs. 8 oz.
6. Observe the 1/256 ounces display. Changes in this display should be no greater than ± 4/256 oz. (± 1/64).
7. Move Gross Test switch to OFF. Move Net Test switch to ON.
8. Add 40 lbs. of weight to the load cell.
9. Depress the Auto Zero switch.
10. Remove the 40 lbs. of weight.
11. Adjust R4 on the load cell amplifier card until the display reads -40 lbs. 0 oz. 0 1/16 oz 0 1/256 oz. ± 4/256 oz.
12. Repeat Steps 8 thru 11 as needed.

The Postal Scale is now calibrated. Replace the scale deck and run the following test: (Net Test switch ON)

A. With no weight on scale deck, depress the Auto Zero switch

B. Add 4 lbs. to scale deck.

C. Display should read 4 lbs. ± 8/256 oz. (1/32).

D. Increase weight on scale deck to 10 lbs.

E. Display should read 10 lbs. ± 1/16 oz.

F. Increase weight on scale deck to 20 lbs.

G. Display should read 20 lbs. ± 2/16 oz. (1/8).

H. Increase weight on scale deck to 30 lbs.

I. Display should read 30 lbs. ± 3/16 oz.

J. Increase weight on scale deck to 50 lbs.

K. Display should read 50 lbs. ± 8/16 oz. (1/2).

L. Increase weight on scale deck to 70 lbs.

M. Display should read 70 lbs. ± 12/16 oz. (3/4).

Remove the scale deck and move the Net Test switch to the OFF position.

Replace the scale deck.

The scale is now ready to be returned to operation.

If the scale fails to perform during any part of the calibration procedure, refer to the Troubleshooting Guide.

NOTE: In computing mode, the Postal Scale will read 1/32 oz. low. This is to give the customer the benefit of the ± 1/32 oz. Post Of accuracy specification.

The scale may be checked as follows:

1. Depress Reset and Auto Zero.
2. Add 4 lbs. to the scale deck.
3. Display will show 3 lbs., 15.5 oz.
4. Add 1/32 oz. to the scale deck.
5. Display will show 4 lbs., 0 oz

SECTION IV - THEORY OF OPERATION

SECTION IV - THEORY OF OPERATION

The descriptions in this manual are given to acquaint service personnel with the operating functions of this scale. Each major section will be discussed. A simplified block diagram of the circuit will accompany the description.

The POST 70 Postal Scale consists of two major sections, Analog and Digital.

The Analog section converts the force (weight) of a letter or parcel to a proportional voltage within a range of from 0 to 70 pounds.

The Digital section converts the weight proportional voltage to a digital quantity and processes it to compute postage and provide a display to the operator.

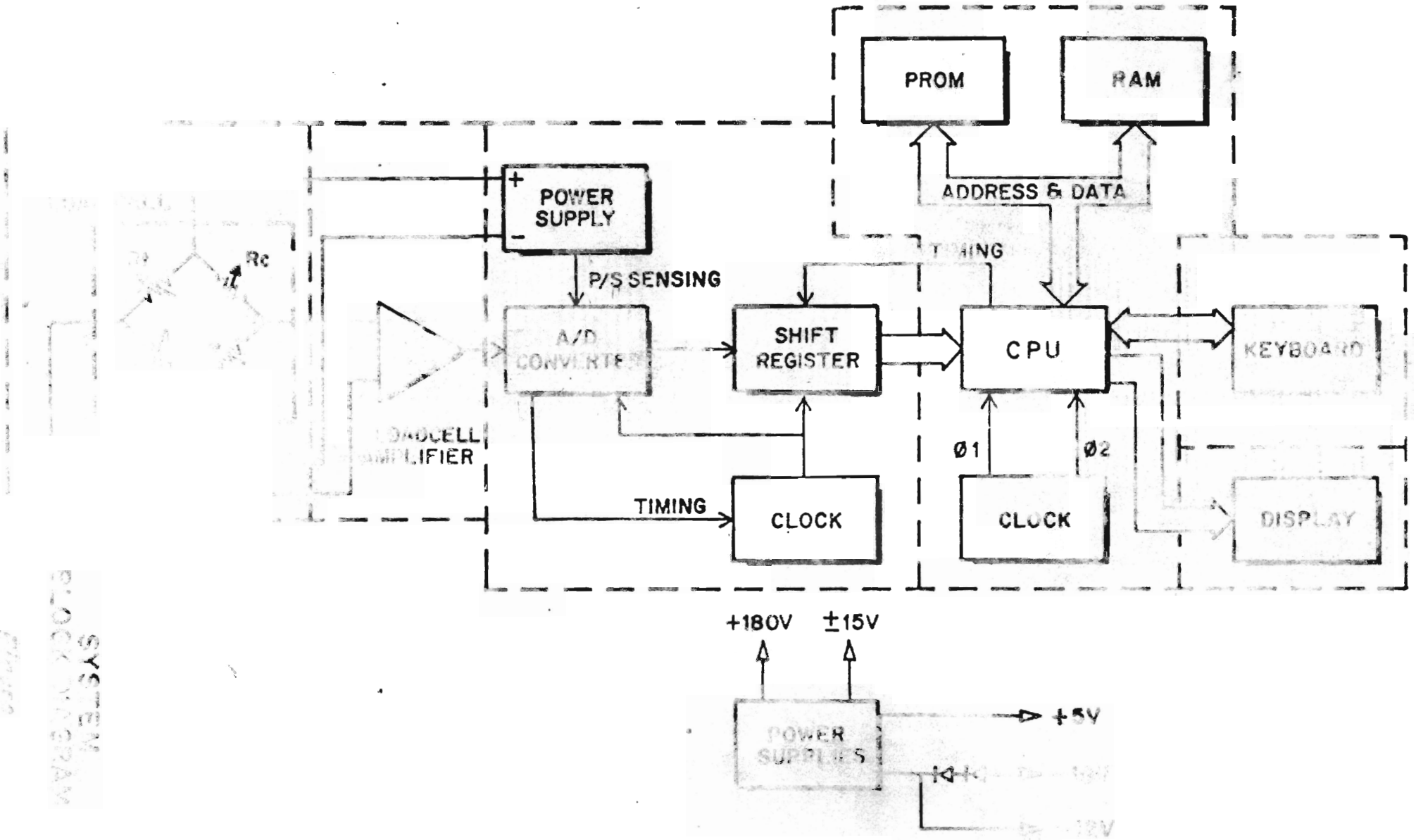
4.0 System Block Diagram Description

Figure 4.1 is an overall block diagram of the scale, showing the major circuit signal flow. The output of load cell is sent to the load cell amplifier and passed on to the Analog to Digital Converter. The Analog to Digital Converter comprises a power supply, shift register and clock circuit. The power supply supplies excitation voltage to the load cell. Power supply sensing signals sense any unwanted change in excitation voltage at the load cell and adjusts the output of the Digital to Analog Converter to compensate. The clock circuit is controlled by the Analog to Digital Converter and in turn controls the shift register. The shift register counts clock pulses relative to the signal that is present at the input to the Digital to Analog Converter. A zero input to the A to D Converter represents zero clock pulses collected in the shift register and 2 V input represents 22000 clock pulses from the above. It can be seen that each shift register count equals 80 microvolts of input signal. The CPU comprises control circuitry sig

4.0 System Block Diagram Description (Cont.)

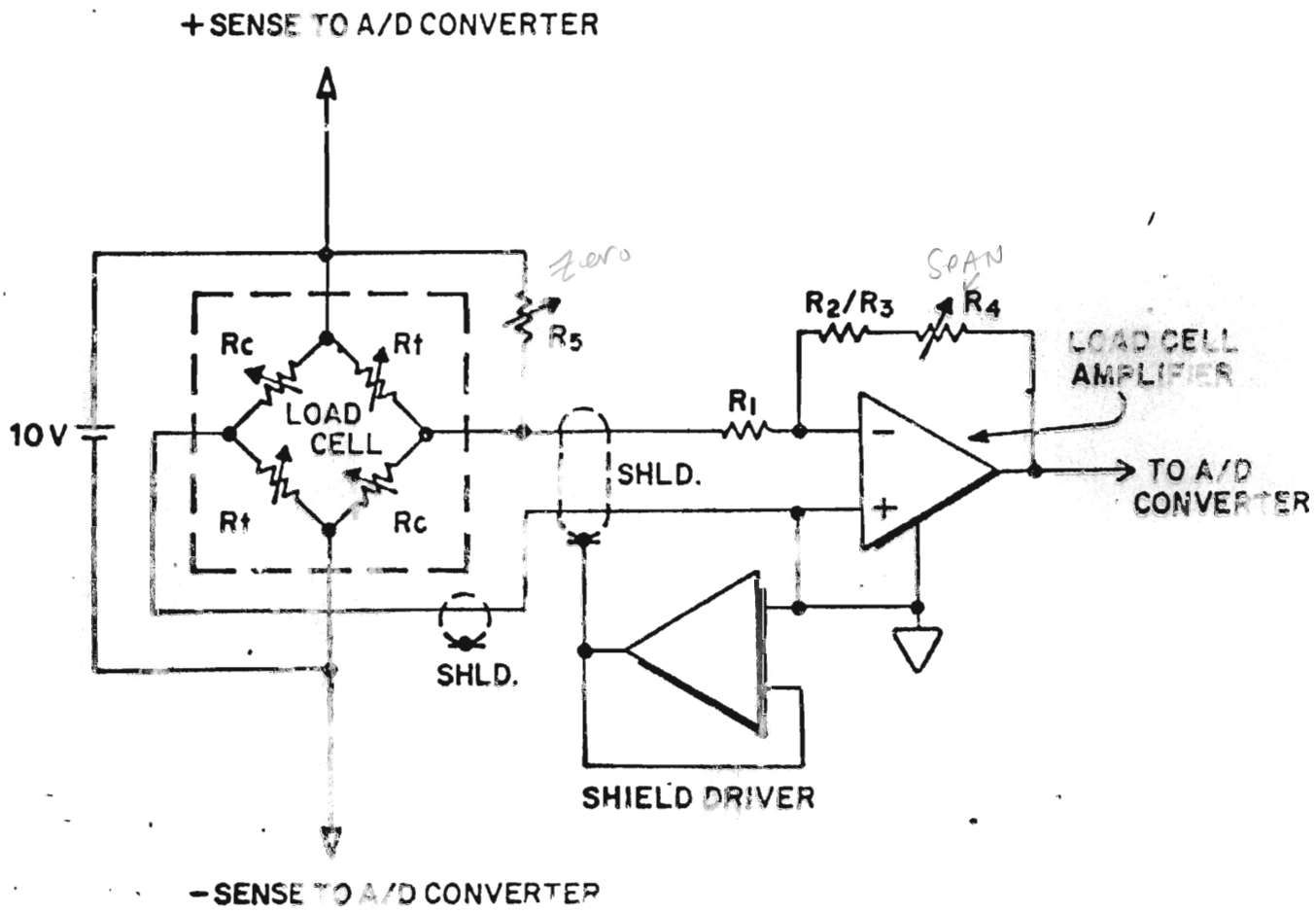
and RAM and PROM memory circuits

The CPU receives a data ready signal from the shift register The CPU sends out pulses to the shift register to retrieve the information that is in the registers, so that it can be stored in RAM memory. The control program is stored in PROM memory and directs the CPU to operate on the stored information along with inputs from the keyboard and other constants that are also programmed in memory. The resulting outputs are sent to the display for visual presentation.


PROM
RAM
ADDRESS & DATA
POWER SUPPLY
+
-
P/S SENSING
TIMING
A/D CONVERTER
SHIFT REGISTER
CPU
KEYBOARD
Rc
LOADCELL AMPLIFIER
Ø1
Ø2
TIMING
CLOCK
CLOCK
DISPLAY
+180V
±15V
POWER SUPPLIES
+5V

4.2 Load Cell and Amplifier Description

The circuit shown in Figure 4.3 consists of a power supply, load cell and load cell amplifier. The power supply supplies an excitation voltage to the load cell. The load cell is a mechanical device designed with strain gauges formed to an electrical configuration of a balanced wheatstone bridge. The excitation voltage is applied to two terminals of the bridge. When there is no force applied to the load cell, the bridge is balanced with no output voltage present. When a compression force is applied to the load cell, the Rc gauges change resistance causing an unbalance of the wheatstone bridge and an output voltage which is approximately equal to 2 MV per volt of excitation times a constant K where K equals 1 at capacity. Since the input to the Analog to Digital Converter has a maximum input of ± 2.5 volts, the load cell has been intentionally unbalanced by resistor R5 so that the load cell output with no force applied is set close to half of its maximum positive output, which is approximately +10 millivolts. When a compression force is applied the load cell output would change in a negative direction thru zero to half of its negative output, which is approximately -10 millivolts. This is done to obtain more resolution from the Analog section by making full use of the Analog to Digital Converters full ± 2.5 volt range. The load cell amplifier is used to amplify the ± 10 millivolt signal from the load cell to a ± 2.5 volt signal used as an input to the Analog to Digital Converter.



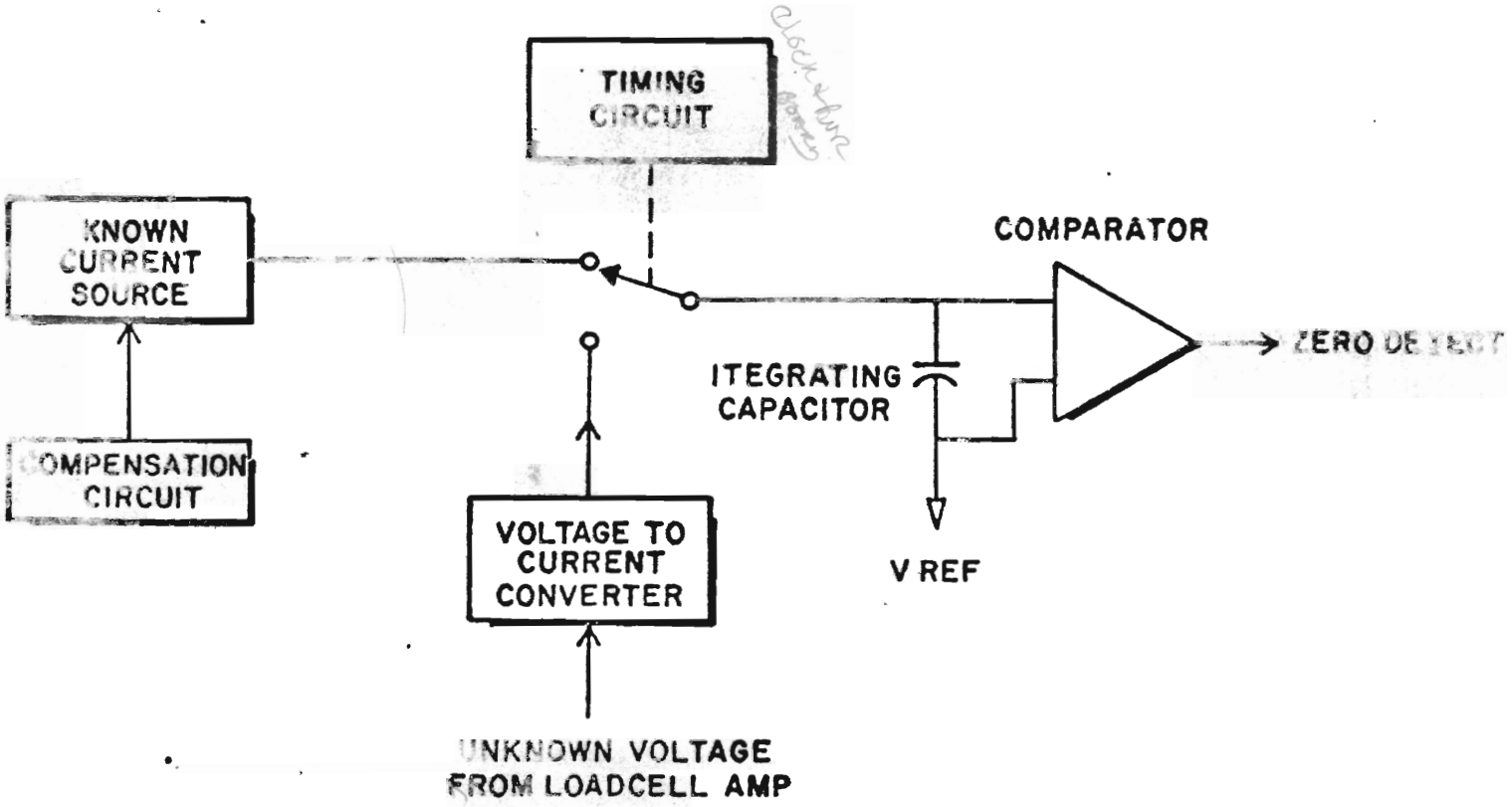
LOADCELL AMPLIFIER
BLOCK DIAGRAM

Figure 4

4.4 Analog to Digital Converter

The Analog to Digital Converter is a dual slope type converter. (See Figure 4.5) This process of conversion is summarized as follows:

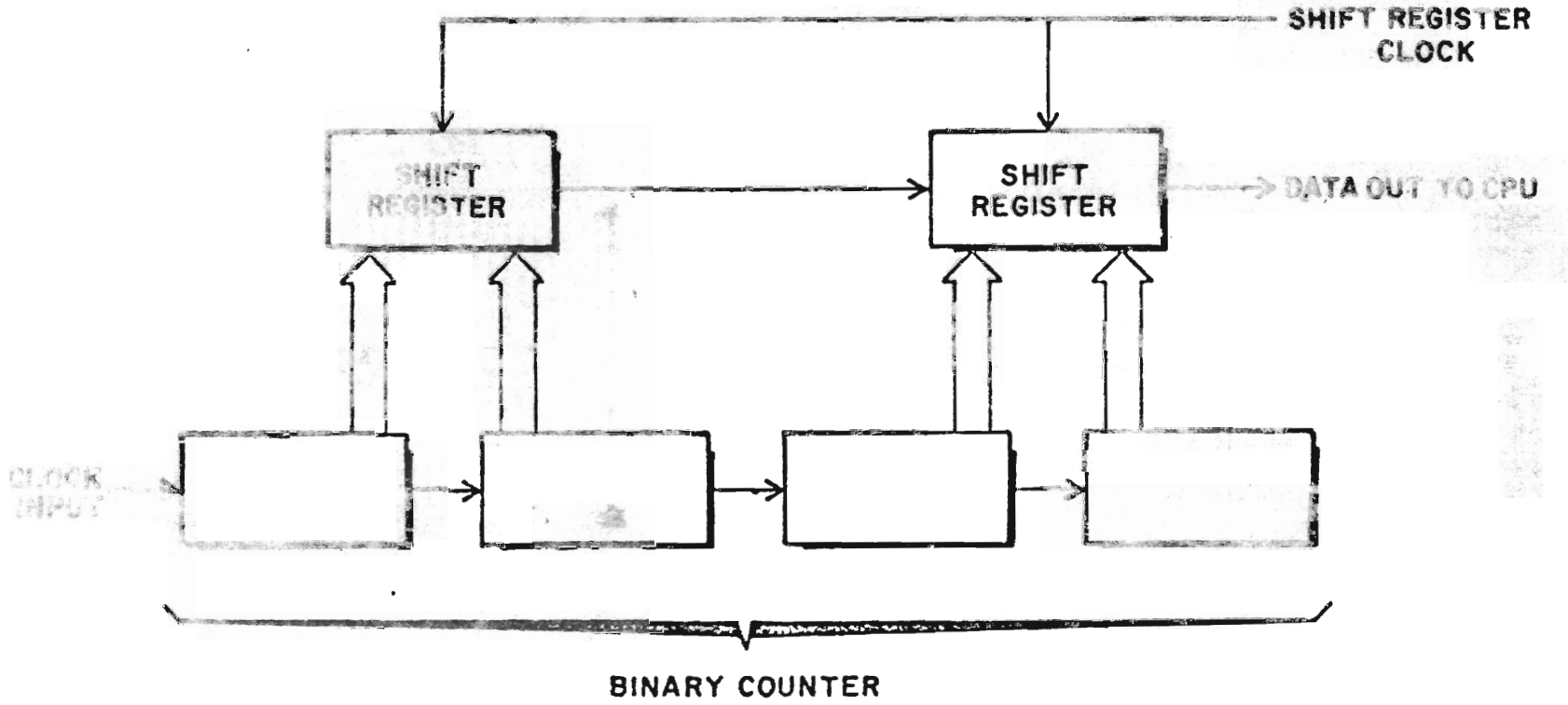
The analog voltage from the load cell amplifier is applied to the input of Analog to Digital Converter and is converted to a current. This current (Ix) discharges an integrating capacitor for a predetermined length of time (16,000 clock counts). When the time period ends, a solid state switch switches a known current source to charge the capacitor back to its starting point. The known current source is calibrated such that if the input voltages were 2V, it would take 32,000 clock pulses to charge the integration capacitor back to the starting point. The comparator's function is to detect the zero or the starting point to control the timing circuitry and shift register. The current source compensation is provided to correct for load cell excitation supply changes.



ANALOG TO DIGITAL CONVERTER

4.6 Counter and Shift Register

The Counter and Shift Register (Refer to Figure 4.7) is an integral part of the Analog to Digital Converter. The Shift Register receives the clock pulses from the converter and stores them in a binary counter. At "Zero Detection" time the binary counter stops accumulating the clock pulses from the converter The contents of the binary counter is now a binary number directly proportional to the weight on the scale and is in a form that can be used by the microprocessor. The information from the binary counter is loaded into the Shift Register. A Shift Register clock signal command comes from the microprocessor to the Shift Register, as a command to output data on the data out line which returns to the microprocessor.


SHIFT REGISTER CLOCK
SHIFT REGISTER
SHIFT REGISTER
DATA OUT TO CPU
CLOCK INPUT
BINARY COUNTER

4.8 Microprocessor Description

The NCI Postal System uses a 4 bit microprocessor, reference Figures 4-10 and 4-11. All data is transmitted between the system elements in Groups of 4 bits. The instruction cycle for the computer requires eight, 4 bit time intervals. The eight time intervals accomplish program memory addressing, instruction retrieval and instruction execution. The 12 bit address required to address up to 4096 words of program memory, is sent from the CPU (4004) to the program memory (1702) via the (4008) in three time intervals defined as A1, A2 and A3. The eight bits of instruction for each word are sent from the addressed program memory (1702) via the (4009) to the CPU (4004) in two time intervals defined as M1 and M2. During the last three time intervals defined as X1, X2, and X3, the CPU executes the instructions.

Each time interval is generated by the operation of a two phase CPU clock circuit. A sync. pulse is generated by the CPU (4004) to keep the RAM's (4402) and interface devices (4008, 4009) in step with the CPU.

The microprocessor communicates with the Postal System via the output buss, input buss, address buss, and memory port 0.

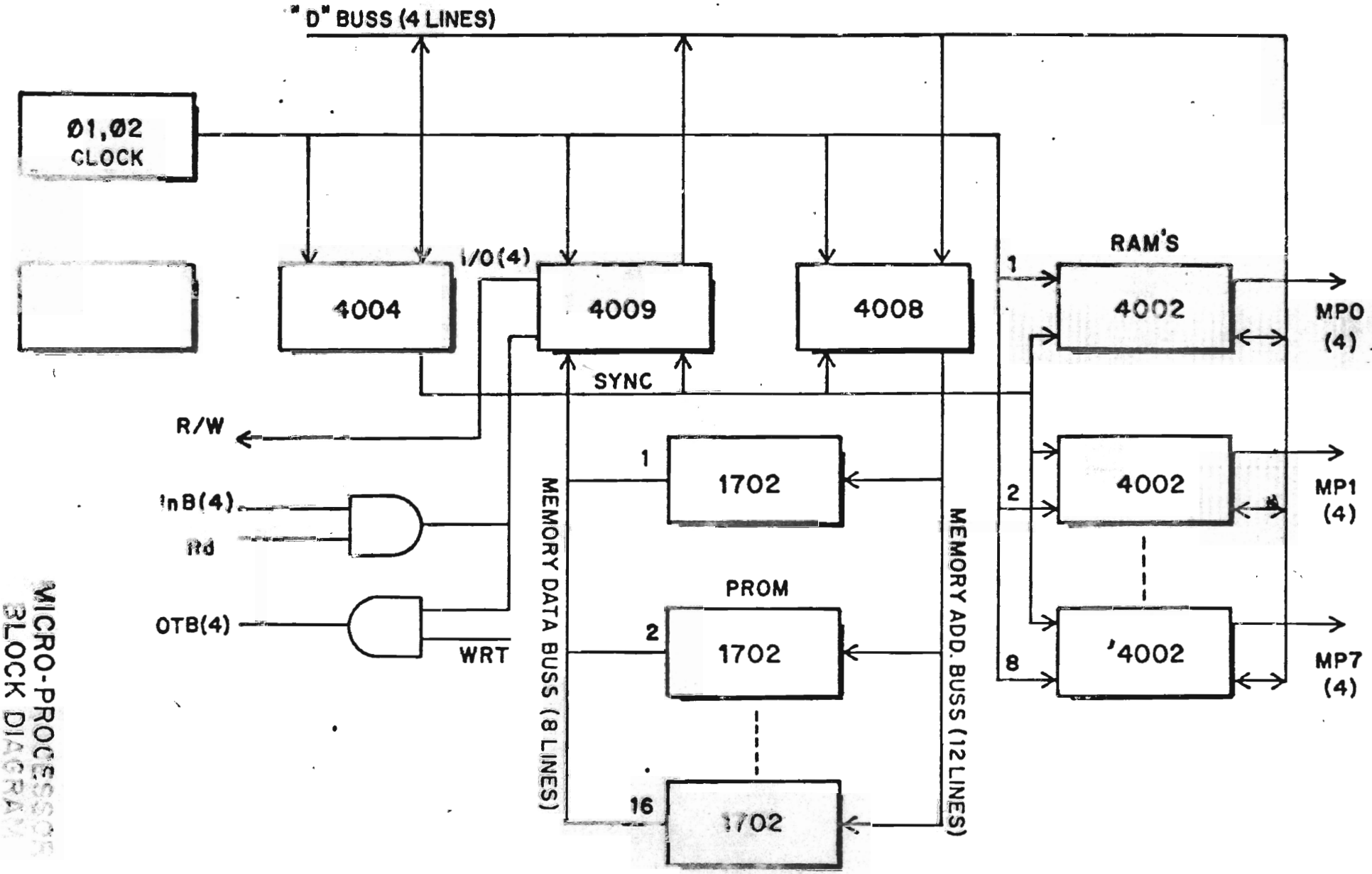
Memory Port 0 consists of the 4 latched outputs of RAM 0. These four lines go to the data clock control section of the keyboard assy. where they are decoded to enable one of the data control clocks.

The four output buss lines go to the display board, lamp board and ROM address register. Whenever a write output buss command is executed by the computer, a hexadecimal character is presented on the output buss. During the write command, a WRT-pulse is generated.

4.8 Microprocessor Description

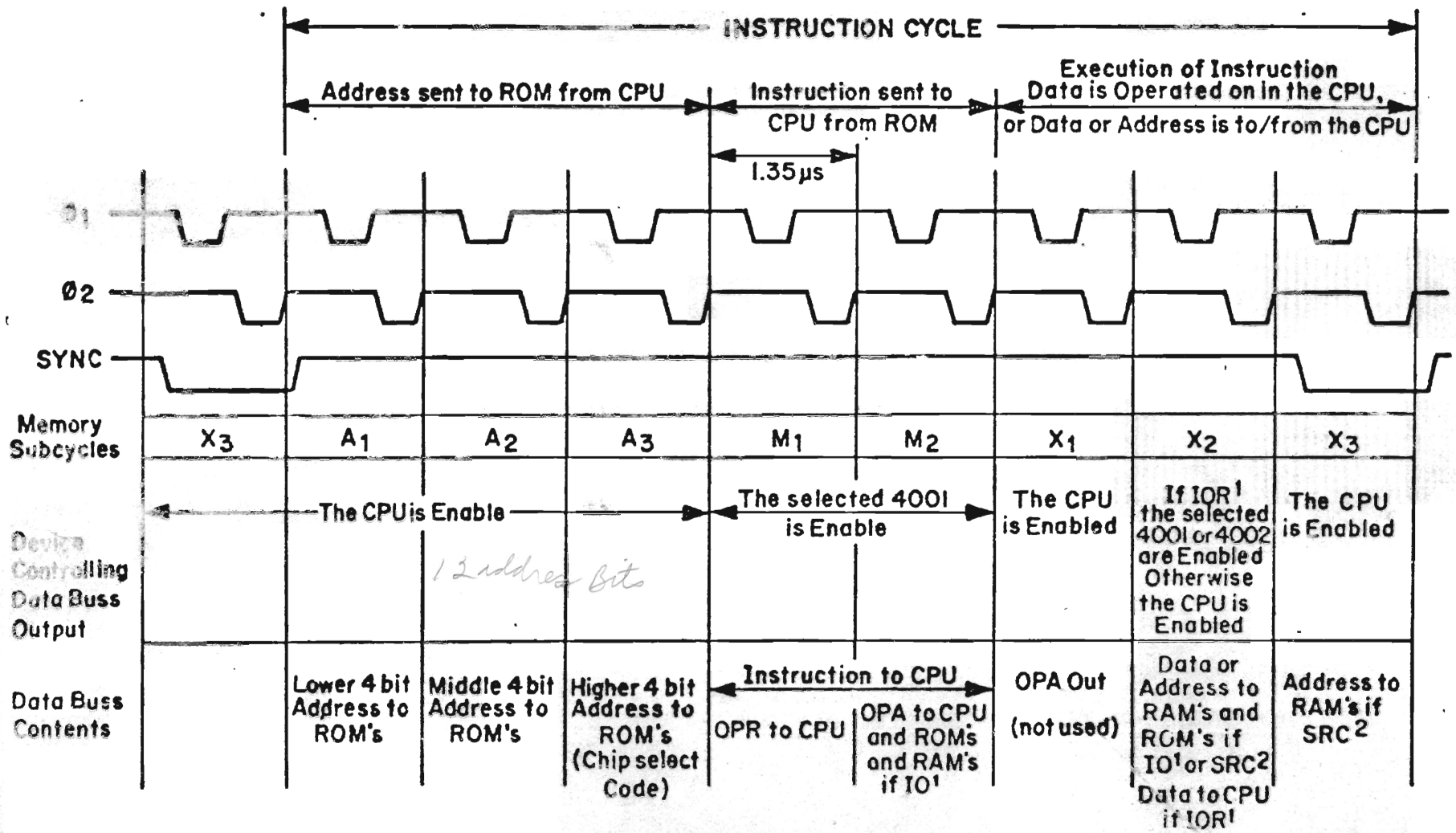
This pulse generates a data clock which clocks the output buss data into the appropriate board.

The 4 input buss lines are used to bring 4 bits of data from the Postal System back to the computer. By charging the value of the address buss, the keyboard data, ROM data, front panel switches, or the meter data can be presented on the input buss. The computer uses the read input buss command to retrieve data from the input buss.



MICRO-PROCESSOR
BLOCK DIAGRAM

Figure 4.6



MICRO-PROCESSOR TIMING DIAGRAM

Figure 4.10

(1) IO instructions control the flow of information between accumulator in CPU, I/O lines in ROM's and RAM storage. IOR stands for IO Read. In this case the CPU will receive data from RAM storage locations or I/O input lines of 4001's.

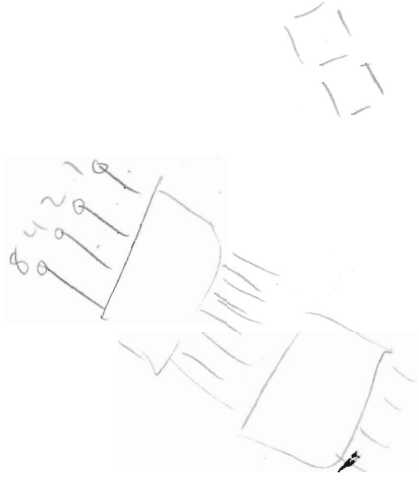
(2) The SRC instruction designates the chip number and address for a following IO instruction.

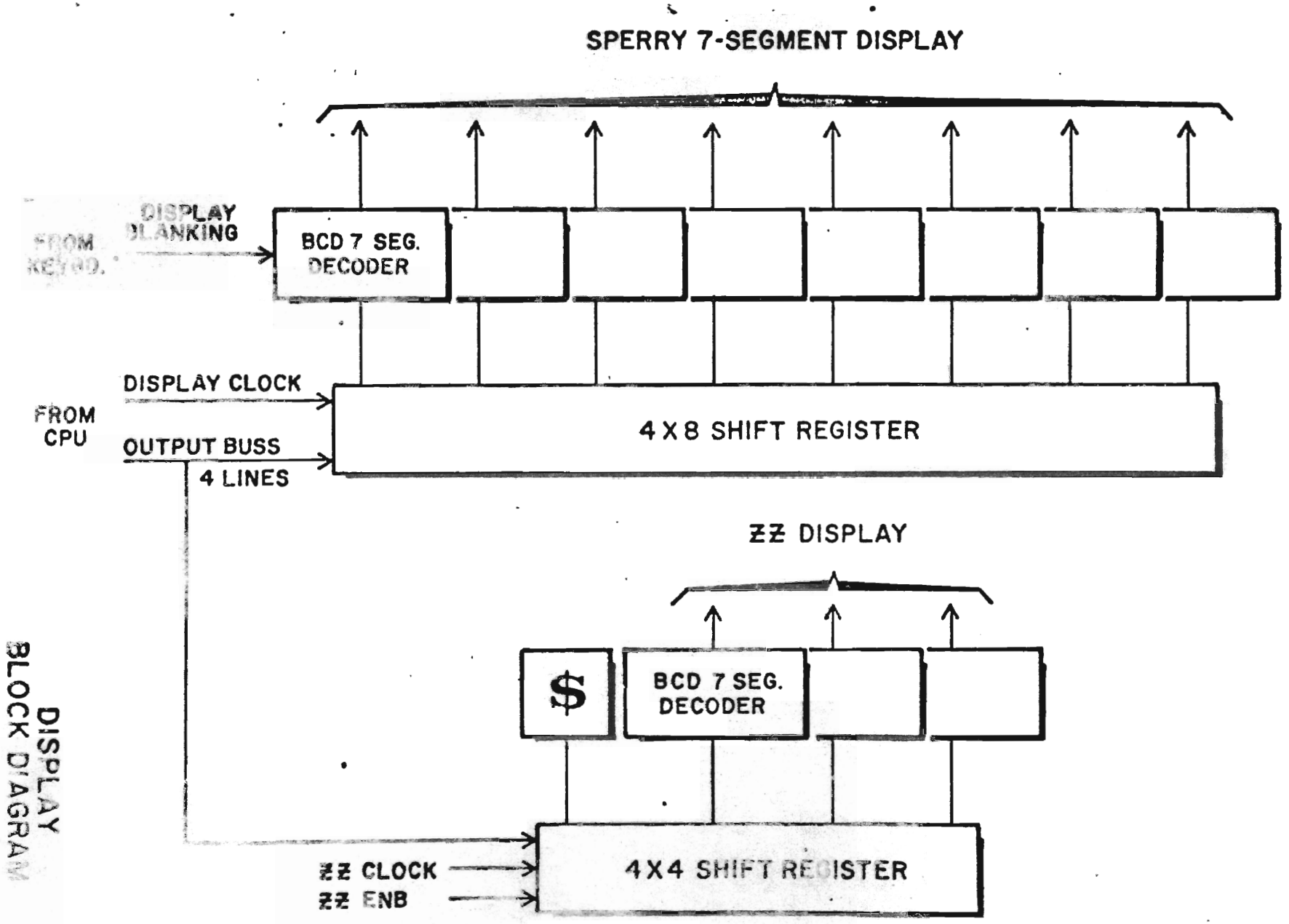
4.11 Display Description (Ref. Figure 4.12)

The digital display receives eight 4 bit characters from the computer. These characters are shifted into the 4 x 8 Shift Register by eight display clocks. The display is blanked during loading. When the display is fully loaded, the blanking is removed and the characters are decoded and displayed. BCD to seven segment decoders are used to drive seven segment gas discharge display modules.

The 180V high voltage to drive the displays comes from a remote power supply located on the Analog to Digital Converter.

The Z/Z board is similar to the digital display except it is only four characters long.





DISPLAY BLOCK DIAGRAM

Figure 4.12

SECTION V - TROUBLESHOOTING GUIDE

SECTION V - TROUBLESHOOTING GUIDE

5.1 Troubleshooting Guide - Digital

TROUBLE	POSSIBLE SOLUTION
No dollar sign and no keyboard lamps.	Replace fuse. Replace line filter.
No dollar sign or display. Keyboard lamps O.K.	Replace A/D Converter.
Random numbers on display. Keyboard lamps O.K.	Replace display.
Keyboard lamps random. Display O.K.	Replace keyboard. Replace microprocessor.
Display random or blank. Lamps random.	Check +5, - 9.5 supply. Replace microprocessor. Replace Memory A. Replace keyboard. See Analog section.
One bad character on display.	Replace display.
Weight O.K., bad rates.	Replace Memory A. Replace microprocessor.
Weight O.K., Z/Z bad.	Replace Memory B. Replace microprocessor.

5.2 Troubleshooting Guide - Analog

TROUBLE	POSSIBLE SOLUTION
Display random and lamps random.	Replace A/D Converter. Replace load cell amp. Replace load cell. See Note 1 for isolating problem.
Zero light blinks on and off.	Same as above.
Weight incorrect.	See Calibration. Replace A/D Converter. Replace load cell amp. Replace load cell.

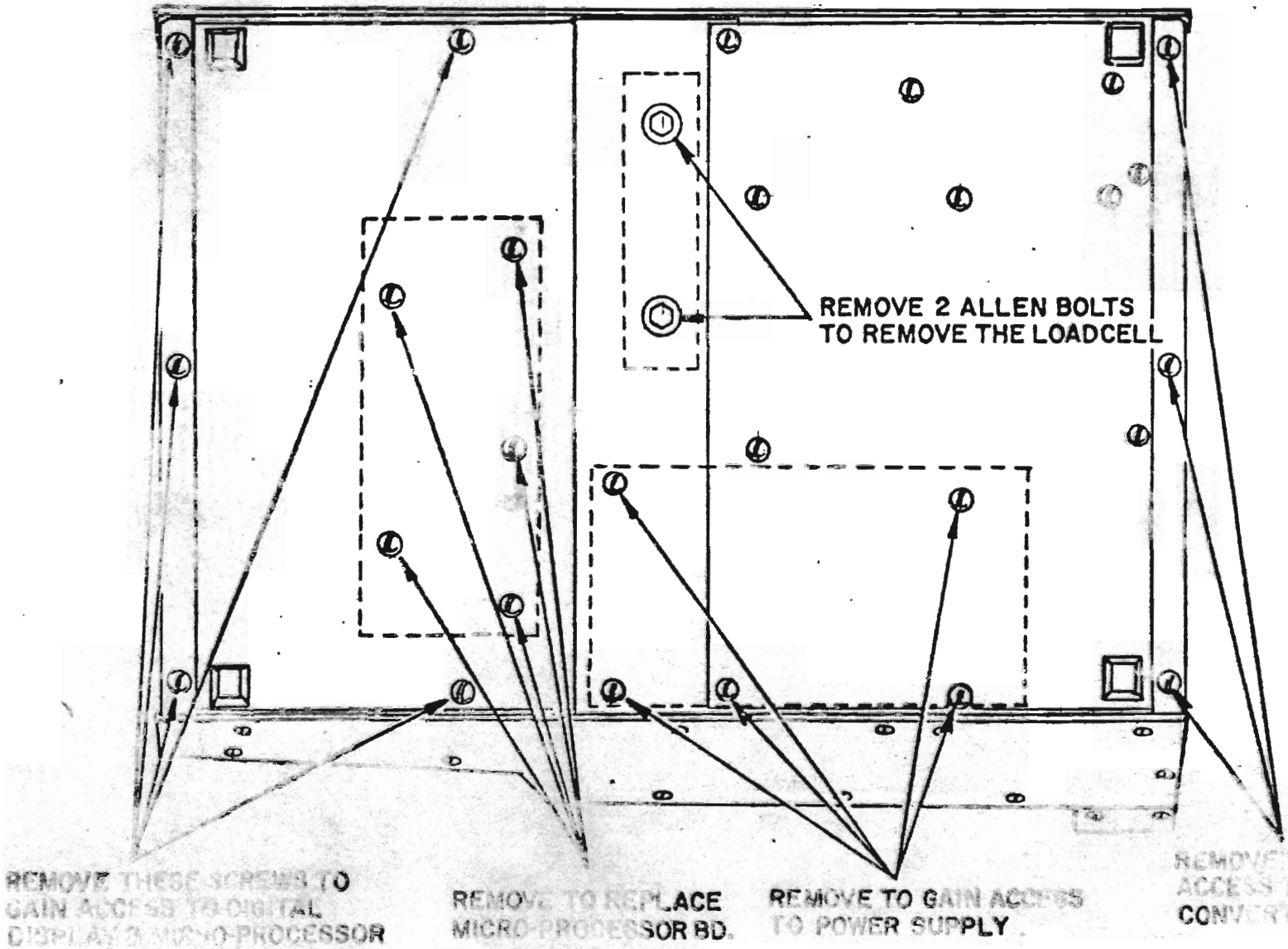
Note 1: Use the following procedure to isolate problems in the Analog section.

1. Put gross test switch in the ON position. Use a clip lead to short Pin 18 to Pin P on the A/D Converter Card. Display should read 0 lbs. ± 1 lb. If this test fails, replace the A/D Converter.

2. Move clip to short the green to white wires on the end of the load cell cables. Display should read 0 lbs. ± 1 lb. If this test fails, replace the load cell amp.

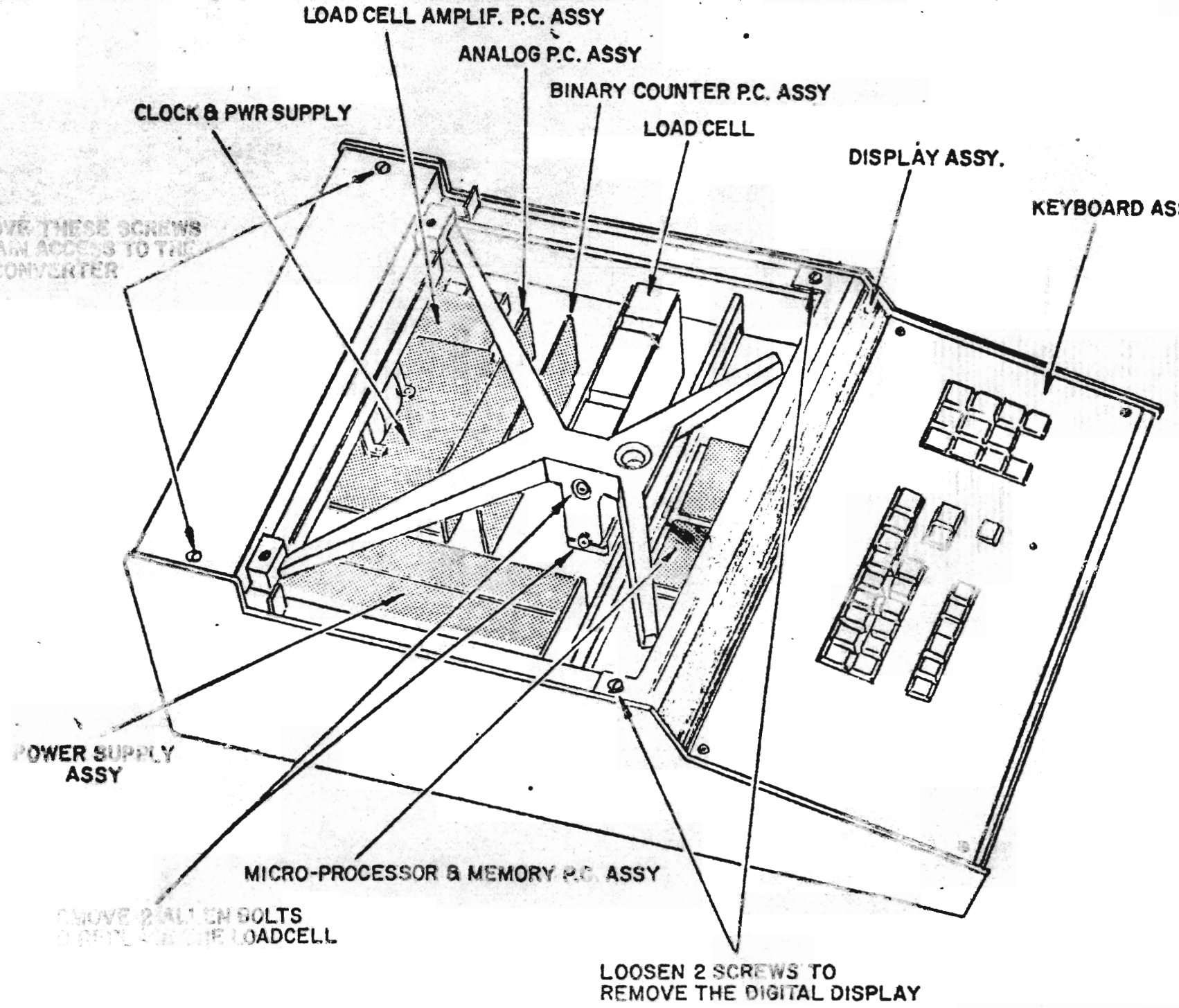
3. If test 2 passes and a problem still exists, replace the load cell.

Use this procedure to isolate electrical noise also. The units portion of the display can be used to determine noise, ± 4 digits of instability are allowed. If more noise is present, use Note 1 to isolate the noise to a portion of the Analog section.



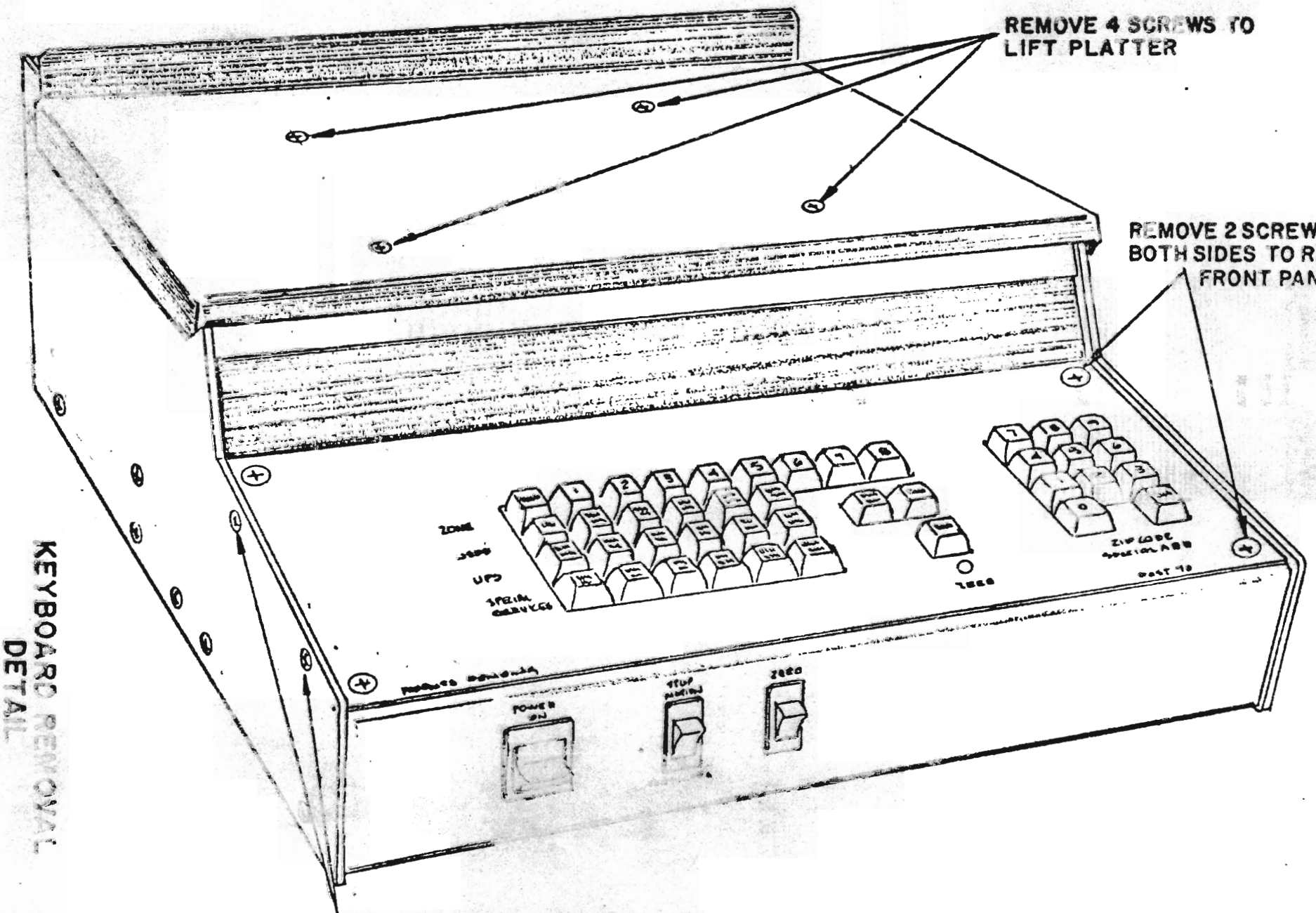
BOTTOM COVER
REMOVAL - DIAGRAM

Figure 5.3



ASSEMBLY LOCATION DIAGRAM

Figure 5.4



KEYBOARD REMOVAL DETAIL

Figure 6.5

5.6 Load Cell Removal Procedure (Ref: Figures 5.3 and 5.4)

1. Turn off "Power ON" switch and unplug scale from power outlet.
2. Four Phillips head screws hold the scale deck in place. Remove these screws and lift the deck from the Postal Scale.
3. Two aluminum head bolts hold the load cell spider on the load cell. Remove these bolts and lift the spider from the load cell.
4. The load cell cable must now be disconnected. The load cell cable connects to a 7 position TB on the load cell amp. card. Loosen all screws on the load cell amp. TB and remove the load cell cable.
6. Turn the Postal Scale on its side.
7. Hold the load cell with one hand and remove the two aluminum head screws which hold the cell to the chassis, with the other.

5.7 Removal of Load Cell Amplifier (Ref: Figure 5.4)

1. Turn off "Power ON" switch and unplug the scale from power outlet.
2. Four Phillips head screws hold the scale deck in place. Remove these screws and lift the deck from the Postal Scale.
3. Loosen the 7 screws that hold the load cell cable to the load cell amp. TB.
4. Remove the two slot head screws on either end of the load cell amp. TB.
5. Remove the load cell amplifier card.

5.8 Removal of Analog to Digital Converter (Ref: Figures 5.3 and 5.4)

1. Turn off "Power ON" switch and unplug the scale from power outlet.
2. Four Phillips head screws hold the scale deck in place. Remove these screws and lift the deck from the Postal Scale.
3. To gain access to the A/D Converter, the rear panel must be removed. The rear panel is held in place by (5) slot head screws. Remove the (2) screws on the top of the rear panel. Turn the scale on its side. Remove the (3) screws on the bottom of the rear panel. Push outward on the bottom of the rear panel until it clears the bottom panel of the Postal Scale. Remove the rear panel from the chassis and let it rest to the rear of the Postal Scale. Removal of the wire harness is not necessary.
4. Remove the edge connector on the A/D Converter.
5. Remove the 4 Phillips head screws that hold the A/D Converter to the chassis.
6. Remove the A/D Converter.

5.9 Removal of the Microprocessor (Ref. Fig. 5.3)

1. Turn off "Power ON" switch and unplug the scale from power outlet.
2. Turn the scale on its side.
3. Remove the (5) slot head screws from the front bottom panel.
4. Let the panel lay on the table top.
5. Remove the edge connector from the microprocessor.
6. Remove the 5 Phillips head screws that hold the microprocessor to the bottom panel.
7. Remove the microprocessor card.

5.10 Removal of the Display Board (Ref: Figures 5.3 and 5.4)

1. Turn off "Power ON" switch and unplug the scale from power outlet.
2. Four Phillips head screws hold the scale deck in place. Remove these screws and lift the deck from the Postal Scale.
3. An aluminum bracket holds the top of the display board in place. Loosen the two screws that hold this bracket in place.
4. Turn the scale on its side.
5. Remove the (5) slot head screws that hold the bottom panel in place. Let the bottom panel lay on the table.
6. Remove the edge connector from the display board.
7. Remove the (3) hex nuts that hold the display board in place.
8. Remove the display board. Be careful not to damage the polaroid window when removing the display board.

5.11 Removal of Keyboard (Ref: Figure 5.5)

1. Turn off "Power ON" switch and unplug scale from power outlet.
2. Remove the (4) Phillips head screws that hold the keyboard panel in place.
3. Remove the (4) Phillips head screws that hold the keyboard to th chassis.
4. Remove the keyboard panel.
5. Remove the (2) Phillips head screws that hold the keyboard to the display assembly.
6. Lift the keyboard until the edge connector can be removed.
7. Remove the keyboard.

5.12 Removal of Power Supply (Ref. 5.3 and 5.4)

1. Turn off "Power ON" switch and unplug scale from power outlet.
2. Remove the (4) Phillips head screws that hold the scale deck in place. Remove the scale deck.
3. Turn the scale on its side.
4. Remove (3) Phillips head screws and (1) slot head screw that holds the power supply to the bottom panel of the scale.
5. Turn the scale so it is resting in a normal position.
6. Remove the (2) Phillips head screws that hold the power supply terminal strip in place.
7. Remove the power supply.

SECTION VI - RATE CHANGE PROCEDURES

SECTION VI - RATE CHANGE PROCEDURES

USPS Rate Changes

USPS rate changes are accomplished by changing the integrated circuits on the Memory A and Memory B boards.

NCI will supply the modified integrated circuits or modified memory boards prior to the effective date of the rate change.

In the event that the new rates are not announced prior to the rate change NCI will supply the modified integrated circuits or modified boards within the two week period following the rate change.

The parts necessary for the rate changes will be enclosed with a written and pictorial description of the steps necessary to implement the change. See APPENDIX II.

It is very important to install the modified parts in the scale for which they are intended. The scale serial number is written on the first page of the instruction write-up. Installation of a rate change kit in any scale other than the specified scale will result in inproper operation.

NCI insists that the old integrated circuits or memory boards be returned within 30 days. In the event that the parts are not returned the appropriate charges will apply.

UPS Rate Changes

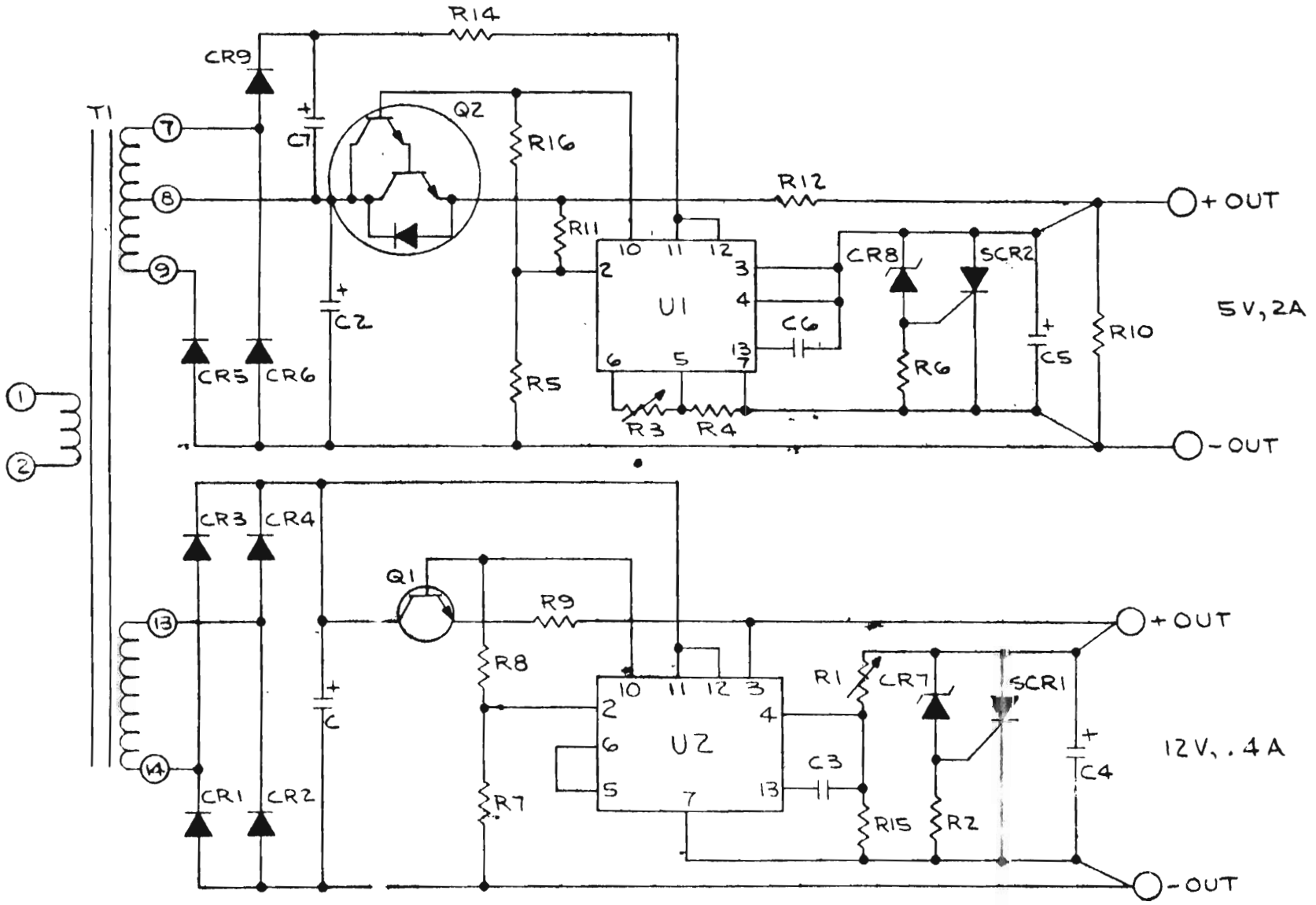
The procedure for implementing a UPS rate change is identical to the USPS rate changes.

SECTION VII - SCHEMATICS

REF DES	HAA 512		DESCRIPTION
C1	330/35		CAPACITOR, ALUM. ELECT.
C2	9000/15		
C4	100/35		
C5,7	220/16		ALUM. ELECT.
C3	.001/100		MYLAR
C6	.003/100		CAPACITOR, MYLAR
CR1,2,3,4,9	AE1C		DIODE, 1A, 200V
CR5,6,	AE3B		DIODE, 3A, 100V
CR8			DIODE, ZENER, 200MW
SCR2			3A SCR
Q1	12500-4		TRANSISTOR, NPN
Q2	2N6055		TRANSISTOR. DARL. NPN
CR7, R2, SCR1	—		—
R5	1K		RESISTOR, 1/2 W, CARB.
R6			
R7			
R ,	240Ω		
R14.16	270Ω		1/2 W, CARB.
R4	2.81K		1/4 W, M.F.
R15	1.18K		1/4 W, M.F.
R9	1.5Ω		1/2 W, CARB.
R12			RESISTOR., 2W, WW, BWH
R1,3	1.5K		POTENTIOMETER, 2W, WW
U1,2	Ua723		I.C. VOLTAGE REGULATOR
T1			TRANSFORMER
P.C.B.	12666		P.C. BOARD
CHASSIS	11091		CHASSIS, ALUM.

MADE FROM 12653

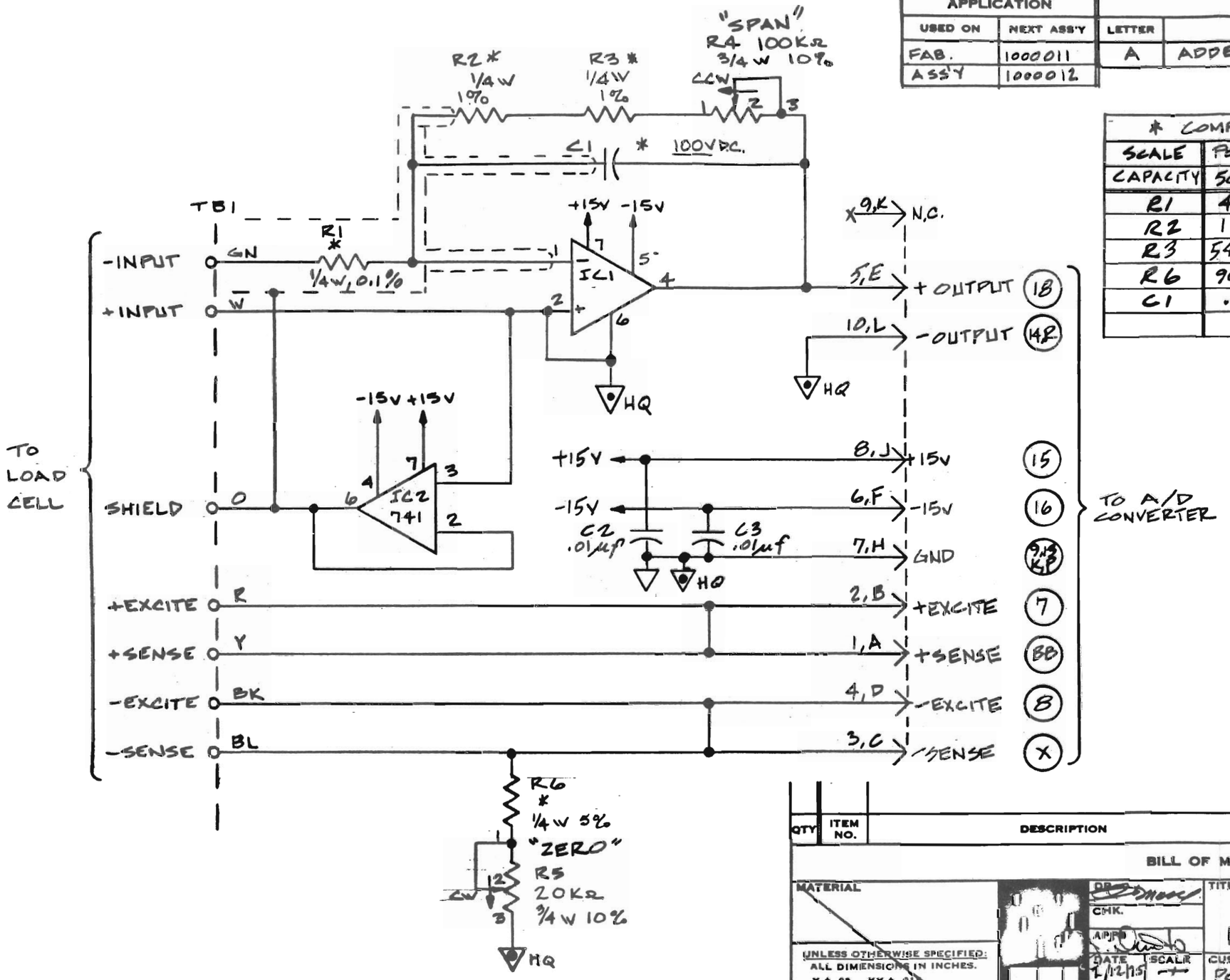
POWER-ONE, Inc.



APPLICATION	
USED ON	NEXT ASS'Y
FAB.	1000011
ASS'Y	1000012

REVISIONS			
LETTER	DESCRIPTION	DATE	APPD.
A	ADDED COMPONENT VALUES	10-13-75	

* COMPONENT VALUE CHART				
SCALE	POSTAL	COUNTING		
CAPACITY	50/100	10	25	1/50/100
R1	4.65K	2K	4.65K	4.65K
R2	1 MEG	348K	1 MEG	1 MEG
R3	549K	499K	200K	200K
R6	90.9K	113K	68.1K	68.1K
C1	.1uf	.47uf	.1uf	.1uf



QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE IDEN. NO.	MATERIAL

BILL OF MATERIAL

MATERIAL

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN INCHES.
.X ± .03 .XX ± .01
.XXX ± .005
FRACTIONS ± 1/32
ANGLES ± 1/2°
MACHINE FINISH 200

DR. [signature]
CHK.
APP'D. [signature]
DATE 2/12/75
SCALE —

TITLE: SCHEMATIC LOAD CELL AMPLIFIER

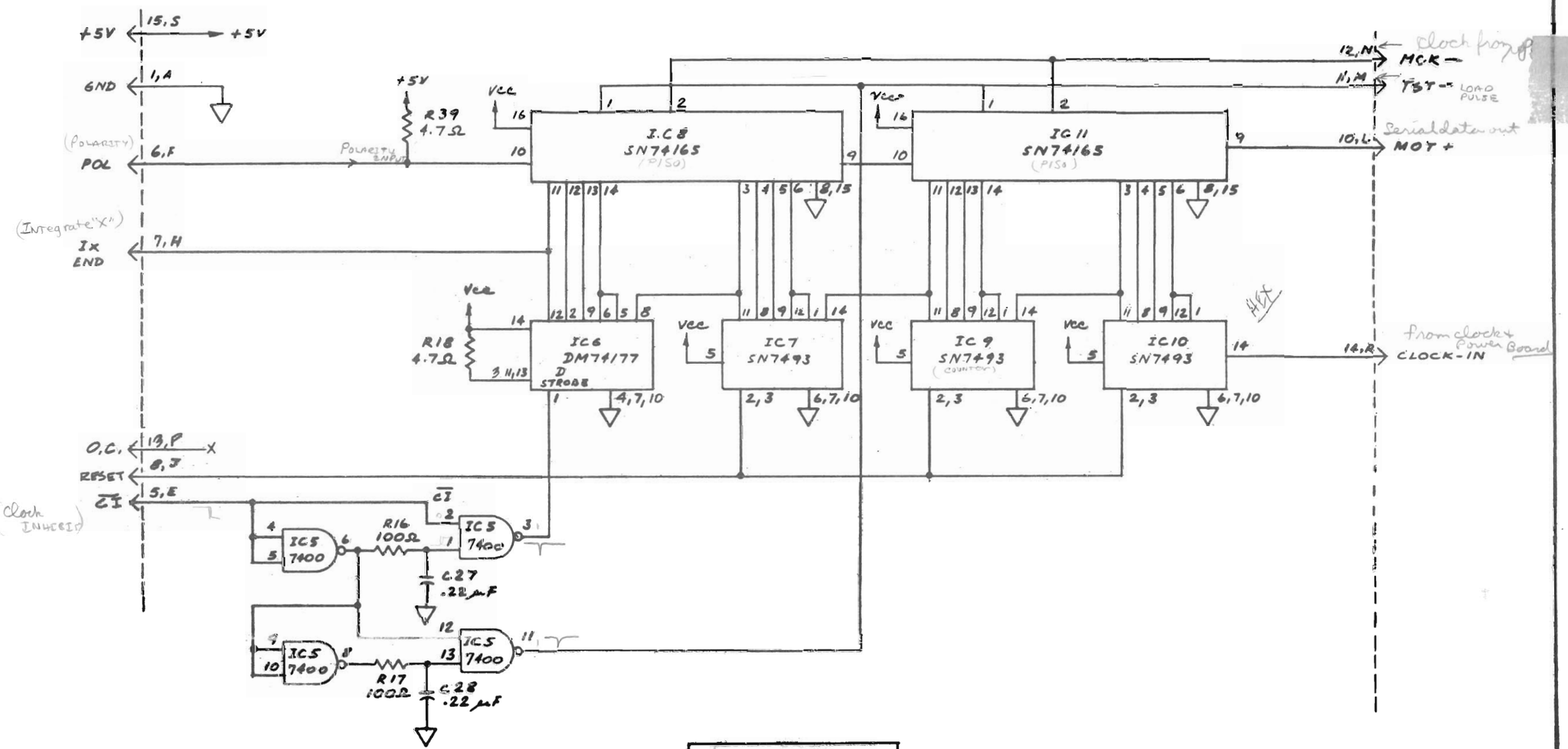
CUSTOMER: POSTAL/COUNTING
JOB NO.

NATIONAL CONTROLS, INC.
SANTA ROSA, CALIF.

DWG. NO. B-1000010
REV. A
SHEET 1 OF 1

PRINTED ON DIEPO NO. 1020-8 CLEARPRINT FADEOUT

APPLICATION		REVISIONS			
USED ON	NEXT ASS'Y	LETTER	DESCRIPTION	DATE	APPR.



REFERENCE DESIG.	
LAST USED	UNUSED
I.C 5 – IC 11 R 39	IC 1 – IC 4 R1 – R 15 & R19 – R38
UNUSED CONTACTS	
2, 3, 4, 9, 13 B, C, D, K, P	

NOTES: EXCEPT AS NOTED.

1. RESISTORS ARE 1/4 W, 5%.
2. REFERENCE DRAWINGS:
   FABRICATION: 1000005-01
   ASSEMBLY : 1000006-01
   ARTWORK: 1000005-01 (ISSUE-001)

QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE NUM.	MATERIAL

BILL OF MATERIAL

MATERIAL

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN INCHES.
.X ± .03 .XX ± .015
.XXX ± .005
FRACTIONS ± 1/32
ANGLES ± 1/2°
MACHINE FINISH √125

DR. G. M.
CHK.
APP'D.
DATE 1.6.75
SCALE —

TITLE: BINARY COUNTER AND SHIFT REGISTER SCHEM.

CUSTOMER POSTAL SYSTEM

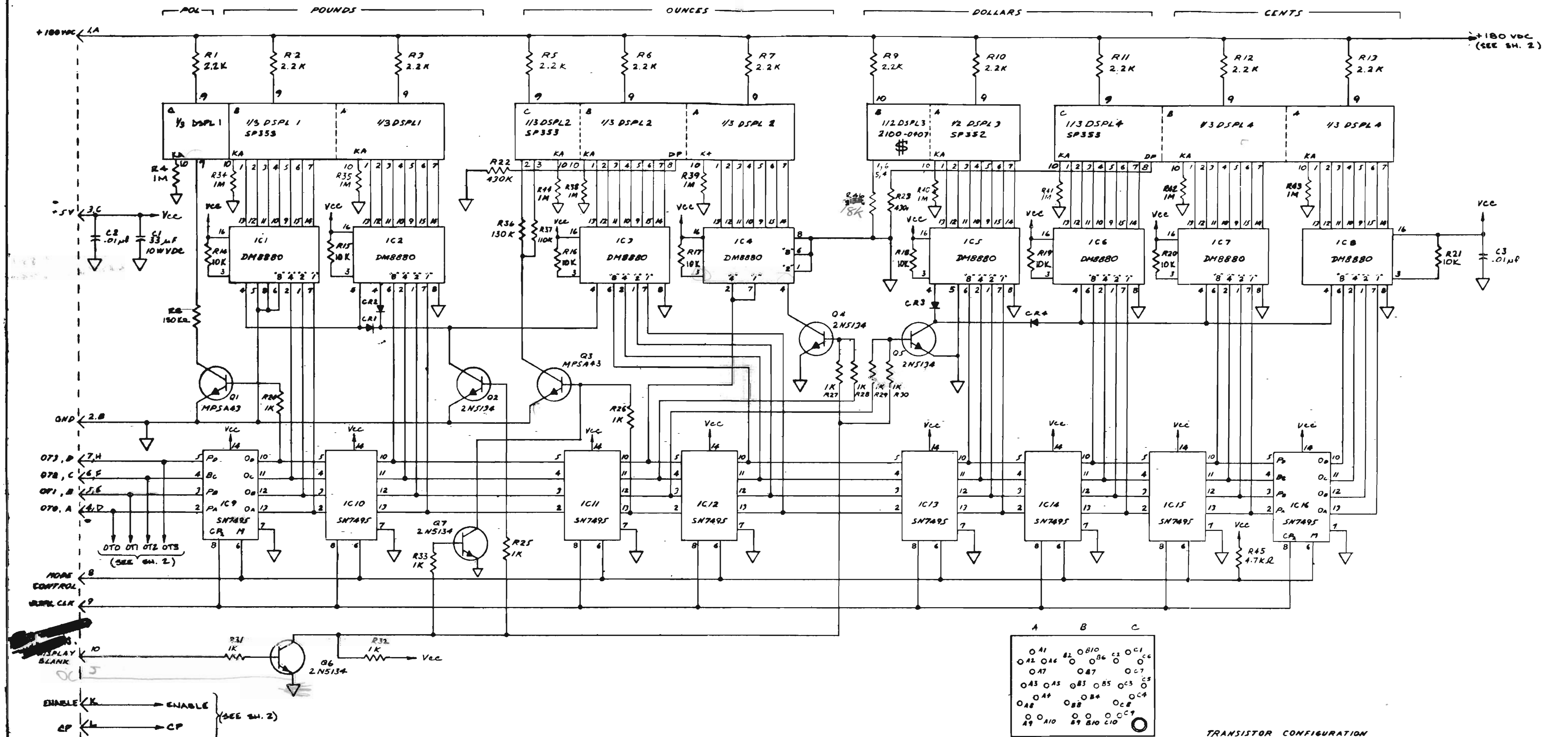
JOB NO.

NCI NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.

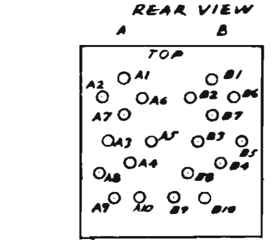
DWG. NO. C-1000004

REV.

SHEET 1 OF 1

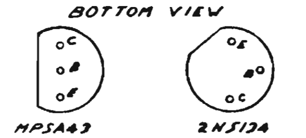


3 DIGIT DISPLAY CONFIGURATION REAR VIEW



2 DIGIT DISPLAY CONFIGURATION REAR VIEW

TRANSISTOR CONFIGURATION BOTTOM VIEW



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5%.
2. ALL DIODES ARE IN4148.
3. ASSEMBLY NO 1000015-02.
4. FAB NO. 1000014-02.

REFERENCE DESIGNATORS USED	
LAST USED	UNUSED
R 61	
Q 8	
IC 24	
CR 4	
DSPL 6	
C 4	

APPLICATION		REVISIONS			
USED ON	NEXT ASSY	LETTER	DESCRIPTION	DATE	APPD
		A	ADDED R.44 - [illegible]		
		B	REVISED - ADDED SH. 2	4/14/75	

BILL OF MATERIAL

TITLE: SCHEMATIC DIGITAL DISPLAY (POSTAL SCALE)

DR A. LEACH

CUSTOMER: NCI STD

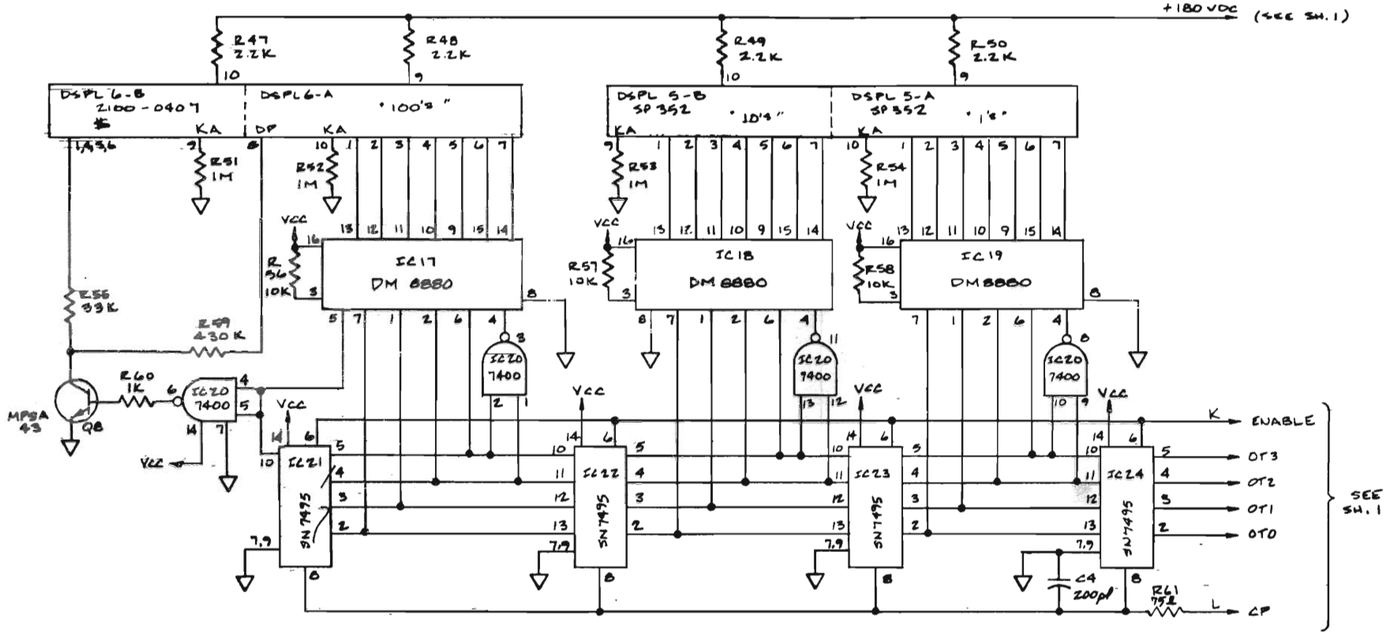
JOB NO 6840

NATIONAL CONTROLS, INC. SANTA ROSA, CALIF

DWG NO D-1000013 REV B

SHEET 1 OF 2

APPLICATION		REVISIONS			
USED ON	NEXT ASS'Y	LETTER	DESCRIPTION	DATE	APPR.



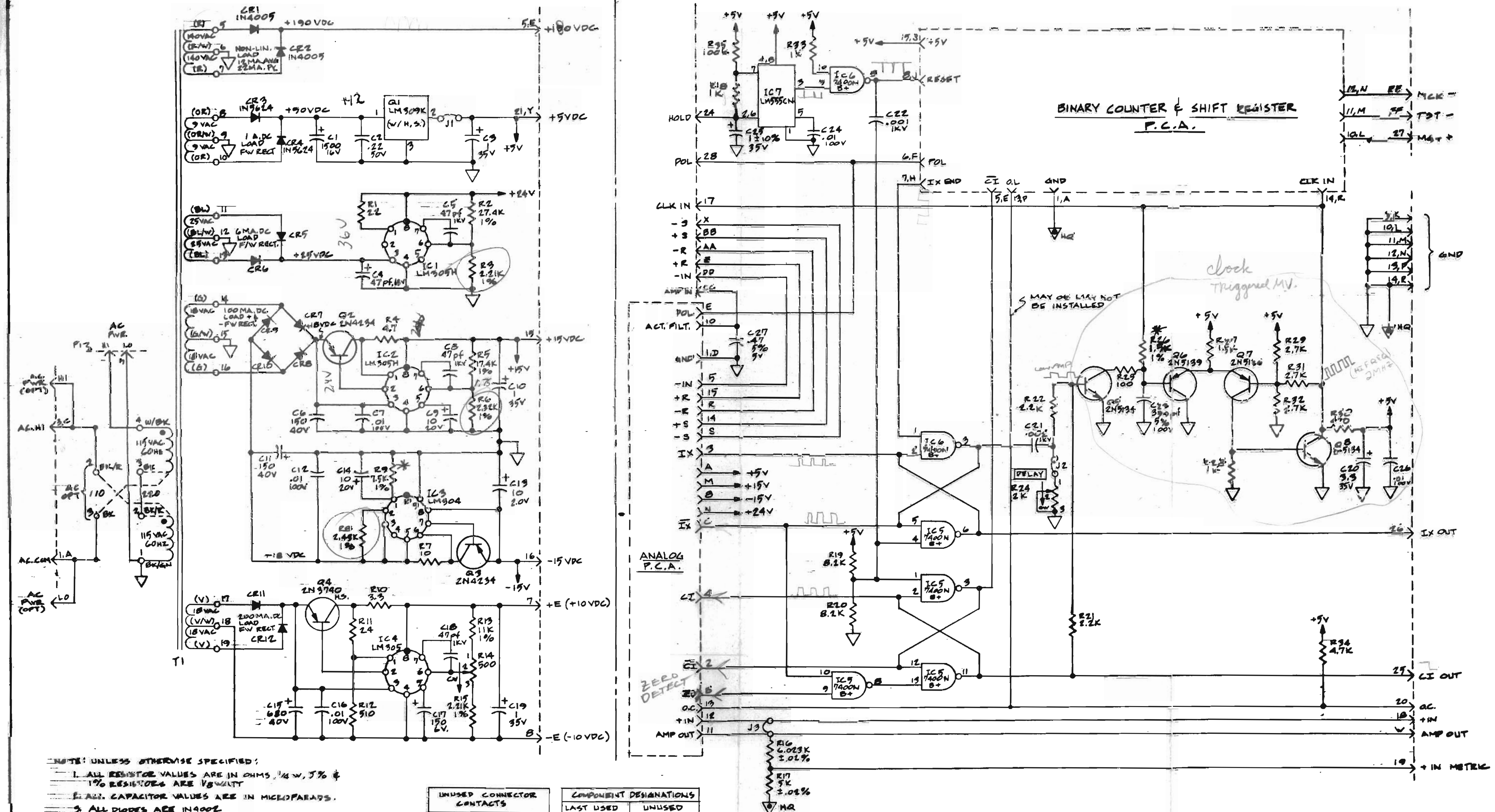
(ZIP TO ZONE)

QTY	ITEM NO.	DESCRIPTION	PART NO	MANUFACTURER CODE (SEE NO)	MATERIAL

BILL OF MATERIAL

MATERIAL	DRN A. LEACH 8/75	TITLE SCHEMATIC DIGITAL DISPLAY		
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN INCHES .X ± .03 .XX ± .010 .XXX ± .005 FRACTIONS ± 1/32 ANGLES ± 1/2° MACHINE FINISH √	CHK			
	APPD			
	DATE 9/14/75	SCALE	CUSTOMER POSTAL SYSTEM	JOB NO 6840
NCI NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.			DWG NO D-1000013 SHEET 2 OF 2	REV B

APPLICATION		REVISIONS			
USED ON	NEXT ASSY	LETTER	DESCRIPTION	DATE	APPR.
		A	REVISED & REDRAWN	[illegible]	[illegible]
		B	ADDED O.L. INDICATION	[illegible]	[illegible]



NOTE: UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5% & 1% RESISTORS ARE 1/8 WATT
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. ALL DIODES ARE IN4002
4. Q1 & Q4, REQUIRE HEAT SINK
5. Q2 & Q3 REQUIRE TRANSISTOR SPACER PAD
6. REF. DRAWINGS; FABRICATION: 1000002-01
   ASSEMBLY: 1000003-01

*7. R26 IS 1KΩ ON COUNTING VERSION 1000003-02.

UNUSED CONNECTOR CONTACTS
B, D, F, H, J, S, T, U, V
2, 4, 6, 22, 23

COMPONENT DESIGNATIONS	
LAST USED	UNUSED
Q8	
T1	
R35	
IC7	
CR12	
C27	
J3	

IC	DEVICE	PWR	+5V(Vcc)	GND
1	LM 305 H	3	-	4
2	LM 309 H	3	-	4
3	LM 304	3,5	-	9
4	LM 305 H	3	-	4
5	SN 7400 N B+	-	14	7
6	SN 7400 N B+	-	14	7
7	LM555CN	-	4,8	1

QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE IDEN NO.	MATERIAL

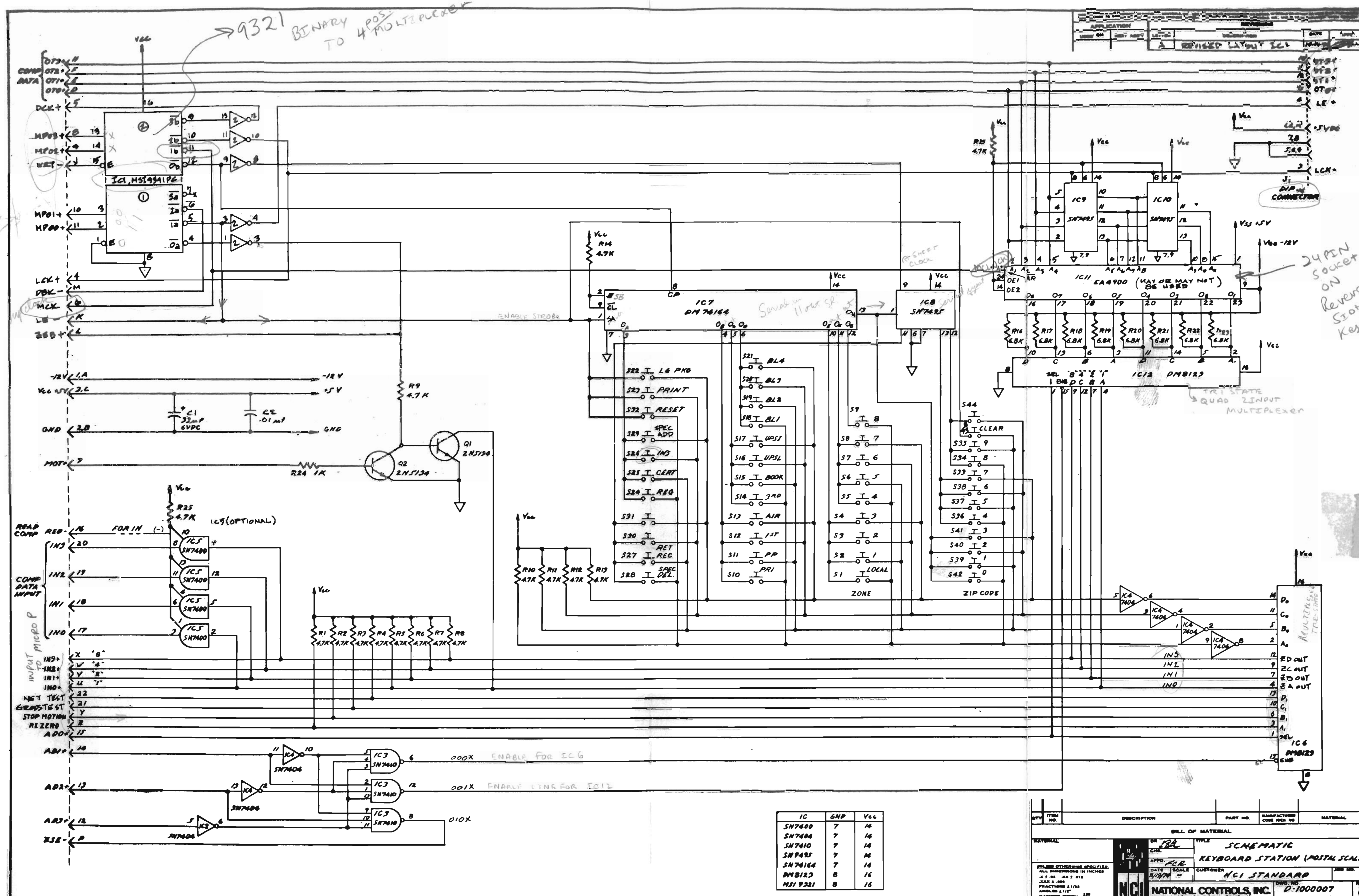
BILL OF MATERIAL

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN INCHES .X ± .03 .XX ± .01 .XXX ± .005 FRACTIONS ± 1/64 ANGLES ± 1/2° MACHINE FINISH

NCI

DR.	[signature]
CHK.	
APP.	J. DRISKO
DATE	6/4/75
SCALE	—
TITLE	CLOCK & POWER SUPPLY SCHEMATIC
CUSTOMER	POSTAL SCALE
DWG. NO.	D-1000001
REV.	B
SHEET	1 OF 1

NATIONAL CONTROLS, INC.
SANTA ROSA, CALIF.



IC	GND	Vcc
SN7400	7	14
SN7404	7	14
SN7410	7	14
SN7495	7	14
SN74164	7	14
DM8123	8	16
MSI 9321	8	16

QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE IDENT NO	MATERIAL

BILL OF MATERIAL

MATERIAL

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS IN INCHES
.X ± .03 .XX ± .015
.XXX ± .005
FRACTIONS ± 1/32
ANGLES ± 1/2°
MACHINE FINISH √125

DR FRA
CHK
APPD. FCR
DATE 8/19/74
SCALE —

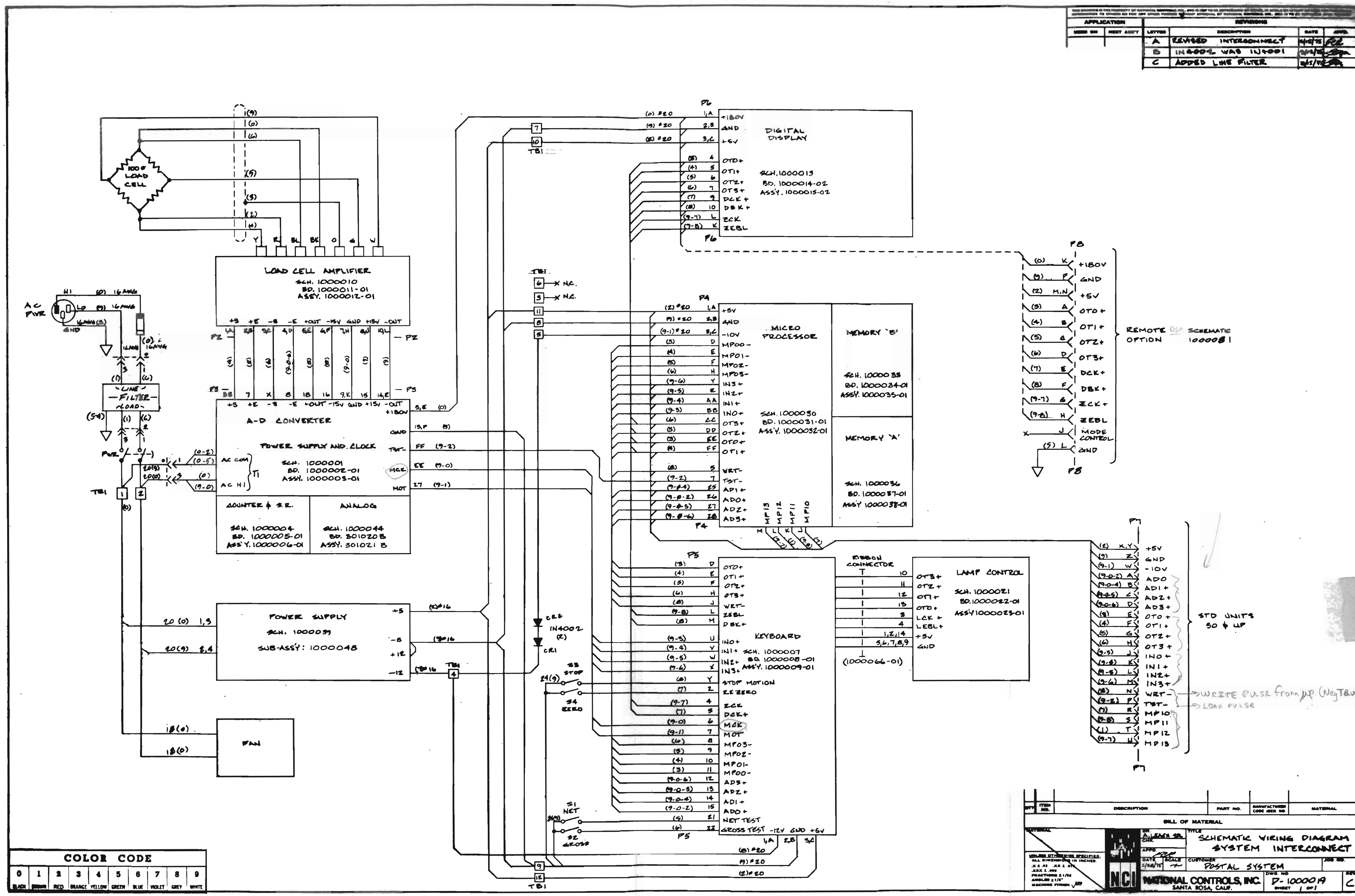
TITLE: SCHEMATIC KEYBOARD STATION (POSTAL SCALE)

CUSTOMER: NCI STANDARD

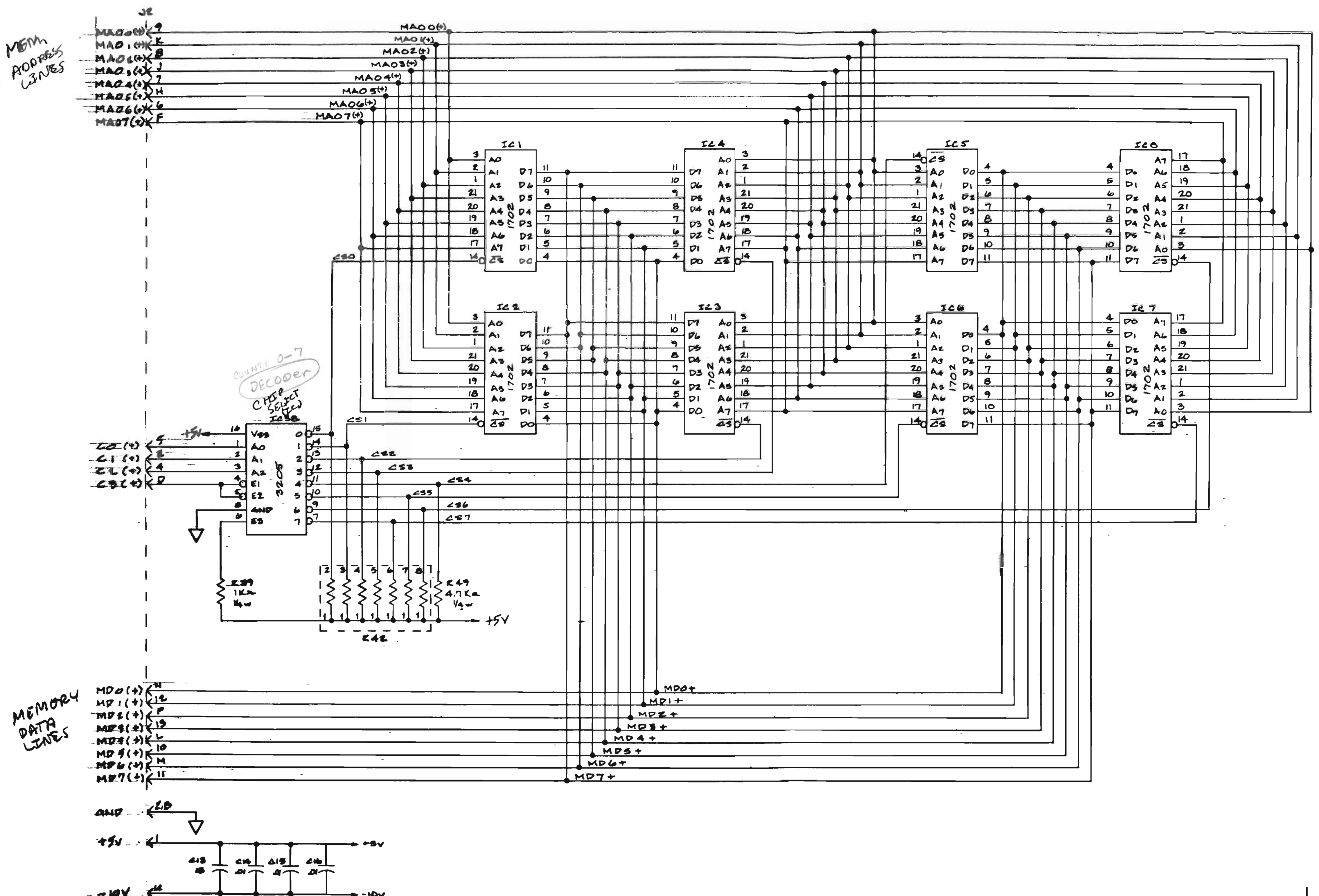
JOB NO.

NCI NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.

DWG. NO. D-1000007
SHEET 1 OF 1
REV. A


REVISIONS
A REVISED INTERCONNECT
B IN4002 WAS IN4001
C ADDED LINE FILTER
100# LOAD CELL
LOAD CELL AMPLIFIER
SCH. 1000010
BD. 1000011-01
ASSY. 1000012-01
AC PWR
LINE FILTER LOAD
A-D CONVERTER
POWER SUPPLY AND CLOCK
SCH. 1000001
BD. 1000002-01
ASSY. 1000003-01
COUNTER & S.R.
SCH. 1000004
BD. 1000005-01
ASS'Y. 1000006-01
ANALOG
SCH. 1000044
BD. 301020B
ASSY. 301021 B
POWER SUPPLY
SCH. 1000039
SUB-ASSY: 1000048
FAN
DIGITAL DISPLAY
SCH. 1000013
BD. 1000014-02
ASSY. 1000015-02
MICRO PROCESSOR
SCH. 1000030
BD. 1000031-01
ASS'Y. 1000032-01
MEMORY 'B'
SCH. 1000033
BD. 1000034-01
ASSY. 1000035-01
MEMORY 'A'
SCH. 1000036
BD. 1000037-01
ASSY 1000038-01
KEYBOARD
SCH. 1000007
BD. 1000008-01
ASSY. 1000009-01
RIBBON CONNECTOR
(1000066-01)
LAMP CONTROL
SCH. 1000021
BD. 1000022-01
ASSY 1000023-01
REMOTE DSP. OPTION
SCHEMATIC 1000081
STD UNITS 50 & UP
WRITE PULSE from µP. (Neg True)
LOAD PULSE
S1 NET
S2 GROSS
S3 STOP
S4 ZERO
CR2 IN4002 (2) CR1
COLOR CODE
0 BLACK 1 BROWN 2 RED 3 ORANGE 4 YELLOW 5 GREEN 6 BLUE 7 VIOLET 8 GREY 9 WHITE
BILL OF MATERIAL
SCHEMATIC WIRING DIAGRAM SYSTEM INTERCONNECT
CUSTOMER POSTAL SYSTEM
NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.
DWG. NO D-1000019
REV. C

APPLICATION		REVISIONS			
USED ON	NEXT ASS'Y	LETTER	DESCRIPTION	DATE	APPD.
		A	REVISED PIN CONNECTIONS		



NOTE:

1. R42 IS AN 8 PIN RESISTOR PACK 750-81-4.7KΩ
2. IC'S 1-8 (1702'S) POWER AND GND PINS,

Vss(+5V)	Vgg(-10V)	GND
12,13,15 22,23	16,24	

3. ALL CAPACITORS ARE IN μF.

QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE IDEN NO.	MATERIAL

BILL OF MATERIAL

UNLESS OTHERWISE SPECIFIED.
ALL DIMENSIONS IN INCHES.
.X ± .03 .XX ± .01
.XXX ± .005
FRACTIONS ± 1/32
ANGLES ± 1/2°
MACHINE FINISH 125

DR. A. LEACH
CHK.
APPD.
DATE 1/7/75
SCALE ~

TITLE: MICRO - PROCESSOR MEMORY 'A'

CUSTOMER: POSTAL SYSTEM

NCI NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.

DWG NO D. 1000036 SHEET 1 OF 1

REV. A

APPLICATION		REVISIONS				
USED ON	NEXT ASSY	LETTER	DESCRIPTION	DATE	APPD
		A	R35 WAS 12.4KΩ	8-31-75	

RATIO OFFSET - KEEPS CURRENT CONSTANT

CONSTANT CURRENT SOURCE

DPM CALIB

+13V

OV-INPUT

INPUT-VARY

ZERO DETECT ZD OUT

CLOCK INHIBIT

INTERRUPT

OVER CAPACITY

TRANSDUCER LINEARITY

INPUT

POLARITY

ACTIVE FILTER

+ OUTPUT

— OUTPUT

+5V

GND

-15V

-E

-S

+E

+S

+ INPUT

— INPUT

DPM ZERO

NOTE: UNLESS NOTED;

1. ALL RESISTORS 1/4W, 5%
2. ALL CAPACITORS IN μf
3. ALL DIODES G-D 2N5478
4. LEGEND: ( ) = BACK CONNECTOR
   □ = ANALOG BOARD
   ⬡ = AMPLIFIER BOARD
5. FOR NEGATIVE NONLINEARITY CORRECTIONS JUMPER A TO C
6. FOR POSITIVE NONLINEARITY CORRECTIONS JUMPER A TO B
7. FOR USE WITH DIGITAL SUBTRACT JUMPER "D" TO "E"
   FOR USE WITHOUT DIGITAL SUBTRACT JUMPER "D" TO "F"
8. MATCHED PAIR
9. REF DWGS FABRICATION 301020 REV B
   ASSEMBLY 301021-B REV C
10. THIS ASSEMBLY IS USED WITH 1000002-02 ASSY

DESIGNATORS	
LAST USED	UNUSED
R52, CR10, IC9, RA6, Q22, C12, C9, IC9	

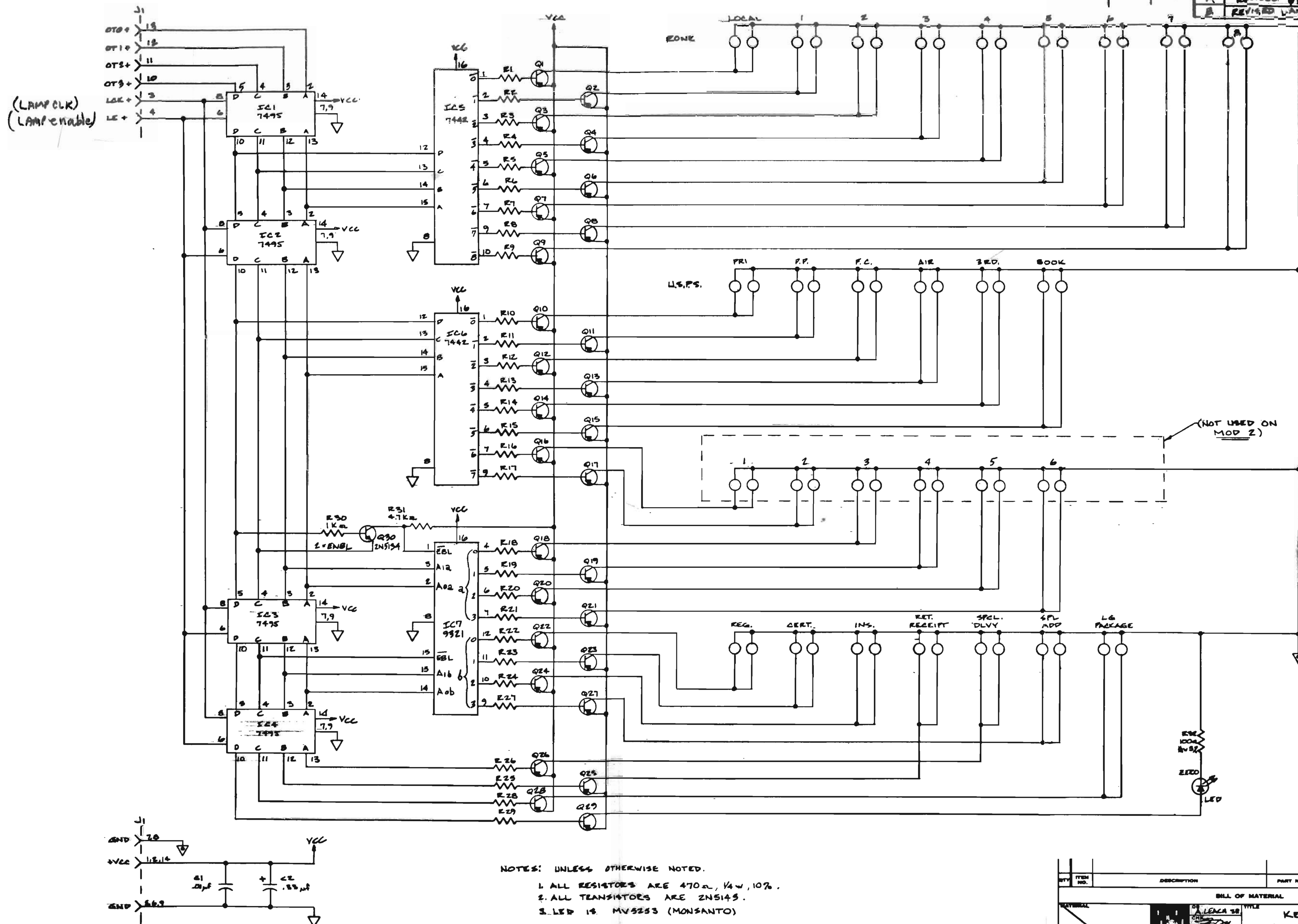
BILL OF MATERIAL

ITEM NO	DESCRIPTION	PART NO	MANUFACTURER OR JOHNSON NO	MATERIAL

SCHEMATIC ANALOG

POSTAL SYSTEM

NATIONAL CONTROLS, INC. D-1000044 A



NOTES: UNLESS OTHERWISE NOTED.

1. ALL RESISTORS ARE 470Ω, 1/4W, 10%.
2. ALL TRANSISTORS ARE 2N5145.
3. LED IS MV5253 (MONSANTO)

QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE IDEN. NO.	MATERIAL

BILL OF MATERIAL

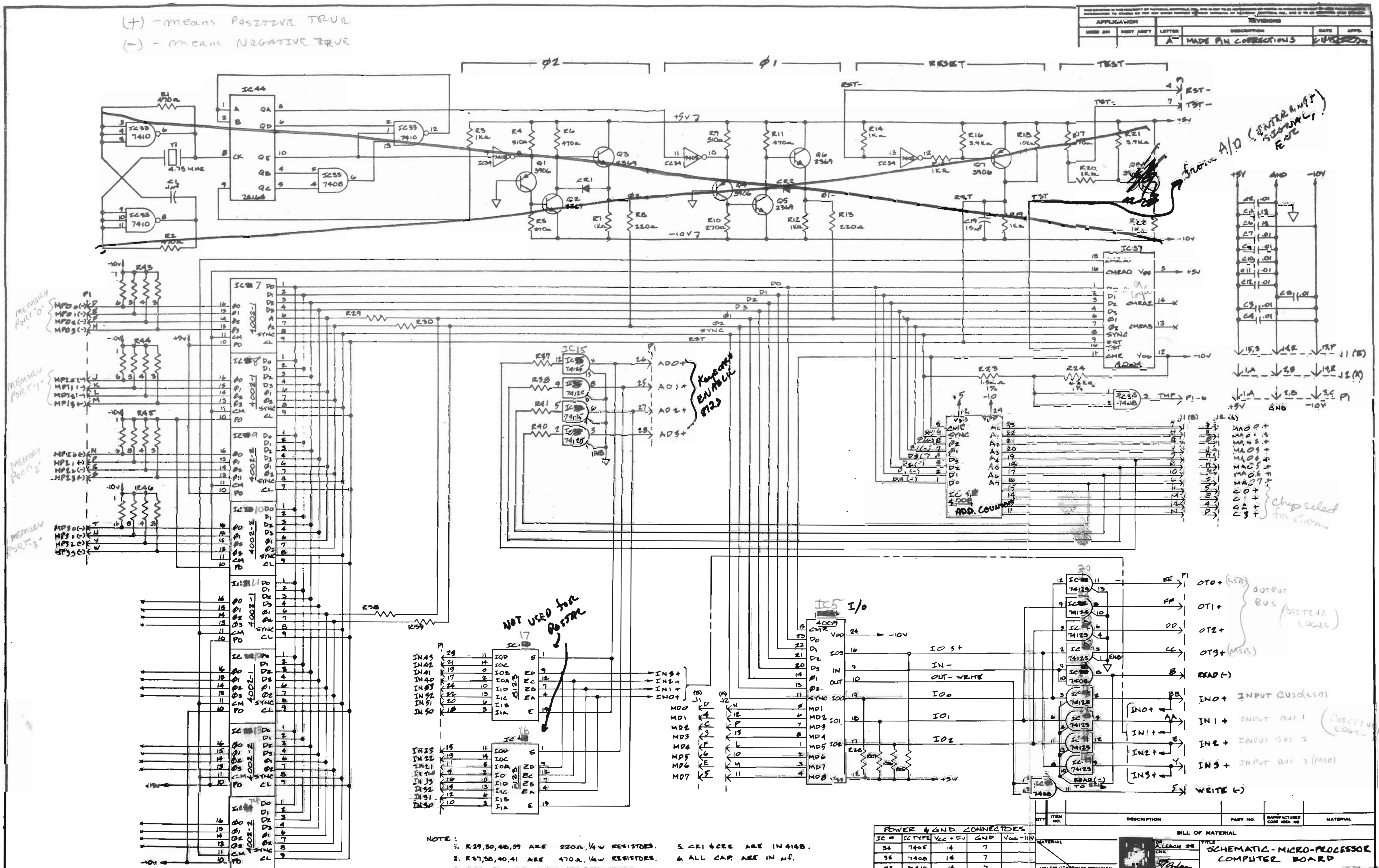
TITLE: KEYBOARD LAMP CONTROL

CUSTOMER: POSTAL SYSTEM

NATIONAL CONTROLS, INC.
SANTA ROSA, CALIF.

DWG. NO. D-1000021 REV. B

SHEET 1 OF 1



NOTE:
1. R29, 30, 38, 39 ARE 220Ω, 1/4W RESISTORS.
2. R37, 38, 40, 41 ARE 470Ω, 1/4W RESISTORS.
3. R43 - 46 ARE 6 PIN RESISTOR PACKS. (CTS 750-61-15KΩ)
4. R26 - 28 ARE 6.8KΩ, 1/4W RESISTORS.
5. CR1 & CR2 ARE IN 4148.
6. ALL CAP. ARE IN μf.

POWER & GND. CONNECTORS

IC #	IC TYPE	Vcc +5V	GND	Vgg -10V
34	7405	14	7	
35	7408	14	7	
33	7410	14	7	
36, 41, 45	74125	14	7	
44	74164	14	7	
[illegible]	4002	5		10, 12
[illegible]		5, 10		12

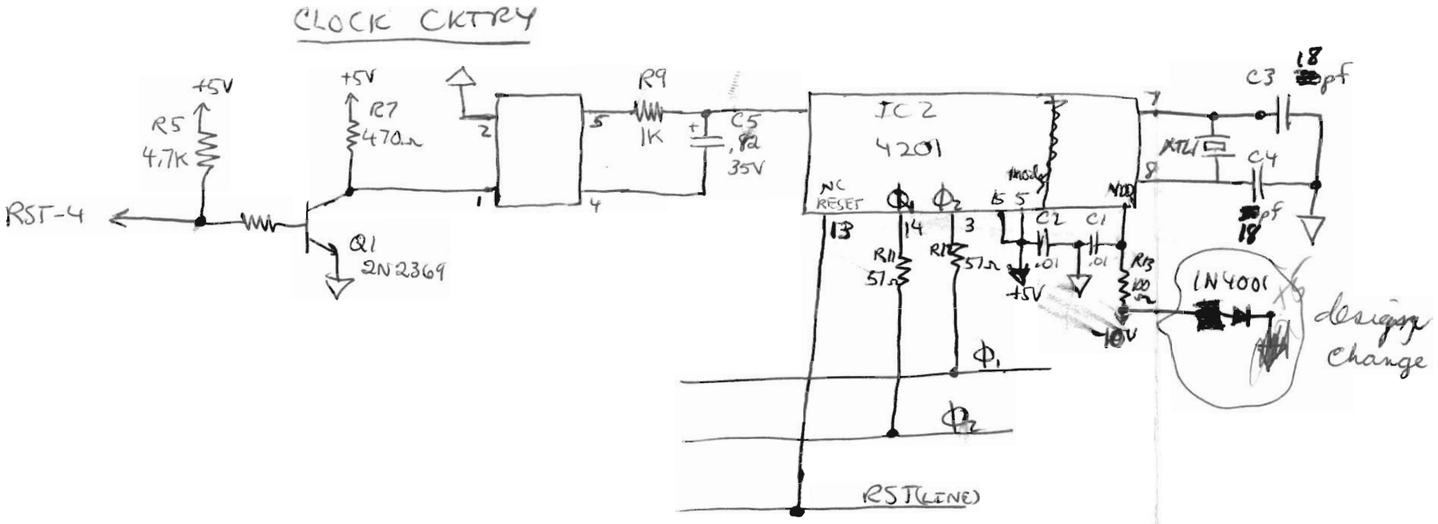
QTY	ITEM NO.	DESCRIPTION	PART NO.	MANUFACTURER CODE IDEN NO	MATERIAL

BILL OF MATERIAL

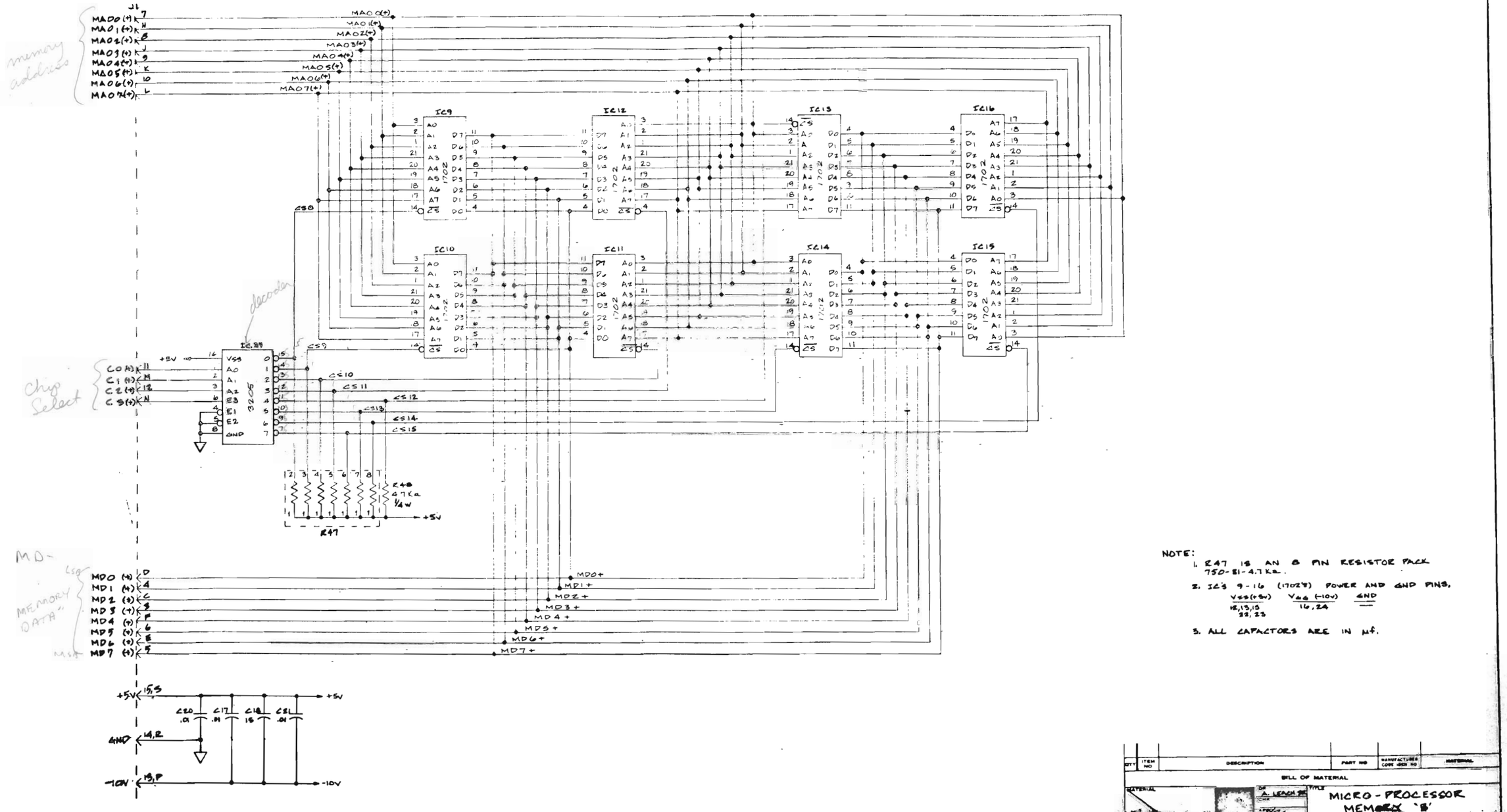
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN INCHES

DR. A. LEACH SR.
CHK.
DATE 7/31/74
SCALE
TITLE: SCHEMATIC - MICRO-PROCESSOR COMPUTER BOARD
CUSTOMER: POSTAL SYSTEM
NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.
DWG NO [illegible]
SHEET OF
REV A

CLOCK CKTRY


+5V
R5
4.7K
RST-4
Q1
2N2369
R7
470Ω
R9
1K
C5
.1μf
35V
IC 2
4201
NC
RESET
Φ1
Φ2
R11
51Ω
R12
51Ω
C2
.01
C1
.01
R13
100Ω
-10V
C3
18 pf
XTL
C4
18 pf
1N4001
design change
Φ1
Φ2
RST(LINE)

MA - memory address



NOTE:

1. R47 IS AN 8 PIN RESISTOR PACK 750-81-4.7 KΩ.
2. IC'S 9-16 (1702'S) POWER AND GND PINS.

Vss (+5V)	V_{BB} (-10V)	GND
12, 13, 15 22, 23	16, 24	—

3. ALL CAPACTORS ARE IN μf.

APPLICATION		REVISIONS			
USED ON	NEXT ASSY	LETTER	DESCRIPTION	DATE	APPD
		A	REVISED PIN NO'S.	4/19/75	

BILL OF MATERIAL

QTY	ITEM NO	DESCRIPTION	PART NO	MANUFACTURER CODE AND NO	MATERIAL

MATERIAL	
DR A. LEWIS 3/5/75	TITLE MICRO-PROCESSOR MEMORY 'B'
CHK	
APP	
DATE 3/5/75	SCALE — CUSTOMER POSTAL SYSTEM
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN INCHES .X ± .03 .XX ± .010 FRACTIONS ± 1/32 ANGLES ± 1° MACHINE FINISH 250	NCI NATIONAL CONTROLS, INC. SANTA ROSA, CALIF.

DWG NO D-1000033 SHEET 1 OF 1 REV A

SECTION VIII - APPENDIX

Procedure for Replacing Memory "A" Circuit Board

1. Unplug power cord.
2. Self-contained scale: Remove four (4) screws from scale deck.

   Remote Platform scale: Remove eight (8) screws from bottom panel.
3. Remove two (2) screws holding Memory "A" circuit board.
4. Remove original Memory "A" board and install new Memory "A" board.
5. Replace two (2) screws holding Memory "A" circuit board.
6. Replace holding screws on scale deck or scale bottom panel.
7. The scale is now ready to be returned to operation.

Procedure for Replacing Memory "B" Circuit Board

1. Unplug power cord.
2. Self-contained scale: Remove four (4) screws from scale deck.

   Remote Platform scale: Remove eight (8) screws from bottom panel.
3. Remove two (2) screws holding Memory "B" circuit board.
4. Remove original Memory "B" board and install new Memory "B" board.
5. Replace two (2) screws holding Memory "B" circuit board.
6. Replace holding screws on scale deck or scale bottom panel.
7. The scale is now ready to be returned to operation.

Procedure for Replacing IC's on Memory "A" or Memory "B" Boards

1. Replace IC's on Memory "A" or Memory "B" (Reference Figure 1)
   - A. Unplug power cord.
   - B. Self-contained scale: Remove four (4) screws from scale deck.

     Remote Platform scale: Remove eight (8) screws from bottom panel.
   - C. Remove two (2) screws holding Memory "A" or Memory "B" circuit board.

D. Remove Memory "A" or Memory "B" circuit board and place on a flat surface such as a desk or table.

E. Gently remove the IC's being replaced (two methods may be used to remove the IC's).

1. Insert a small screwdriver or pen knife between the end of the IC and the plastic socket. Pry the IC gently upward. Move the screwdriver to the opposite end of the IC and repeat the prying operation described above. Move from end to end as needed to work the IC completely out of the socket. Do not try to make this a two step operation as this will result in bent IC pins.

2. Hold the ends of the IC between thumb and first finger. Gently lift one end at a time until the IC is clear of the plastic socket. Once again, do not try to remove the IC in one motion as this will bend or break the IC pins.

F. Using Figure 1 as a guide, insert the new IC's .(Note: While inserting the IC's, check carefully for bent IC pins. If a bent pin is detected, remove the IC and straighten the pin with needlenose pliars).

G. Replace Memory "A" or Memory "B" circuit board.

H. Replace holding screws on scale deck or bottom panel.

I. The scale is now ready to be returned to operation.

NOTE: The Intel IC's used on the NCI Memory Boards will work only when properly inserted. A black dot is printed on the IC. This dot locates Pin 1. Pin 1 on the IC socket is identified by a 45° corner cut into the plastic. Pin 1 on the IC must match Pin 1 on the IC socket.

Procedure for Replacing Key Tops

1. Refer to Figure 1 to determine new key top layout.

2. Turn power switch to OFF position.

3. Gently remove key tops to be replaced. Use a small screwdriver or knife blade on one side for support and push upward with fingers.

4. Install new key tops by pressing into place.

5. The scale is now ready to be returned to operation.

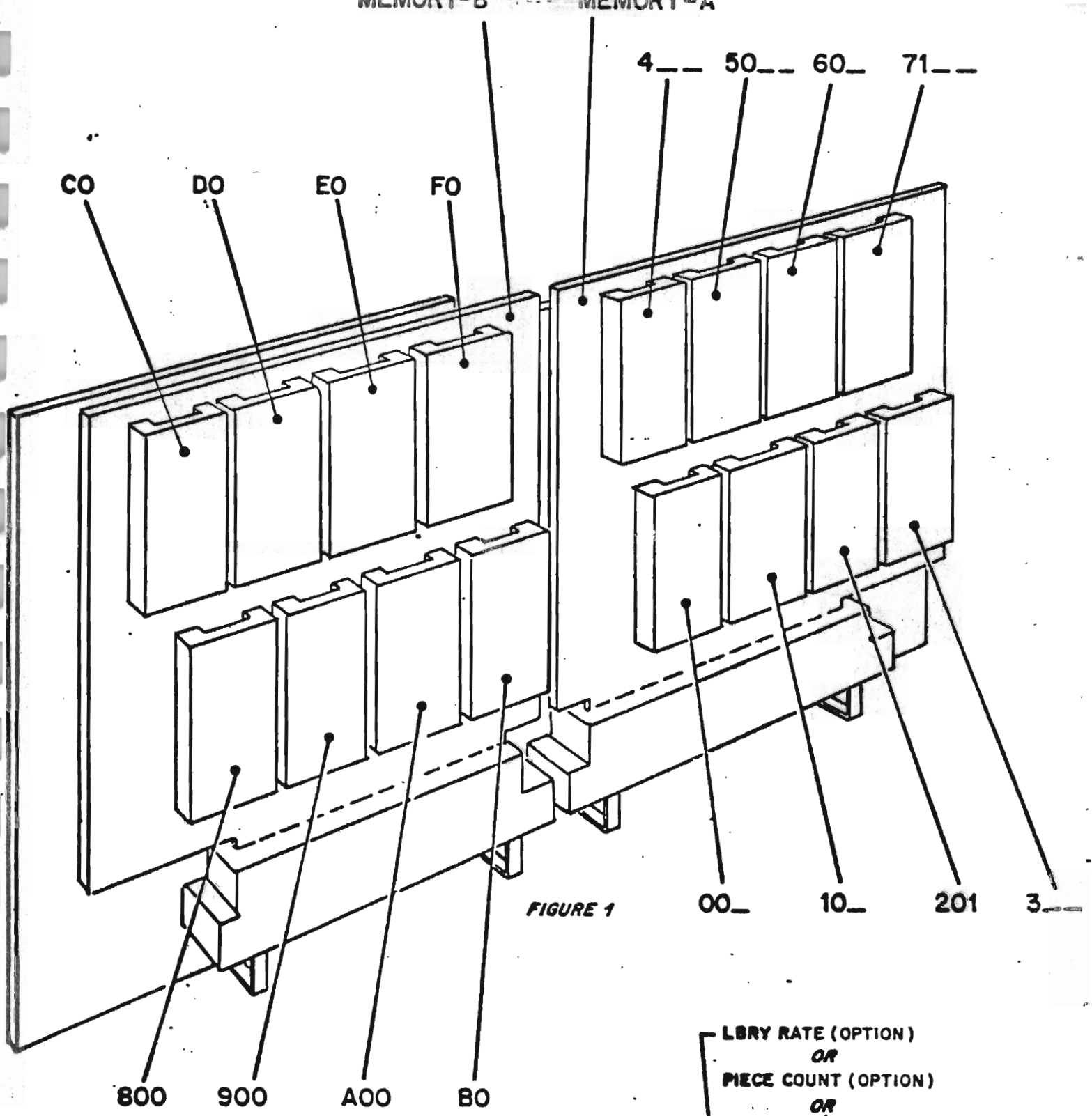


FIGURE 1

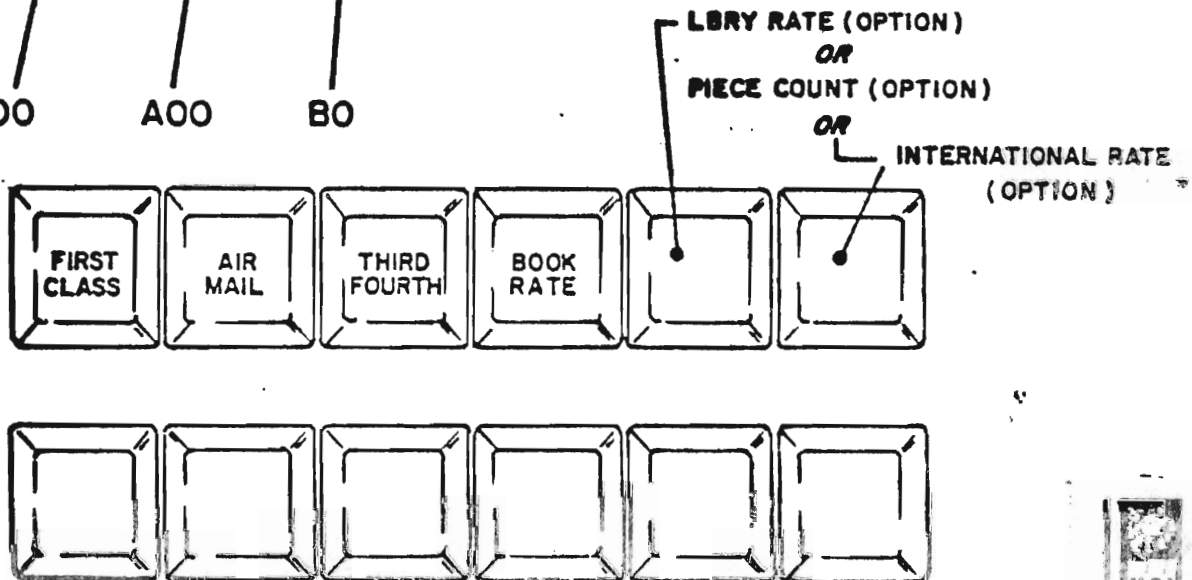


FIGURE 2

TEST PROCEDURE

POSTAL PRINTED CIRCUIT ASSEMBLIES

PURPOSE: To insure all postal boards meet all specifications before assembly.

EQUIPMENT:

1. Analogic voltage standard
2. Oscilloscope
3. DVM
4. Load cell simulator
5. NCI postal test station
6. One good set of postal boards

CONTEXT:

1. Power one
2. Clock and power
3. Analog
4. Binary counter
5. Display board
6. Keyboard
7. Micro processor
8. Mem A
9. Mem B
10. Load cell amplifier

PROGRAMS NEEDED:

1. Postal test program - PT000 - PT100 - PT200
2. Postal table test - PTT 4/15
3. Memory A test - Mem A PO, PX
4. Memory B test - Mem A PO - Mem B PX, Mem B, BO

1. POWER ONE

1.1 Inspect unit for faulty assembly
1.2 Install unit in Power One test rack, or connect 115 vac to transformer with AC cord
1.3 Test +5v and -12v outputs with DVM for correct voltages and stability
1.4 Measure AC ripple with scope
1.4.1 AC ripple should be less than 10 mv

2. CLOCK AND POWER

2.1 Use postal test program PT
2.2 Inspect board for wrong parts, backward parts, and solder bridges

2.3 Power on. Measure all voltage supplies with a DVM
+15v ± .5v
-15v ± .5v
+24v ± .75v
10v adjustable 2v
180v - 20v
2.4 With scope, check the reset pulse time for 60 to 78 ms
2.5 Plug in good Binary Counter. Display should go to - FFFF
2.6 Plug in good Analog card. Check for active reading
2.7 Adjust excitation voltage to 10.000 +5mv
2.8 With analogic, adjust analog input to 00.000v. Adjust Analog zero pot R52 so the reading just trips from - to +. Adjust zero width pot R24, on meter board until display reads 00.000.
2.9 Set input to +100 μv and check to see that display reads +00.002
2.10 Set input to -100μv. Display should read -00.002
2.11 Set input to 2v. Display should read 8000. Analog span can be adjusted to obtain this reading
2.12 Check for stability of ±1 digit on display

3. ANALOG P.C.B.

3.1 Program used
3.1.1 Use postal test program PT, or 5800
3.1.2 Select (F) on keyboard switches
3.1.3 Use known good clock and power
3.1.4 Use known good binary counter
3.2 Visual Inspection
3.2.1 Inspect PCB for correct installation of all components
3.2.2 Inspect PCB for solder shorts
3.3 Insert analog and binary counter into clock and power. Power on
3.4 + and - bias adjustment
3.4.1 Set R48 and R49 bias pots full CCW
3.4.2 Set input voltage to 00.0000v
3.4.3 Adjust meter zero pot R52 to where display just trips from - minimum to + minimum. The minimum should be less than 4 counts.
3.4.4 Adjust zero width pot R24 on clock and power PCA until display reads 0000
3.4.5 Set input to +100μv and check to see that display reads +0002
3.4.6 Set + bias pot R48 for an output (Pin 6 of IC8) of +1.25v ±.05v. Monitor with DVM
3.4.7 Apply input of -100μv
3.4.8 Set - bias for and output (Pin 6 of IC9) of +1.25v ±.05v. Monitor with DVM
3.5 Zero and span adjustment
3.5.1 Set input voltage to zero
3.5.2 Adjust zero pot R52 for reading of +0000
NOTE: If zero pot is less than 20% CW or CCW, change R50 on analog
3.5.3 Set input voltage to +2.000v
3.5.4 Adjust span pot R39 for reading of 8000
NOTE: If span pot is less than 20% CW or CCW, change R12 on analog

3.5.5 Apply input of -2.000v and verify that display reads -8000 ± 2 counts

3.6 Linearity

3.6.1 Check zero and span

3.6.2 Check the following values with both positive and negative voltage inputs

Analog Input	Display Reading
.0000v	0000
.5000v	2000
1.0000v	4000
1.5000v	6000
2.0000v	8000

3.6.3 The meter readings should be within a 2 count tolerance

3.7 Ratio offset

3.7.1 Turn ratio offset pot R4 full CCW

3.7.2 Turn excitation supply pot full CCW

3.7.3 Using a simulator, apply full scale positive input to analog amp.

3.7.4 Rotate excitation supply pot from maximum CCW to maximum CW and note range of meter change

3.7.5 Rotate ratio offset pot slightly CW and repeat step 3.7.4.

3.7.6 Continue steps 3.7.4 and 3.7.5 until meter change is + 10 counts

3.7.7 Reset excitation voltage to 10.000 v ± 5mv

3.8 Hi-Low line

3.8.1 Set input to zero

3.8.2 Adjust variac from 105 vac to 130 vac. There should be no change in meter reading

3.8.3 Set input to full scale

3.8.4 Repeat step 3.8.2. The meter should not change more than 1 digit

3.8.5 Set excitation supply for 10.000v ± 5mv

4. BINARY COUNTER

4.1 Use known good clock and power supply. Use known good analog card

4.2 Plug binary to be tested and analog card into clock and power supply

4.3 Use postal program PT0, PT1, PT2. Select "F" for meter display, power on.

4.4 Adjust analog input to 0.0v. Display should read 00.00

4.5 Adjust analog input to 2.0v. Display should read 7FFF

4.6 This test will check each decade for both zero and full capacity output. If there is any doubt, check each decade individually. Adjust analog input so display counts from 0 to F for each decade.

5. DISPLAY BOARD

5.1 Inspect PCB for backwards and wrong components. Check for solder bridges.

5.2 Use postal test program PT0, PT1 and PT2. Select (3) on the keyboard switches

5.3 Power on. Watch for bad segments and leaky drivers. Observe test routine and check for bad numbers

6. KEYBOARD

6.1 Run the following test routines with postal test

6.1.1 Keyboard lamps. Switch (1) and (B). Check all lamps and switches

6.1.2 Display. Switch "3" check all digits

6.1.3 Meter switch F. Check for active meter reading

6.2 Use postal table test 415 to check prom socket and associated circuitry

6.2.1 Plug Rom 49190 in prom socket on bottom of keyboard

6.2.2 Select 1 on keyboard switches. Power on.

6.2.3 Select "0" on switches. Display will count 00 to 75. When display reaches 75 successfully, the test is complete.

7. MICRO-PROCESSOR

7.1 Run the following test routines

7.1.1 Postal test PT0, PT1, PT2
Lamp test - switch (1)
Display test - switch (3)
Keyboard test - switch (B)
Meter test - switch (F)

7.1.2 Postal table test (PTT 415)

7.1.3 Memory A test
Plug in prom (Mem A pgo) in page (0), memory A board. Plug (Mem A pg x) in pages (1) through (7). Power on. Select 1 to 7 on keyboard switches. Display will run from 000 to 7FF. Test is complete when display successfully reaches 7FF.

7.1.4 Memory B test
Insert prom (Mem A pgo) in page (8). Insert prom (Mem B px) in pages 9 to F. Insert prom (Mem B pgo) in page (0). Power on. Select 8 to F on keyboard switches. Display will run 800 to FFF successfully to complete test

8. MEMORY A TEST

8.1 Refer to 7.1.3

9. MEMORY B TEST

9.1 Refer to 7.1.4

10. LOAD CELL AMPLIFIER

10.1 Inspect PCB

10.2 Insert amplifier to be tested into the postal test harness
10.3 Power on. With program PT0, PT1, PT2 select F on the keyboard switches. Observe active meter reading with ± 4 digit stability

DB:kw