

Information for these sections is included in BR5A5  
Disk Storage Unit, Publication No. 83302300.

SECTION 1

GENERAL DESCRIPTION

SECTION 2

OPERATION

SECTION 4

THEORY OF OPERATION



SECTION 5

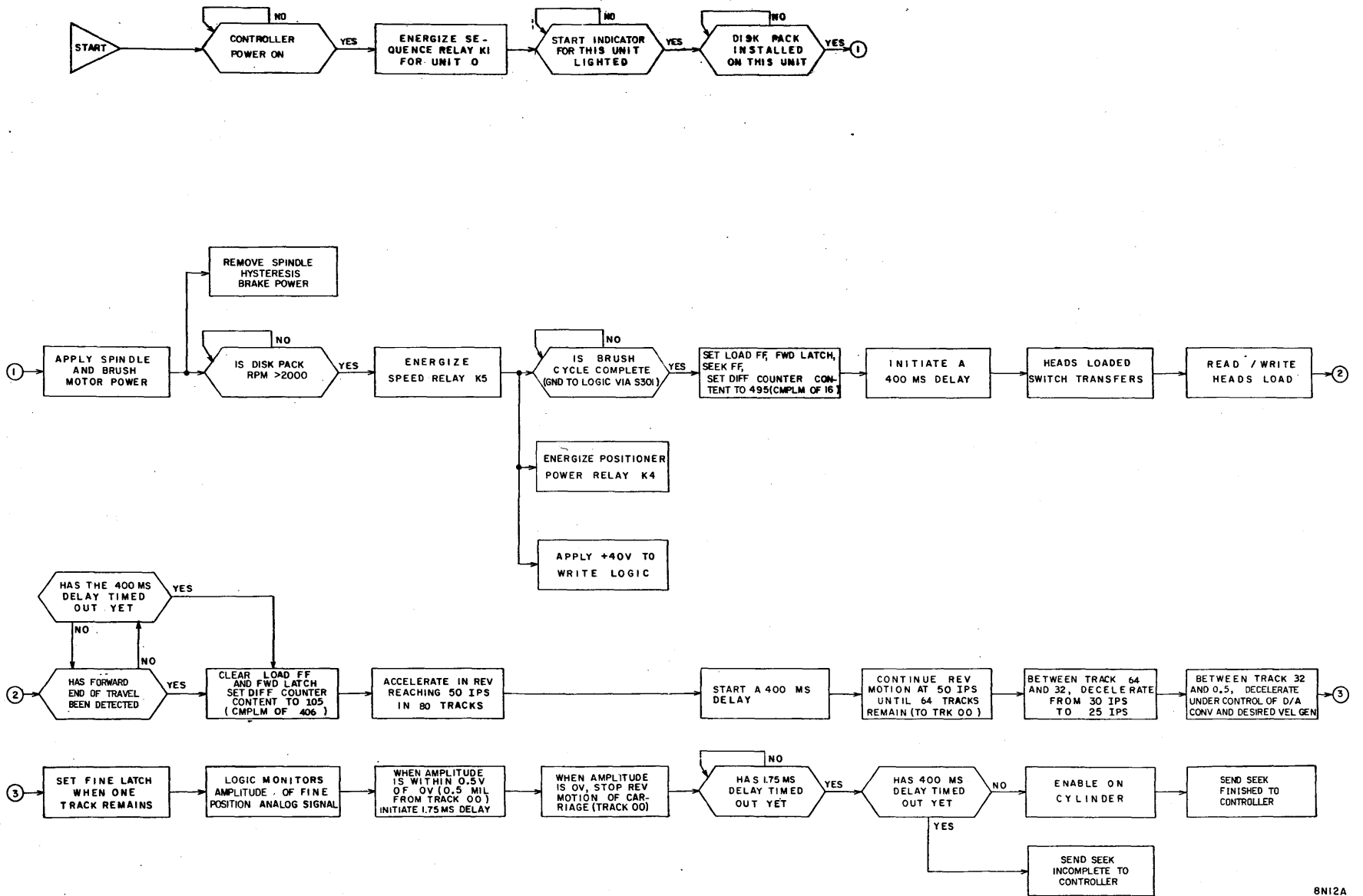
DIAGRAMS



## DIAGRAMS

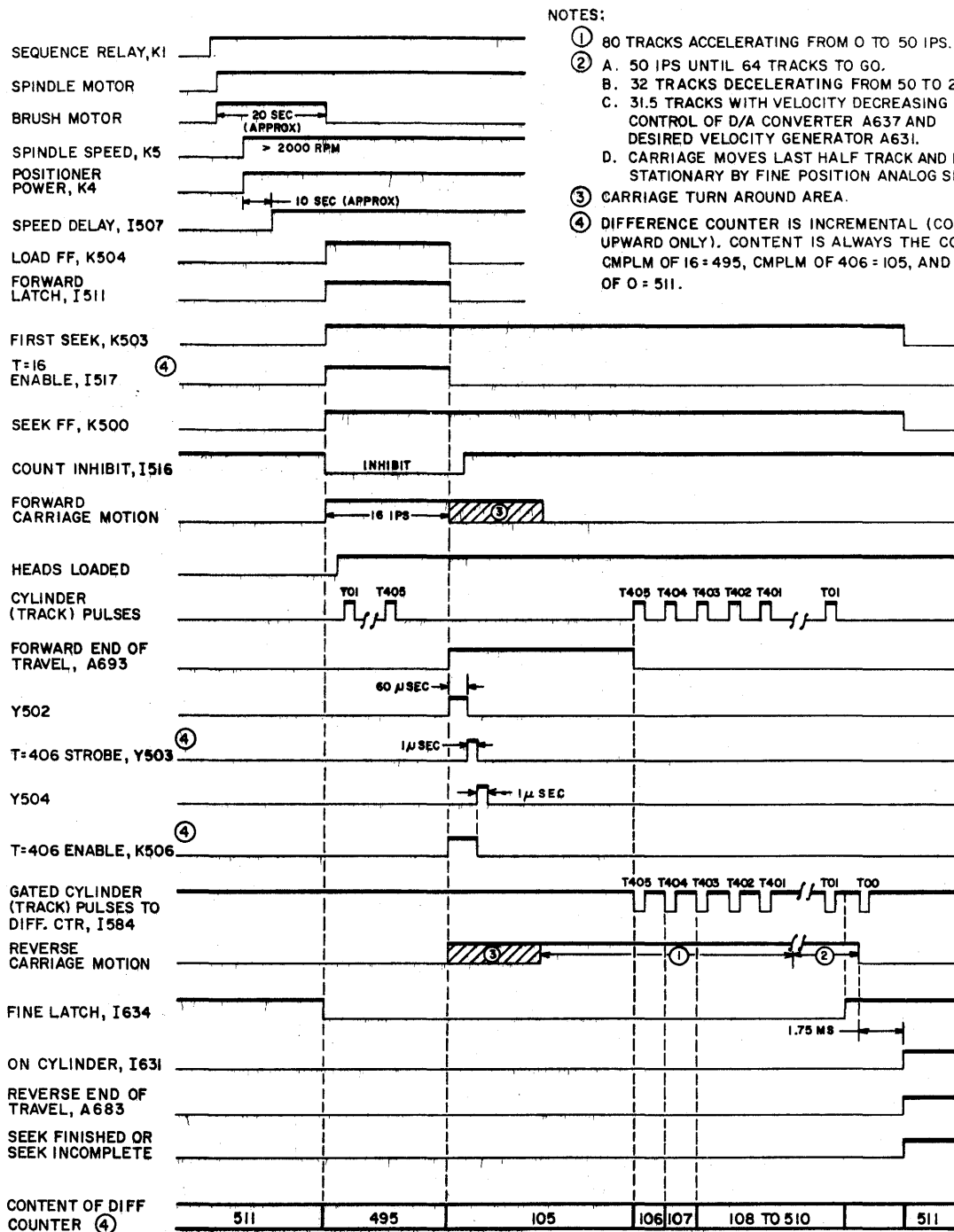
### INTRODUCTION

This section contains diagrams that logically describe the DSU in terms of the functions which the unit performs. Figures 5-1 through 5-13 are flow charts, simplified circuits, and timing diagrams that describe the First Seek function, the Power Off sequence, the Direct Seek (forward and reverse) function, the Return to Zero function, the Read/Write operations and Head Advance timing. The logic diagrams for the unit are provided on pages 5-14 through 5-37. The unit power supply schematics are located on pages 5-38 through 5-41. The operator panel schematic is found on page 5-42. Schematic diagrams for the logic cards are found at the end of the section.



8N12A

Figure 5-1. Power On/First Seek Sequence

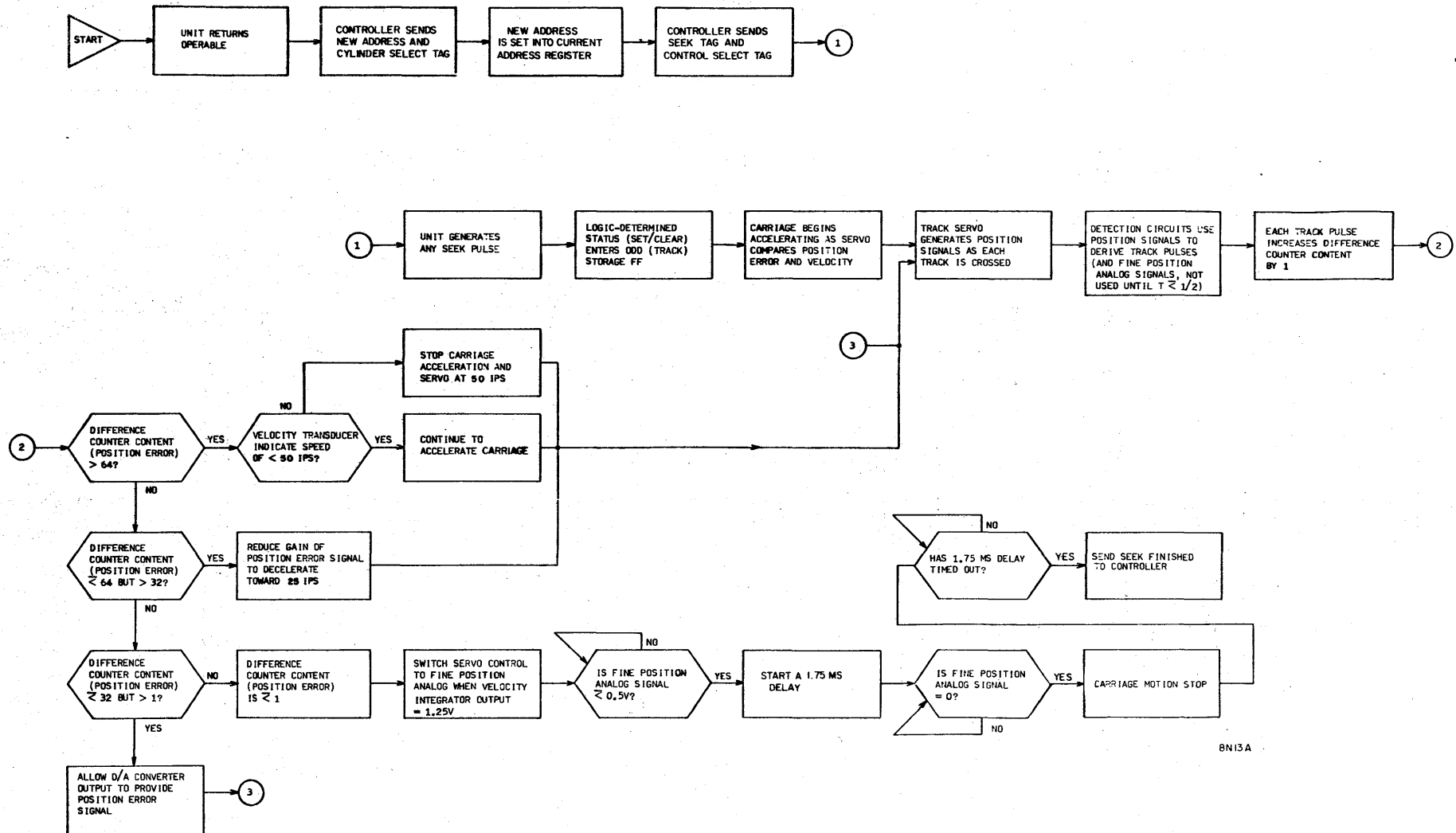


NOTES:

- ① 80 TRACKS ACCELERATING FROM 0 TO 50 IPS.
- ② A. 50 IPS UNTIL 64 TRACKS TO GO.  
B. 32 TRACKS DECELERATING FROM 50 TO 25 IPS.  
C. 31.5 TRACKS WITH VELOCITY DECREASING UNDER CONTROL OF D/A CONVERTER A637 AND DESIRED VELOCITY GENERATOR A631.  
D. CARRIAGE MOVES LAST HALF TRACK AND IS HELD STATIONARY BY FINE POSITION ANALOG SIGNAL.
- ③ CARRIAGE TURN AROUND AREA.
- ④ DIFFERENCE COUNTER IS INCREMENTAL (COUNTS UPWARD ONLY). CONTENT IS ALWAYS THE COMPLEMENT: CMPLM OF 16 = 495, CMPLM OF 406 = 105, AND CMPLM OF 0 = 511.

8N37

Figure 5-2. Power On/First Seek Timing



8N13A

Figure 5-3. Direct Seek Sequence



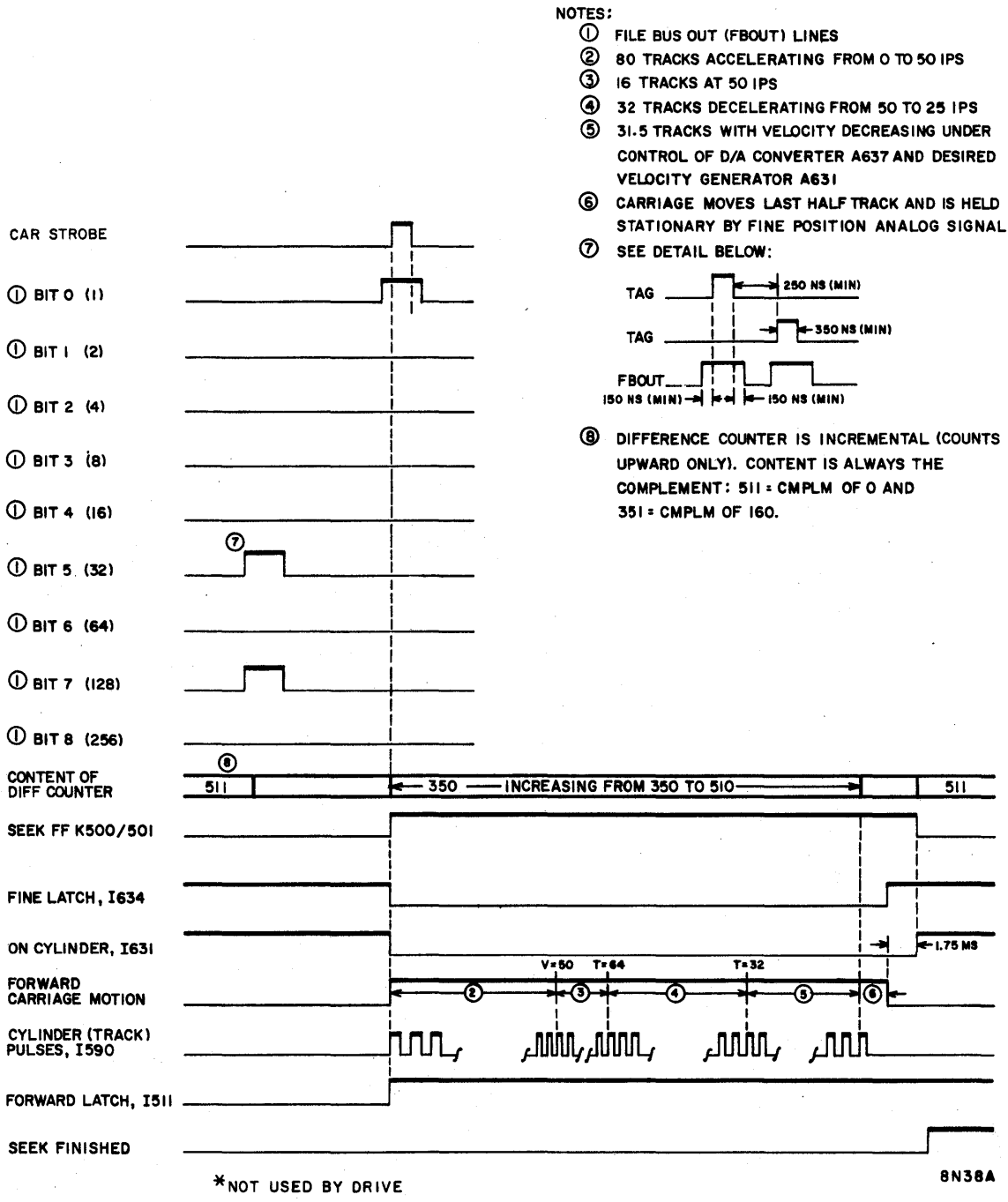
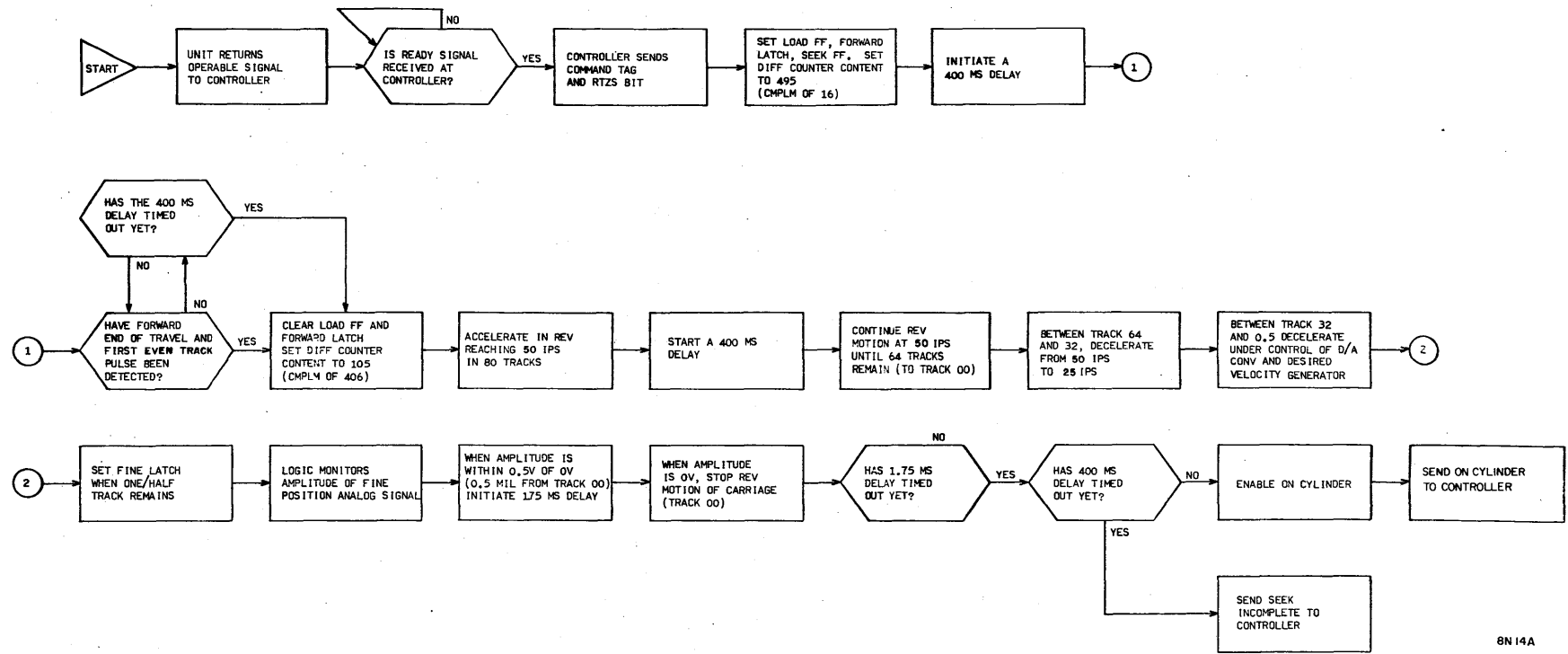
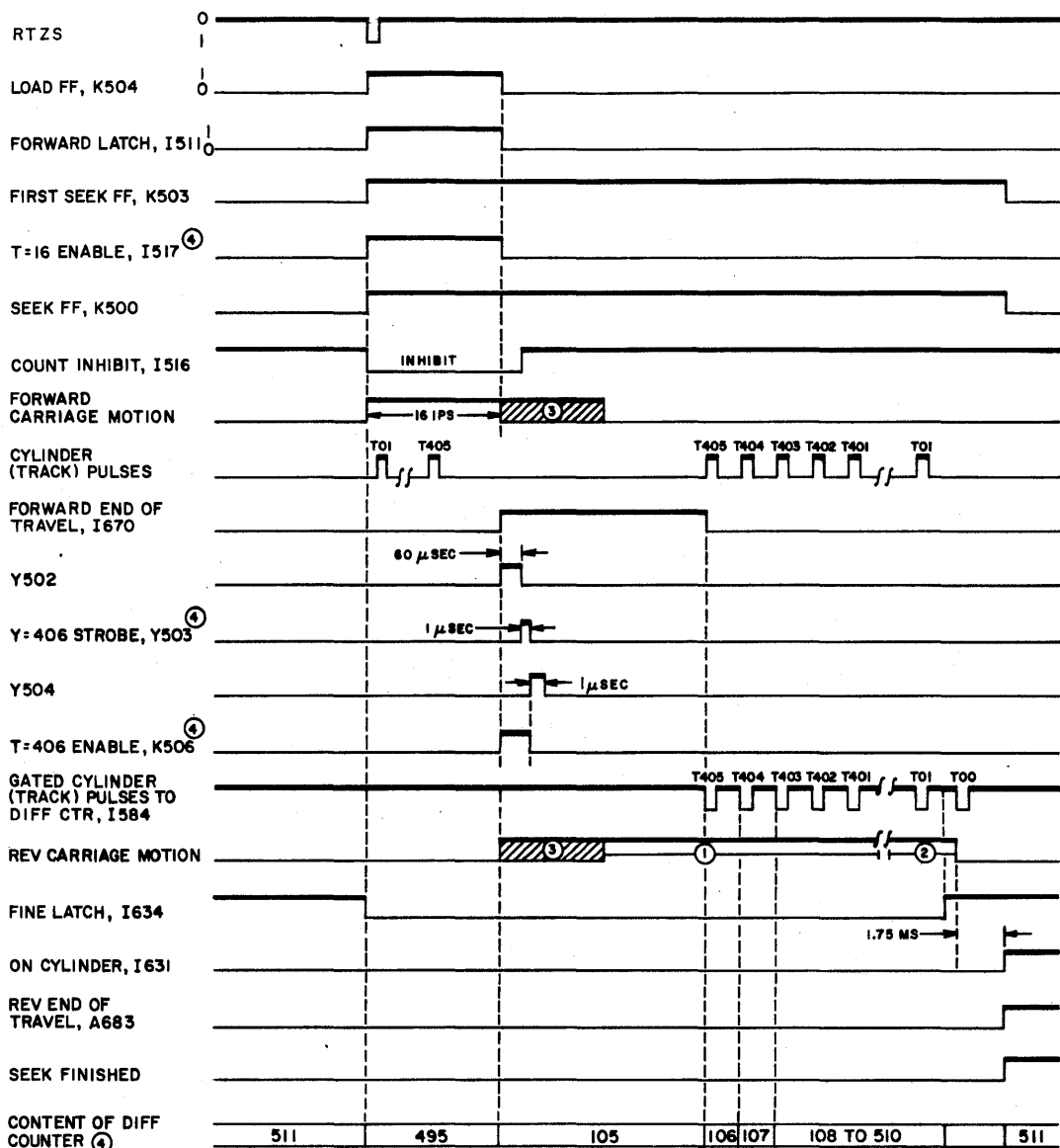


Figure 5-4. Direct Seek Timing



8N14A

Figure 5-5. Return to Zero Seek Sequence

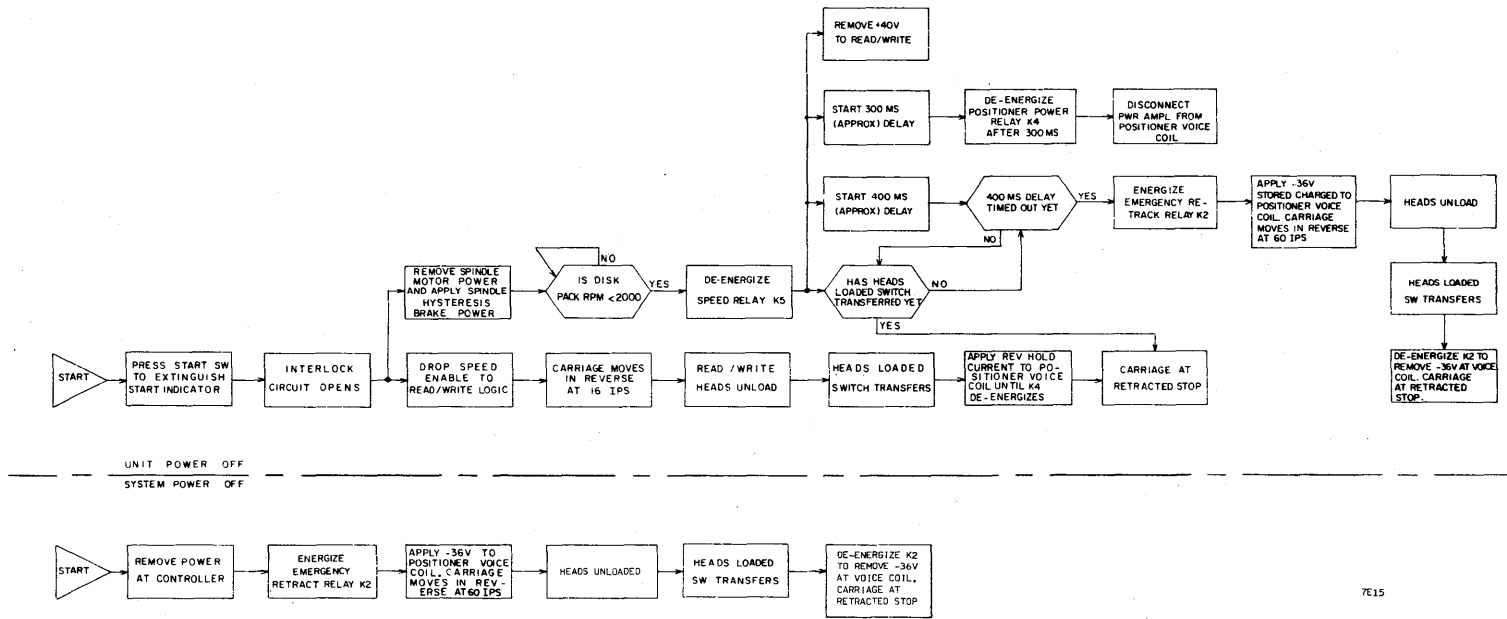


NOTES:

- ① 80 TRACKS ACCELERATING FROM 0 TO 50 IPS.
- ② A. 50 IPS UNTIL 64 TRACKS TO GO.  
B. 32 TRACKS DECELERATING FROM 50 TO 25 IPS.  
C. 31.5 TRACKS WITH VELOCITY DECREASING UNDER CONTROL OF D/A CONVERTER A641 AND DESIRED VELOCITY GENERATOR A631.  
D. CARRIAGE MOVES LAST HALF TRACK AND IS HELD STATIONARY BY FINE POSITION ANALOG SIGNAL.
- ③ CARRIAGE TURN AROUND AREA.
- ④ DIFFERENCE COUNTER IS INCREMENTAL (COUNTS UPWARD ONLY). CONTENT IS ALWAYS THE COMPLEMENT:  
COMPLEMENT OF 16 = 495  
COMPLEMENT OF 406 = 105  
COMPLEMENT OF 0 = 511

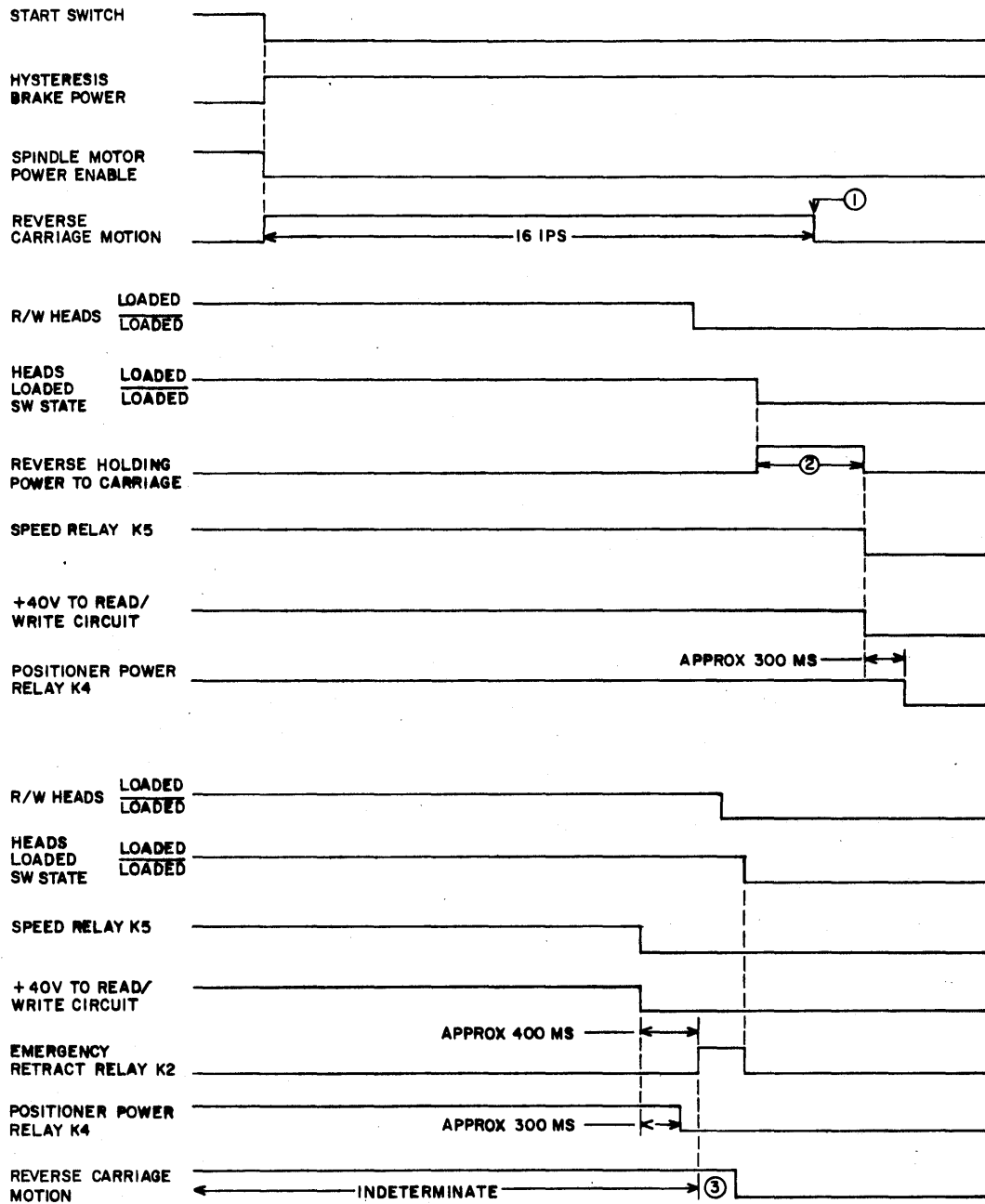
8N39A

Figure 5-6. Return to Zero Seek Timing



7E15

Figure 5-7. Unit or System Power Off Sequence



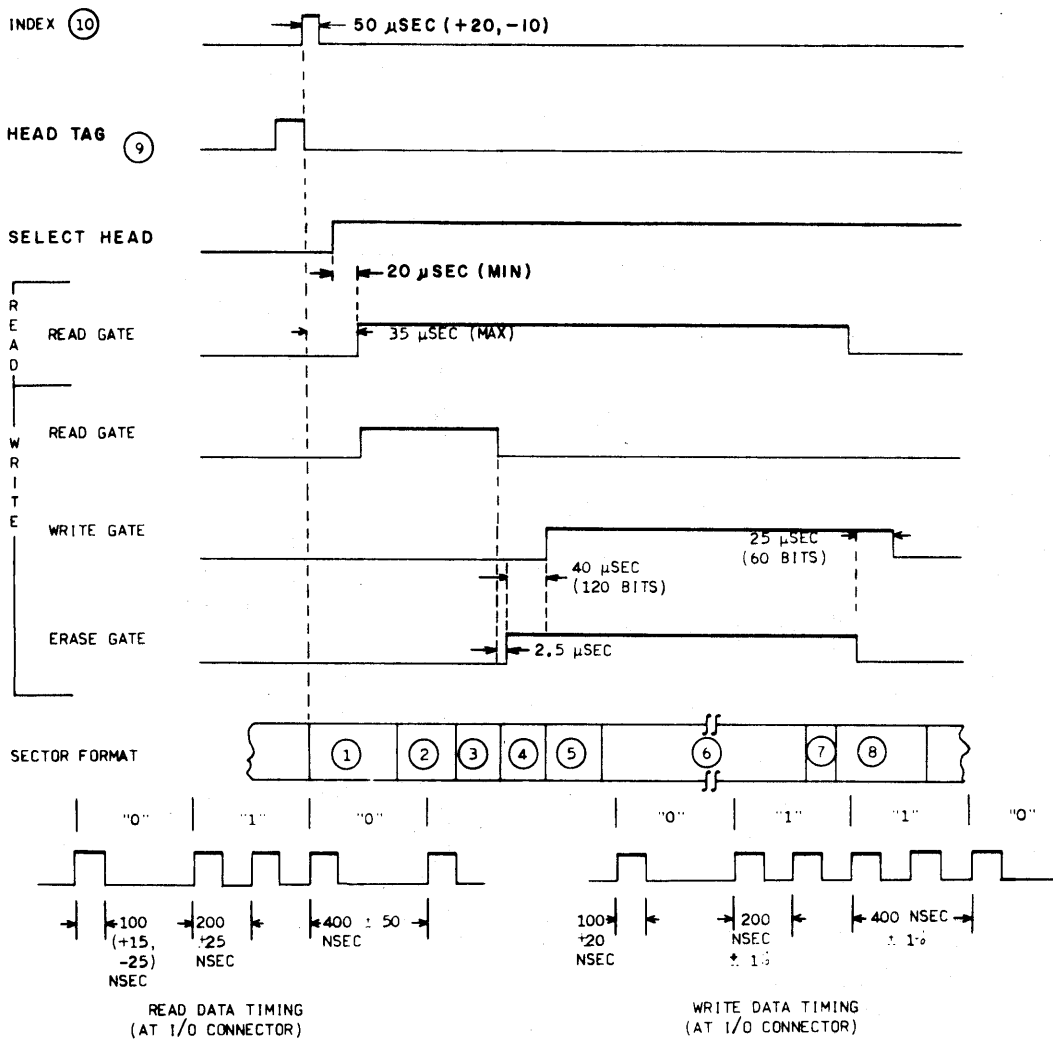
NOTES:

- ① CARRIAGE ENCOUNTERS RETRACTED STOP.
- ② ONE AMP (APPROX) OF HOLDING CURRENT APPLIED TO POSITIONER UNTIL K5 DROPS.
- ③ CARRIAGE MOVES TO RETRACTED STOP AT 60 IPS.

6T50A

Figure 5-8. Power Off Timing

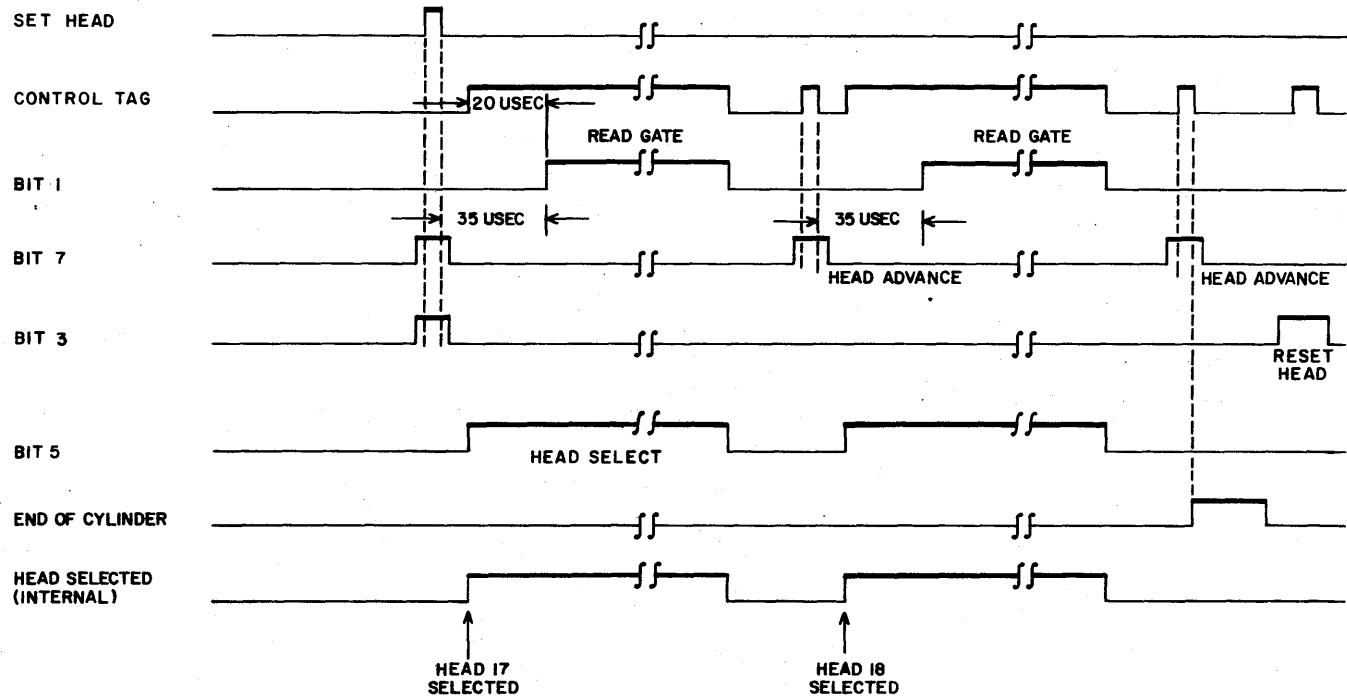
FIGURE 5-9 DELETED



- NOTES:
- ① TOLERANCE GAP 1 - 120 BITS - ACCOMMODATES PHYSICAL READ/WRITE TO ERASE GAP DISTANCE AND ALLOWS HEAD SWITCHING AND READ AMPLIFIER STABILIZATION TIME.
  - ② SYNC PATTERN 1 - 112 BITS - INDICATES BEGINNING OF ADDRESS AREA. CONTROLLER MUST INITIATE SYNC BYTE (OR BIT) SEARCH MIDWAY THROUGH THIS PATTERN (REQUIRED TO INSURE THAT HEAD IS READING A KNOWN PATTERN EVEN UNDER WORST-CASE CONDITIONS OF HEAD SKEW, RPM, AND INDEX TOLERANCES DUE TO DISK PACK INTERCHANGE).
  - ③ ADDRESS - 36 BITS (TYPICAL) - TWELVE-BIT UPPER ADDRESS, 12-BIT LOWER ADDRESS, AND 12-BIT CHECKWORD.
  - ④ HEAD GAP - 100 BITS (MIN) - ACCOMMODATES PHYSICAL READ/WRITE TO ERASE GAP DISTANCE.
  - ⑤ SYNC PATTERN 2 - 112 BITS (MINIMUM) - INDICATES BEGINNING OF DATA FIELD.
  - ⑥ DATA FIELD - LENGTH DEPENDS UPON DATA RECORD FORMAT.
  - ⑦ POST AMBLE - 1 BIT - A PAD TO ENSURE THAT LAST BIT OF DATA IS NOT DESTROYED OR DISTORTED.
  - ⑧ TOLERANCE GAP 2 - LENGTH DEPENDS UPON FORMAT (SHOULD EQUAL APPROXIMATELY 2.5% OF SECTOR BIT CAPACITY). COMPENSATES FOR WORST-CASE CONDITIONS OF SPINDLE SPEED AND OSCILLATOR TOLERANCES.
  - ⑨ HEAD/DIRECTION TAG LINE SHOWN OCCURRING AT LATEST ACCEPTABLE TIME RELATIVE TO INDEX: NOT TO BE CONSIDERED A TYPICAL RELATIONSHIP.
  - ⑩ INDEX PULSE AVAILABLE TO CONTROLLER TO INDICATE BEGINNING OF TRACK OR CYLINDER.

8N40

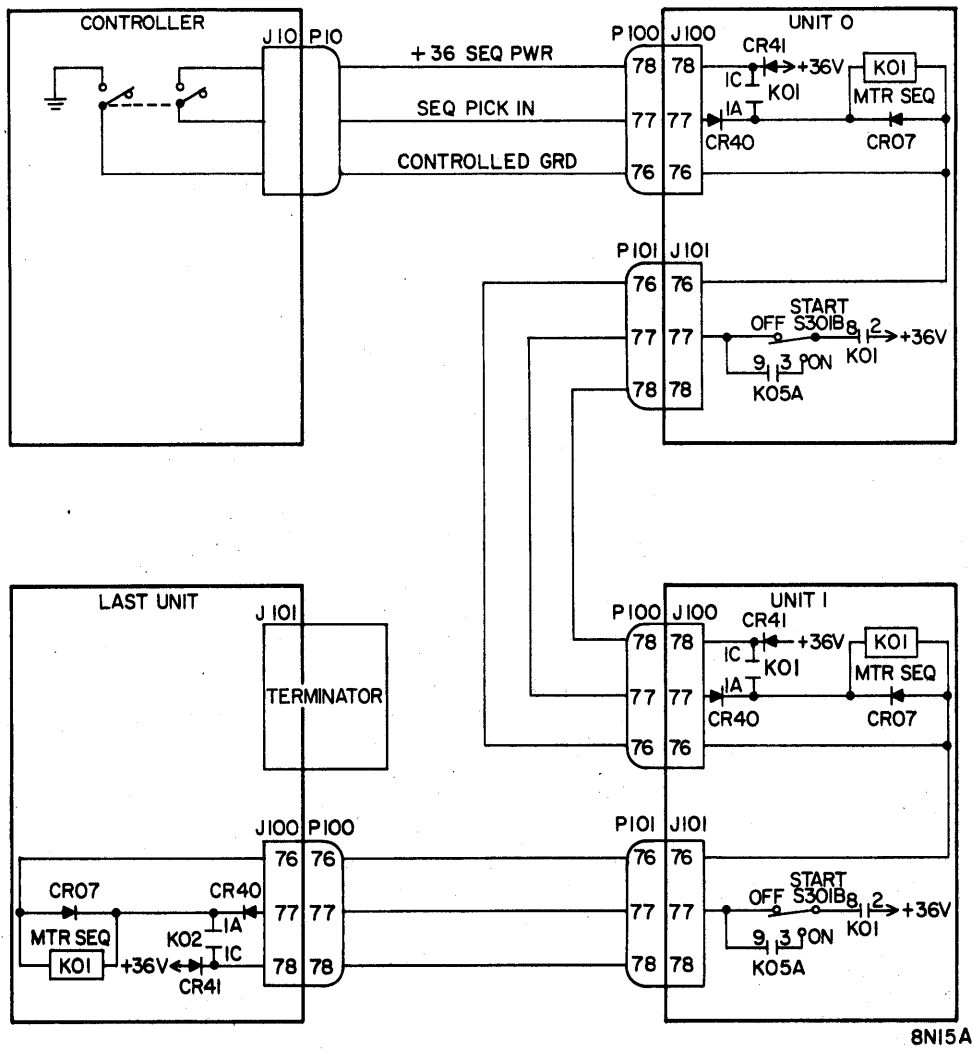
Figure 5-10. R/W Timing and Format



8N41

Figure 5-11. Head Advance Timing



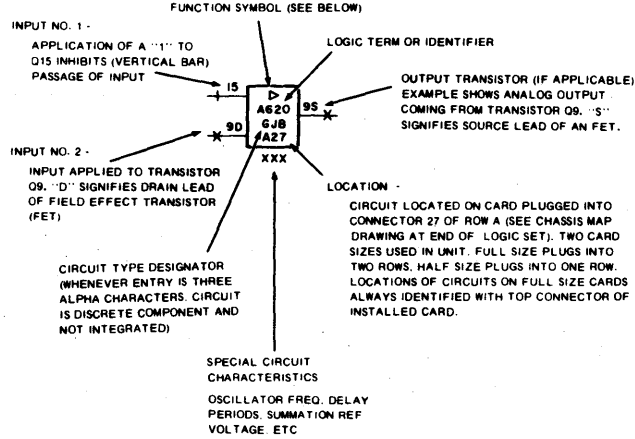


8N15A

Figure 5-12. System Power Sequence Lines

### DISCRETE COMPONENT

#### DISCRETE COMPONENT CIRCUIT INFORMATION EXAMPLE:

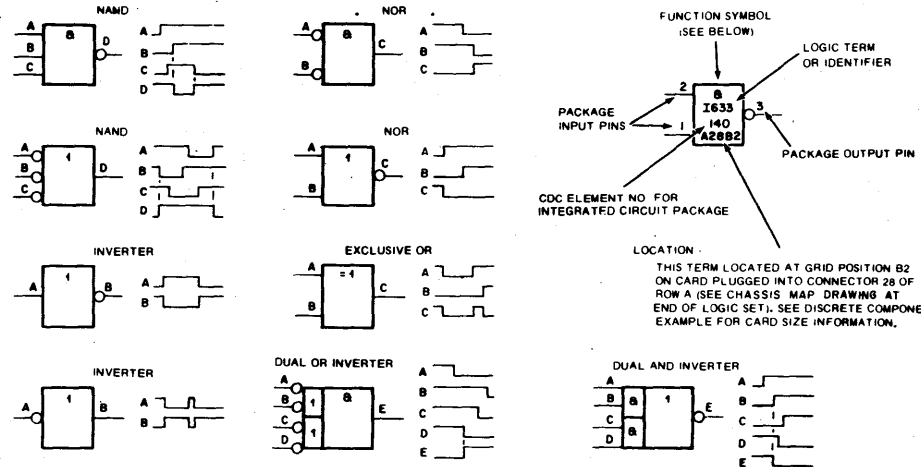


#### FUNCTION SYMBOLS:

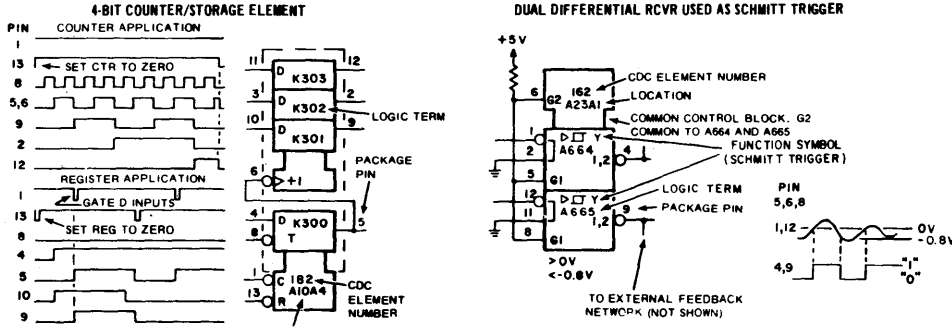
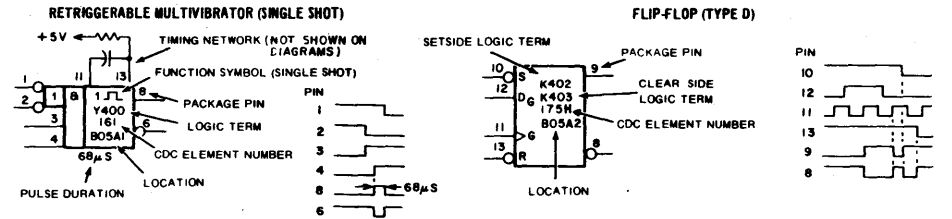
$\Delta$	AMPLIFIER	$\Sigma X / \Delta$	ANALOG SUMMATION OF DIGITAL INPUTS (REF VOLTAGE OUTSIDE OF BOX INDICATES OUTPUT SIGNAL LEVEL RESULTING WHEN SPECIFIED INPUT(S) ARE NEGATED)
$X / \Delta$	DIGITAL TO ANALOG CONVERSION	$X / Y$	LEVEL CONVERSION. TRANSMISSION LINE TO LOGIC LEVEL. SWITCH STATE (GROUND OR OPEN) TO LOGIC LEVEL. LOGIC LEVEL TO POWER OUTPUT (TO DRIVE LAMP, RELAY SOLENOID, ETC)
$X / \Delta$	DIGITAL TO ANALOG CONVERSION WITH ADJUSTABLE (ELECTRICALLY) GAIN	$\square$ 200NS 12	DELAY - WHEN INPUT CHANGES TO A "1", A 200 NSEC DELAY OCCURS BEFORE THE "1" IS PASSED ON.
$G$	OSCILLATOR (FREQ NOTED OUTSIDE OF BOX)	$\Delta$	AND GATE OR INVERTER
$f \Delta$	DEMODULATOR	$\Gamma$	OR GATE OR INVERTER
$F \Delta$	FUNCTION GENERATOR	$\Delta / Y$	ANALOG TO DIGITAL CONVERTER
$> 28.5 \text{ HZ}$	FREQUENCY SENSOR	$f \Delta / Y$	ADJUSTABLE ANALOG TO DIGITAL CONVERTER
$f \Delta / Y$	ABSOLUTE DIFFERENCE SENSOR (VOLTAGE VALUE OF DIFFERENCE INDICATED OUTSIDE OF BOX) WITH DIGITAL CONVERSION	$\Gamma$	SINGLE SHOT
$> 1$	SINGLE LINE MULTIPLE SELECT DETECTOR (EXCESSIVE VOLTAGE DROP OCCURS AT INPUT IF MORE THAN ONE SELECTION IS MADE)	$\Gamma \Delta$	ADJUSTABLE SINGLE SHOT
$X \rightarrow Y$	ENCODER	$X / \Delta / Y$	ADJUSTABLE RINGING AMPLIFIER (DESIRED RESONANT FREQ SPECIFIED ADJACENT TO BOX)
		$f X \Delta Y$	SWITCH RECEIVER

### INTEGRATED

#### INTEGRATED CIRCUIT (GATES) INFORMATION EXAMPLE:



#### SPECIAL INTEGRATED CIRCUITS INFORMATION EXAMPLES:



CONTROL DATA	KEY TO LOGIC SYMBOLS PART I	DATE REVISION	19333	FORM NO	VCDE 7640	REV	A
DEVELOPMENT DIVISION			C		2		

83302400

A

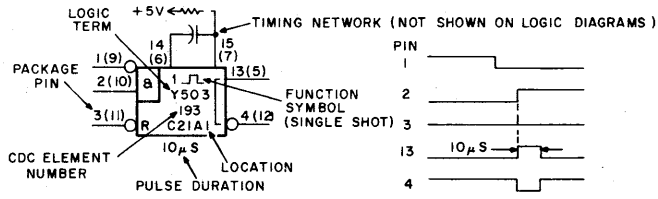
D

C

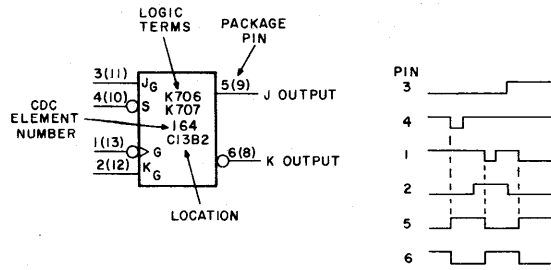
B

A

### DUAL RETRIGGERABLE AND RESETTABLE MULTIVIBRATOR (SINGLE SHOT)



### DUAL JK FLIP-FLOP



**CONTROL DATA**

NORMANDEALE DIVISION

KEY TO LOGIC SYMBOLS  
PART 2

**C**

DWG NO  
VCDE 7640

REV  
A

CODE IDENT  
19333

SHEET  
3

PAGE

5-15

4

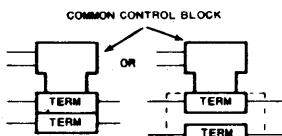
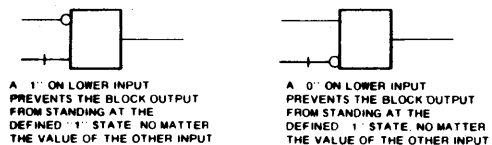
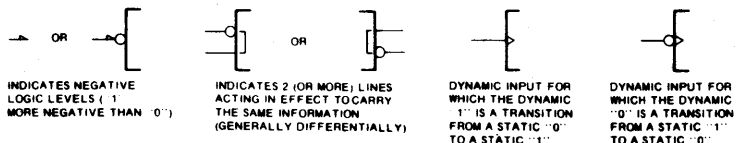
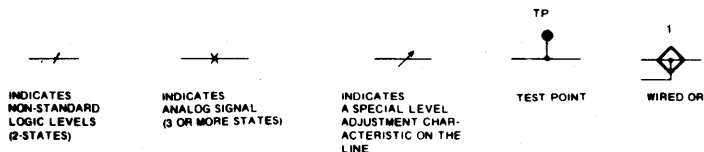
3

2

1

**GENERAL INFORMATION AND SYMBOLOLOGY:**

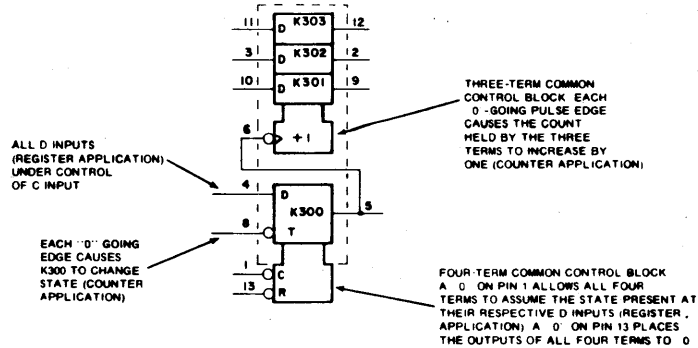
STANDARD LOGIC LEVEL 1 = +3V 0 = 0V  
 LOGIC DIAGRAMS DRAWN WITH INPUTS TO LEFT AND OUTPUTS TO RIGHT EXCEPT WHERE SPACE OR LAYOUT PROHIBITS. LOGIC TERM NUMBERS ASSIGNED IN SEQUENTIAL BLOCKS SO THAT LOWEST NUMBERED TERMS (TO XX [0XX ETC]) APPEAR ON SHEET 3 AND HIGHEST NUMBERED TERMS ARE FOUND AT THE END OF THE LOGIC SET



INDICATES THAT INPUT(S) TO THE COMMON CONTROL BLOCK ARE COMMON TO EACH TERM IN THE ARRAY. UNCOMMON LINES GO DIRECTLY TO THE APPLICABLE TERM

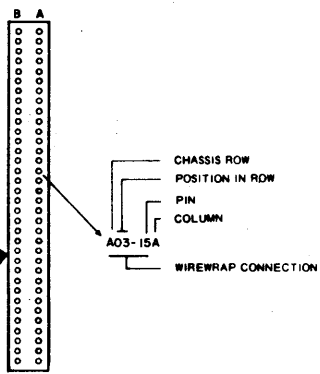
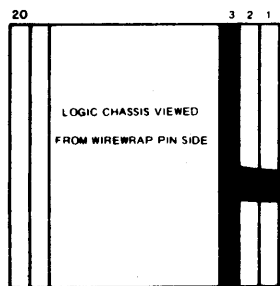
**GENERAL SIGNAL ANNOTATION, GATING, AND INHIBITING INFORMATION:**

- S\* SET INPUT TO BISTABLE DEVICE
- R\* RESET (CLEAR) INPUT TO BISTABLE DEVICE
- G\* GATE INPUT HAS NO DIRECT ACTION ON CIRCUIT BUT MUST BE PRESENT BEFORE INPUTS AND/OR OUTPUT(S) ARE ABLE TO FUNCTION. IF MORE THAN ONE IS USED A NUMERICAL SUFFIX IS ADDED (G1 G2, ETC)
- D\* IDENTIFIES AN INPUT SIGNAL WHOSE ACTION IN THE BLOCK REQUIRES THE PRESENCE OF ANOTHER SIGNAL(S)
- C\* STROBE PULSE USUALLY USED TO GATE D INPUTS INTO A BISTABLE DEVICE
- T\* TOGGLE INPUT. BISTABLE DEVICE CHANGES STATE EACH TIME T ASSUMES ITS SPECIFIED STATE
- \* THE SIGNAL STATE REQUIRED FOR THIS SIGNAL TO PERFORM ITS ASSIGNED FUNCTION IS ADDITIONALLY DESCRIBED AT POINT AT WHICH IT ENTERS THE LOGIC TERM BOX. SEE ADJACENT EXAMPLE



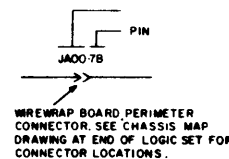
**GENERAL WIREWRAP AND CONNECTOR INFORMATION:**

LOGIC CHASSIS CARD LOCATIONS IDENTIFIED ACCORDING TO ALPHA-NUMERIC MATRIX. WIREWRAP PINS AT EACH CARD LOCATION ARRANGED IN TWO COLUMNS (A AND B)



N934 ACCESS TESTER I504

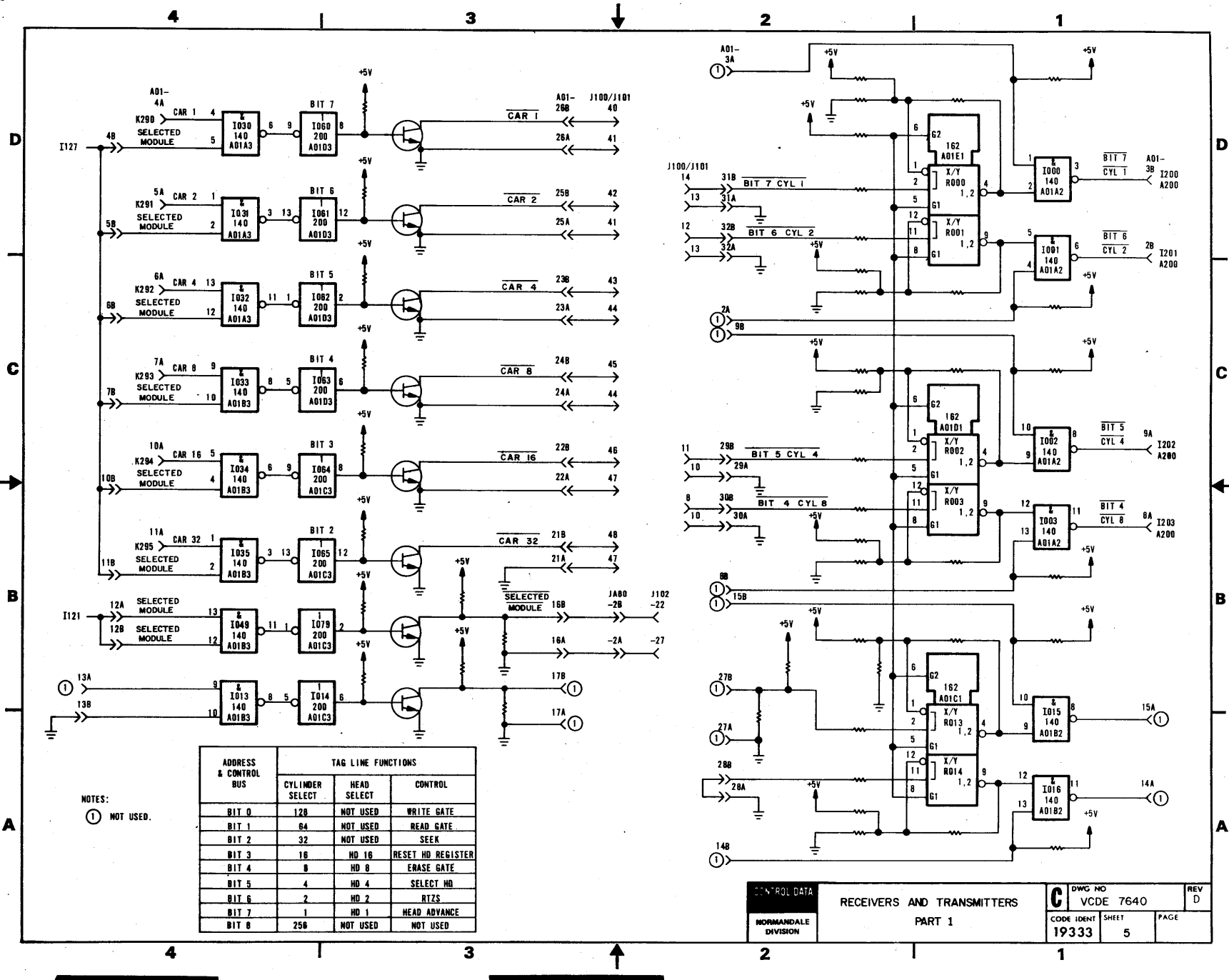
DENOTES CONNECTION TO ACCESS (OR R/W) TESTER CARD. USE OF THESE CARDS IS OPTIONAL DURING TESTS. SEE CHASSIS MAP



19333	VCDE 7640	D
C	4	

KEY TO LOGIC SYMBOLS PART 3

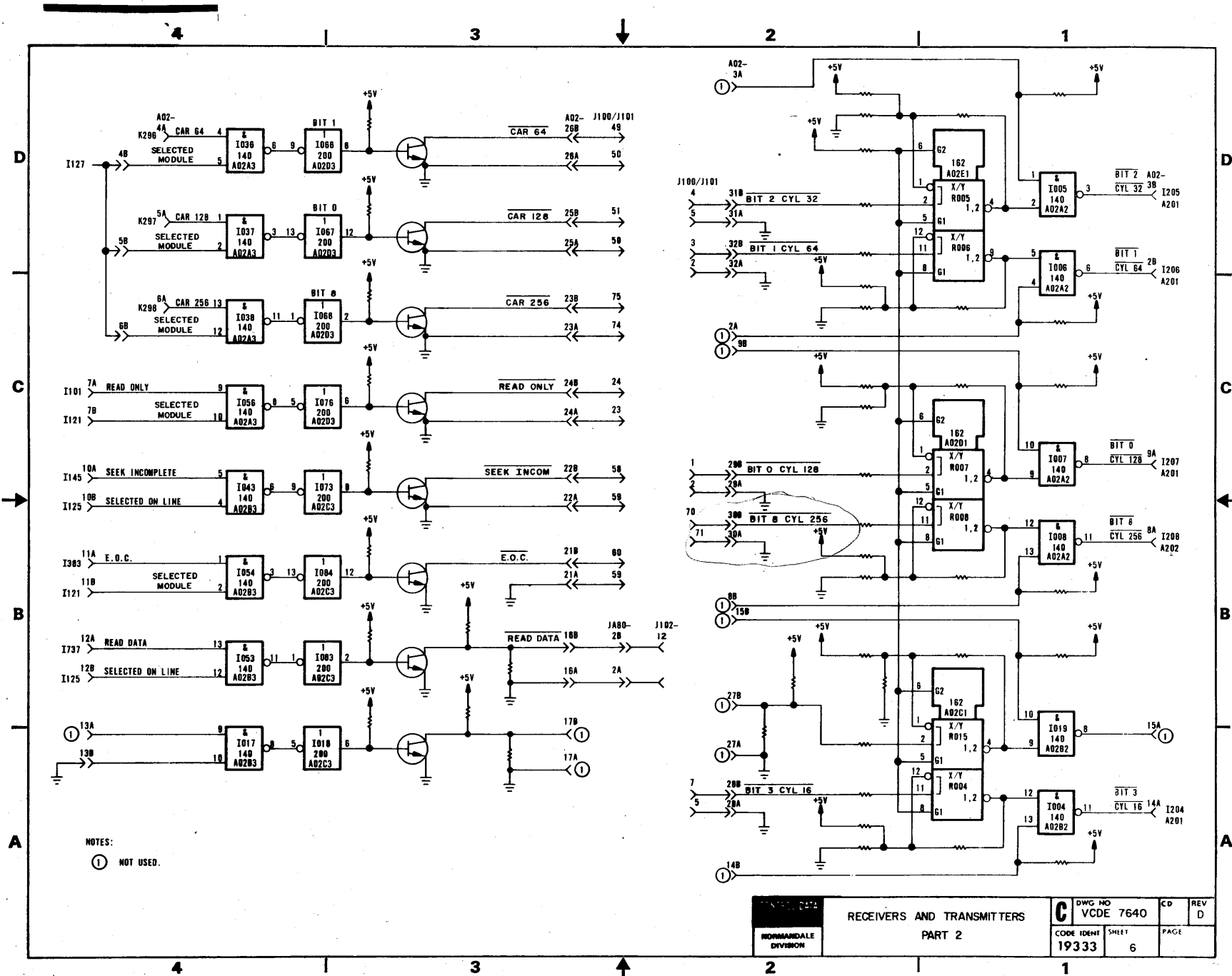
DEVELOPMENT DIVISION



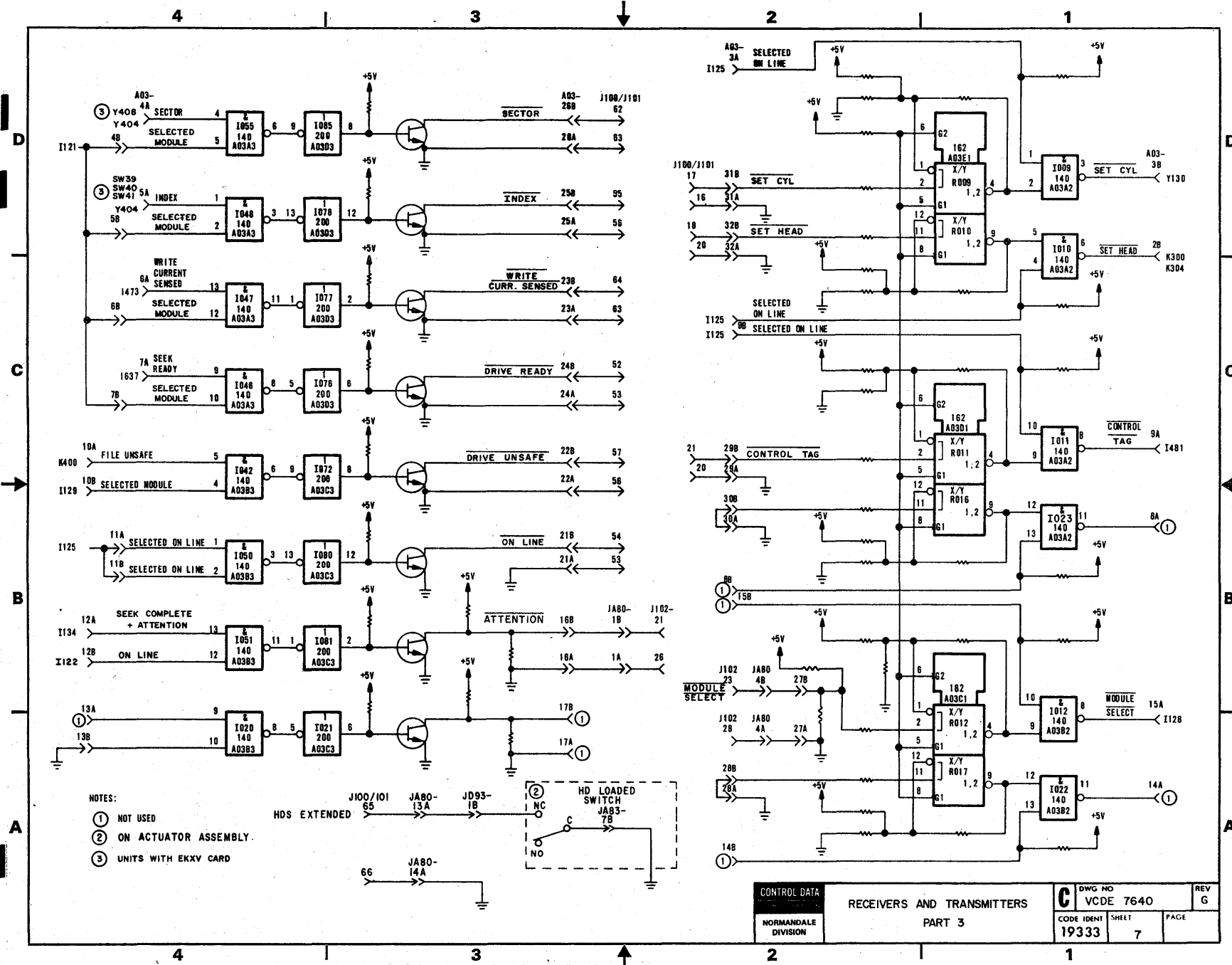
ADDRESS & CONTROL BUS	TAG LINE FUNCTIONS		
	CYLINDER SELECT	HEAD SELECT	CONTROL
BIT 0	128	NOT USED	WRITE GATE
BIT 1	64	NOT USED	READ GATE
BIT 2	32	NOT USED	SEEK
BIT 3	16	HD 16	RESET HD REGISTER
BIT 4	8	HD 8	ERASE GATE
BIT 5	4	HD 4	SELECT HD
BIT 6	2	HD 2	RTZS
BIT 7	1	HD 1	HEAD ADVANCE
BIT 8	256	NOT USED	NOT USED

NOTES:  
 ① NOT USED.

CONTROL DATA  
 NORMANDEALE DIVISION  
 RECEIVERS AND TRANSMITTERS  
 PART 1  
 DWG NO VCDE 7640  
 CODE IDENT 19333  
 SHEET 5  
 PAGE  
 REV D

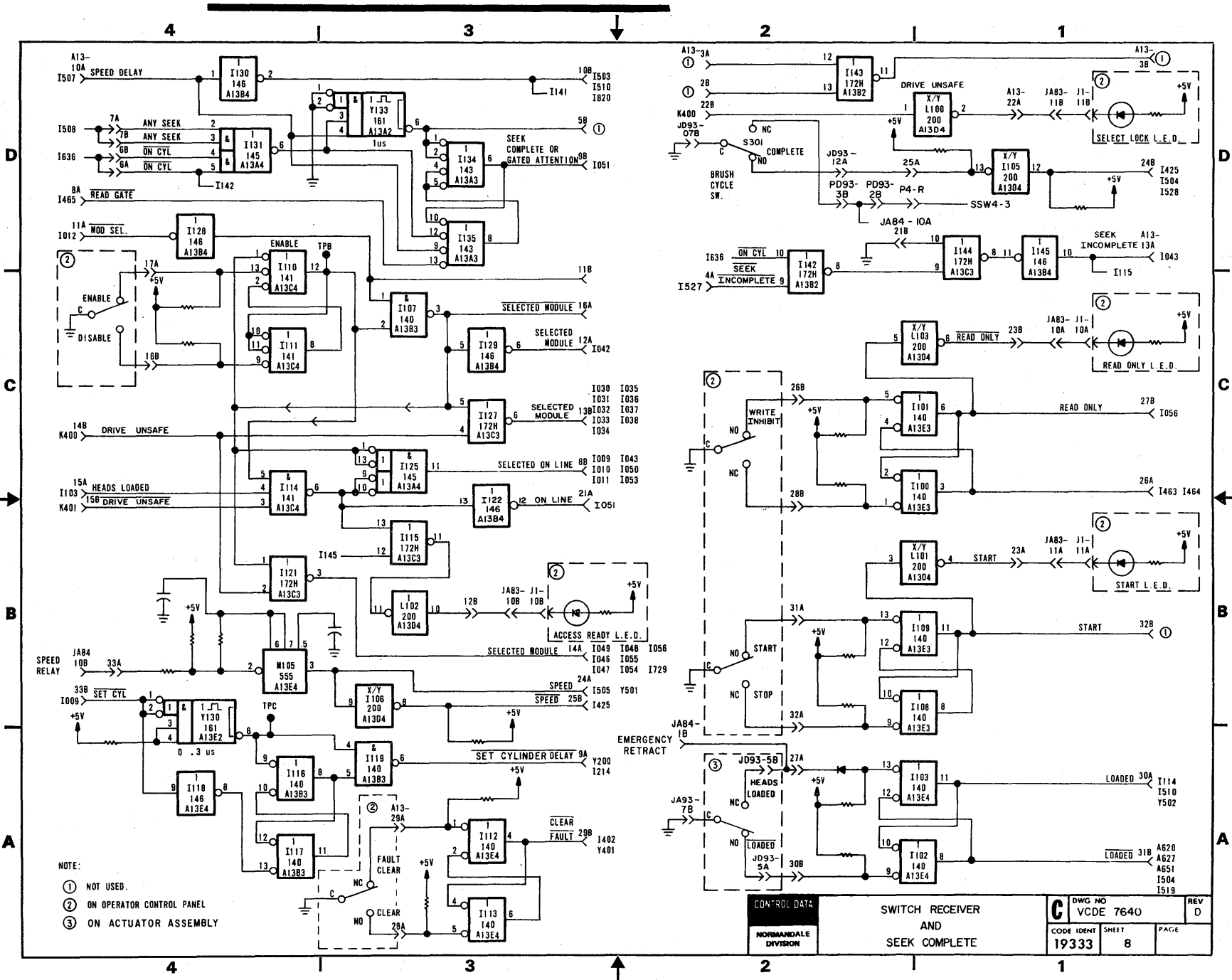


NORMANDEALE DIVISION	RECEIVERS AND TRANSMITTERS PART 2		DWG NO VCDE 7640	CD	REV D
	CODE IDENT 19333	SHEET 6	PAGE		



- NOTES:
- ① NOT USED
  - ② ON ACTUATOR ASSEMBLY.
  - ③ UNITS WITH EKXV CARD

CONTROL DATA		RECEIVERS AND TRANSMITTERS		C	DWG NO	REV
NORMANDALE DIVISION		PART 3			VCDE 7640	
				CODE IDENT	SHEET	PAGE
				19333	7	





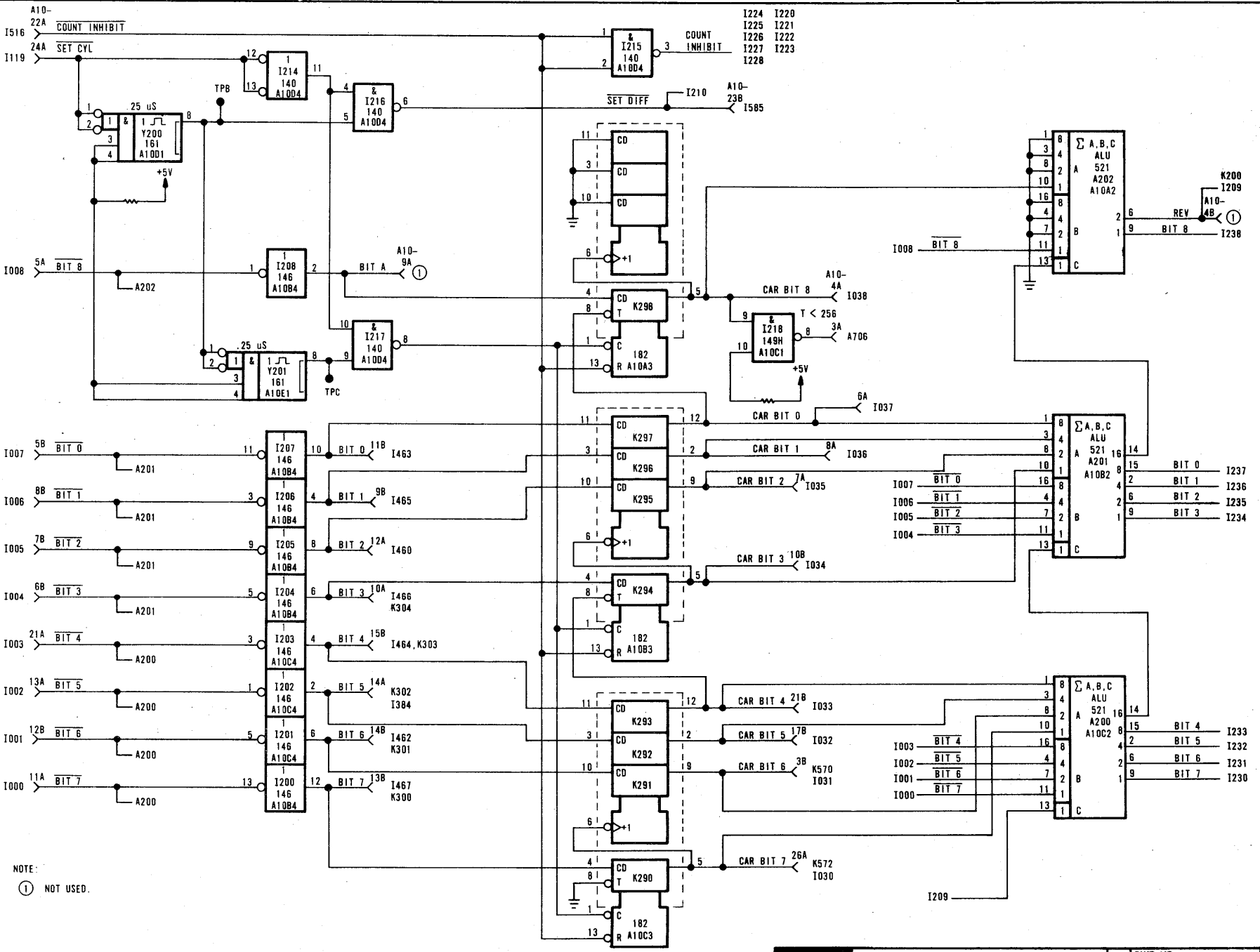
83302400 A

D

C

B

A



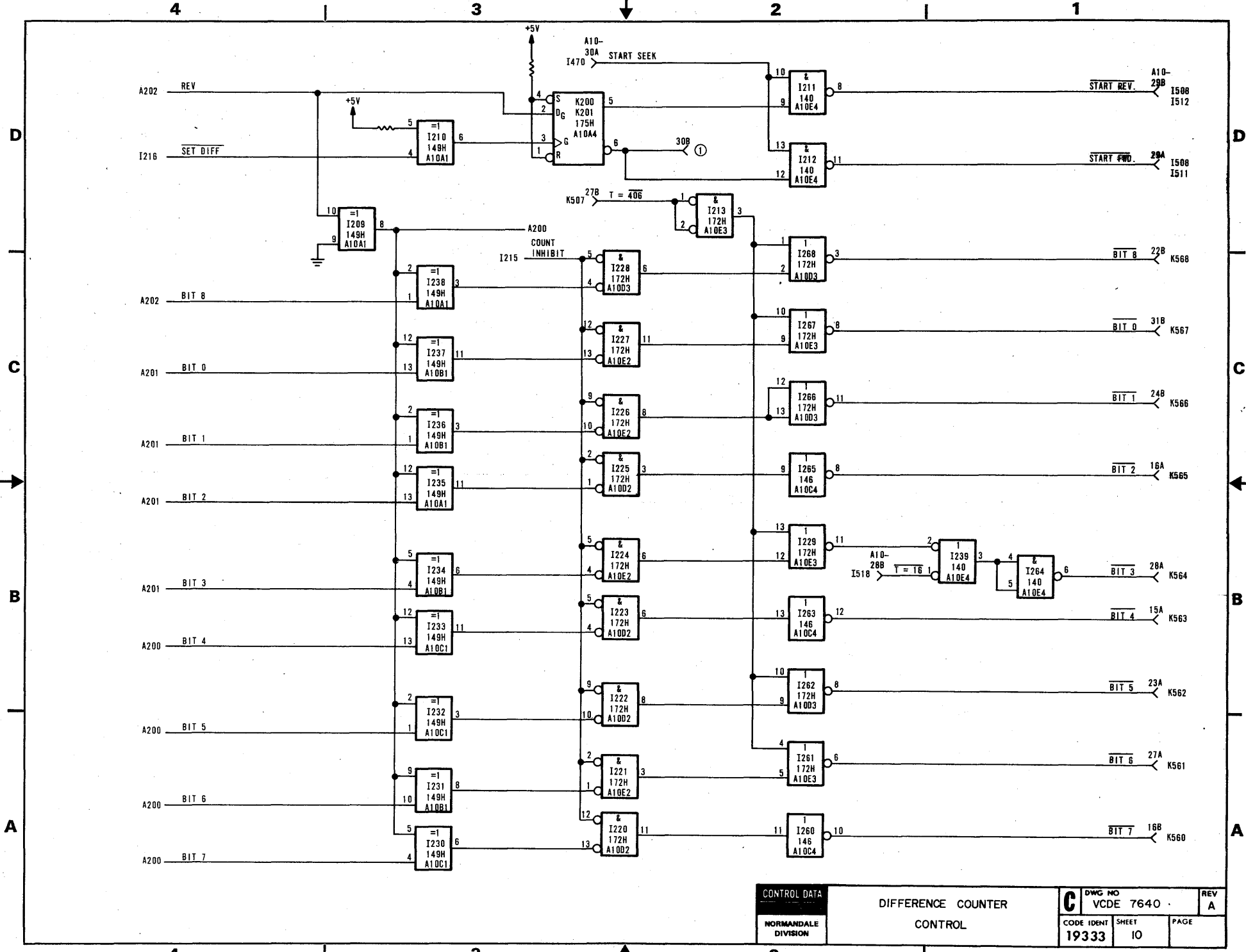
NOTE:  
① NOT USED.

CONTROL UNIT NORMANDEALE DIVISION	CYLINDER ADDRESS REGISTER		DWG NO <b>VCDE 7640</b>	REV <b>A</b>
	CODE UNIT <b>19333</b>	SHEET <b>9</b>	PAGE	

5-21

5-22

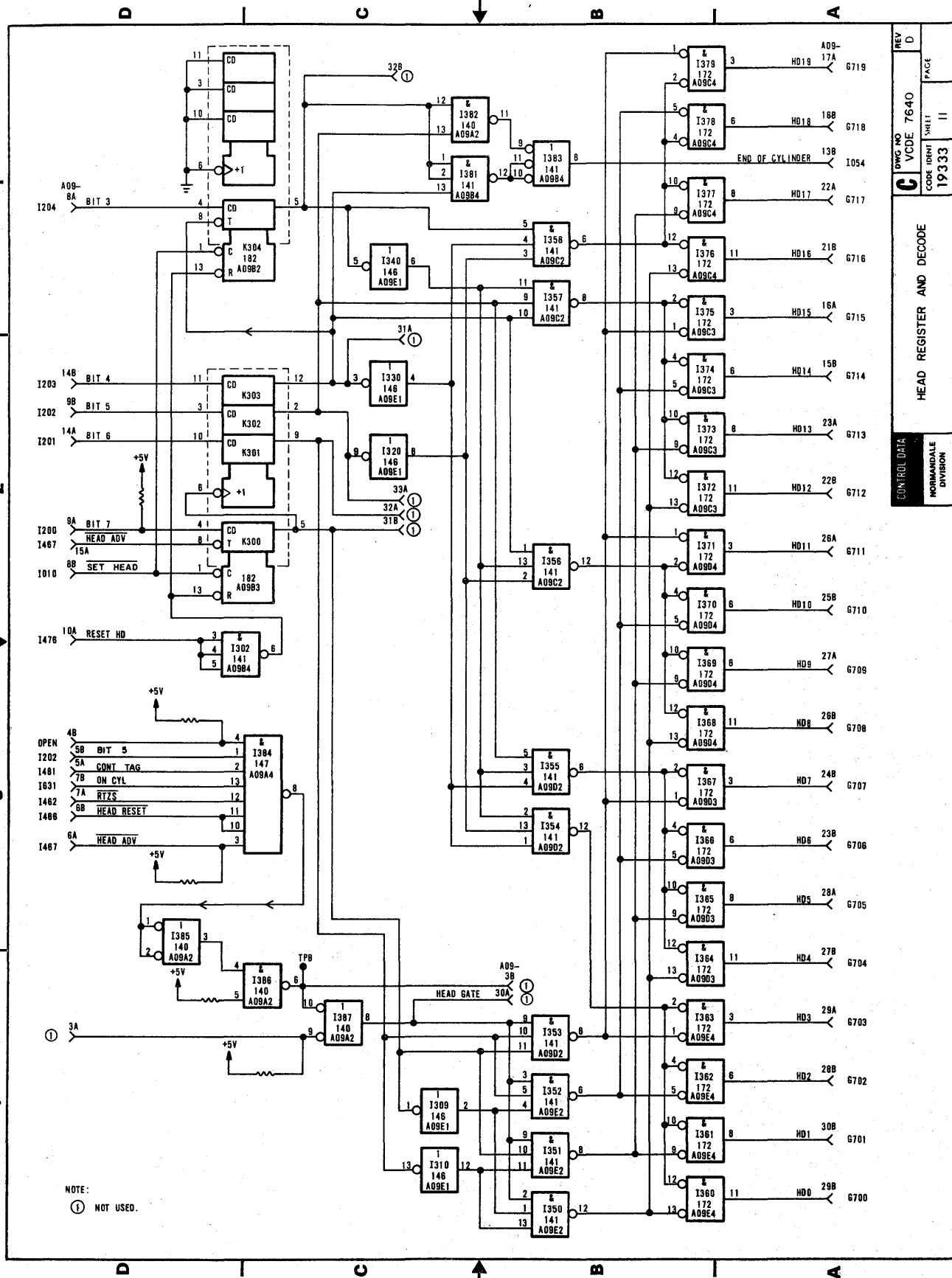
83302400 A



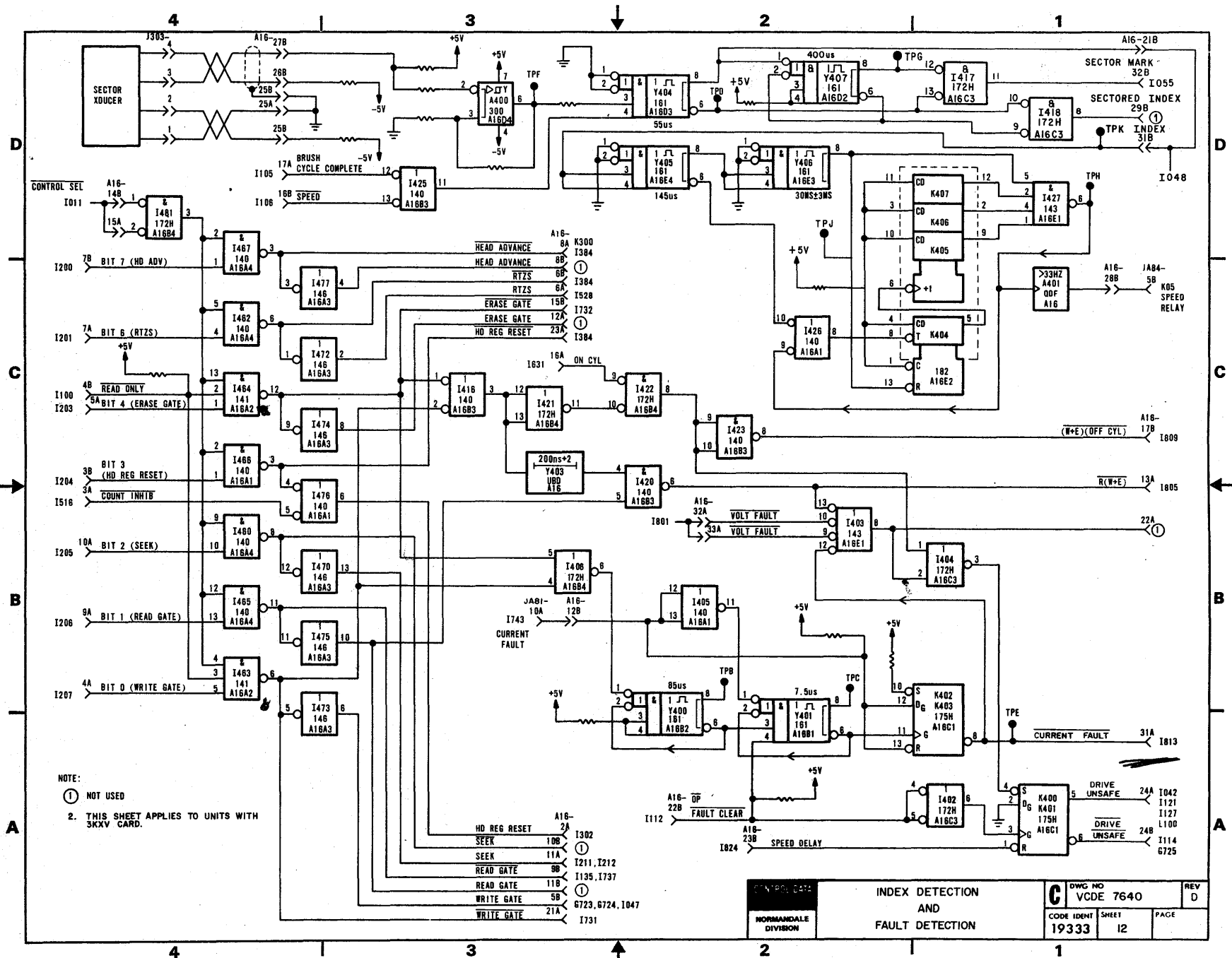
CONTROL DATA  
NORMANDALE  
DIVISION

DIFFERENCE COUNTER  
CONTROL

C	DWG NO		REV
	VCDE 7640		A
CODE IDENT	SHEET	PAGE	
19333	10		



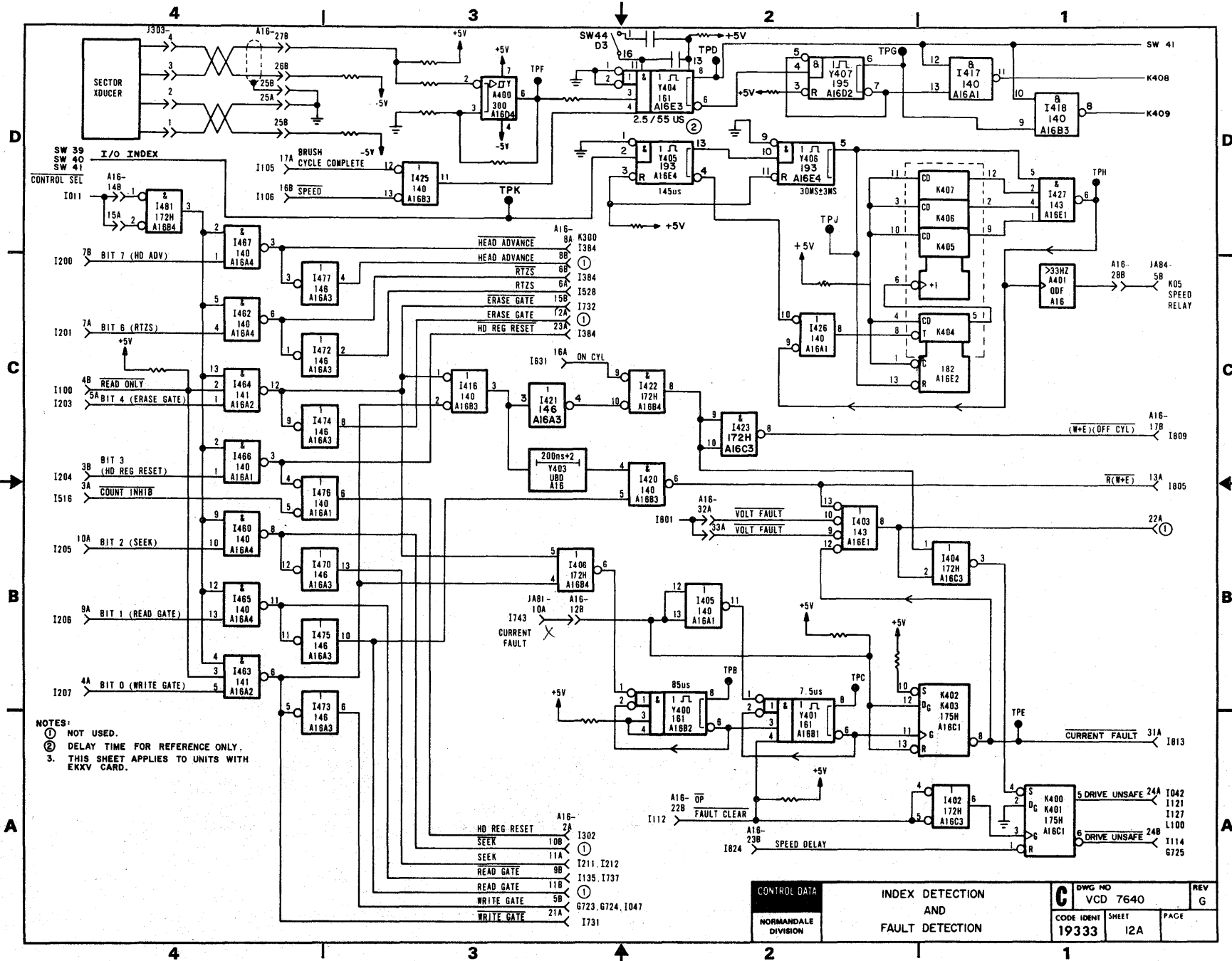
REV	D
DWG NO	VCDE 7640
CODE IDENT SHEET	FACE
19333	11
HEAD REGISTER AND DECODE	
CONTROL DATA	NORMANDALE DIVISION



NOTE:  
 ① NOT USED  
 2. THIS SHEET APPLIES TO UNITS WITH 3KXV CARD.

- HD REG RESET A16-2A ① I302
- SEEK 10B ① I211, I212
- SEEK 11A ① I135, I737
- READ GATE 9B ① I723, I724, I047
- READ GATE 11B ① I731
- WRITE GATE 5B ①
- WRITE GATE 21A ①

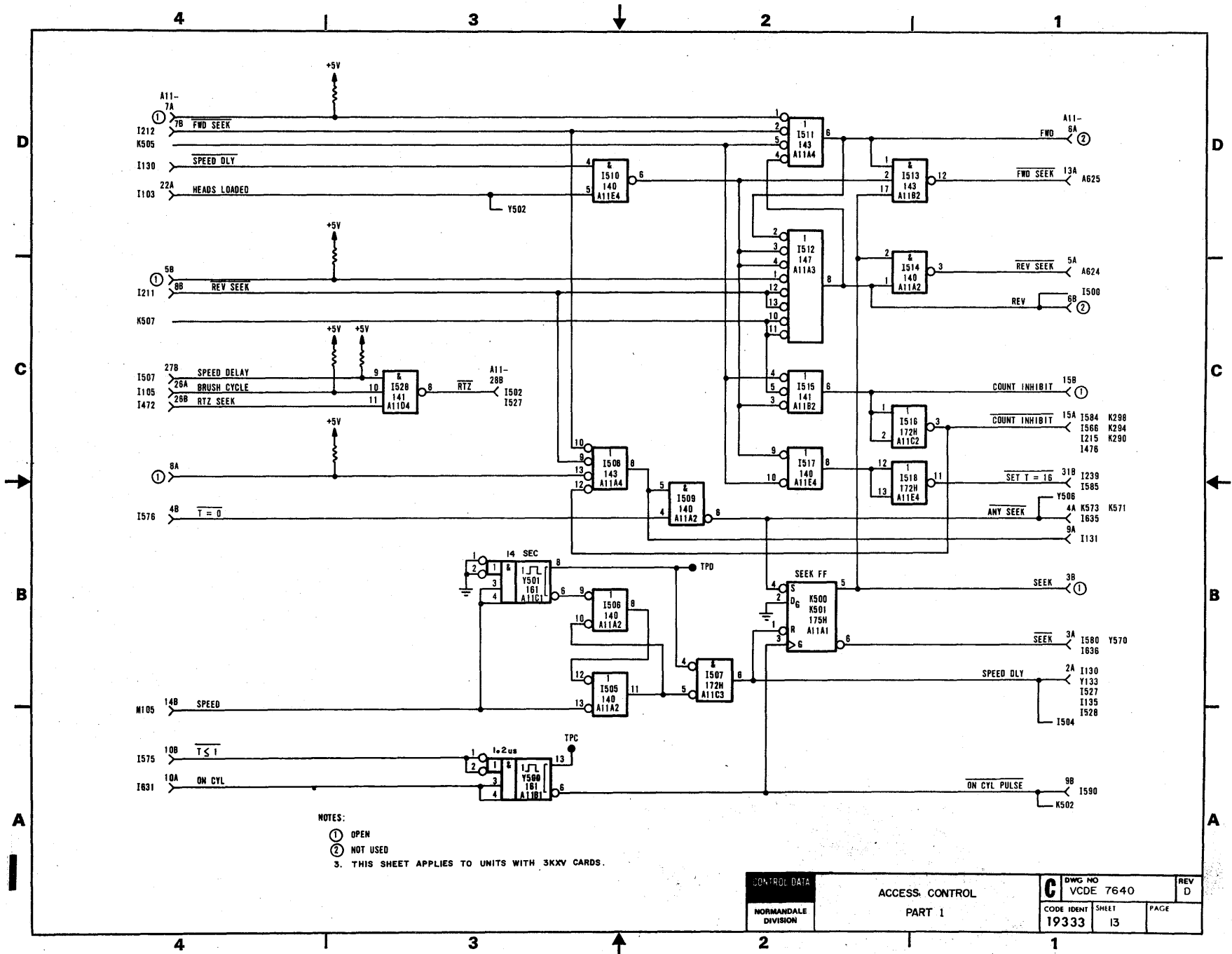
NORMANDEALE DIVISION	INDEX DETECTION AND FAULT DETECTION		DWG NO VCDE 7640		REV D
	CODE IDENT 19333	SHEET 12	PAGE		



NOTES:  
 ① NOT USED.  
 ② DELAY TIME FOR REFERENCE ONLY.  
 3. THIS SHEET APPLIES TO UNITS WITH EKXV CARD.

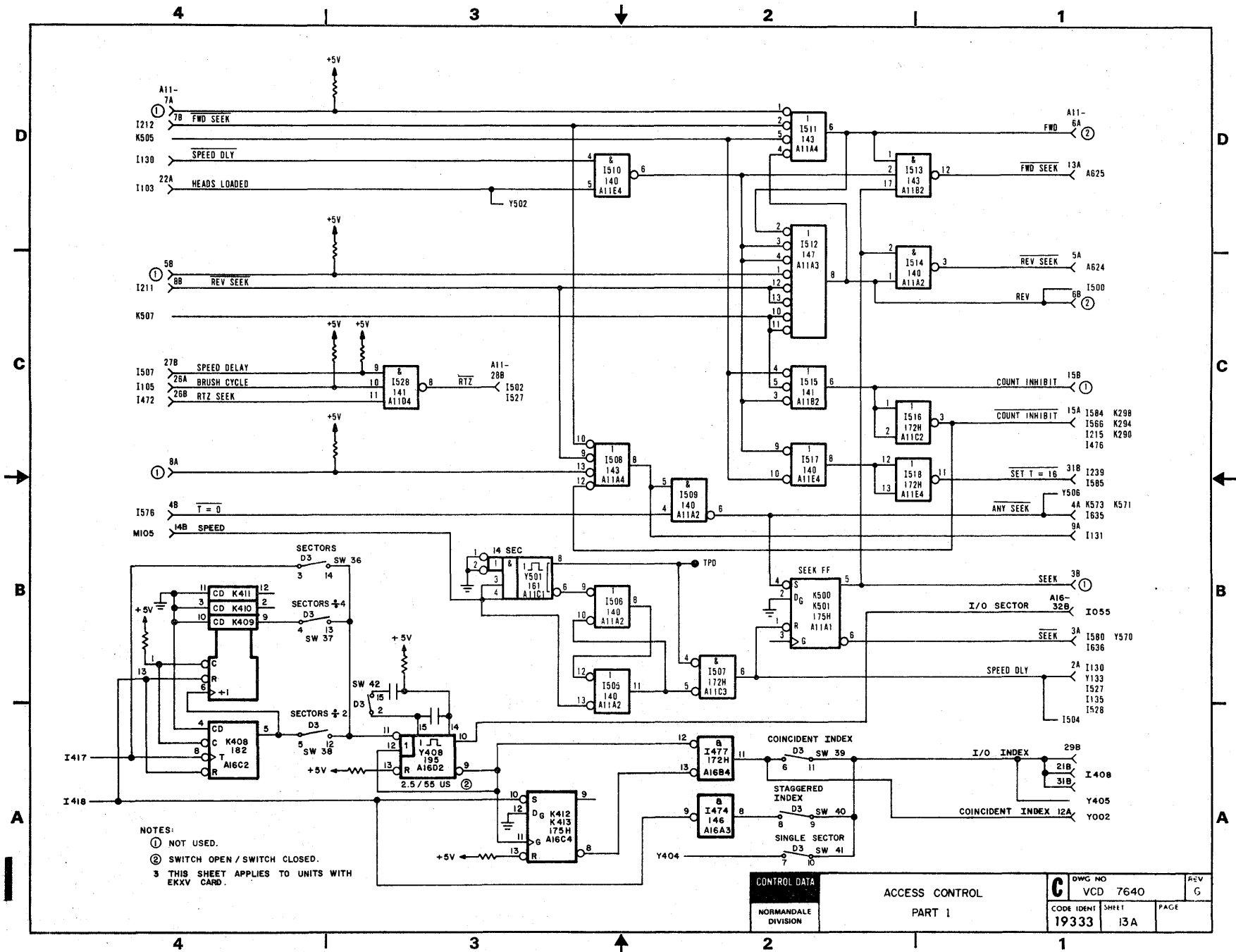
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 SEEK 10B ①  
 SEEK 11A I211, I212  
 READ GATE 9B I135, I737  
 READ GATE 11B ①  
 WRITE GATE 5B I723, G724, I047  
 WRITE GATE 21A I731

CONTROL DATA	INDEX DETECTION AND FAULT DETECTION	DWG NO VCD 7640	REV G
NORMANDEALE DIVISION		CODE IDENT 19333	SHEET 12A
		PAGE	



NOTES:  
 ① OPEN  
 ② NOT USED  
 3. THIS SHEET APPLIES TO UNITS WITH 3KXY CARDS.

CONTROL DATA		ACCESS CONTROL		DWG NO		REV	
NORMANDALE DIVISION		PART 1		VCDE 7640		D	
				CODE IDENT		PAGE	
				19333		13	

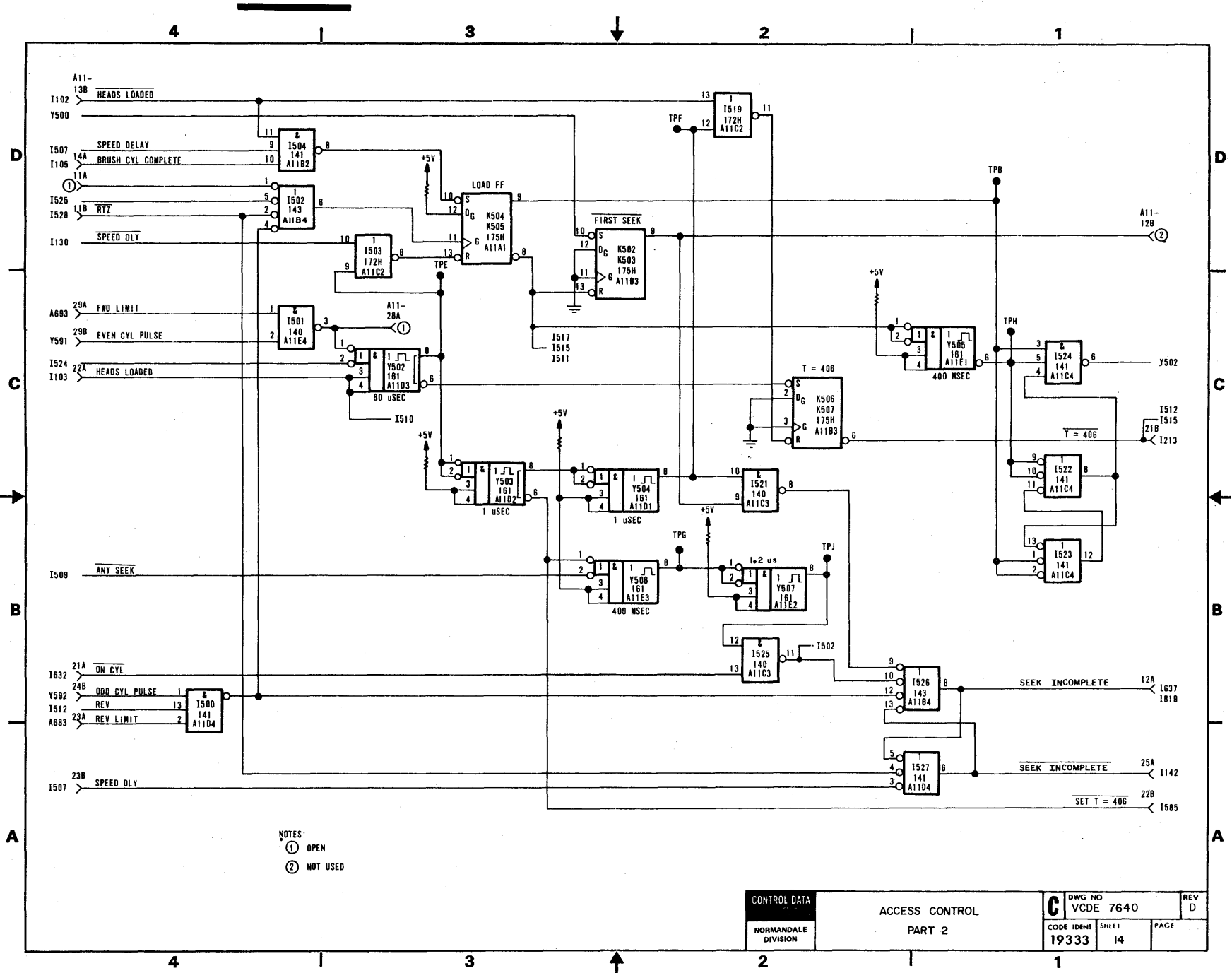


- NOTES:  
 ① NOT USED.  
 ② SWITCH OPEN / SWITCH CLOSED.  
 3 THIS SHEET APPLIES TO UNITS WITH EKXV CARD.

CONTROL DATA  
 NORMANDE  
 DIVISION

ACCESS CONTROL  
 PART 1

C	DWG NO	VCD 7640	REV	G
	CODE IDENT	19333	SHEET	13A
			PAGE	



NOTES:  
 ① OPEN  
 ② NOT USED

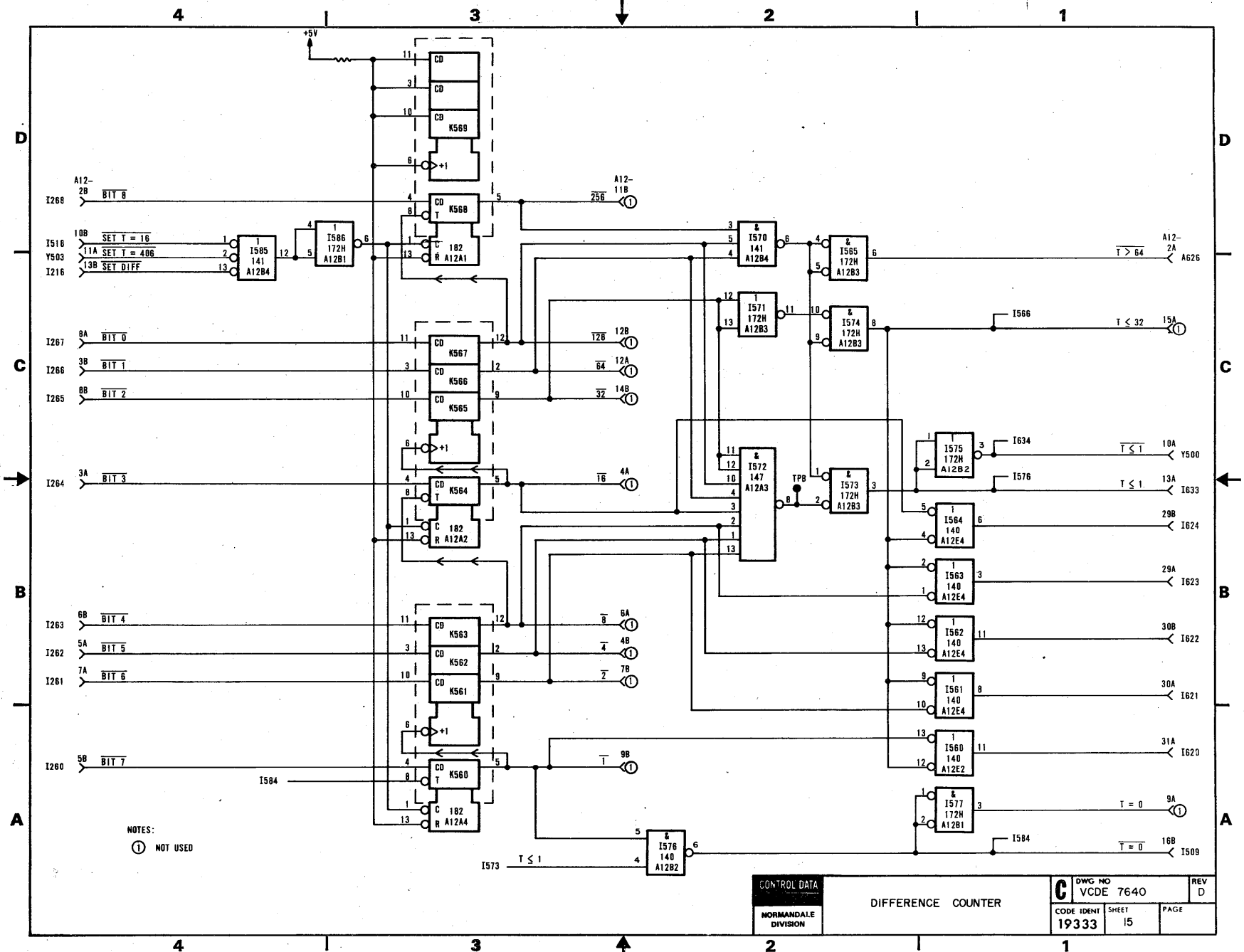
CONTROL DATA  
 NORMANDALE  
 DIVISION

ACCESS CONTROL  
 PART 2

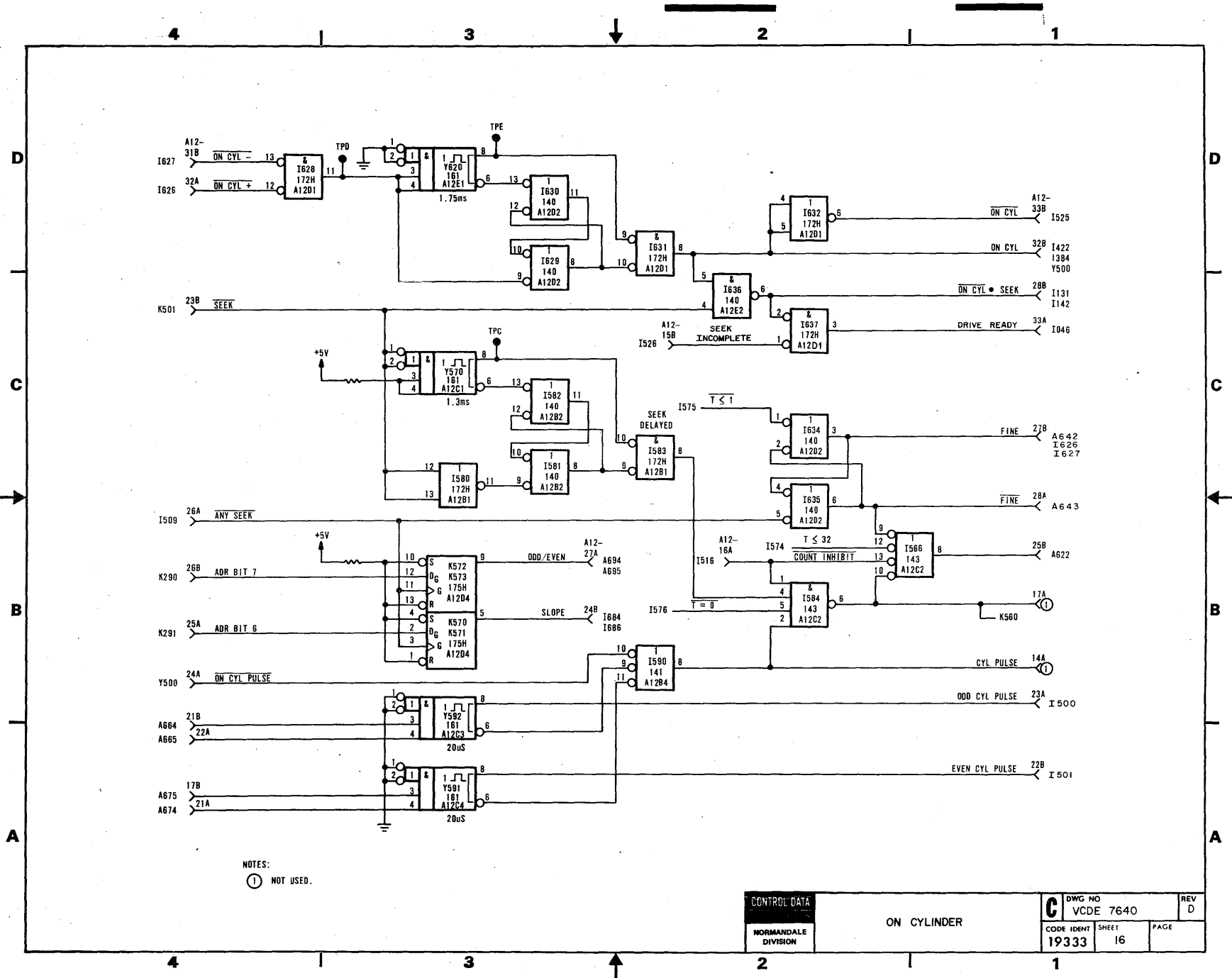
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	VCDE 7640	D
19333	SHEET 14	PAGE

SET T = 406



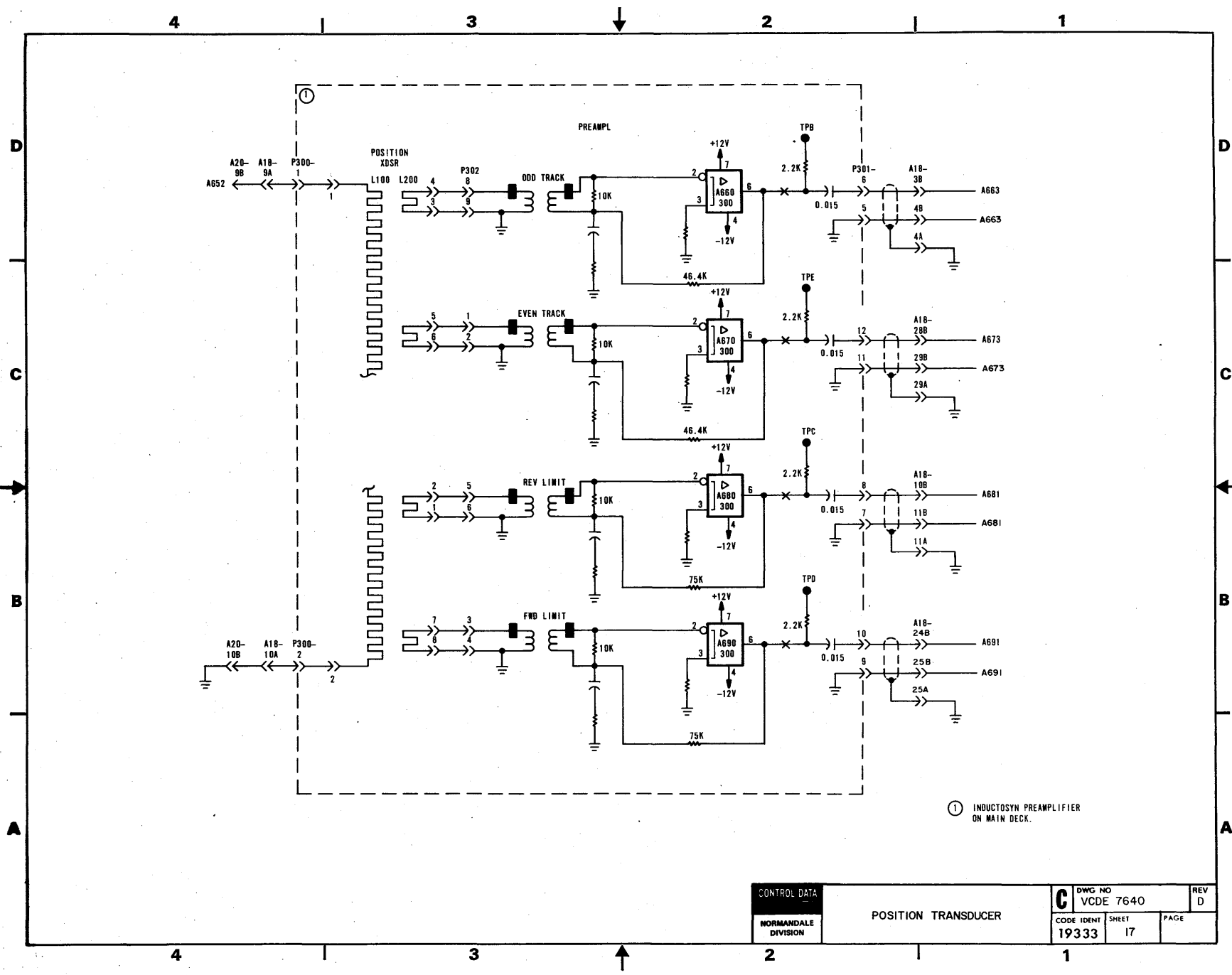


CONTROL DATA NORMANDALE DIVISION	DIFFERENCE COUNTER		DWG NO VCDE 7640	REV D
	CODE IDENT 19333	SHEET 15	PAGE	



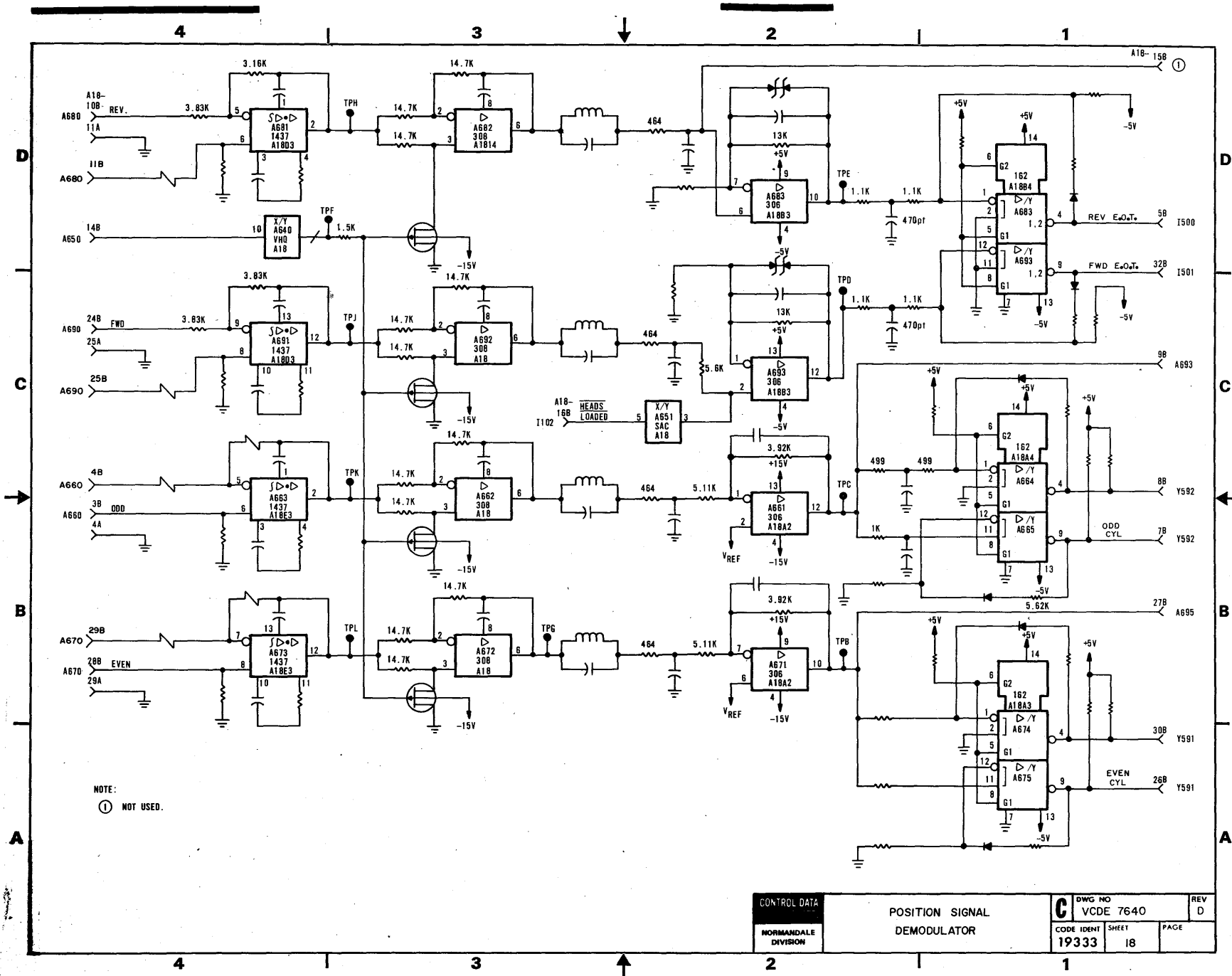
83302400 D

5-29



① INDUCTOSYN PREAMPLIFIER ON MAIN DECK.

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NORMANDEALE DIVISION			VCDE 7640	D
POSITION TRANSDUCER		CODE IDENT	SHEET	PAGE
		19333	17	

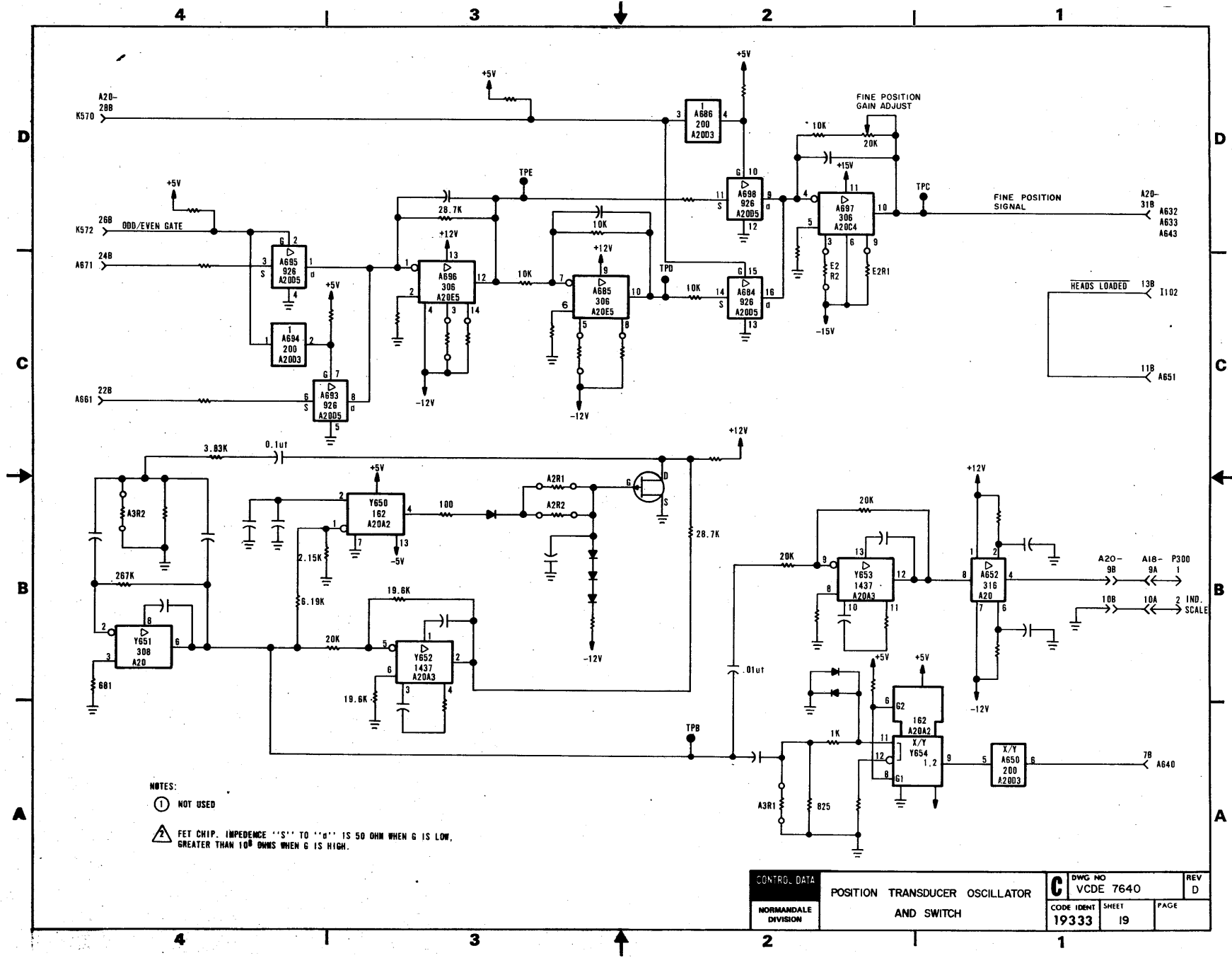


NOTE:  
① NOT USED.

CONTROL DATA  
NORMANDE  
DIVISION

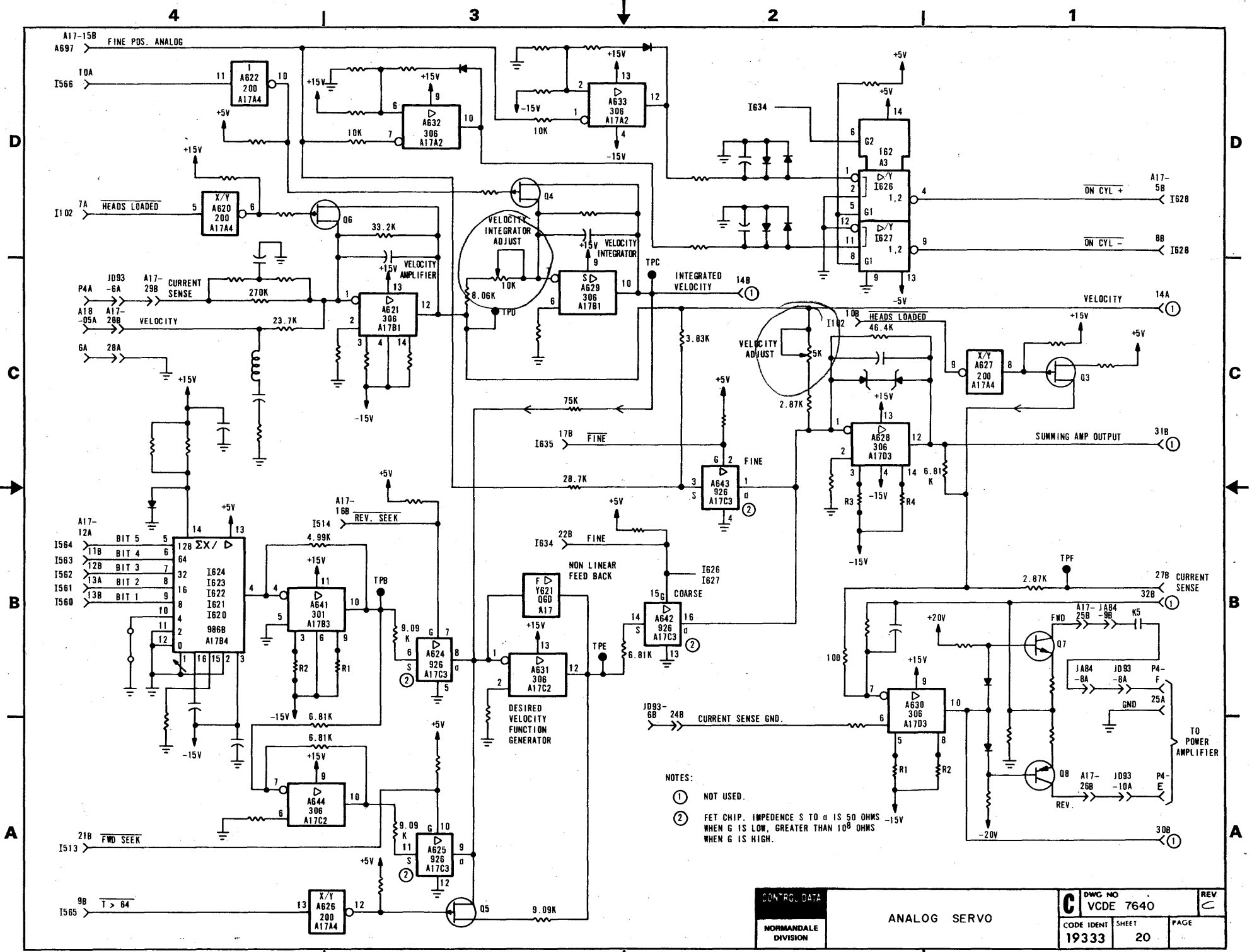
POSITION SIGNAL  
DEMULATOR

C	DWG NO	VCDE 7640	REV	D
	CODE IDENT	19333	SHEET	18
		PAGE		



532

83302400 B



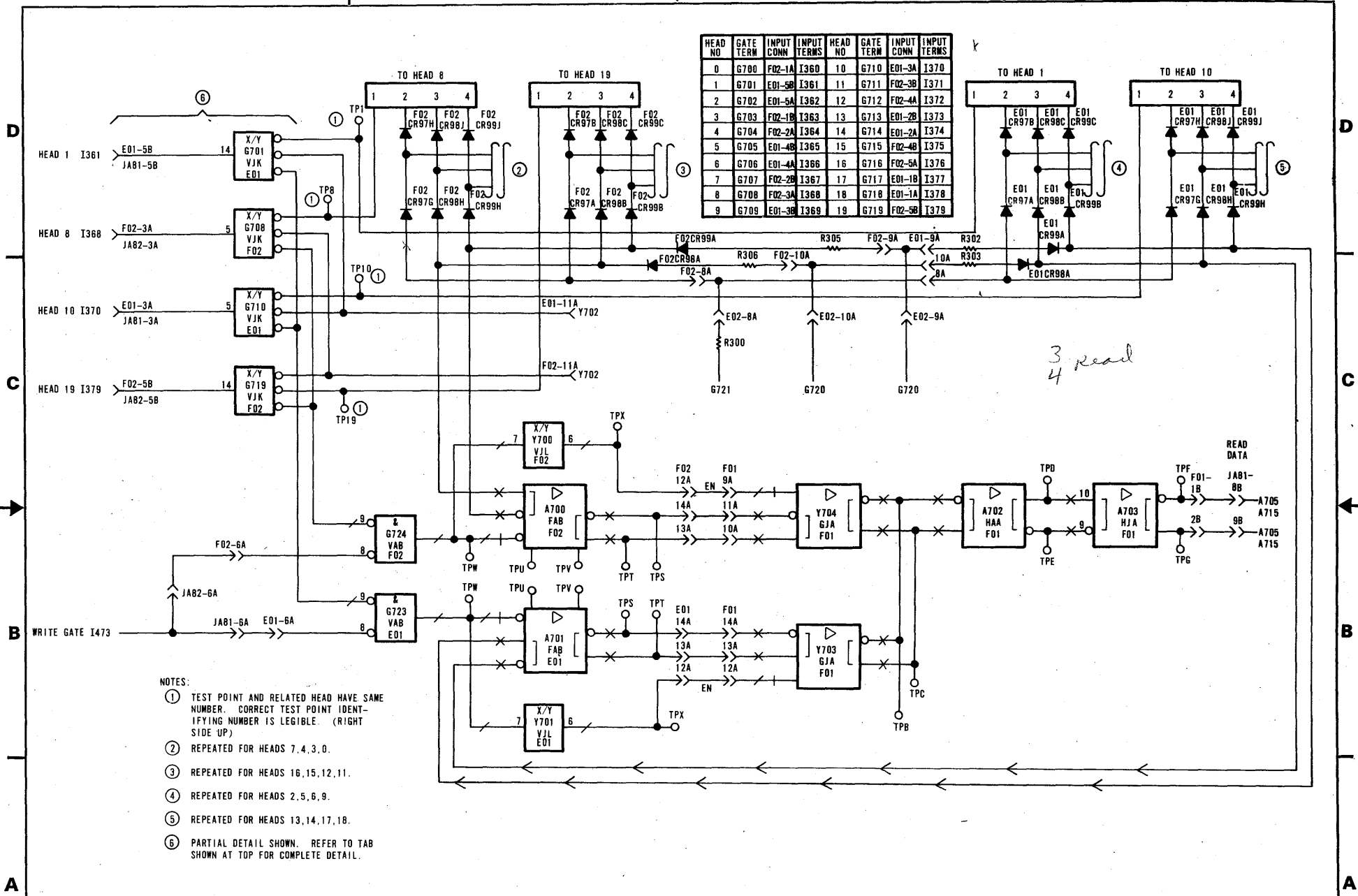
NOTES:  
 (1) NOT USED.  
 (2) FET CHIP. IMPEDANCE S TO G IS 50 OHMS WHEN G IS LOW, GREATER THAN 10<sup>8</sup> OHMS WHEN G IS HIGH.

CONTROL DATA NORMANDE DIVISION	ANALOG SERVO		DWG NO VCDE 7640	REV C
	CODE IDENT 19333	SHEET 20	PAGE	

83302400 A

5-33

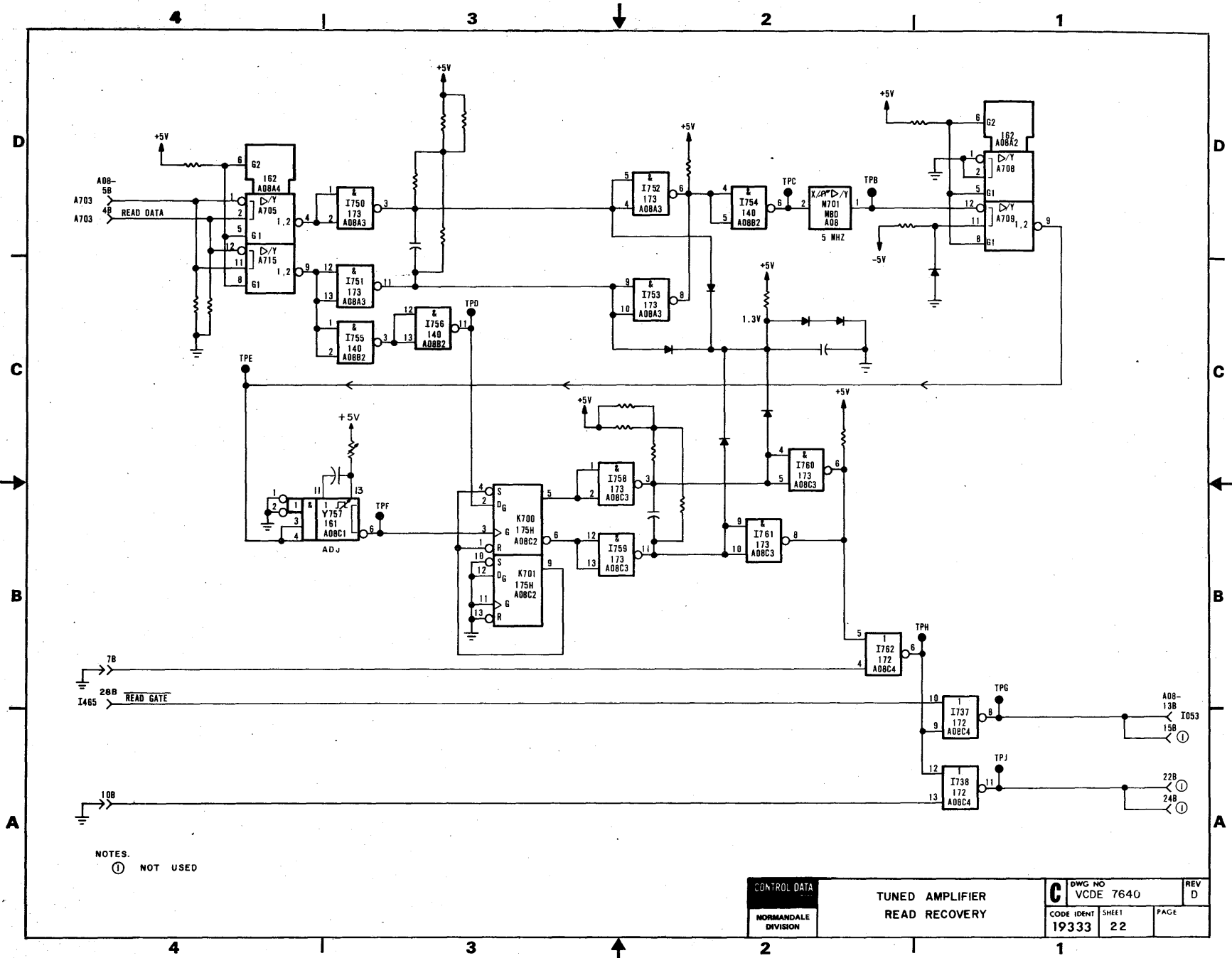
HEAD NO	GATE TERM	INPUT CONN	INPUT TERMS	HEAD NO	GATE TERM	INPUT CONN	INPUT TERMS
0	G700	F02-1A	I360	10	G710	E01-3A	I370
1	G701	E01-5B	I361	11	G711	F02-3B	I371
2	G702	E01-5A	I362	12	G712	F02-4A	I372
3	G703	F02-1B	I363	13	G713	E01-2B	I373
4	G704	F02-2A	I364	14	G714	E01-2A	I374
5	G705	E01-4B	I365	15	G715	F02-4B	I375
6	G706	E01-4A	I366	16	G716	F02-5A	I376
7	G707	F02-2B	I367	17	G717	E01-1B	I377
8	G708	F02-3A	I368	18	G718	E01-1A	I378
9	G709	E01-3B	I369	19	G719	F02-5B	I379



- NOTES:
- ① TEST POINT AND RELATED HEAD HAVE SAME NUMBER. CORRECT TEST POINT IDENTIFYING NUMBER IS LEGIBLE (RIGHT SIDE UP)
  - ② REPEATED FOR HEADS 7, 4, 3, 0.
  - ③ REPEATED FOR HEADS 16, 15, 12, 11.
  - ④ REPEATED FOR HEADS 2, 5, 6, 9.
  - ⑤ REPEATED FOR HEADS 13, 14, 17, 18.
  - ⑥ PARTIAL DETAIL SHOWN. REFER TO TAB SHOWN AT TOP FOR COMPLETE DETAIL.

3 read  
4 read

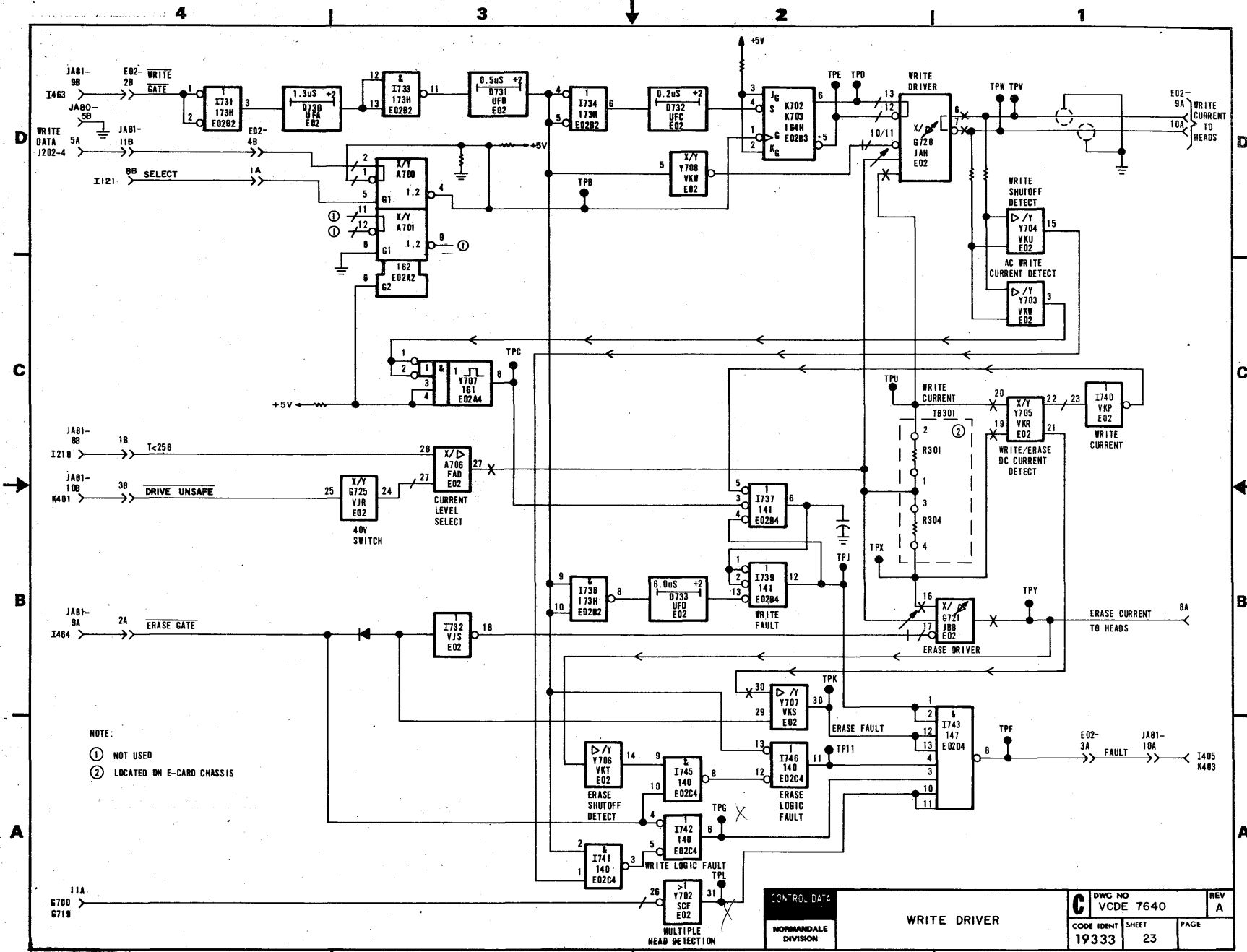
CONTROL DATA NORMANDALE DIVISION	HEAD GATING AND READ AMPLIFIER		REV A
	DWG NO VCDE 7640	SHEET 21	PAGE
CODE IDENT 19333			



NOTES.  
 ① NOT USED

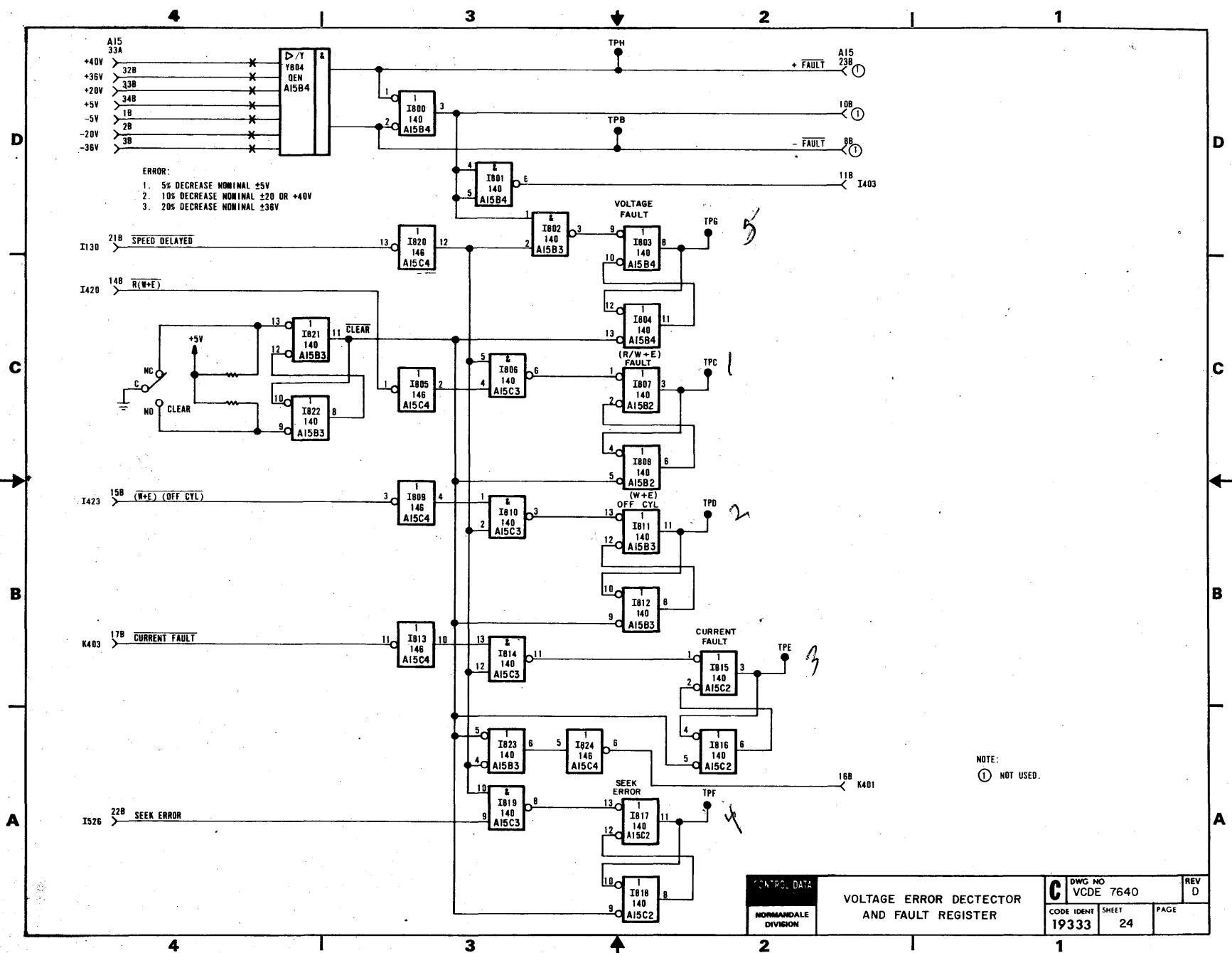
CONTROL DATA		TUNED AMPLIFIER READ RECOVERY		DWG NO VCDE 7640		REV D	
NORMANDALE DIVISION				CODE IDENT 19333	SHEET 22	PAGE	





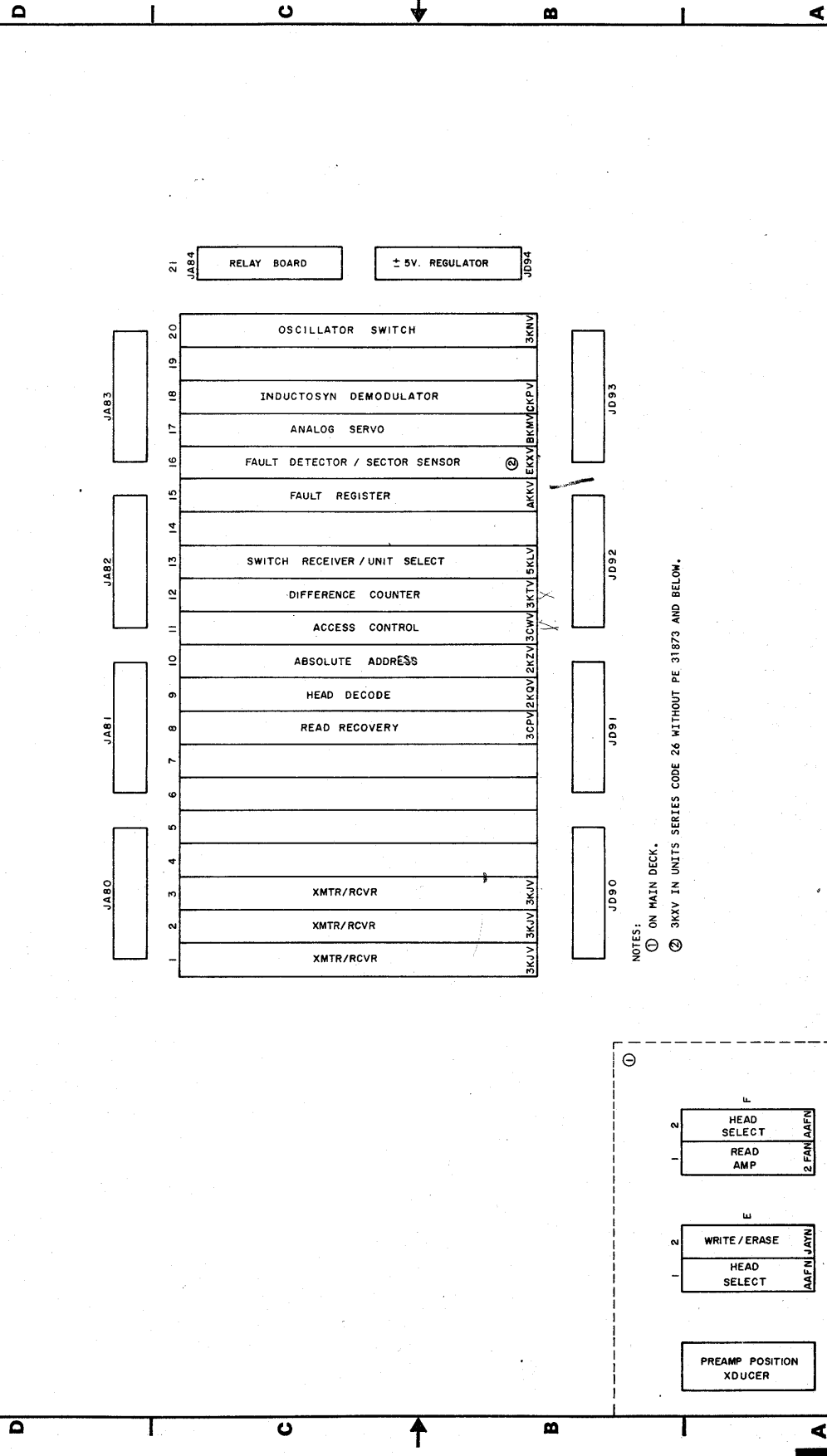
NOTE:  
 ① NOT USED  
 ② LOCATED ON E-CARD CHASSIS

NORMANDE DIVISION	WRITE DRIVER		DWG NO VCDE 7640	REV A
	CONTROL DATA		CODE IDENT 19333	SHEET 23
			PAGE	



CONFG. DATA		DWG NO VCDE 7640		REV D
NORMANDEALE DIVISION		VOLTAGE ERROR DETECTOR AND FAULT REGISTER		
CODE IDENT 19333	SHEET 24	PAGE		

1 2 3 4

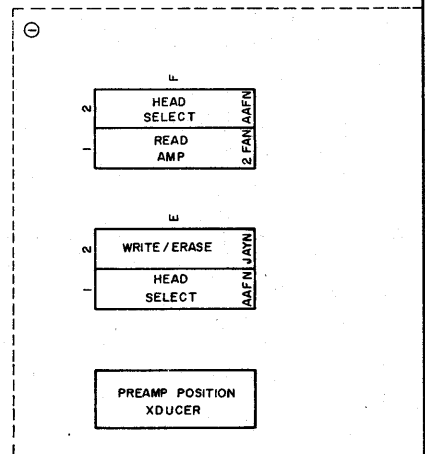


JAB4 RELAY BOARD JAB4  
 † 5V. REGULATOR JD94

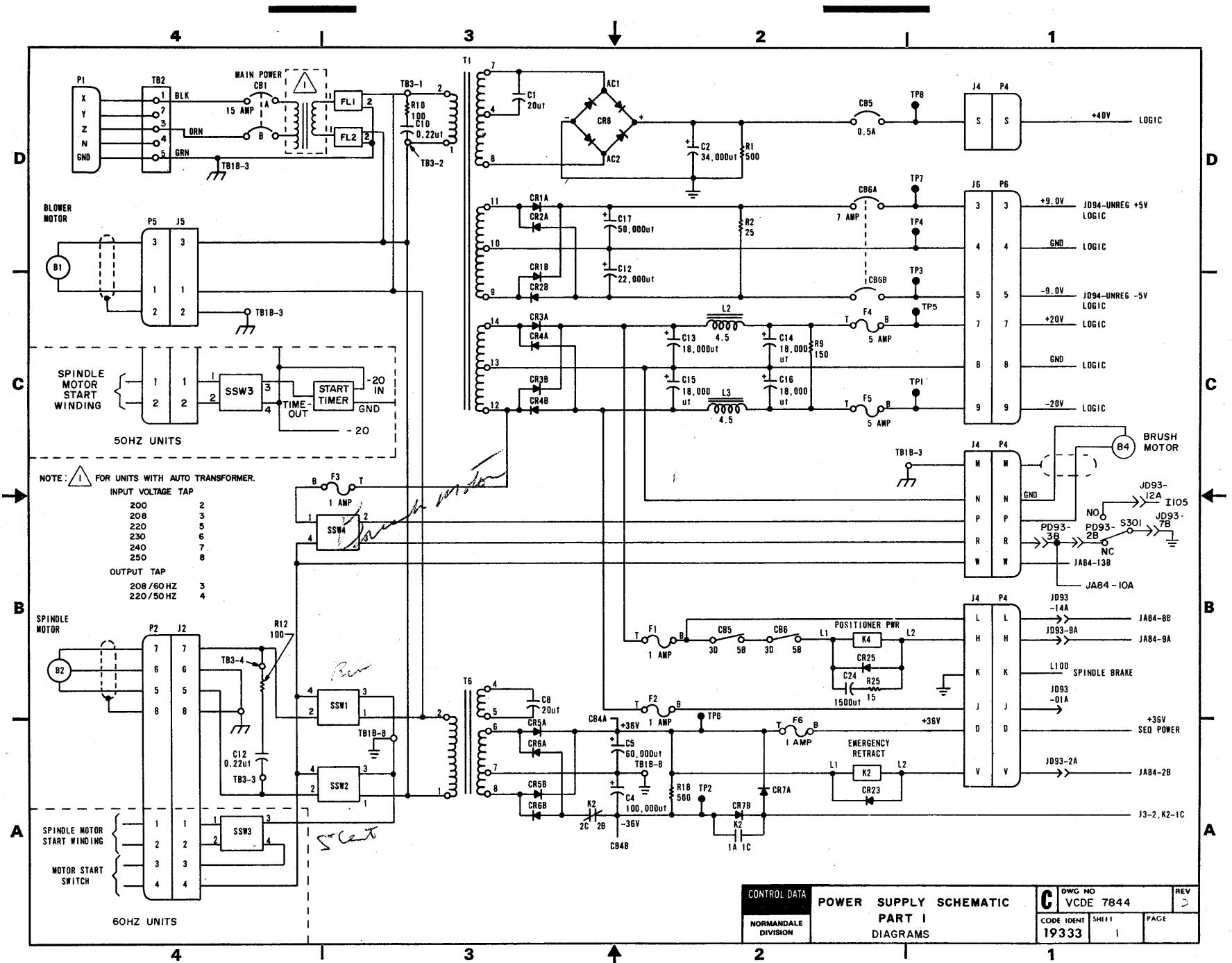
21	OSCILLATOR SWITCH	3KNV
20	INDUCTOSYN DEMODULATOR	3KNV
19	ANALOG SERVO	3KNV
18	FAULT DETECTOR / SECTOR SENSOR	3KNV
17	FAULT REGISTER	3KNV
16	SWITCH RECEIVER / UNIT SELECT	3KNV
15	DIFFERENCE COUNTER	3KNV
14	ACCESS CONTROL	3KNV
13	ABSOLUTE ADDRESS	3KNV
12	HEAD DECODE	3KNV
11	READ RECOVERY	3KNV
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		

JD93  
 JD92  
 JD91  
 JD90

NOTES:  
 ① ON MAIN DECK.  
 ② 3KV IN UNITS SERIES CODE 26 WITHOUT PE 31873 AND BELOW.

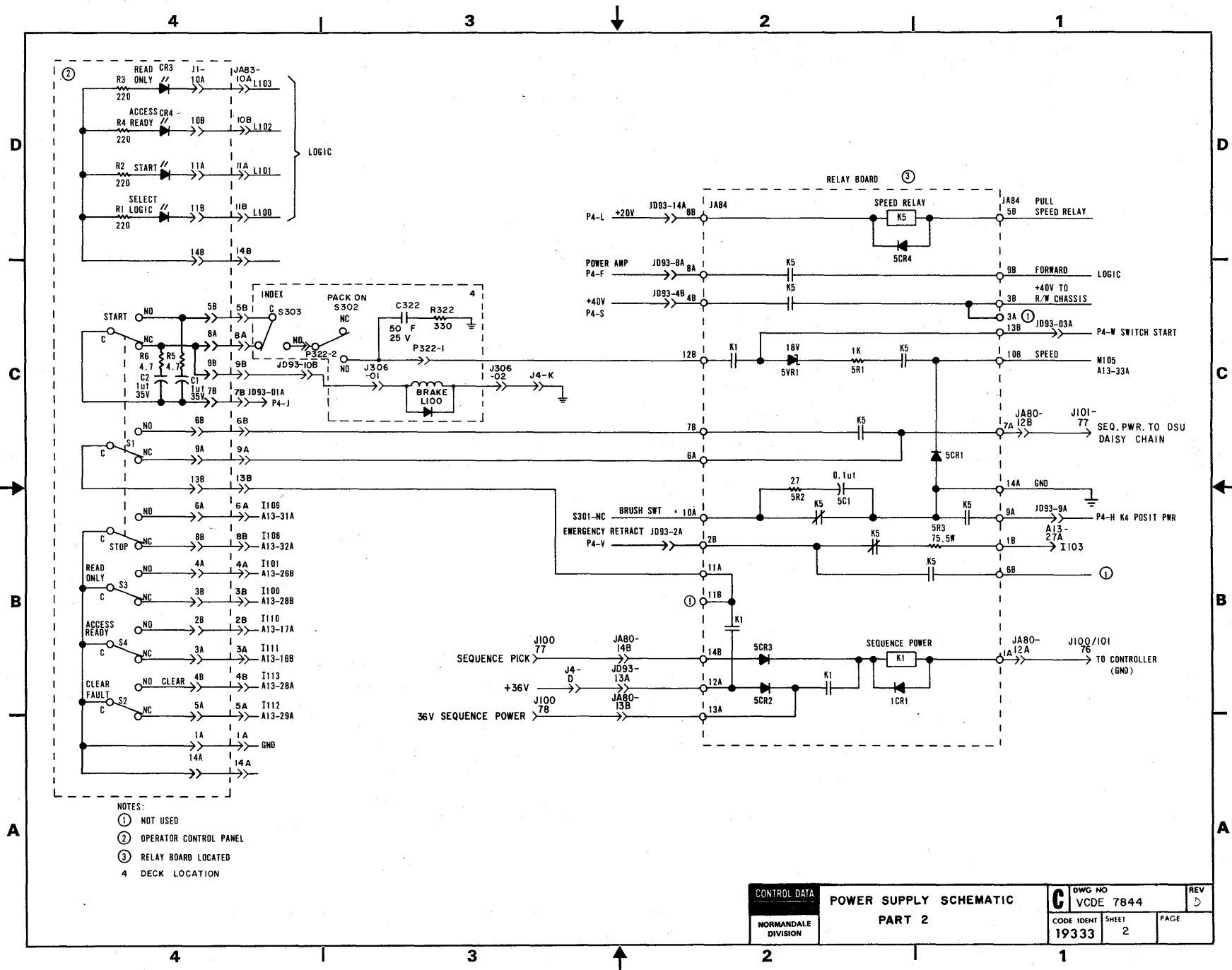


CONTROL DATA	DWG NO	REV
NORMANDALE DIVISION	VCDE 7640	D
	CODE 19333	SHEET 25
		PAGE
CHASSIS MAP		



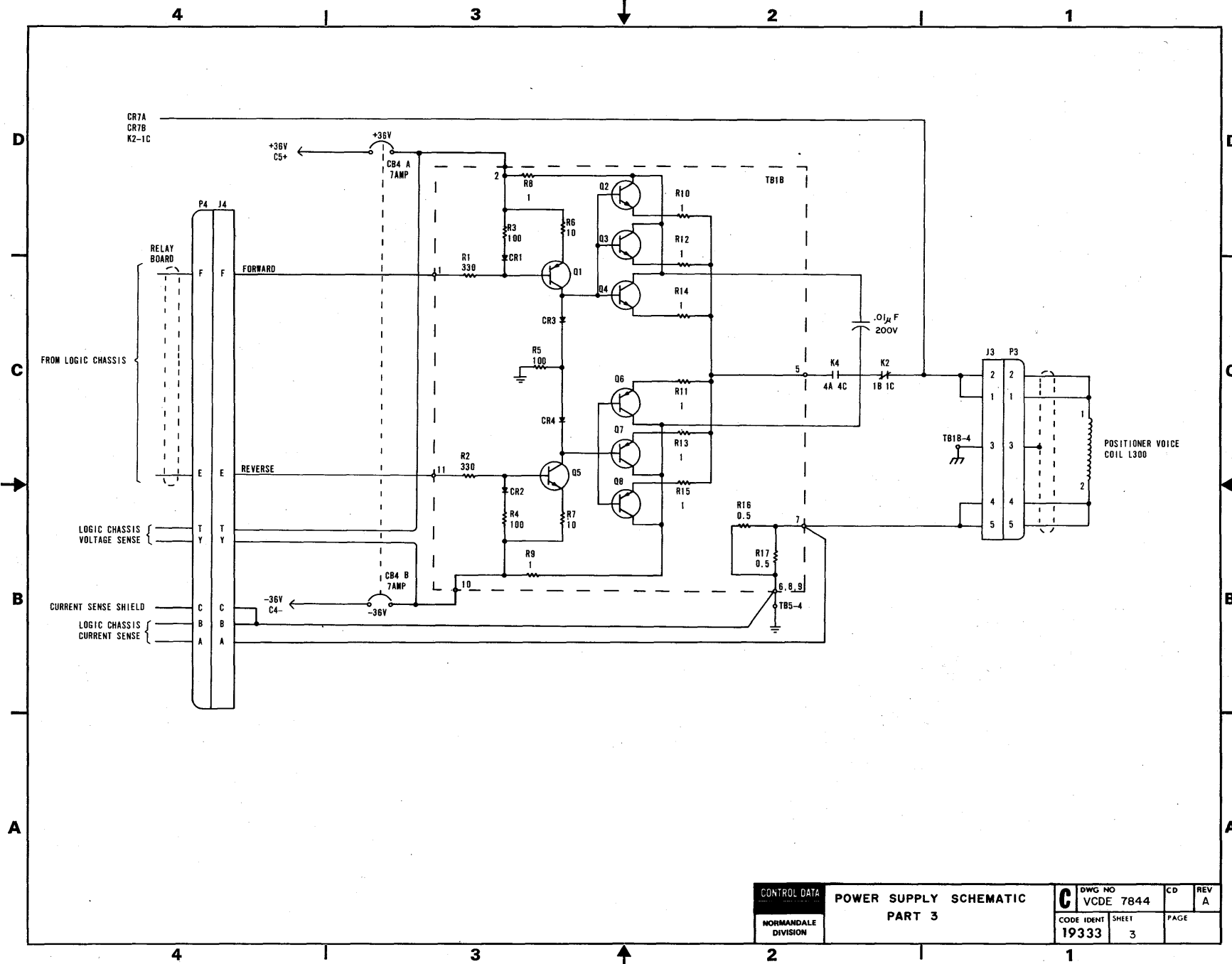
CONTROL DATA  
 NORMANDALE DIVISION  
**POWER SUPPLY SCHEMATIC**  
 PART I  
 DIAGRAMS

<b>C</b>	DWG NO	REV
	VCDE 7844	>
CODE IDENT	SHEET	PAGE
19333	1	



- NOTES:
- ① NOT USED
  - ② OPERATOR CONTROL PANEL
  - ③ RELAY BOARD LOCATED
  - ④ DECK LOCATION

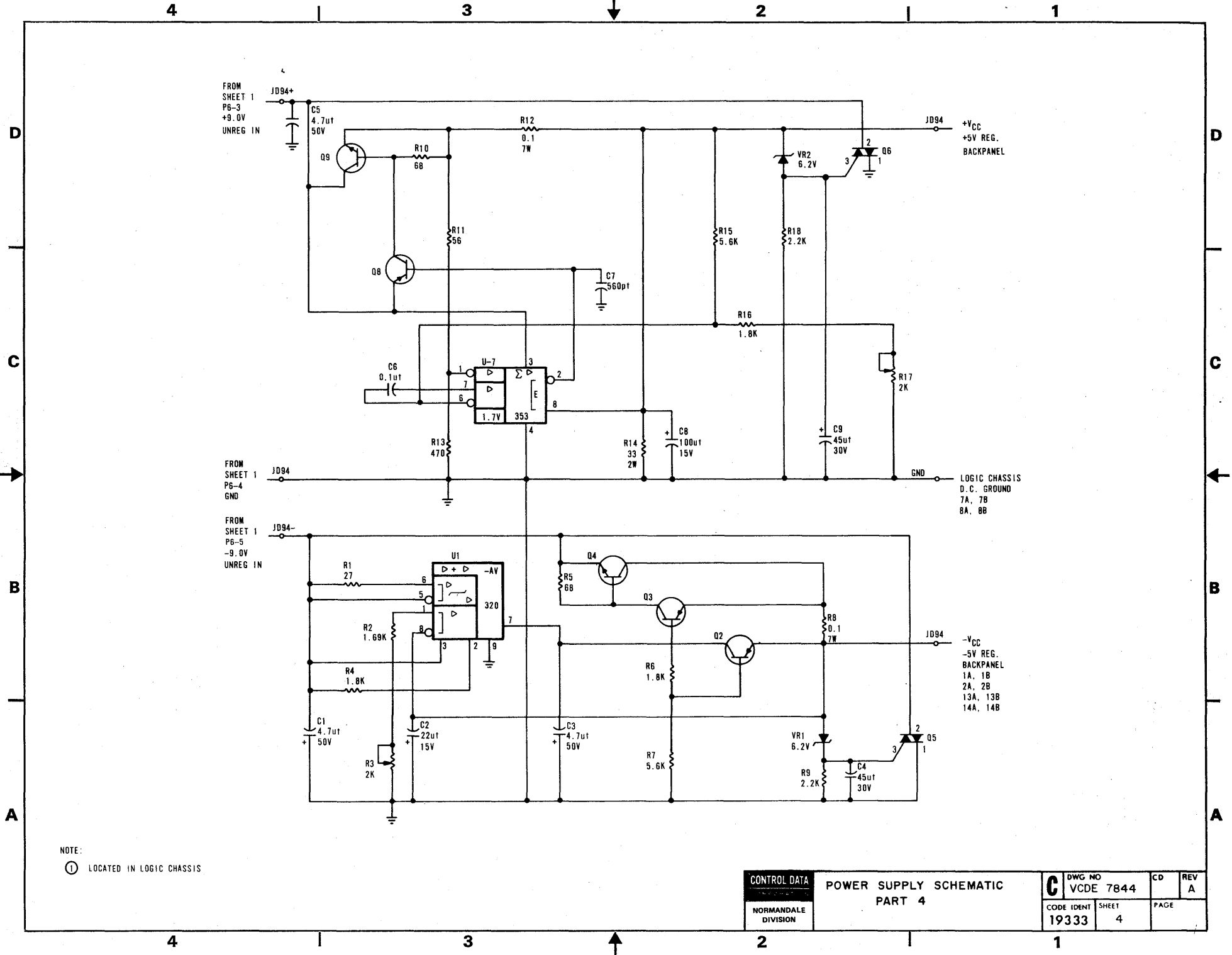
CONTROL DATA NORMANDEALE DIVISION	POWER SUPPLY SCHEMATIC PART 2		DWG NO VCDE 7844	REV D
	CODE IDENT 19333	SHEET 2	PAGE	



CONTROL DATA NORMANDEALE DIVISION	POWER SUPPLY SCHEMATIC PART 3		C	DWG NO VCDE 7844	CD	REV A
	CODE IDENT 19333	SHEET 3		PAGE		

83302400 A

5-41

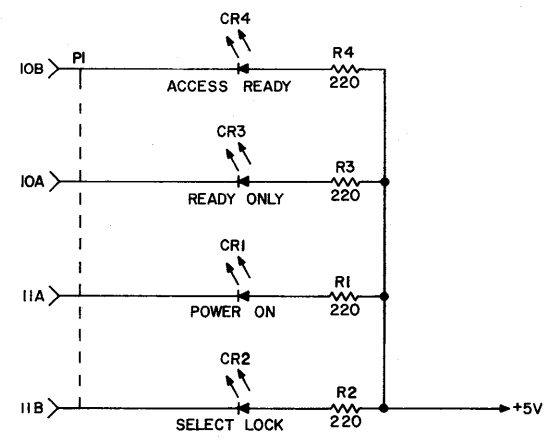
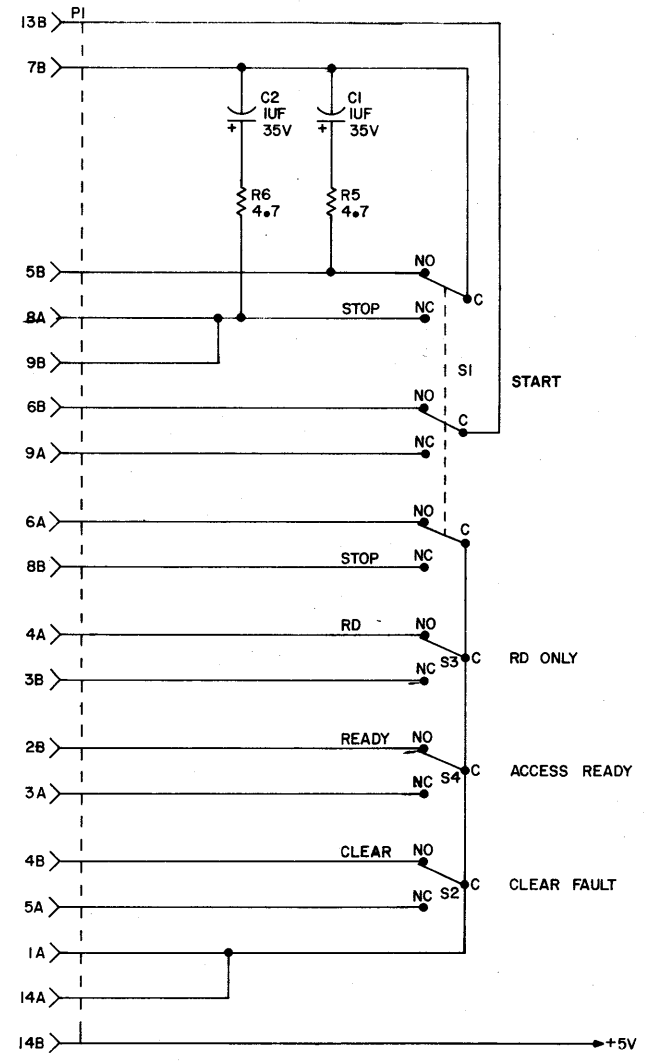


NOTE:  
 ① LOCATED IN LOGIC CHASSIS

CONTROL DATA		POWER SUPPLY SCHEMATIC		CD	REV
NORMANDEALE DIVISION		PART 4		C	A
VCDE	87844	CD	REV		
19333	4	PAGE			

5-42

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP	
A		RELEASED					



REFERENCE DRAWINGS			CONTROL DATA		NORMANDALE DIVISION		TITLE				
COMP ASSY: 75176900			BR5A5		NORMANDALE DIVISION		SCHEMATIC DIAGRAM OPERATOR PANEL				
COMPONENTS, EXCEPT AS NOTED			FIRST USED ON	CHK	ENGR	MFG	APPR	CODE IDENT	DRAWING NUMBER	CD	
TOLERANCE	VALUE	RATING	DWN	MON BAKER	10-17-73	12/28/73	10/23/73	19333	C 75177000	9	
RES	±5%	OHMS	1/4 W								
CAP	±10%										
								SHEET	1	OF	1

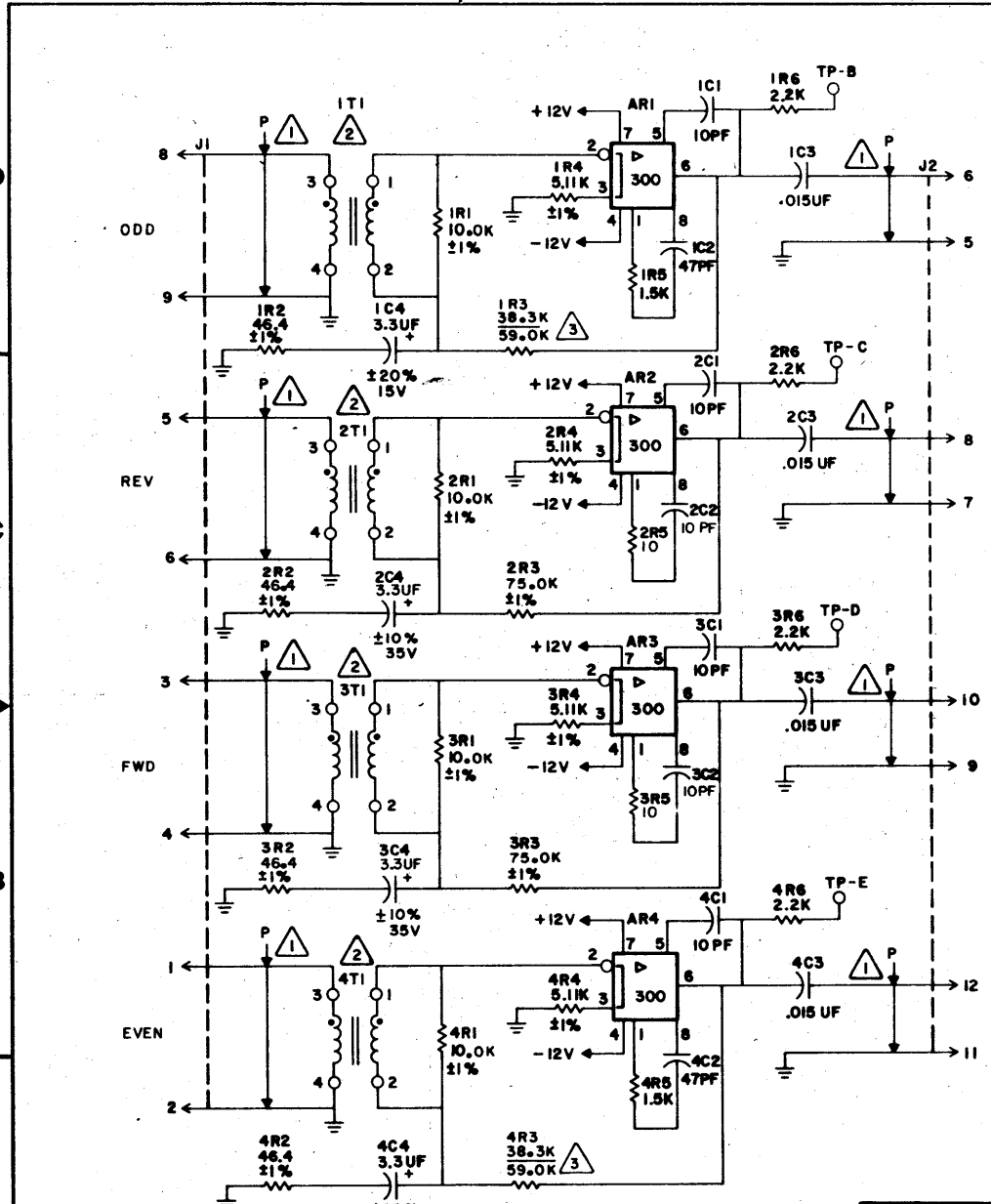
83302400 A

0001515175

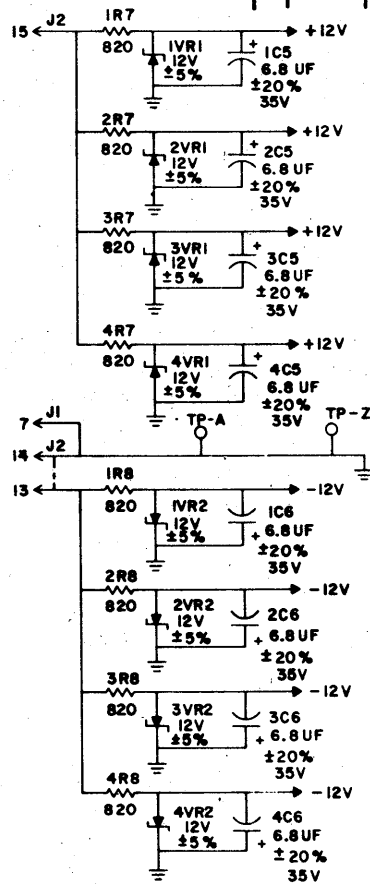


83302400 A

543



SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP	
A		RELEASED		9/73			

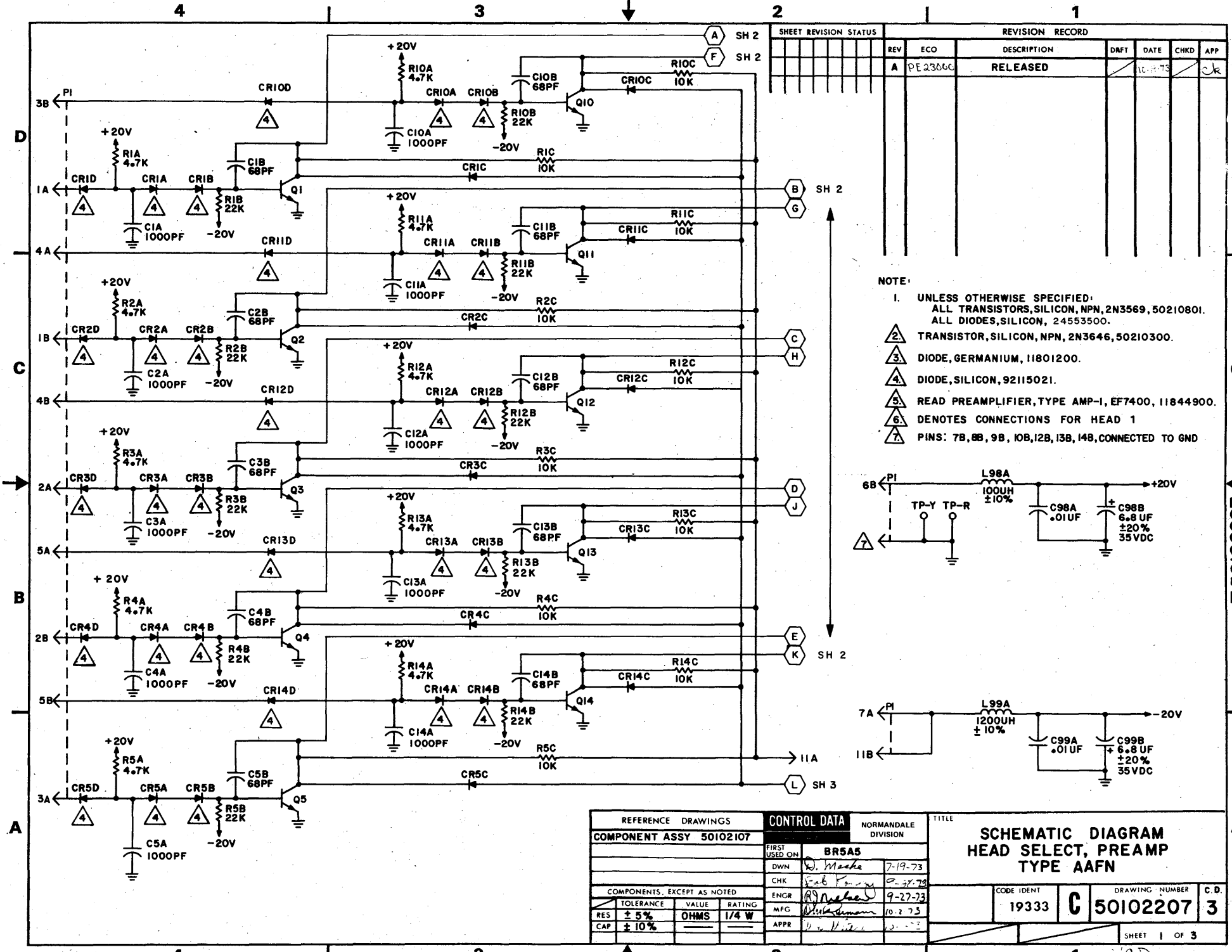


NOTE:  
 1 PAIRED CONDUCTORS SHOWN ON THE SCHEMATIC ARE NOT TWISTED.  
 2 TRANSFORMER, 94245910  
 3 TEST SELECT RESISTOR TO BE SELECTED FROM DRAWING 94357500 AND INSERTED DURING CARD TEST PER RECOMMENDED TEST PROCEDURE.

REFERENCE DRAWINGS		CONTROL DATA		NORMANDEALE DIVISION		TITLE	
COMP ASSY 70738502		FIRST USED ON BR5A5		DWN SR WILSON 10/8/73		SCHEMATIC DIAGRAM PREAMP POSITION XDUCER	
COMPONENTS, EXCEPT AS NOTED		ENGR [Signature]		MFG [Signature]		CODE IDENT 19333	
TOLERANCE	VALUE	RATING				DRAWING NUMBER	CD
RES ±5%	OHMS	1/4W				70739202	3
CAP ±10%							
				SHEET 1 OF 1			

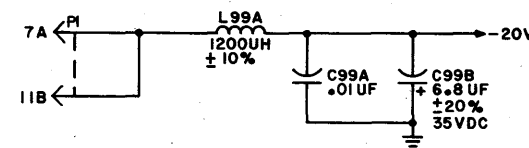
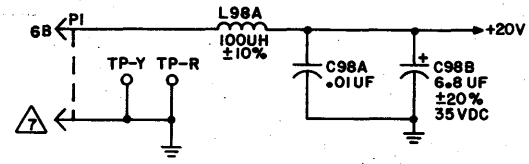
5-144

83302400 A



SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DAFT	DATE	CHKD	APP	
A	PE 2306G	RELEASED		10-17-73			CK

- NOTE:
- UNLESS OTHERWISE SPECIFIED:  
ALL TRANSISTORS, SILICON, NPN, 2N3569, 50210801.  
ALL DIODES, SILICON, 24553500.
  - TRANSISTOR, SILICON, NPN, 2N3646, 50210300.
  - DIODE, GERMANIUM, 11801200.
  - DIODE, SILICON, 92115021.
  - READ PREAMPLIFIER, TYPE AMP-1, EF7400, 11844900.
  - DENOTES CONNECTIONS FOR HEAD 1
  - PINS: 7B, 8B, 9B, 10B, 12B, 13B, 14B, CONNECTED TO GND



REFERENCE DRAWINGS				CONTROL DATA		TITLE	
COMPONENT ASSY 50102107				NORMANDELE DIVISION		SCHEMATIC DIAGRAM HEAD SELECT, PREAMP TYPE AAFN	
COMPONENTS, EXCEPT AS NOTED				FIRST USED ON	BR5A5		
TOLERANCE				DWN	D. Mache 7-19-73		
VALUE				CHK	Fab Pinsky 9-27-73		
RATING				ENGR	D. Mache 9-27-73		
RES	± 5%	OHMS	1/4 W	MFG	W. S. M. 10-2-73		
CAP	± 10%			APPR	D. Mache 10-2-73		
				CODE IDENT	19333	DRAWING NUMBER	50102207
					C		3
				SHEET 1 OF 3			

B 50102207

A

83302400 A

D

I

C

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B

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545

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1

3

↓

2

1

1

4

1

3

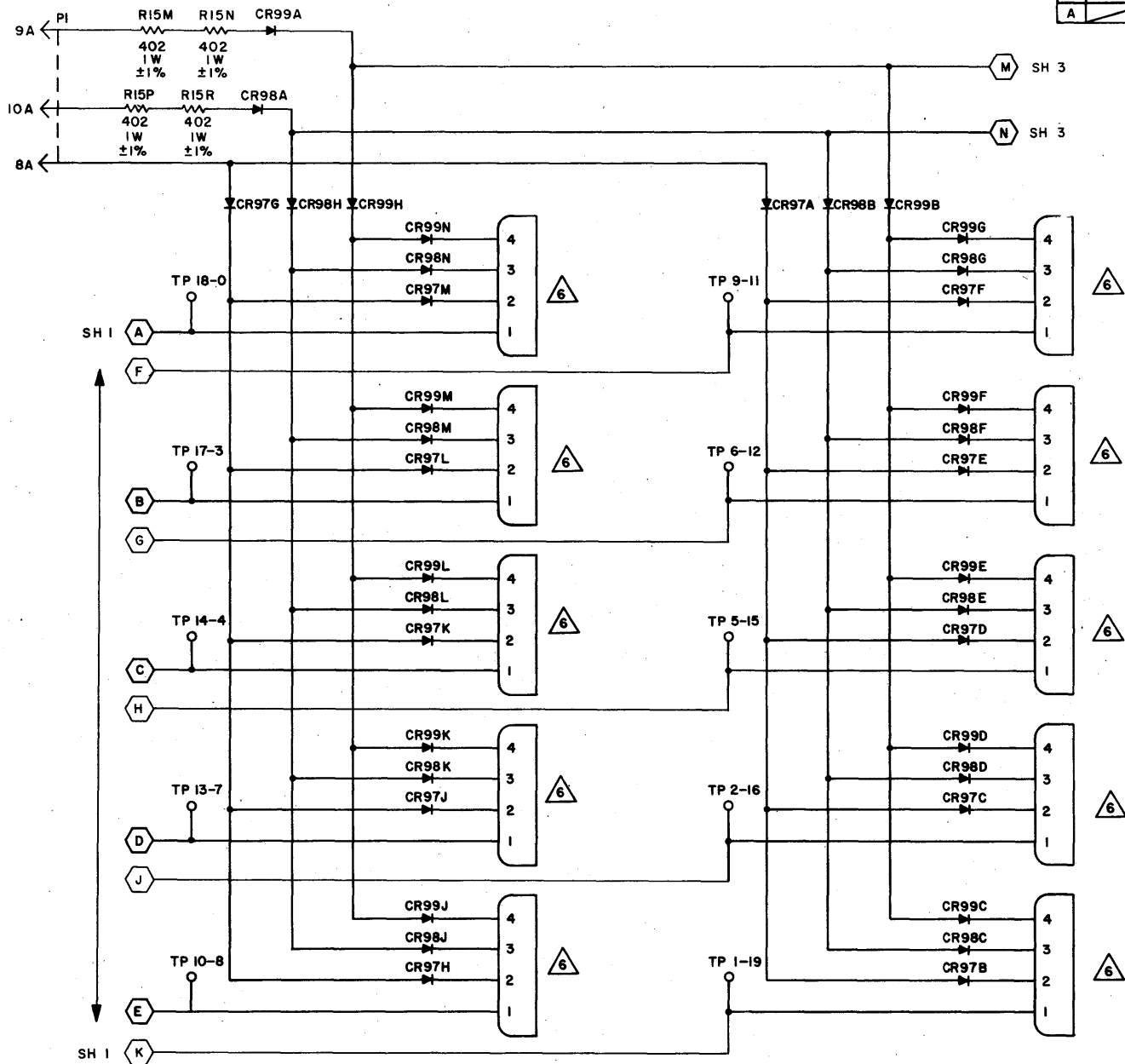
↑

2

1

1

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1				



CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM HEAD SELECT, PREAMP TYPE AAFN		CODE IDENT 19333	DWG NO C 50102207	C.D. 3
				SHEET 2 OF 3	

D

I

C

↑

B

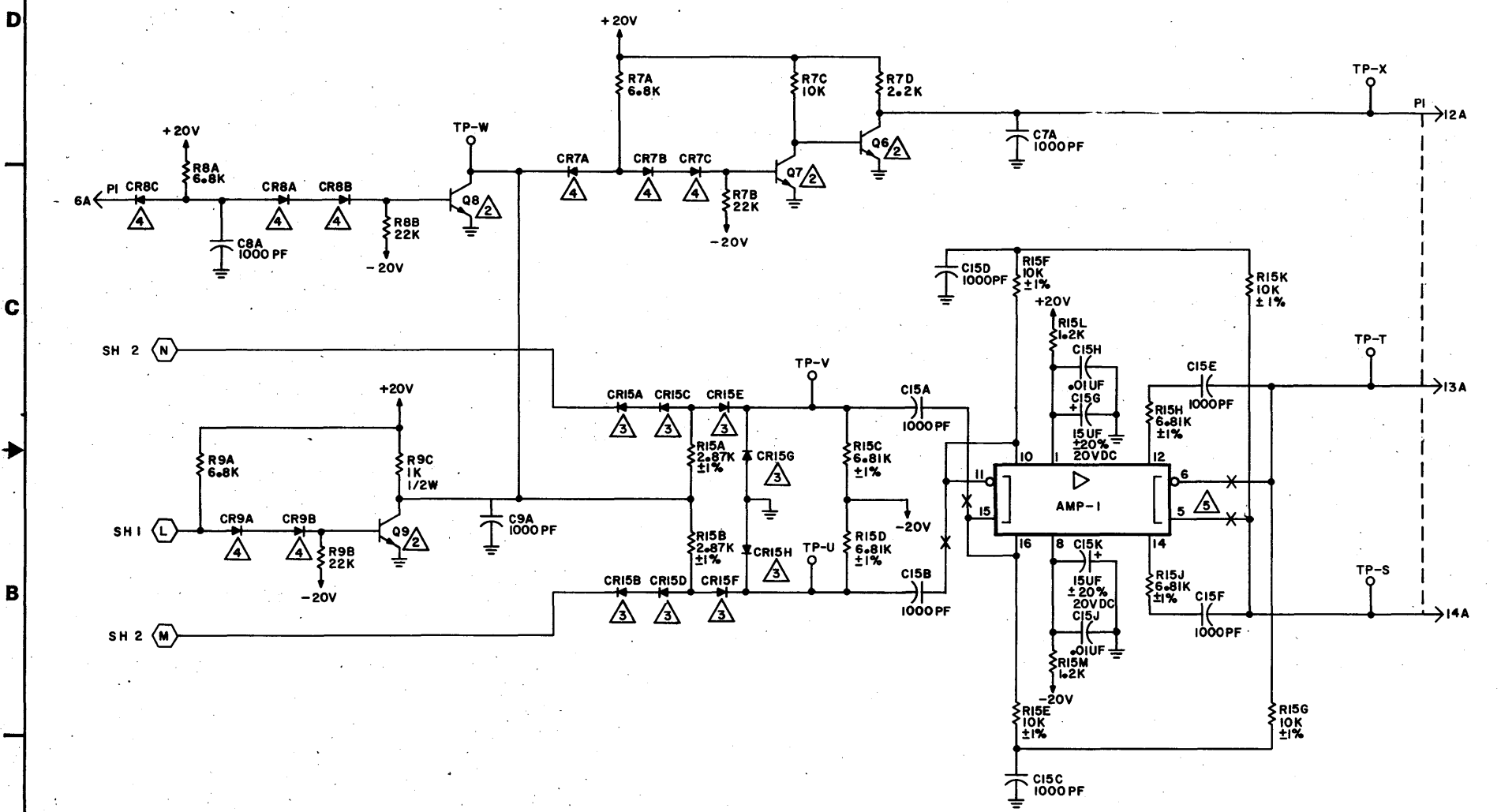
A

B50102207

5-46

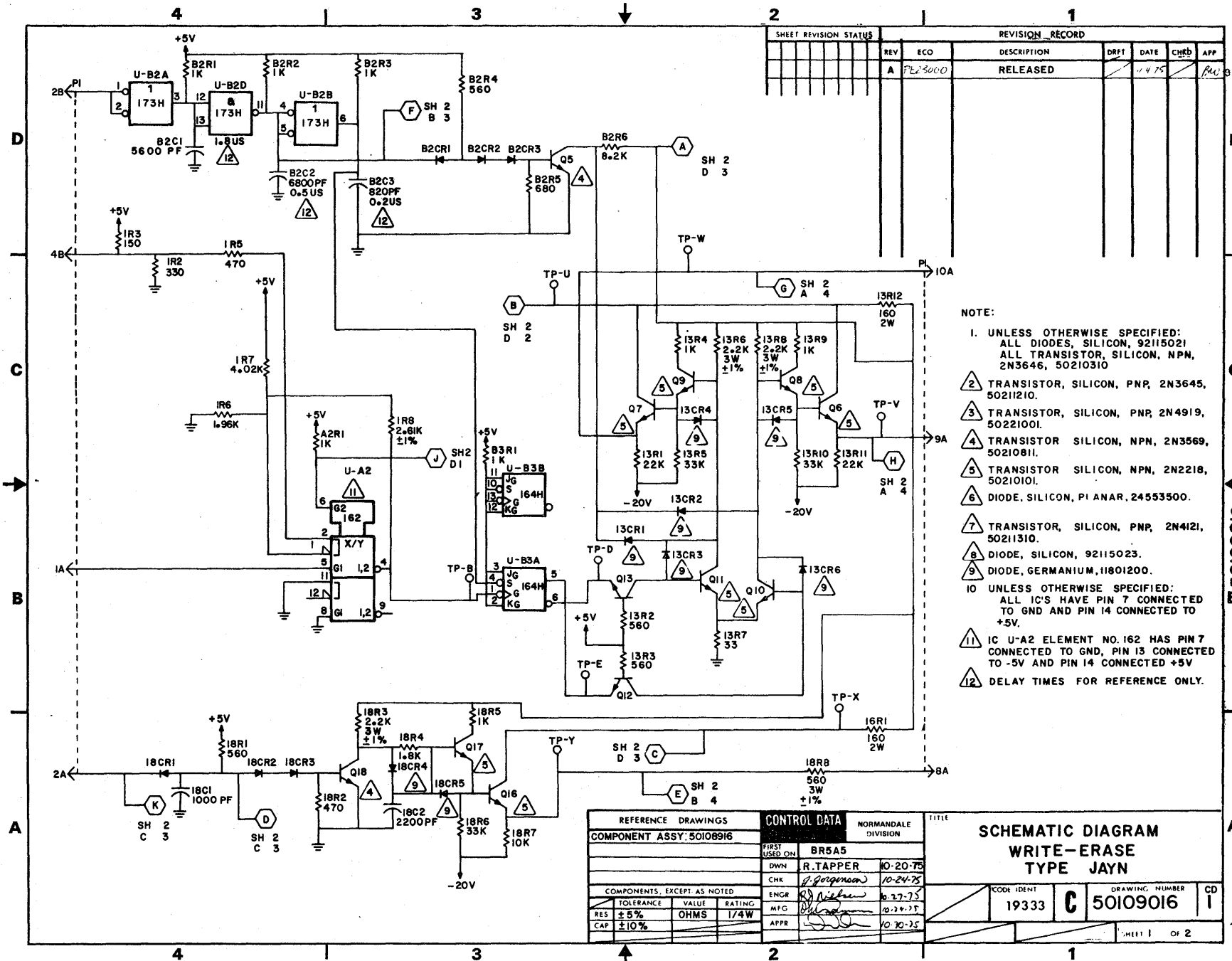
83302400 A

REVISION RECORD					
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD APP
A		SEE SHEET 1			



CONTROL DATA NORMAN DALE DIVISION	SCHEMATIC DIAGRAM HEAD SELECT, PREAMP TYPE AAFN		CODE IDENT 19333	DWG NO C 50102207	CD 3
			SHEET 3 OF 3		

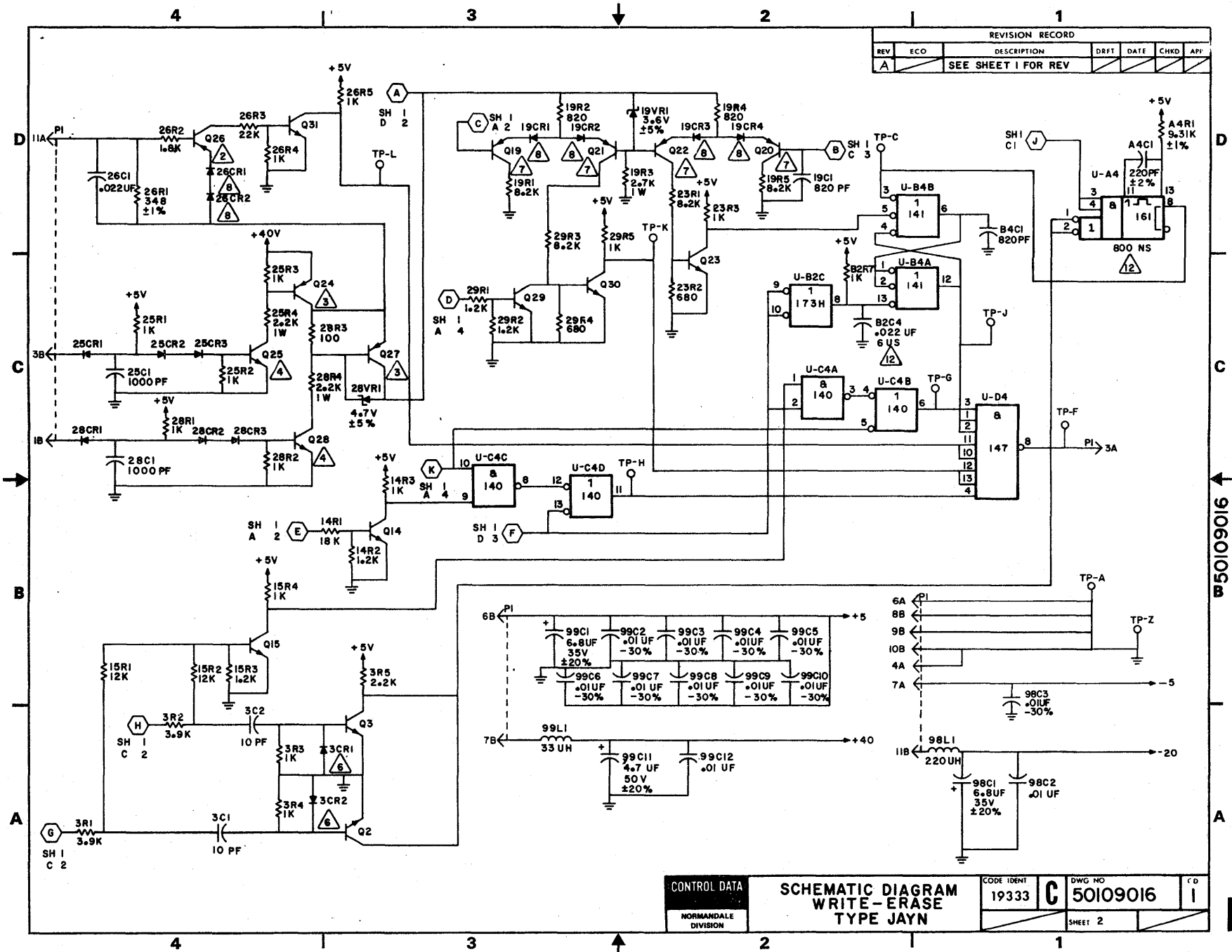
B 50102207



SHEET REVISION STATUS		REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A	PL23000	RELEASED		11-4-75		PLW

- NOTE:
1. UNLESS OTHERWISE SPECIFIED:  
ALL DIODES, SILICON, 92115021  
ALL TRANSISTOR, SILICON, NPN, 2N3646, 50210310
  2. TRANSISTOR, SILICON, PNP, 2N3645, 50211210.
  3. TRANSISTOR, SILICON, PNP, 2N4919, 50221001.
  4. TRANSISTOR SILICON, NPN, 2N3569, 50210811.
  5. TRANSISTOR SILICON, NPN, 2N2218, 50210101.
  6. DIODE, SILICON, PI ANAR, 24553500.
  7. TRANSISTOR, SILICON, PNP, 2N4121, 50211310.
  8. DIODE, SILICON, 92115023.
  9. DIODE, GERMANIUM, 11801200.
  10. UNLESS OTHERWISE SPECIFIED:  
ALL IC'S HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.
  11. IC U-A2 ELEMENT NO. 162 HAS PIN 7 CONNECTED TO GND, PIN 13 CONNECTED TO -5V AND PIN 14 CONNECTED +5V
  12. DELAY TIMES FOR REFERENCE ONLY.

REFERENCE DRAWINGS		CONTROL DATA		NORMANDEALE DIVISION		TITLE	
COMPONENT ASSY: 50108916		FIRST USED ON	BR5A5			SCHEMATIC DIAGRAM WRITE-ERASE TYPE JAYN	
		DWN	R. TAPPER	10-20-75			
		CHK	<i>(Signature)</i>	10-24-75			
		ENGR	<i>(Signature)</i>	10-27-75			
		MFG	<i>(Signature)</i>	10-29-75			
		APPR	<i>(Signature)</i>	10-30-75			
COMPONENTS, EXCEPT AS NOTED							
TOLERANCE	VALUE	RATING					
RES	+5%	OHMS	1/4W				
CAP	+10%						
CODE IDENT		DRAWING NUMBER		CD			
19333		C 50109016		1			



REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET I FOR REV				

CONTROL DATA NORMANDALE DIVISION	SCHMATIC DIAGRAM WRITE-ERASE TYPE JAYN	CODE IDENT 19333	DWG NO <b>C</b> 50109016	C'D 1
			SHEET 2	

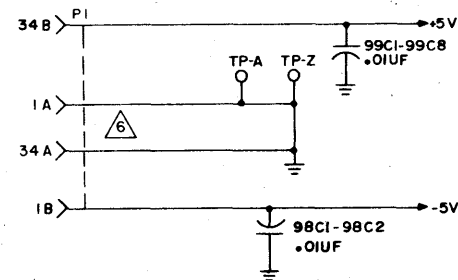
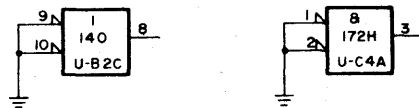
83302400 A

5-49

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP	
A	PC 23000	RELEASED		2-1-73		JTT	
B	PE31545	CORRECT PART NO.	VBW	11-13-73	JTT	IL	

1. UNLESS OTHERWISE SPECIFIED ;
- ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO GROUND AND PIN 14 CONNECTED TO +5V.
- ALL DIODES, SILICON, PLANAR, 24553500.
- ICS U-A2 AND U-A4, ELEMENT NO. 162, HAVE PIN 13 CONNECTED TO -5V.
- RESISTOR A3R1 AND C3R1 TO BE SELECTED FROM DWG. 94357500, AND INSERTED DURING CARD TEST PER RECOMMENDED TEST PROCEDURE.
- Q2 TRANSISTOR, IS SNPN, 2N4258 P/N 50211510.
- Q1, TRANSISTOR, IS SNPN, 2N3646 P/N 50210310.
- ALL CONNECTOR "A" PINS 1A THRU 34A ARE CONNECTED TO GROUND.

SPARE GATES



REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		TITLE	
COMPONENT ASSY 54115303		CORPORATION				SCHEMATIC DIAGRAM	
		FIRST USED ON		BR5A5		READ RECOVERY	
		DWN		EMWOLFE		TYPE 3CPV	
		CHK		7/17/73			
		ENGR		9-22-73		CODE IDENT	
		MFG		2-28-73		19333	
		APPR				DRAWING NUMBER	
COMPONENTS EXCEPT AS NOTED						54115403	
TOLERANCE	VALUE	RATING			CD		5
RES	± 5%	OHMS	1/4 W				
CAP	- 30%						
						SHEET 1 OF 4	

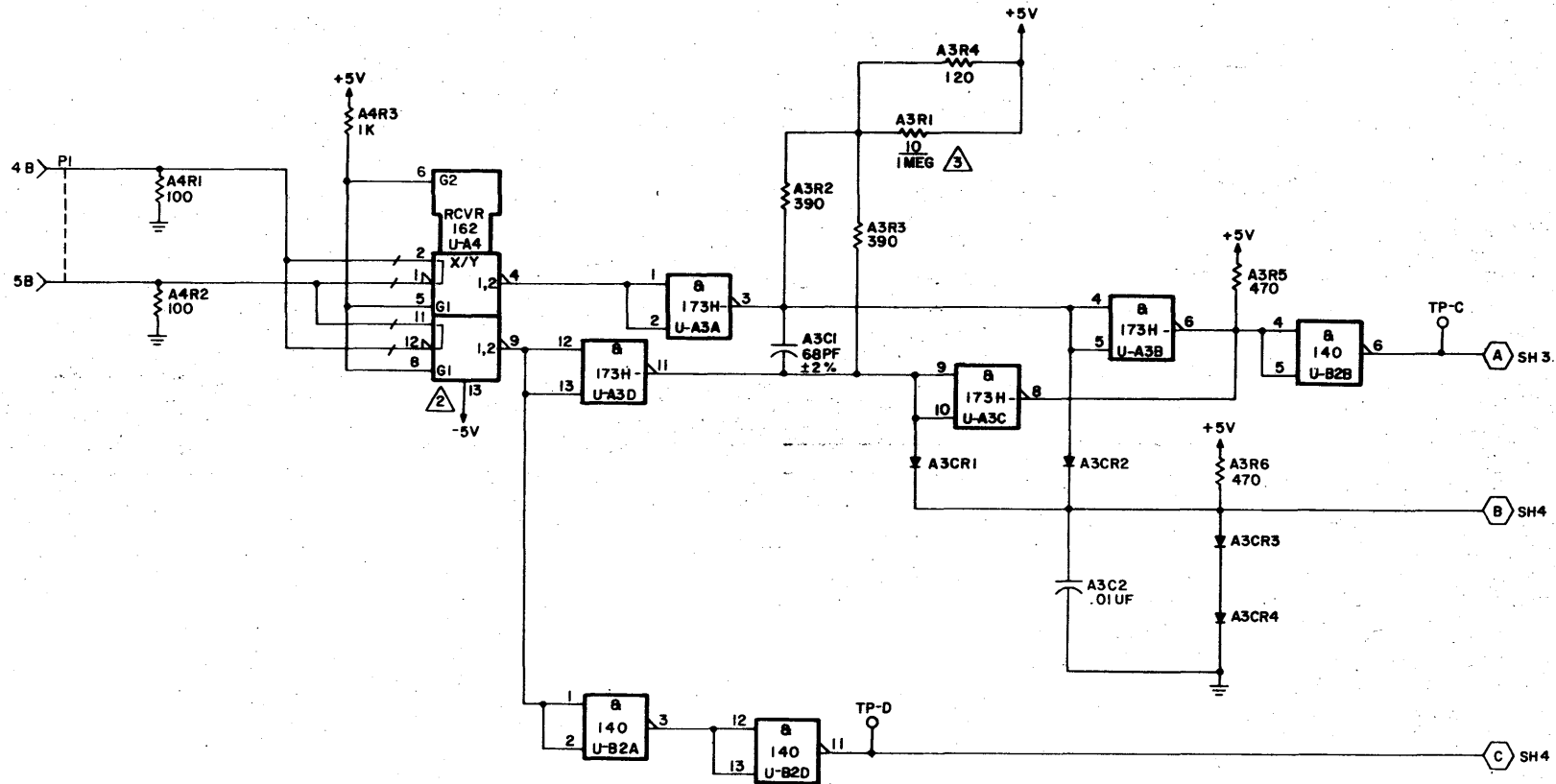
54115403 ↑

V D

5-50

83302400

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
B		SEE SHEET 1 FOR REV				



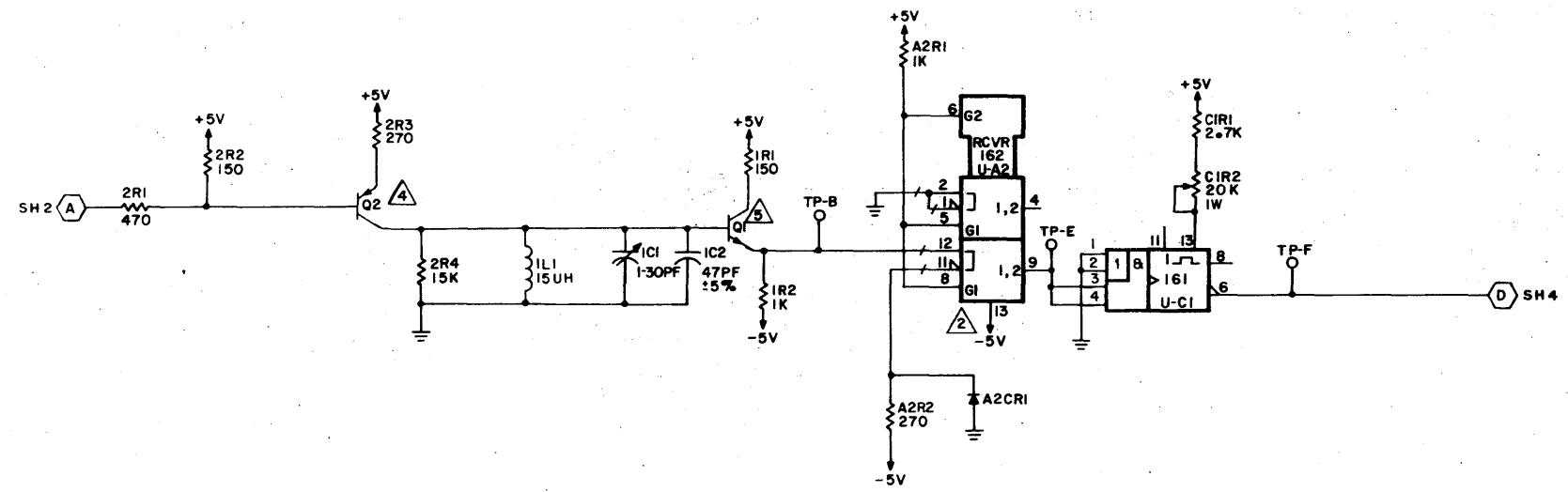
CONTROL DATA NORMAN DALE DIVISION	SCHEMATIC DIAGRAM TYPE 3CPV		CODE IDENT 19333	DWG NO 54115403	CD 5
			SHEET 2		



83302400 A

5-51

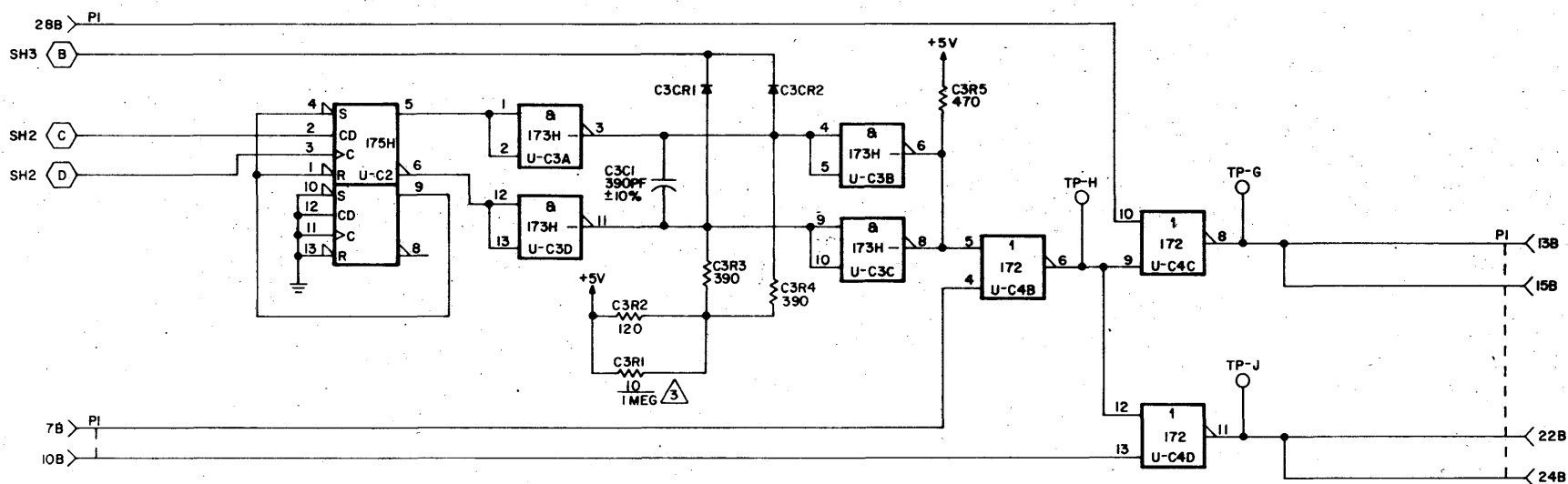
REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
B		SEE SHEET 1 FOR REV				



<b>CONTROL DATA</b> NORMANDEALE DIVISION	<b>SCHEMATIC DIAGRAM</b> <b>TYPE 3CPV</b>		CODE IDENT	DWG NO	CD
			19333	<b>C</b> 54115403	5
			SHEET 3		

5-52

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
B	/	SEE SH 1 FOR REV	/	/	/	/



83302400 A

CONTROL DATA NORWICH DALE DIVISION	SCHEMATIC DIAGRAM TYPE 3CPV		CODE IDENT 19333	DWG NO 54115403	CD 5
				SHEET 4	

54115403

83302400 A

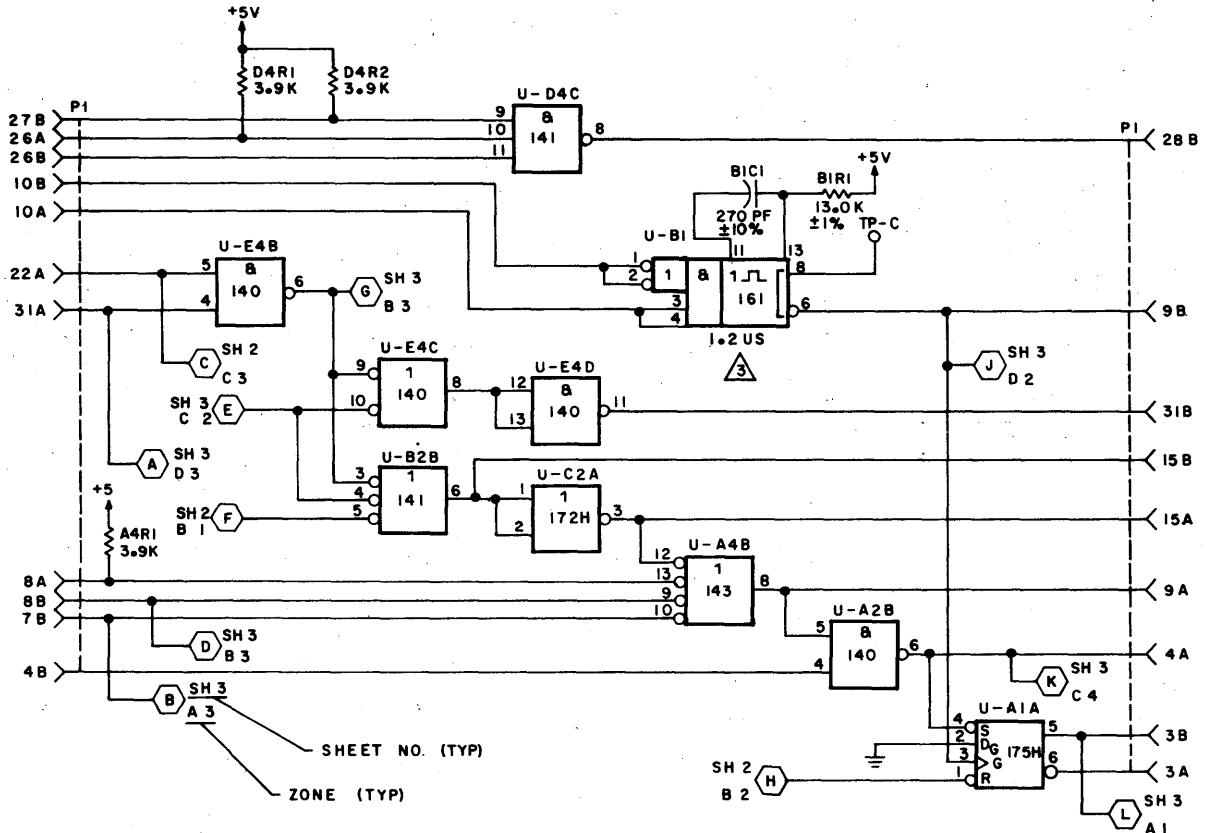
4

3

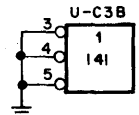
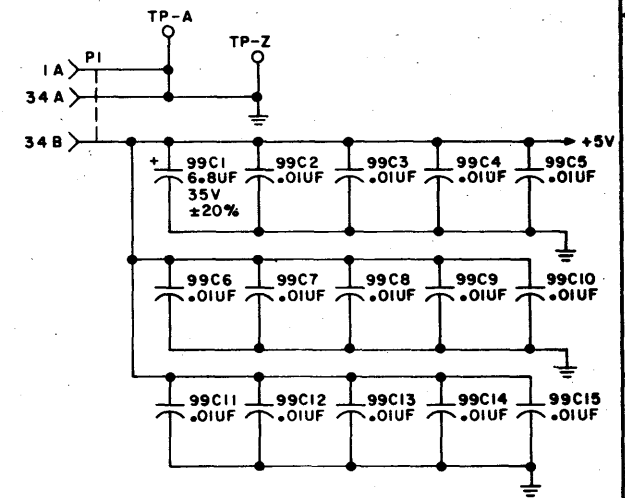
2

1

SHEET REVISION STATUS				REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP		
A	PE230CO	RELEASED		7-27-73	JJR	40		



- NOTE:
- UNLESS OTHERWISE SPECIFIED:  
ALL TRANSISTORS SNPN, 2N3565, 50210710.
  - ALL INTEGRATED CIRCUIT PACKAGES HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.
- ⚠ DELAY TIME FOR REFERENCE ONLY



SHEET NO. (TYP)  
ZONE (TYP)

REFERENCE DRAWINGS		CONTROL DATA		NORMANDEALE DIVISION		TITLE	
COMP ASSY: 54118108		CORPORATION		DIVISION		SCHEMATIC DIAGRAM	
		BR2A5B				ACCESS CONTROL	
		DWN V. WILSON 6-15-73				TYPE 3CW	
		CHK J. P. Rutterford 7-21-73				CODI IDENT	
		ENGR R. Nielsen 7-21-73				DRAWING NUMBER	
		MFG B. [Signature] 7-26-73				CD	
		APPR [Signature] 7-25-73				19333 C 54118208 5	
COMPONENTS EXCEPT AS NOTED						SHEET 1 OF 3	
TOLERANCE	VALUE	RATING					
RES ±5%	OHMS	1/4 W					
CAP -30%							

4

3

2

1

5-53

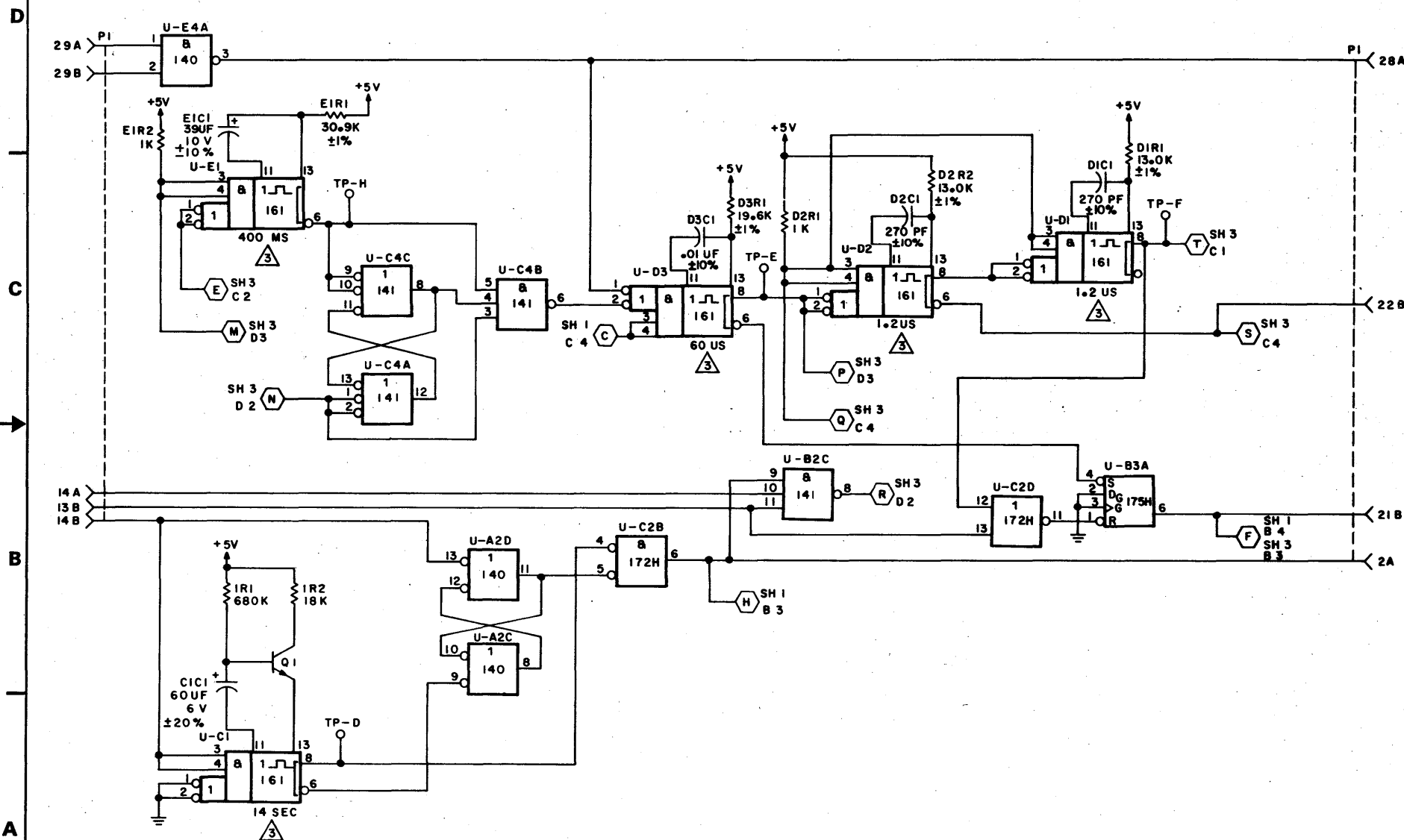
54118208

1 vcd

5-54

83302400 A

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
4		SEE SHEET 1 FOR REV				



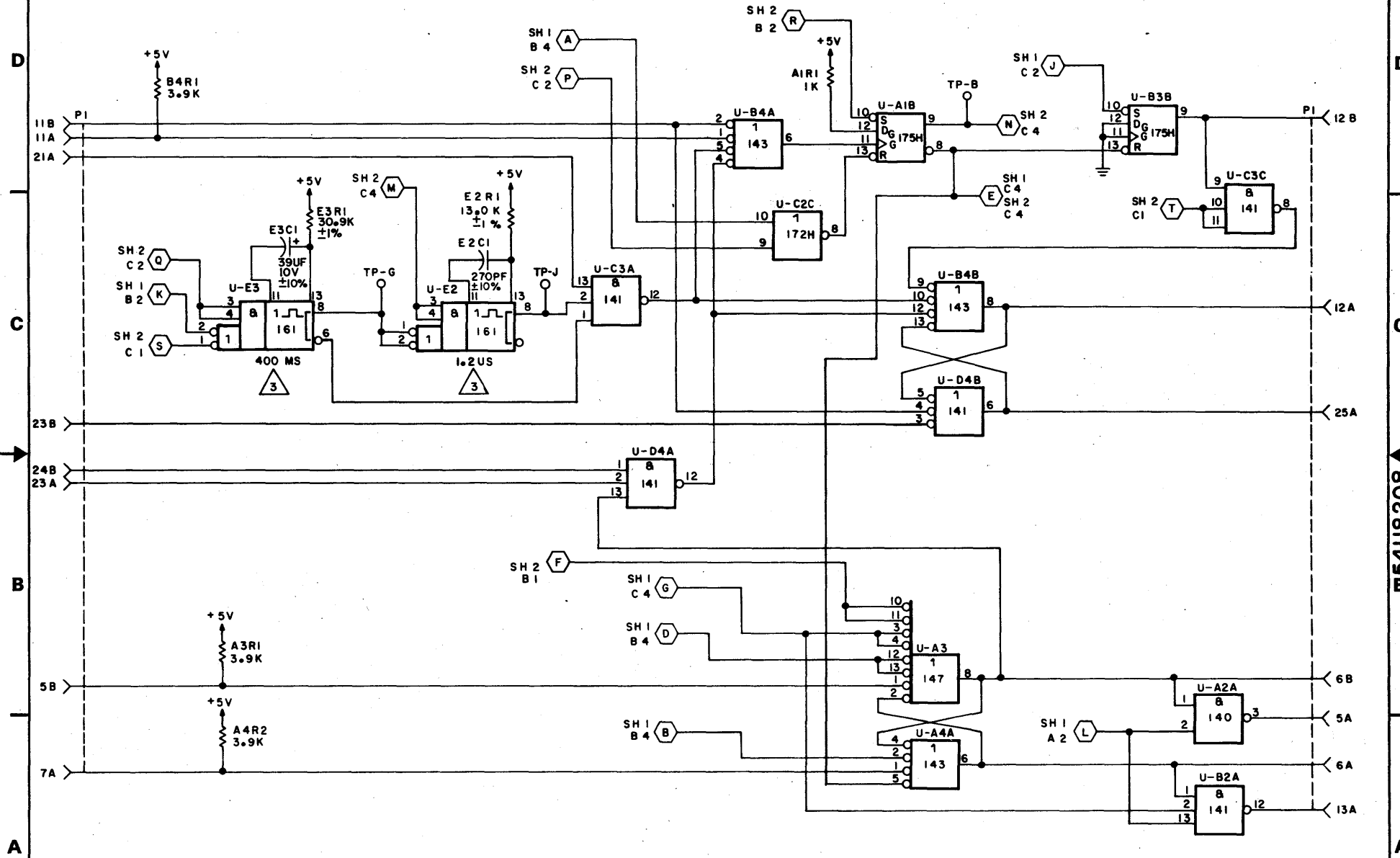
CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM ACCESS CONTROL TYPE 3CWV		CODE IDENT 19333	DWG NO 54118208	CD 5
			SHEET 2		

854118208 A

83302400 A

5-55

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CD
	ACCESS CONTROL		19333	C 54118208	
NORMANDALE DIVISION	TYPE 3CWV		SHEET 3		

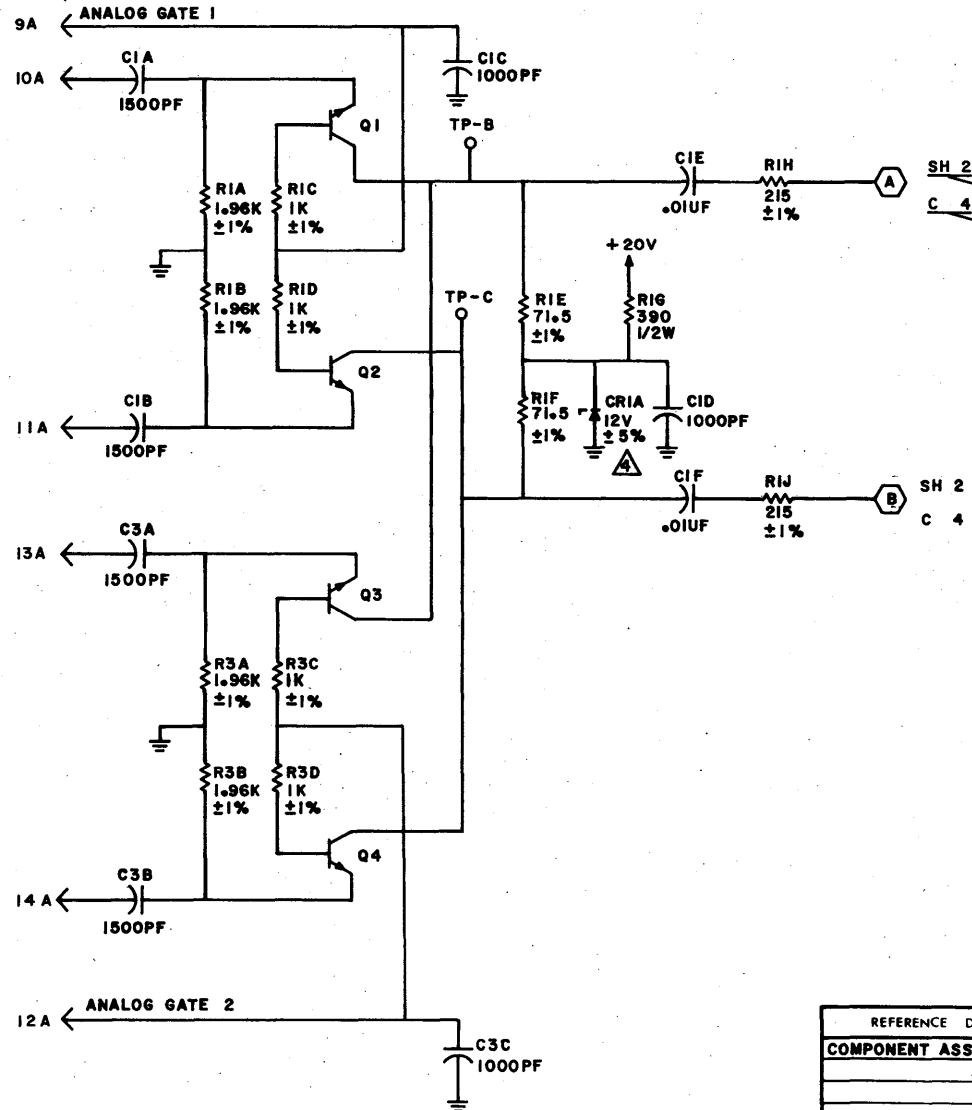
B54118208

5-56

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP	
A	PE 23660	RELEASED		10-14-73		CR	

D  
C  
B  
A

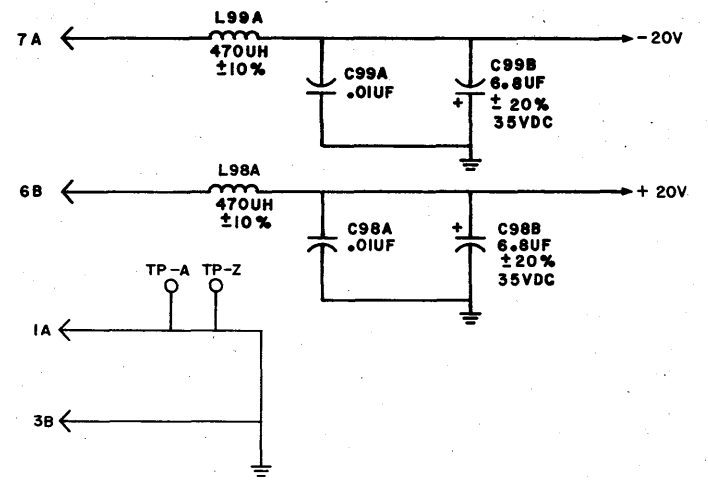
D  
C  
B  
A



SH 2  
C 4

SHEET NO. (TYP)  
DRAWING ZONE (TYP)

- NOTE:
- 1 TRANSISTOR, SILICON, PNP, 2N4258, 50211500.
  - 2 READ PREAMPLIFIER, TYPE AMP-1 EF 7400, I1844900
  3. ALL OTHER TRANSISTORS, SILICON, NPN, 2N3646, 50210300.
  - 4 DIODE, SILICON ZENER, 50240115
  5. ALL OTHER DIODES, SILICON, 50241100
  6. THE FOLLOWING "A" CONNECTOR PINS ARE CONNECTED TO GND. 1,2,3,6. "B" CONNECTOR PINS ALSO CONNECTED TO GND. 3,4,5,7,9,10,11,12,13,14.



B 50180202

83302400 A

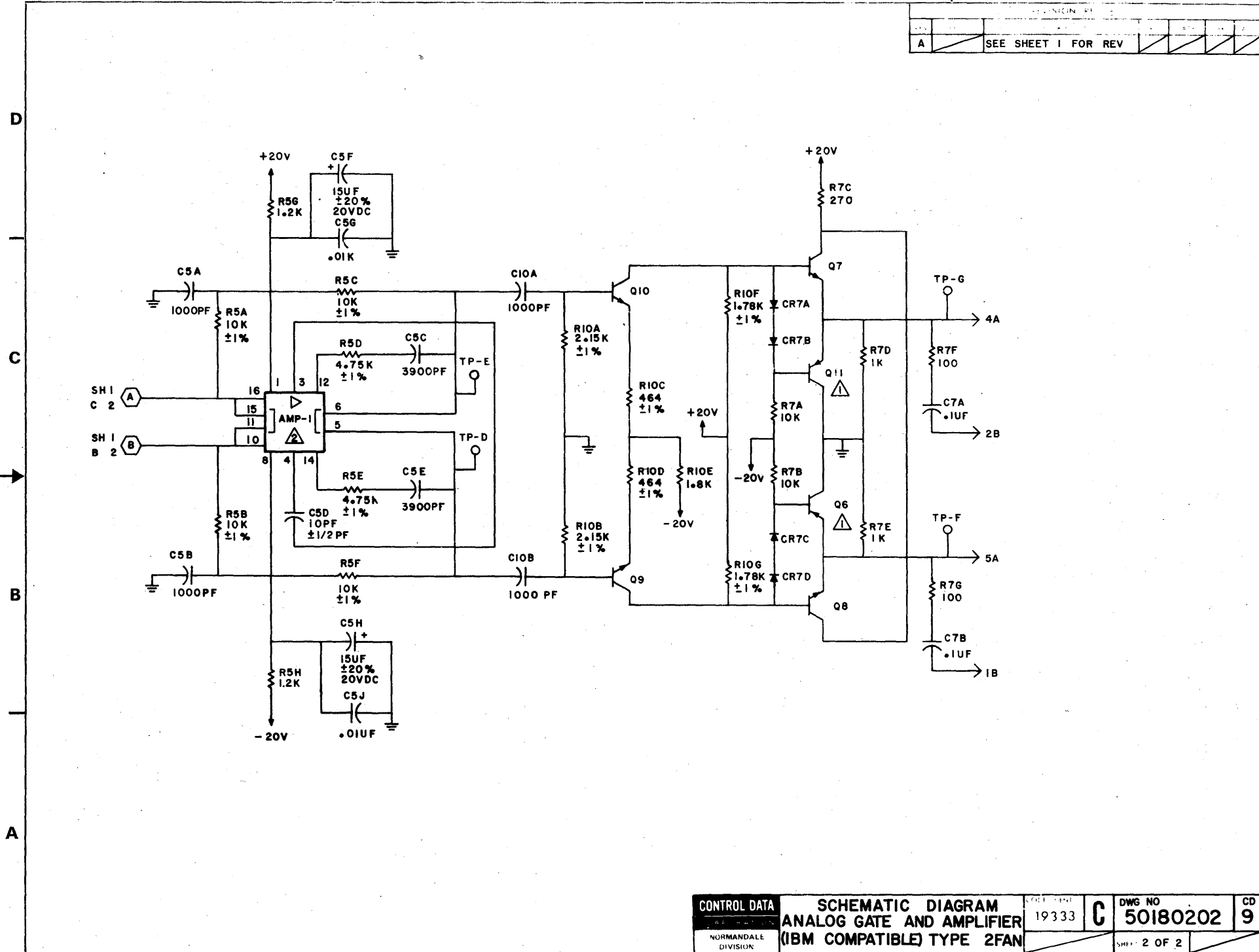
REFERENCE DRAWINGS			CONTROL DATA		NORMANDALE DIVISION		TITLE			
COMPONENT ASSY 50180102			FIRST USED ON		BR 5A5		SCHEMATIC DIAGRAM			
			DWN		2-11-73		ANALOG GATE AND AMPLIFIER			
			CHK		10-15-73		(IBM COMPATIBLE)			
			ENGR		10-5-73		TYPE 2FAN			
COMPONENTS, EXCEPT AS NOTED			MFG		10-10-73		CODE IDENT		DRAWING NUMBER	CD
TOLERANCE	VALUE	RATING	APPR		10-11-73		19333	C	50180202	9
RES	± 5%	OHMS								
CAP	± 10%									

SHEET 1 OF 2

4 3 2 1 VCD

83302400 A

5-57



CONTROL DATA	SCHEMATIC DIAGRAM		19333	C	DWG NO	CD
	ANALOG GATE AND AMPLIFIER				50180202	
NORMANDALE DIVISION		(IBM COMPATIBLE) TYPE 2FAN		SHEET 2 OF 2		

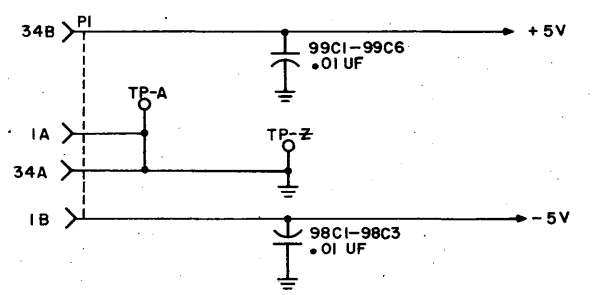
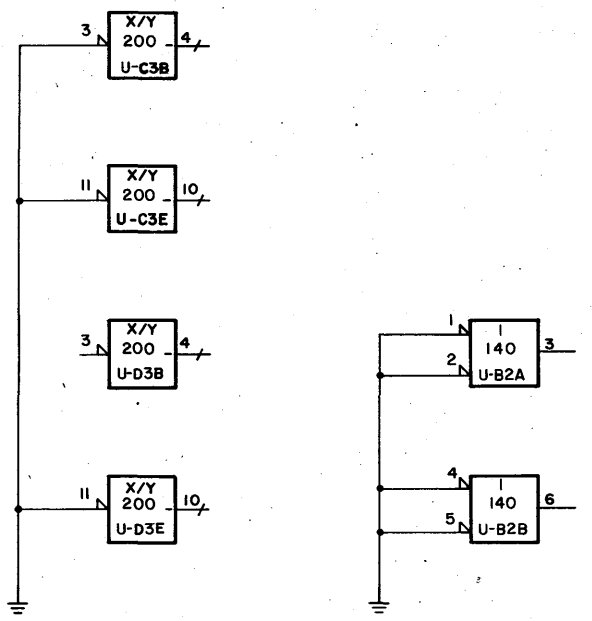
5-58

83302400 A

SHEET REVISION STATUS					REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP			
A	PE23600	RELEASED		10-19-73		<i>CK</i>			

- NOTE:
- UNLESS OTHERWISE SPECIFIED; ALL 14 PIN IC PACKAGES HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.
  - ALL TRANSISTORS, SNPN, 2N3569, 50210811
  - IC PACKAGES U-CI, U-DI AND U-EI, ELEMENT NO. 162 HAVE PIN 13 CONNECTED TO -5V.
- 3** PAIRED INPUTS AND OUTPUTS ARE NOT TWISTED.

SPARE GATES



REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		TITLE		
COMPONENT ASS'Y 54263300		BR5A5				SCHEMATIC DIAGRAM TRANSMITTER & RECEIVER TYPE 3KJV		
FIRST USED ON		DWN		E.M.W.		5/23/73		
CHK		CHK		10-5-73				
ENGR		ENGR		10-5-73				
MFG		MFG		10-10-73				
APPR		APPR						
COMPONENTS, EXCEPT AS NOTED				CODE IDENT		DRAWING NUMBER		CD
RES	± 1%	VALUE	RATING	19333		C 54263400		I
CAP	-30%	OHMS	1/4 W					
SHEET 1 OF 3						VCD		

W 54263400



83302400 A

5-59

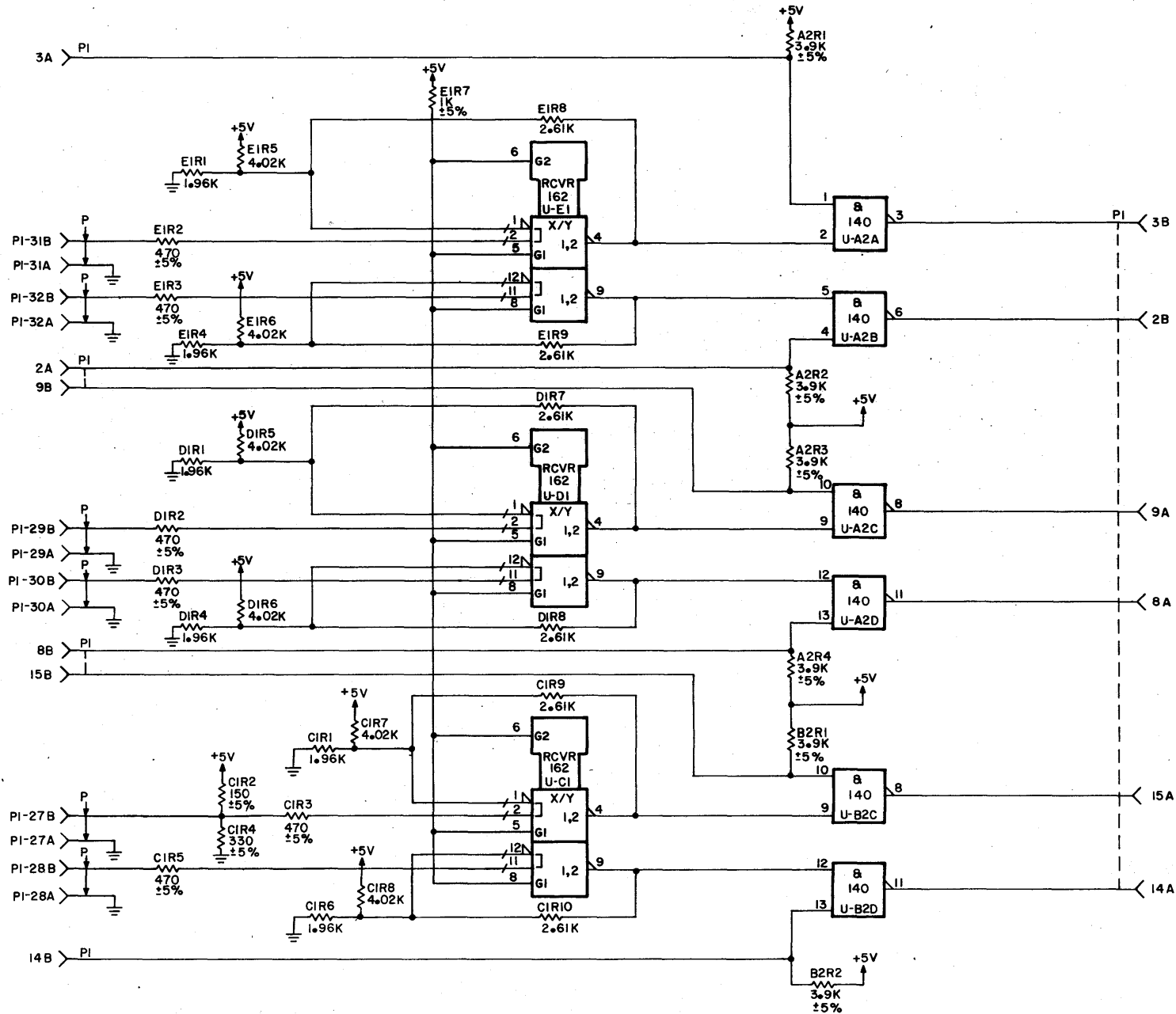
4

3

2

1

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA	CODE IDENT	C	DWG NO	CD
	19333		54263400	
NORMANDEALE DIVISION	SCHEMATIC DIAGRAM		SHEET 2	
	TYPE 3KJV			

4

3

2

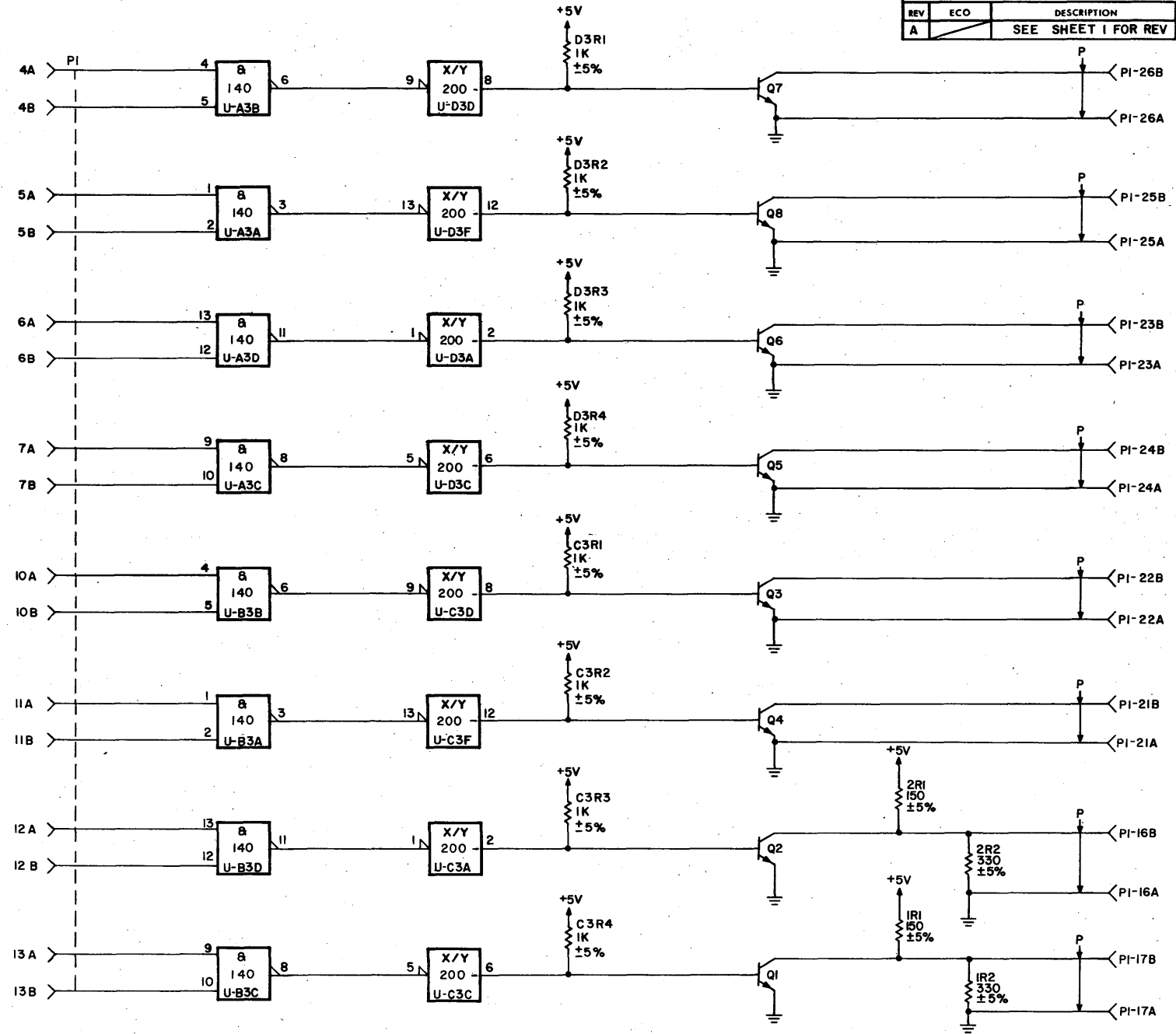
1

B54263400

5-60

83302400 A

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA  
NORMAN DALE  
DIVISION

**SCHEMATIC DIAGRAM**  
**TYPE 3KJV**

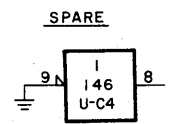
CODE IDENT 19333	DWG NO <b>54263400</b>	CD 1
SHEET 3		

B 54263400

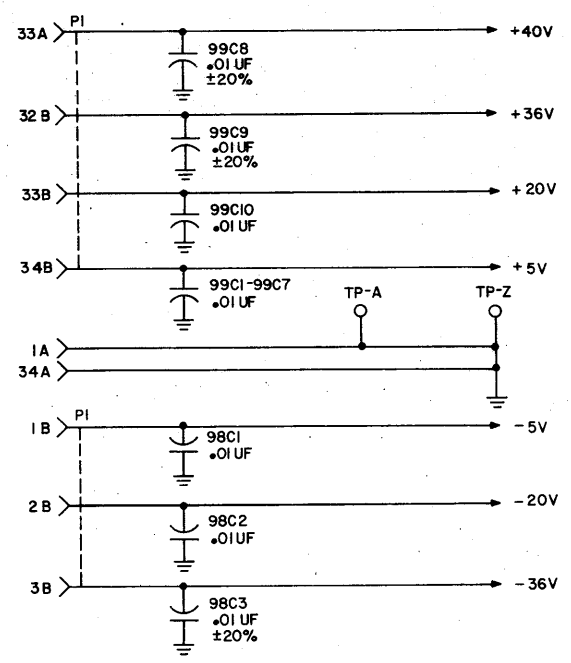
83302400 A

5-61

SHEET REVISION STATUS				REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP		
A	PE31566 PE23000	DWG SIMILAR TO AND CREATED BY USING MASTER FROM 54263800.	VBW	1-24-74	7/7	INR		



- NOTES:
- UNLESS OTHERWISE SPECIFIED:  
ALL 14 PIN IC PACKAGES HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V, EXCEPT CA3045. (U-A4)  
ALL TRANSISTORS SPNP, 2N4258, 50211510.  
ALL DIODES, SILICON, 92115021.
  - TRANSISTOR, SPNP, 2N3646, 50210310.
  - SWITCH SI 94263908 SHOWN IN "ON" POSITION.
  - TRANSISTOR, ARRAY, RCA CA3045, 94675201.
  - RESISTORS 6R1 AND A4R1 TO BE SELECTED IN PRODUCTION PER RECOMMENDED ENGINEERING TEST PROCEDURE FROM A VALUE RANGE OF 100 OHMS TO 6.81K ±1%, FROM DRAWING NO. 94357500.
  - TRANSISTORS, SPNP, 2N4916, 50211610.



REFERENCE DRAWINGS	CONTROL DATA	NORMANDALE DIVISION	TITLE
COMPONENT ASSY: 54263701	FIRST USED ON	BR301	SCHMATIC DIAGRAM
	DWN	V. B. WILSON	FAULT / VOLTAGE CONTROLLER
	CHK	1-3-74	TYPE AKKV
COMPONENTS, EXCEPT AS NOTED		ENGR	CODE IDENT
TOLERANCE	VALUE	RATING	C
RES ±5%	OHMS	1/4W	DRAWING NUMBER
CAP -30%			54263801
		APPR	CD
			0
			SHEET 1 OF 3

54263801 ↑

1 VCD

5-62

4

3

2

1

REVISION RECORD					
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD APP
A		SEE SH. 1 FOR REV			

D

C

B

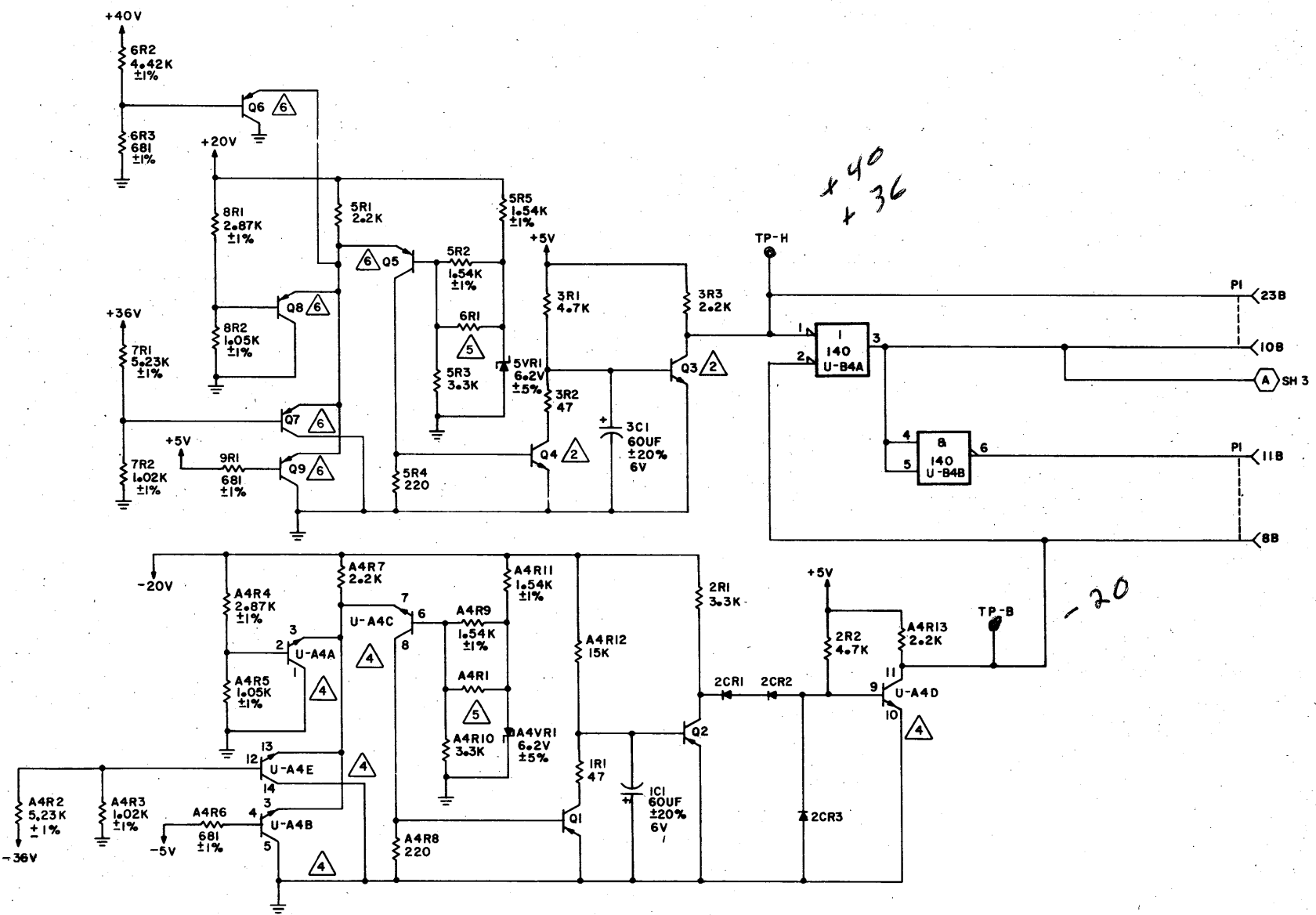
A

D

C

54263801

A



83302400 A

CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CH
	TYPE AKKV		19333	C 54263801	0
NORMANDEALE DIVISION			SHEET 2		

4

3

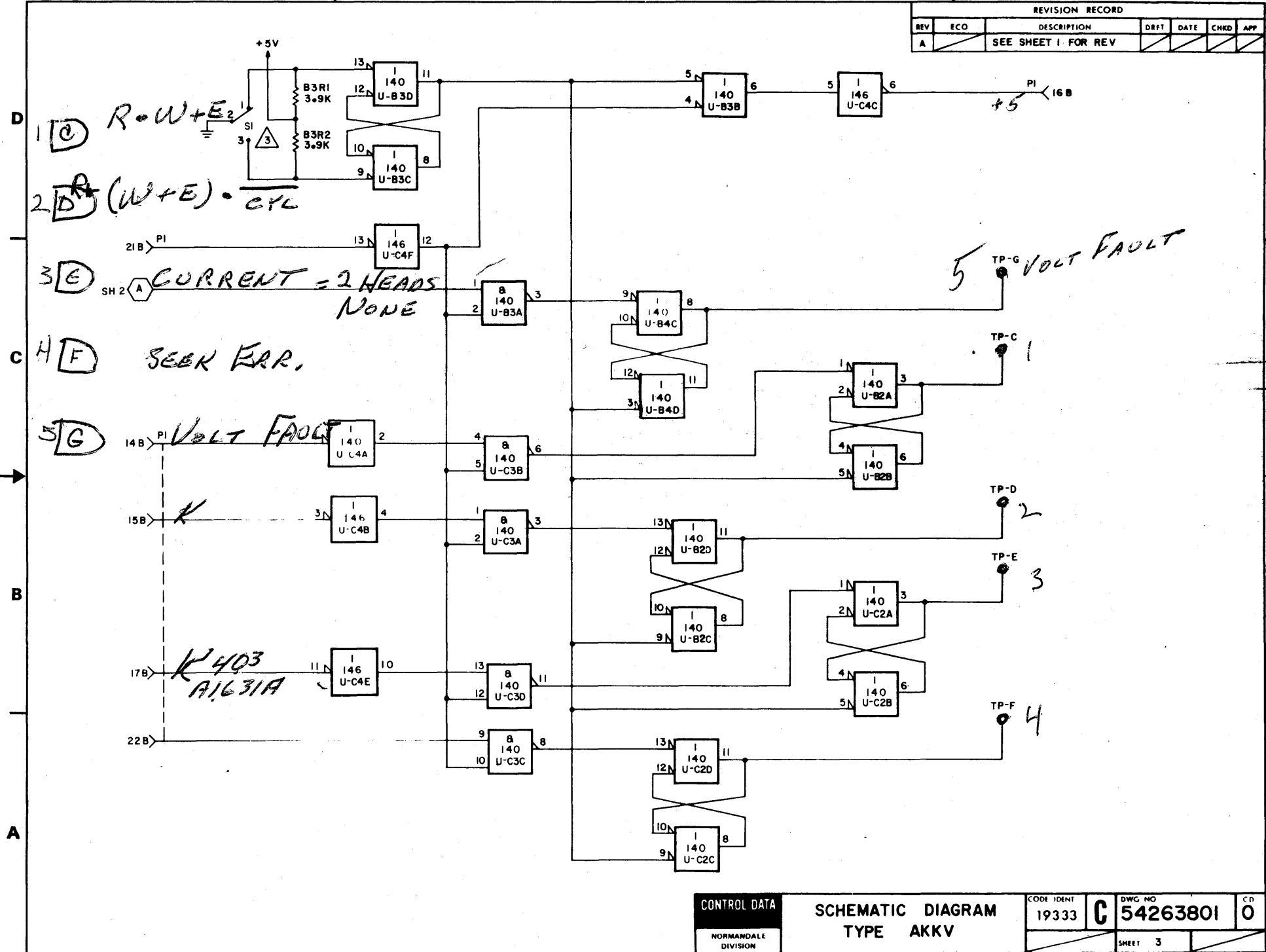
2

1

83302400 A

5-63

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA  
NORMANDALE DIVISION

SCHEMATIC DIAGRAM  
TYPE AKKV

CODE IDENT 19333	DWG NO 54263801	CD 0
SHEET 3		

5-64

4

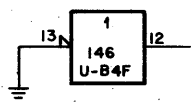
3

2

1

SHEET REVISION STATUS					REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP			
A	PE 23000	RELEASED		1-16-74		BW			

SPARES

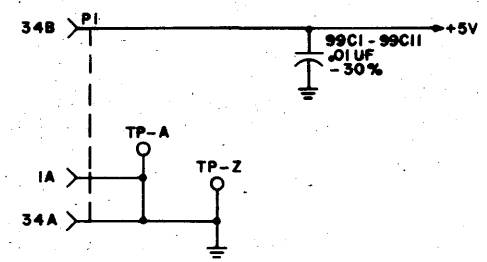


NOTE:

- 1. UNLESS OTHERWISE SPECIFIED:  
ALL DIODES, SCHOTTKY BARRIER, 50241400.  
ALL 14 PIN IC'S HAVE PIN 7 CONNECTED  
TO GND AND PIN 14 TO +5V



DELAY TIME FOR REFERENCE ONLY.



REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		TITLE	
COMP ASSY 54264101		BR5A5				SCHEMATIC DIAGRAM	
		DWN E. WALLACE 1-2-74				SW RCVR'S AND SEEK COMPLETE	
		CHK J. Walker 1/1/74				TYPE 4KLV	
		ENGR [Signature] 1-9-74				CODE IDENT	
		MFG [Signature] 1-15-74				DRAWING NUMBER	
		APPR [Signature] 1-15-74				CD	
COMPONENTS, EXCEPT AS NOTED						19333 C 54264201 2	
RES	TOLERANCE	VALUE	RATING				
	±5%	OHMS	1/4W				
CAP	-30%						
SHEET 1 OF 3							

54264201

4

3

2

1

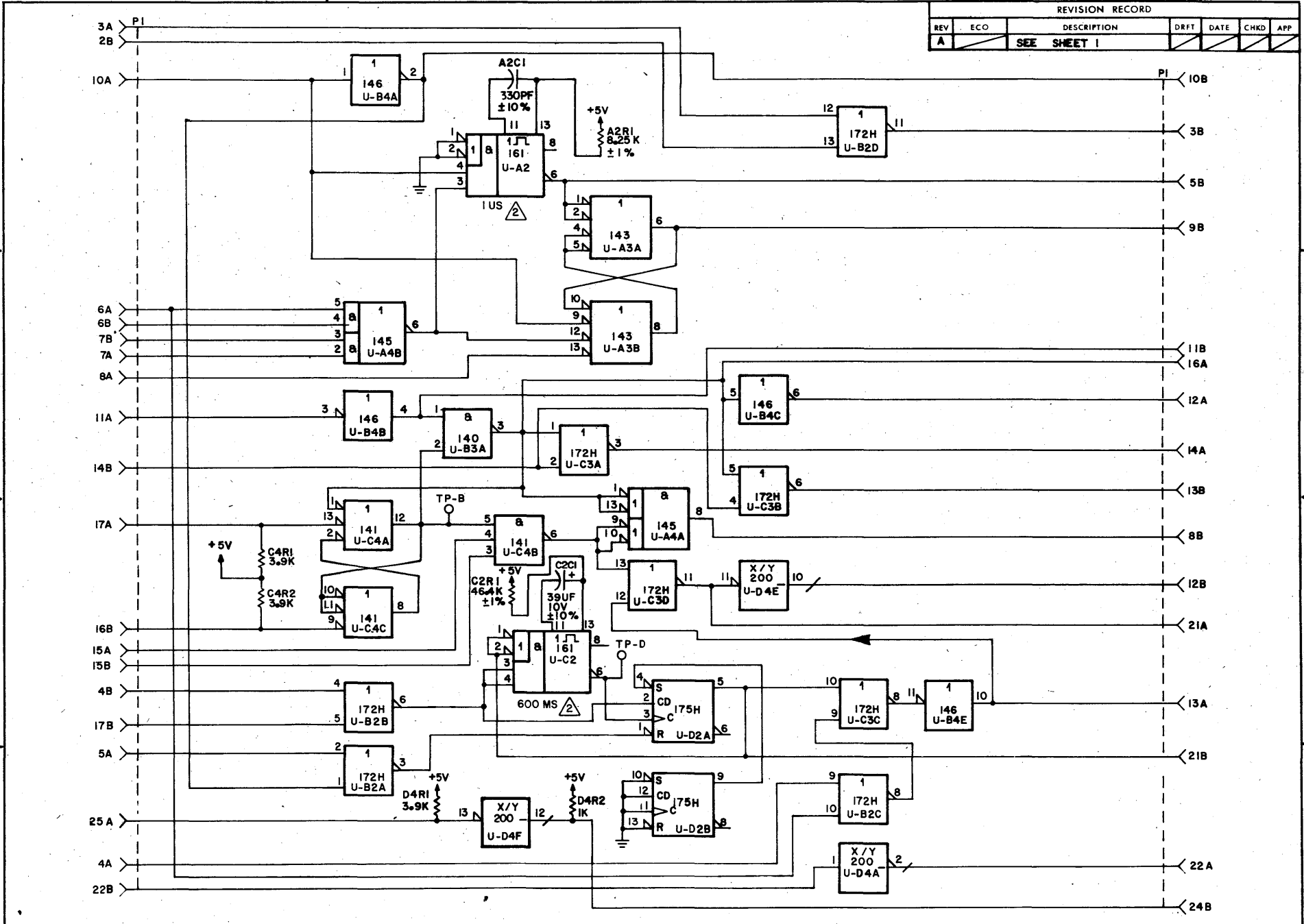
VCD

83302400 A

83302400 A

5-65

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1				



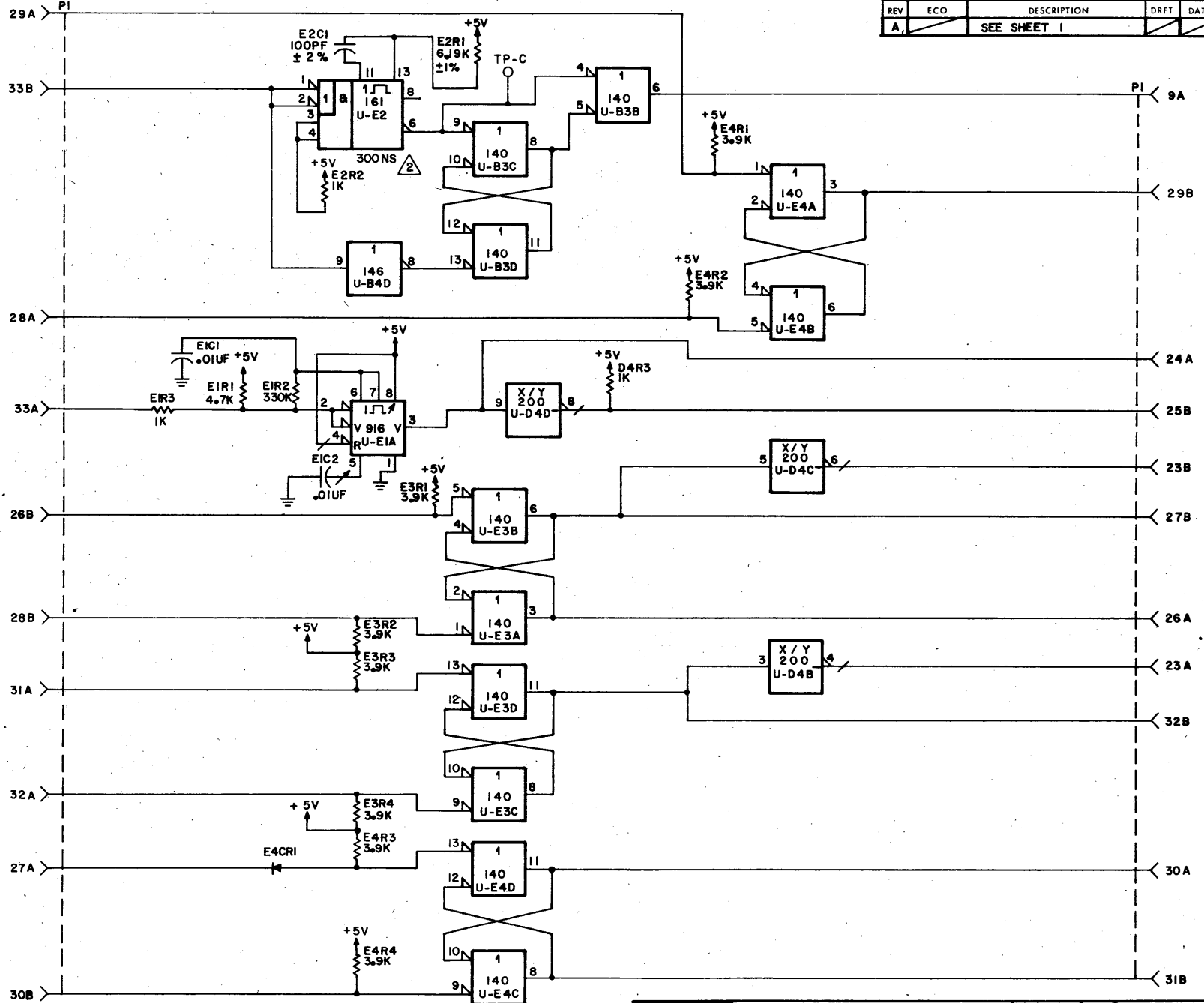
CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE 4KLV		CODE IDENT 19333	DWG NO C 54264201	CD 2
				SHEET 2 OF 3	

54264201

5-66

83302400

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1				



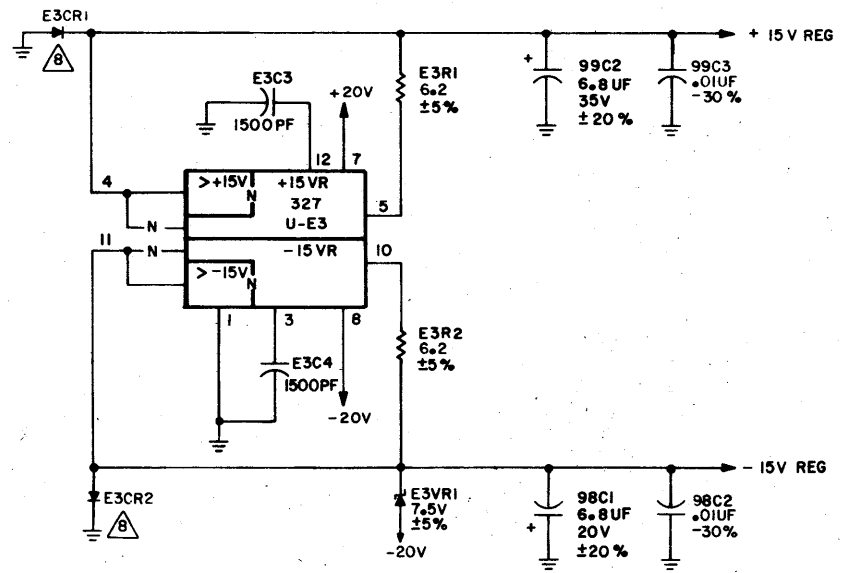
CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE 4KLV		CODE IDENT 19333	DWG NO 54264201	CD 2
				SHEET 3 OF 3	

54264201

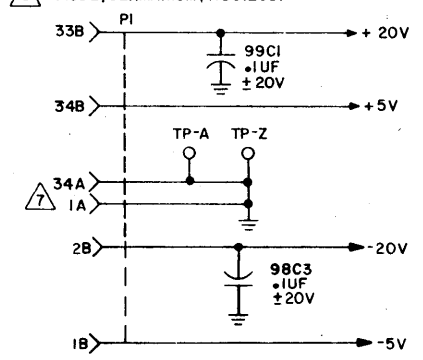
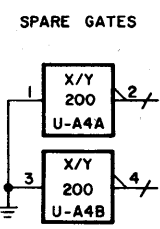


83302400 B

SHEET REVISION STATUS				REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP		
A		RELEASED				RL		



- NOTE:
1. UNLESS OTHERWISE SPECIFIED;
    - ALL 14 PIN IC HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.
    - ALL 16 PIN IC HAVE PIN 1 CONNECTED TO GND AND PIN 16 CONNECTED TO +5V.
    - ALL DIODES SILICON 92115023.
  2. TEST SELECT RESISTOR TO BE SELECTED FROM DRAWING 94357500 AND INSERTED DURING CARD TEST PER RECOMMENDED TEST PROCEDURE.
  3. DIODE SILICON 92115021.
  4. TSTR SNPN 2N4919, 50221001.
  5. TSTR SNPN 2N4922, 50220901.
  6. TSTR FET PI167, 50218200.
  7. CONNECTOR PINS 2A THRU 5A AND 16A THRU 33A ARE GROUNDED.
  8. DIODE, GERMANIUM, 11801200.



REFERENCE DRAWINGS		CONTROL DATA		NORMANDEALE DIVISION		TITLE		
COMP ASSY 54264502		FIRST USED ON	BR5A5			SCHEMATIC DIAGRAM		
		DWN				ANALOG SERVO		
		CHK	D. J. Kullerford	4-9-74		TYPE BKMV		
COMPONENTS, EXCEPT AS NOTED		ENGR	D. Young	4-11-74		CODE IDENT	DRAWING NUMBER	CD
TOLERANCE	VALUE	RATING			19333	C	54264602	1
RES	±1%	OHMS	1/4 W					
CAP	±10%							
		MFG						
		APPR						
		SHEET 1 OF 4						

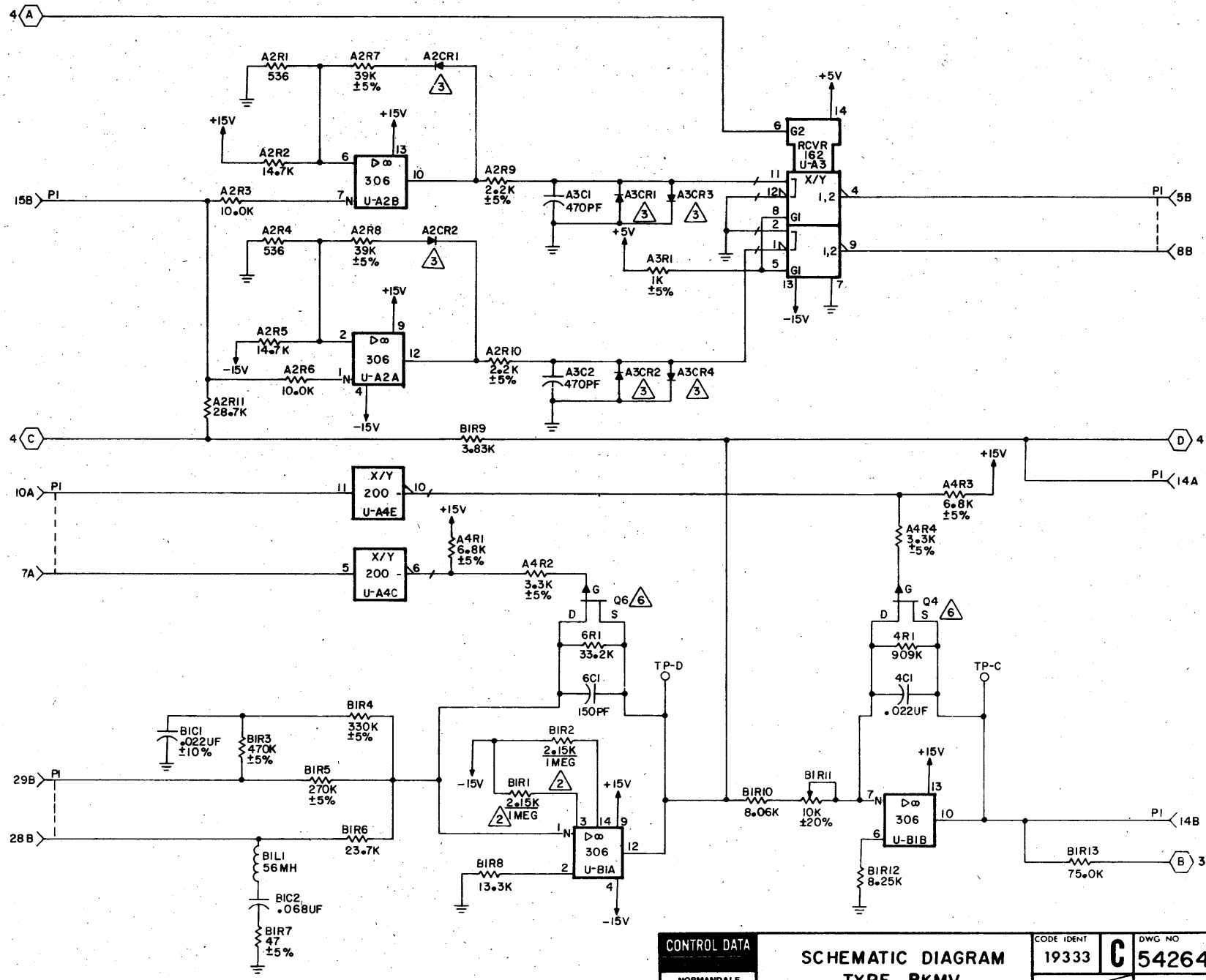
5-67

B 54264602

5-68

83302400 B

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET ONE				



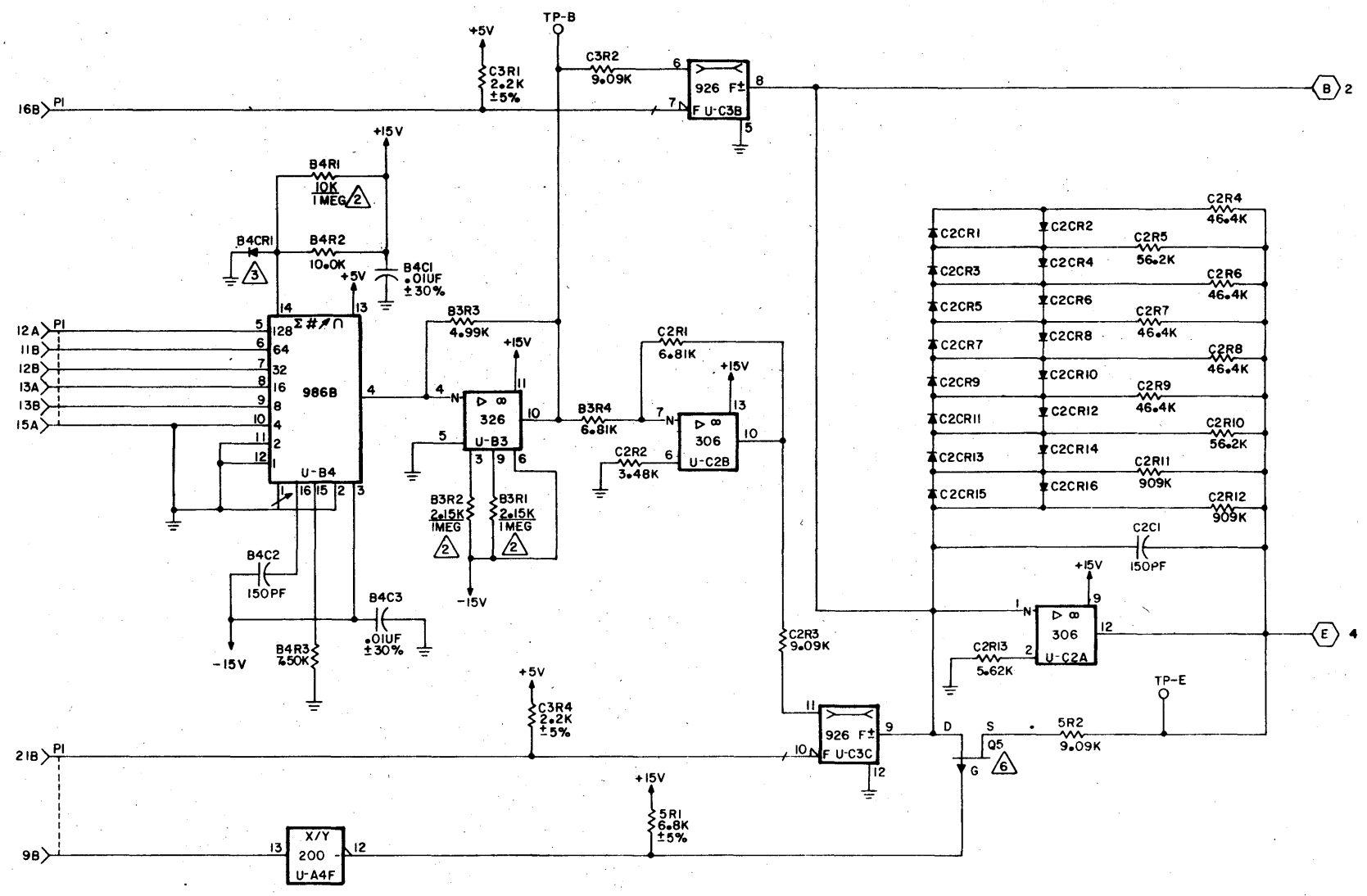
CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CR
	TYPE BKMV		19333	C 54264602	I
NORMANDEALE DIVISION			SHEET 2		

W54264602A

83302400 B

5-69

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET ONE				



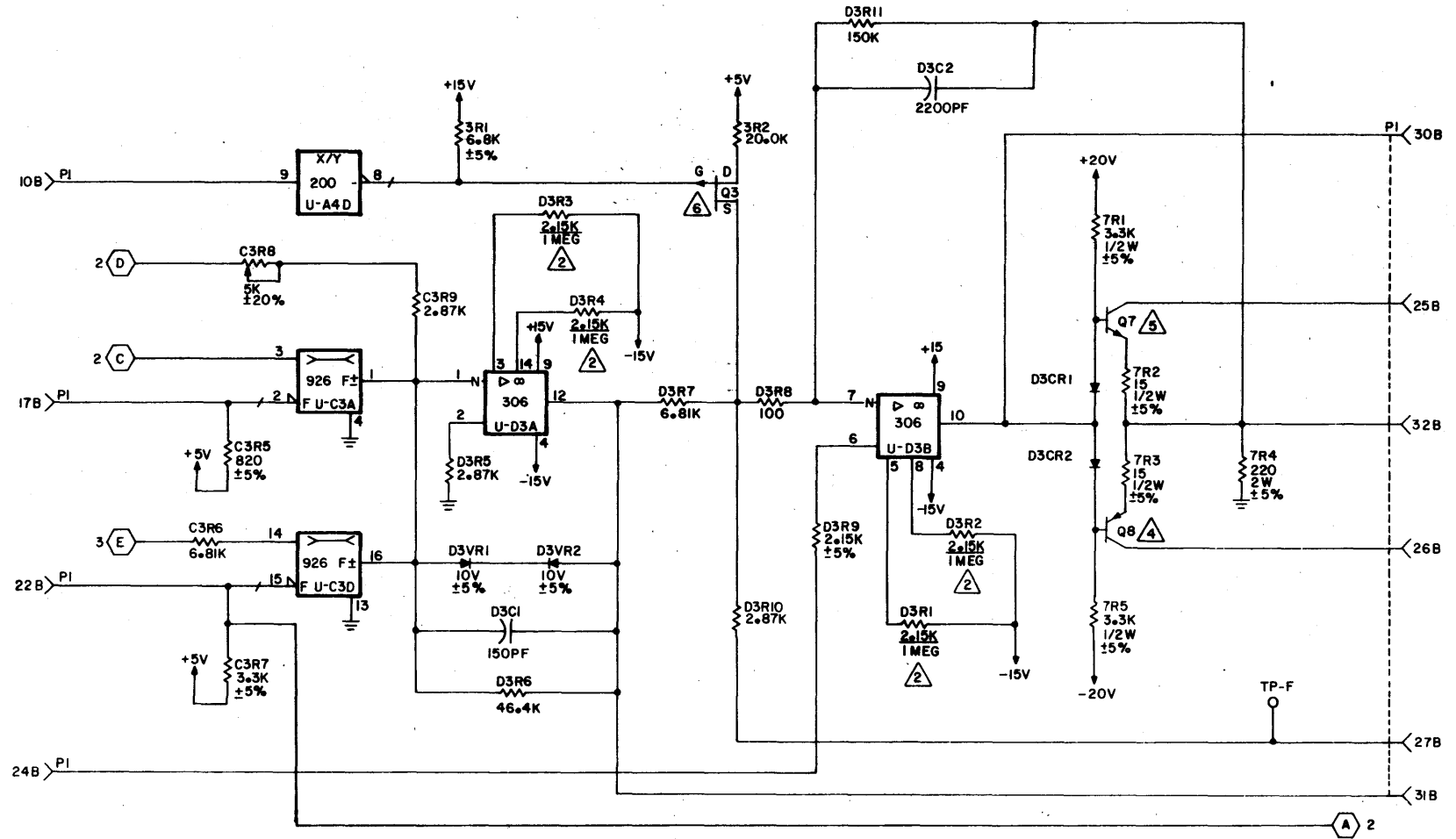
CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CP
	TYPE BKMV		19333	54264602	
NORMANDEALE DIVISION			SHEET 3		i

5-70

83302400

REVISION RECORD

REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET ONE				



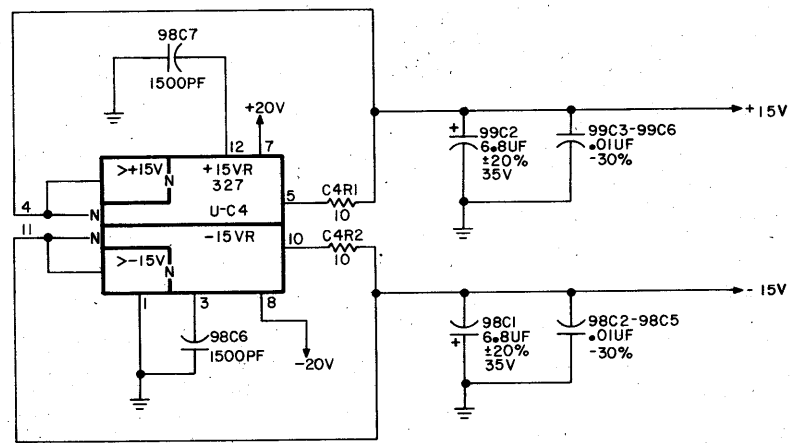
CONTROL DATA NORMANDE DIVISION	SCHEMATIC DIAGRAM TYPE BKMV		CODE IDENT 19333	DWG NO 54264602	CP 1
				SHEET 4	

54264602

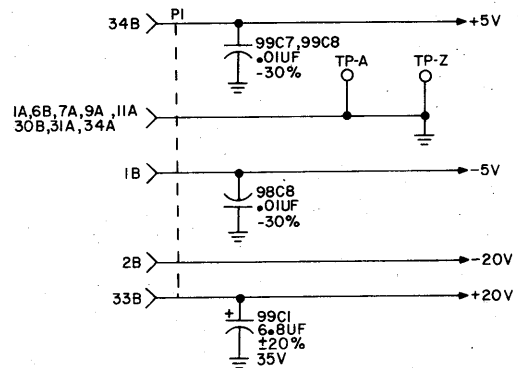
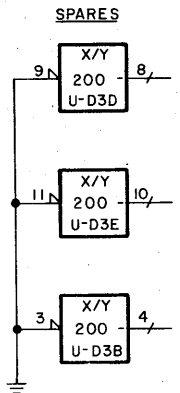
83302400 A

5-71

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP	
A	DE23000	RELEASED		11-26-73		CK	



- NOTE:
- UNLESS OTHERWISE SPECIFIED:  
ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.  
ALL DIODES SILICON PLANAR, 24553500.  
TRANSISTOR, SNPN, 2N3569, 50210811.
  - TEST SELECT RESISTORS TO BE SELECTED FROM DRAWING 94357500 AND INSERTED DURING CARD TEST PER RECOMMENDED TEST PROCEDURE.
  - IC 1437 HAS PIN 7 CONNECTED TO -15V AND PIN 14 CONNECTED TO +15V.
  - IC 747C HAS PINS 9 AND 13 CONNECTED TO +15V.
  - TRANSISTOR, SPNP, 2N3645, 50211210.
  - FET, 2N4861, 50218100.
  - DIODE, GERMANIUM, 1181200.
  - PAIRED OUTPUTS ARE NOT TWISTED.



REFERENCE DRAWINGS			CONTROL DATA		NORMANDELE DIVISION		TITLE	
COMP ASSY: 54264900			CORPORATION		BR5A5		SCHEMATIC DIAGRAM	
FIRST USED ON			DWN		SR WILSON		50 KHZ OSCILLATOR AND	
CHECKED			ENGR		11-1-73		ANALOG SWITCH	
COMPONENTS, EXCEPT AS NOTED			MFG		11/1/73		TYPE 3KNV	
TOLERANCE			APPR		11/1/73		CODE IDENT	
RES ±1%	VALUE OHMS	RATING 1/4 W			19333		DRAWING NUMBER	
CAP ±10%					C		54265000	
							CD	
							7	
							SHEET 1 OF 3	

W54265000

5-72

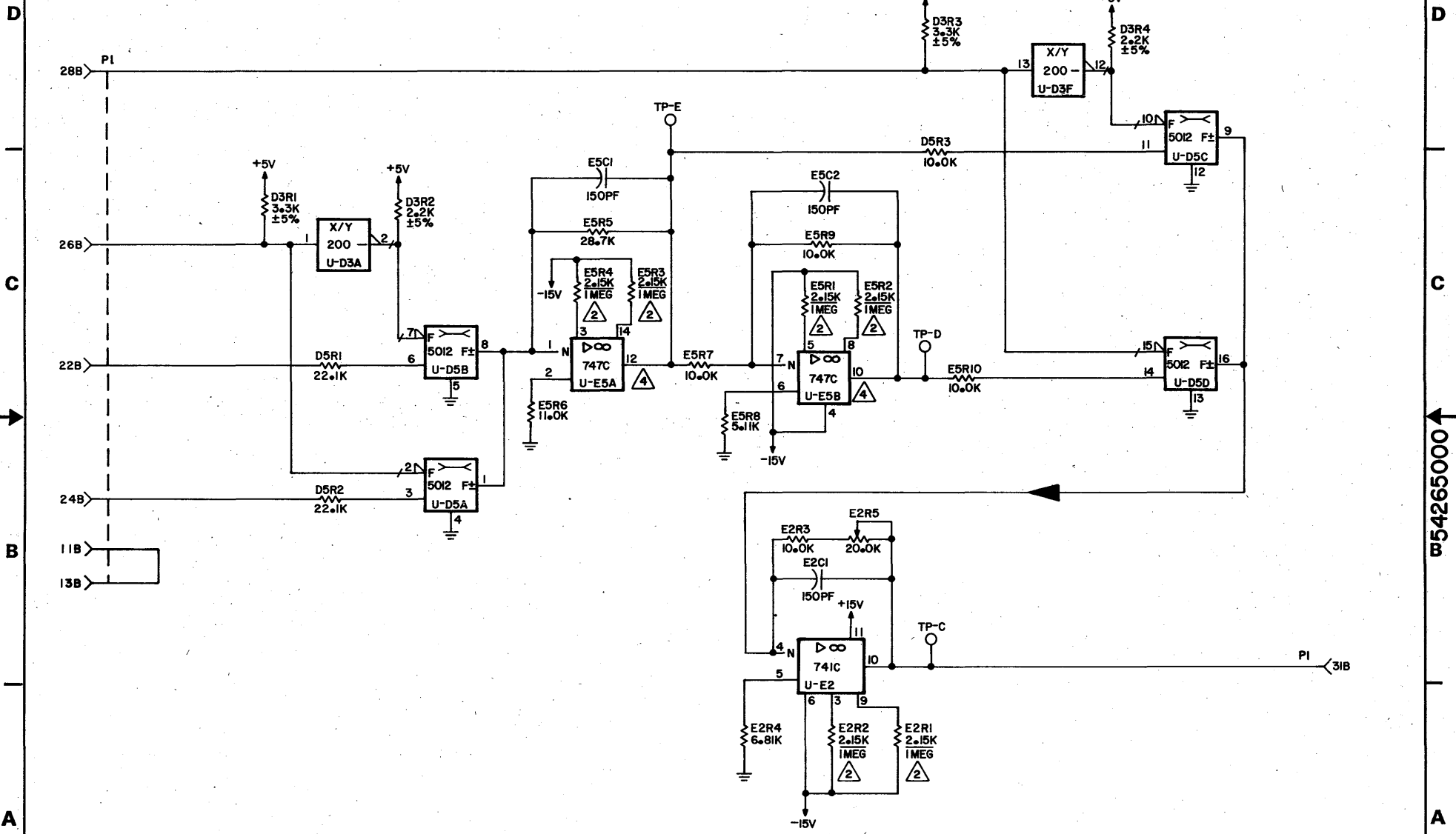
4

3

2

1

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SH 1 FOR REV				



B54265000

83302400 A

CONTROL DATA NORMANDE DIVISION	SCHEMATIC DIAGRAM TYPE 3KNV		CODE IDENT 19333	C	DWG NO 54265000	CD 7
			SHEET 2			

4

3

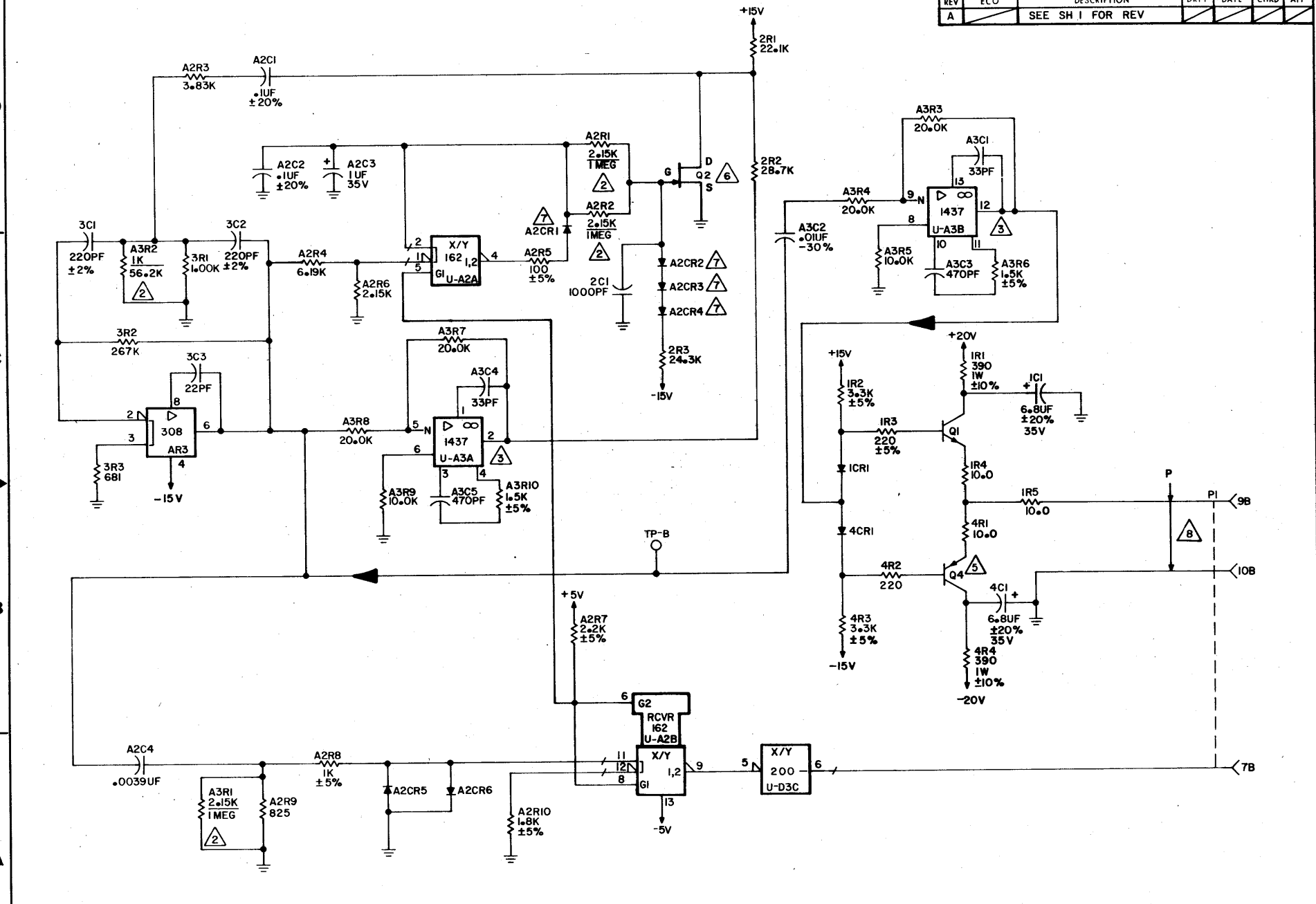
2

1

83302400 A

5-73

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SH 1 FOR REV				

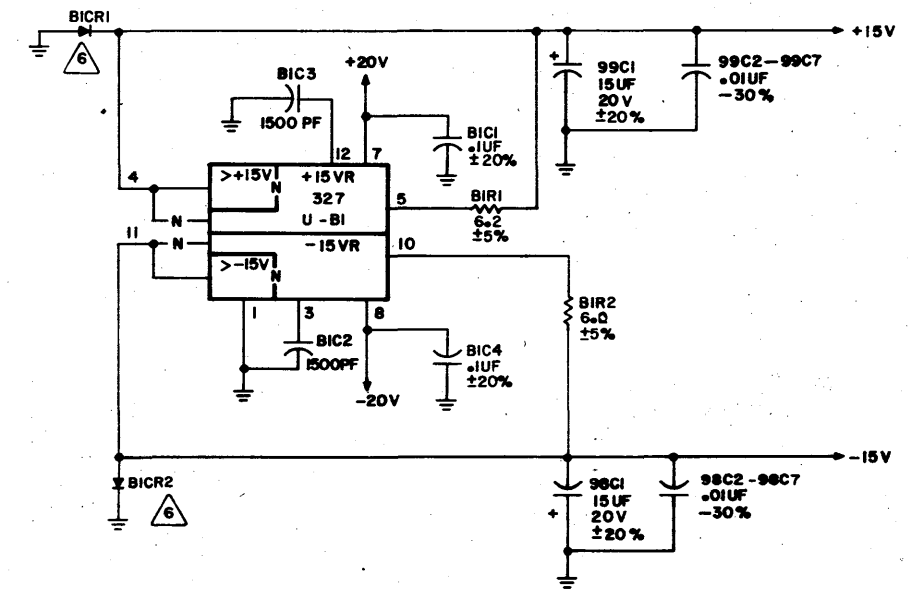


CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CD
	TYPE 3KNV		19333	54265000	7
NORMANDALE DIVISION			SHEET 3		

W54265000

5-74

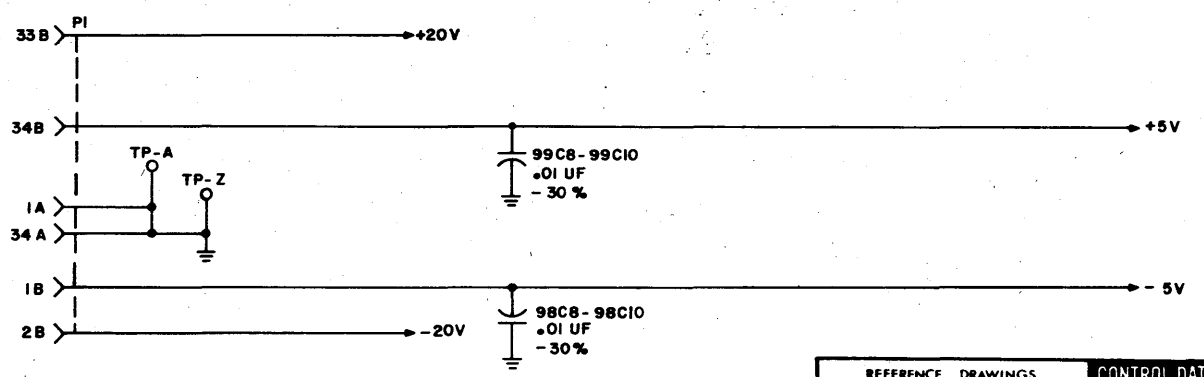
SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CRKD	APP	
A	PE23060	RELEASED		12-18-73		CK	



NOTE:

- UNLESS OTHERWISE SPECIFIED:  
 ALL ZENER DIODE VOLTAGE TOLERANCES  $\pm 5\%$   
 ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO GND AND PIN 14 TO +5V  
 ALL TRANSISTORS, MOS FET 3N138, 50218400  
 ALL DIODES, SILICON, PLANAR, 24553800

TRANSISTOR, SNPN, 2N4916, 50211610.  
 TRANSISTOR, SNPN, 2N3646, 50210310.  
 TEST SELECT RESISTORS TO BE SELECTED FROM DWG 94357500 AND INSERTED DURING CARD TEST PER RECOMMENDED TEST PROCEDURE.  
 DIODE, SCHOTTKY, 50241400.  
 DIODE, GERMAIUM, 11801200.



REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		TITLE	
COMP	ASSY: 54265301	FIRST USED ON	BR5A5			SCHEMATIC DIAGRAM POSITION SIGNAL DEMODULATOR TYPE AKPV	
		DWN	EDMUND WOLFE	12-6-73			
		CHK	<i>H. Hanson</i>	12-10-73			
		ENGR	<i>D. Young</i>	12-10-73			
		MFG	<i>W. J. Williams</i>	12-18-73			
		APPR	<i>W. J. Williams</i>	12-17-73			
COMPONENTS, EXCEPT AS NOTED				CODE IDENT		DRAWING NUMBER	
TOLERANCE	VALUE	RATING	19333		C 54265401		
RES	$\pm 1\%$	OHMS 1/4 W			9		
CAP	$\pm 10\%$				7		

54265401

83302400 A

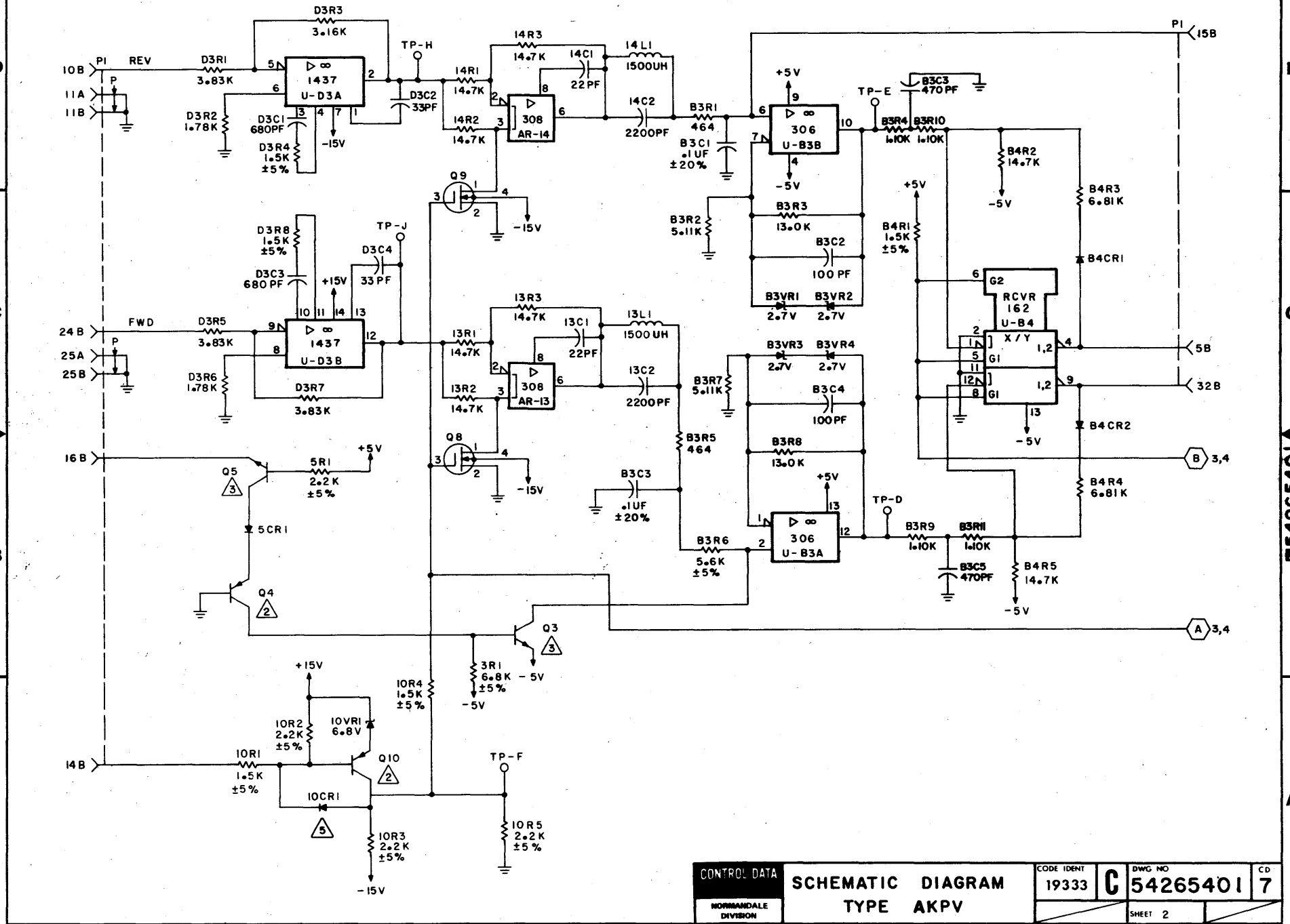
VCD



83302400 A

5-75

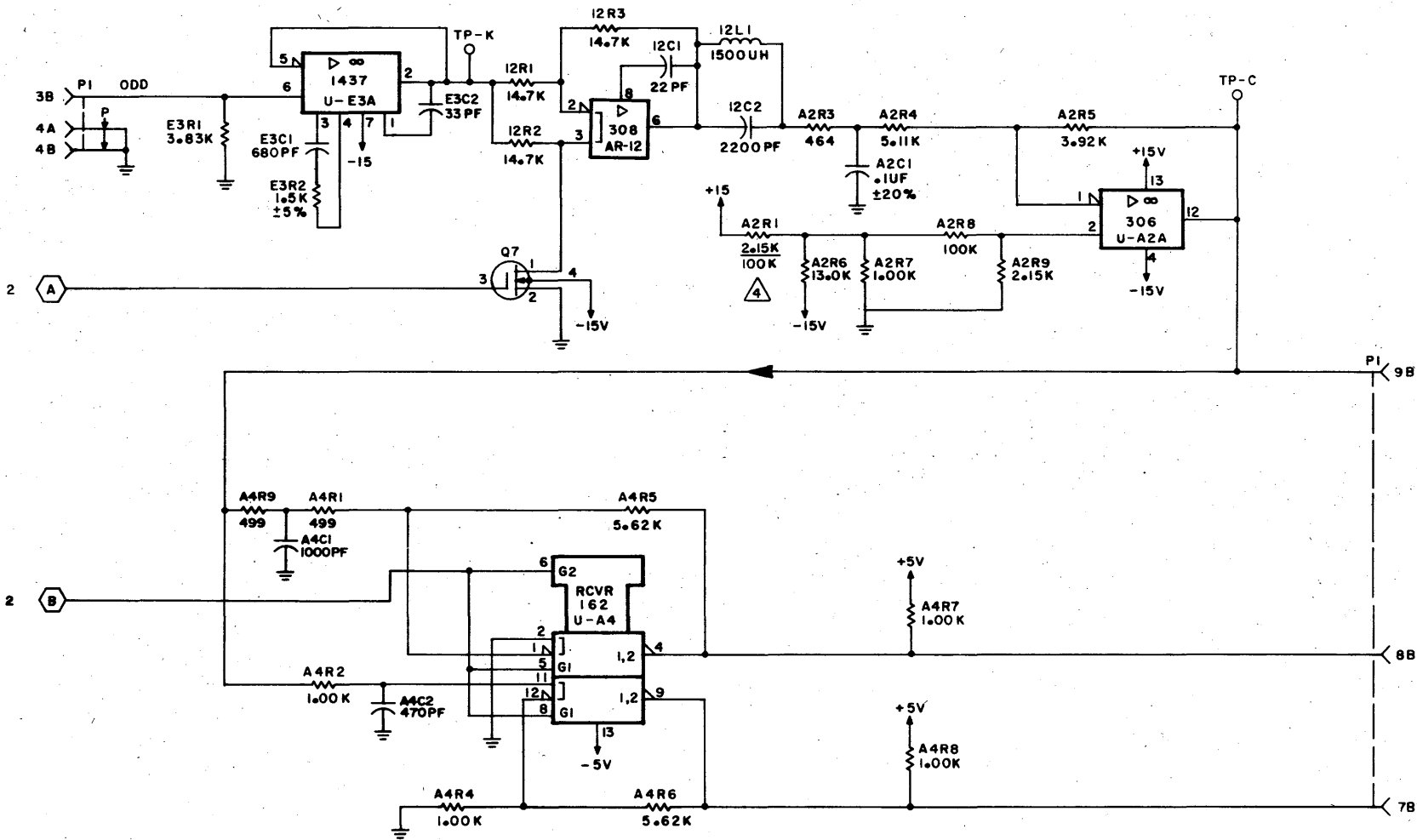
REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA NORMANDALE DIVISION	SCHEMATIC DIAGRAM TYPE AKPV		CODE IDENT 19333	DWG NO C 54265401	CD 7
			SHEET 2		

5-76

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



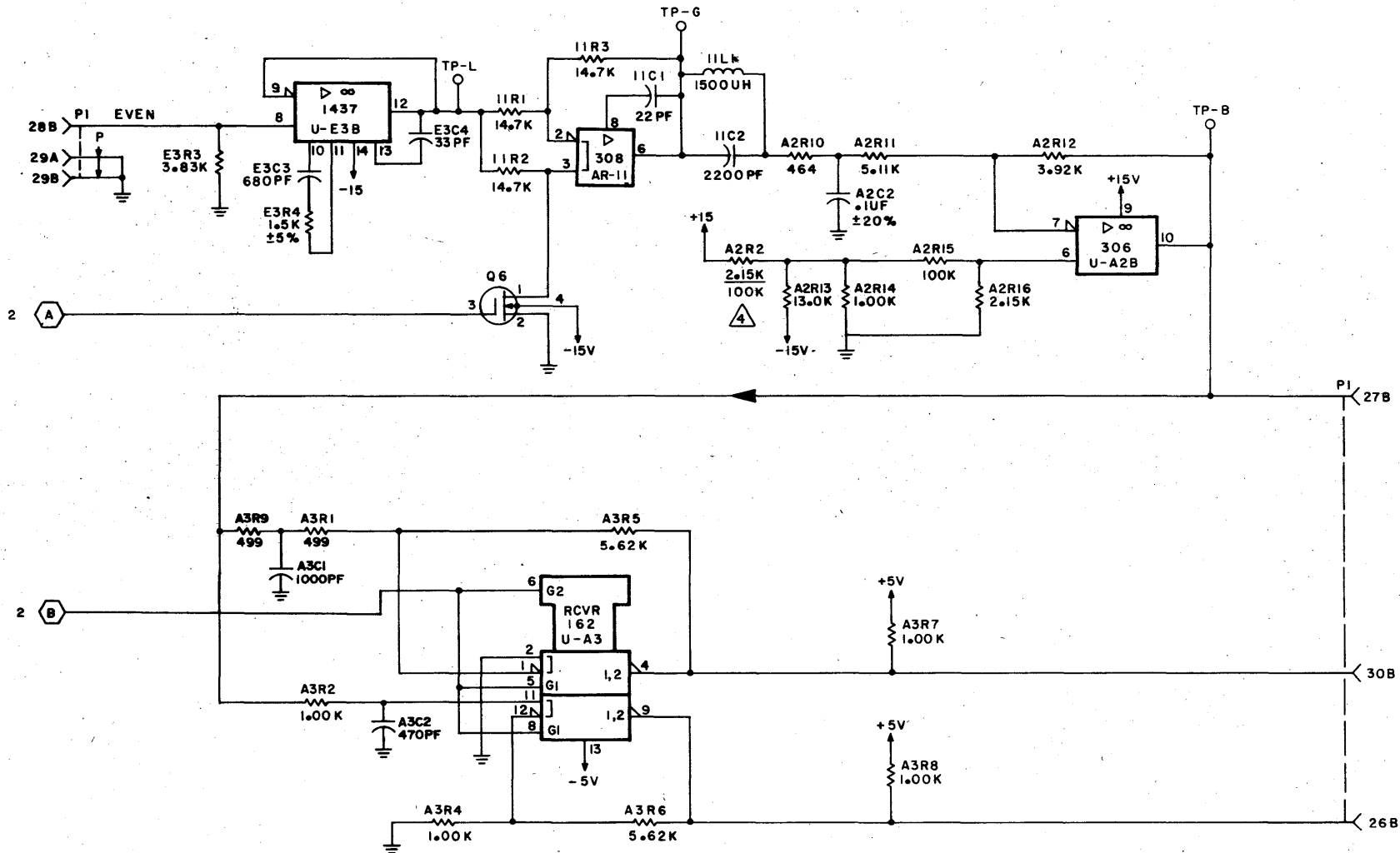
WS4265401

83302400 A

CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE AKPV		CODE IDENT 19333	DWG NO C 54265401	CD 7
			SHEET 3		

83302400 A

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA NORMANDALE DIVISION	SCHEMATIC DIAGRAM TYPE AKPV		CODE IDENT 19333	DWG NO C 54265401	CD 7
				SHEET 4	

5-97

5-78

4

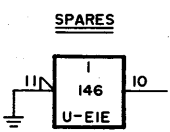
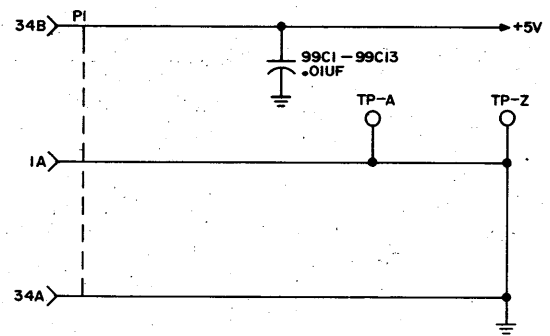
3

2

1

SHEET REVISION STATUS					REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP			
A	PE 23 000	RELEASED		10-19-73		CR			

NOTE:  
 1 UNLESS OTHERWISE SPECIFIED:  
 ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO GND AND  
 PIN 14 CONNECTED TO +5V.



REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		TITLE	
COMP. ASSY. 54265600		FIRST USED ON		BR5A5		SCHEMATIC DIAGRAM	
		DWN		MON BAKER		7-20-73	
		CHK		R. K...		10/1/73	
		ENGR		R. J. ...		10-1-73	
		MFG		...		10-2-73	
		APPR		W. V. ...		10-2-73	
COMPONENTS, EXCEPT AS NOTED				CODE IDENT		DRAWING NUMBER	
TOLERANCE	VALUE	RATING	19333		C 54265800		CD
RES ±5%	OHMS	1/4 W					0
CAP -30%							
						SHEET 1 OF 5	

83302400 A

54265800

4

3

2

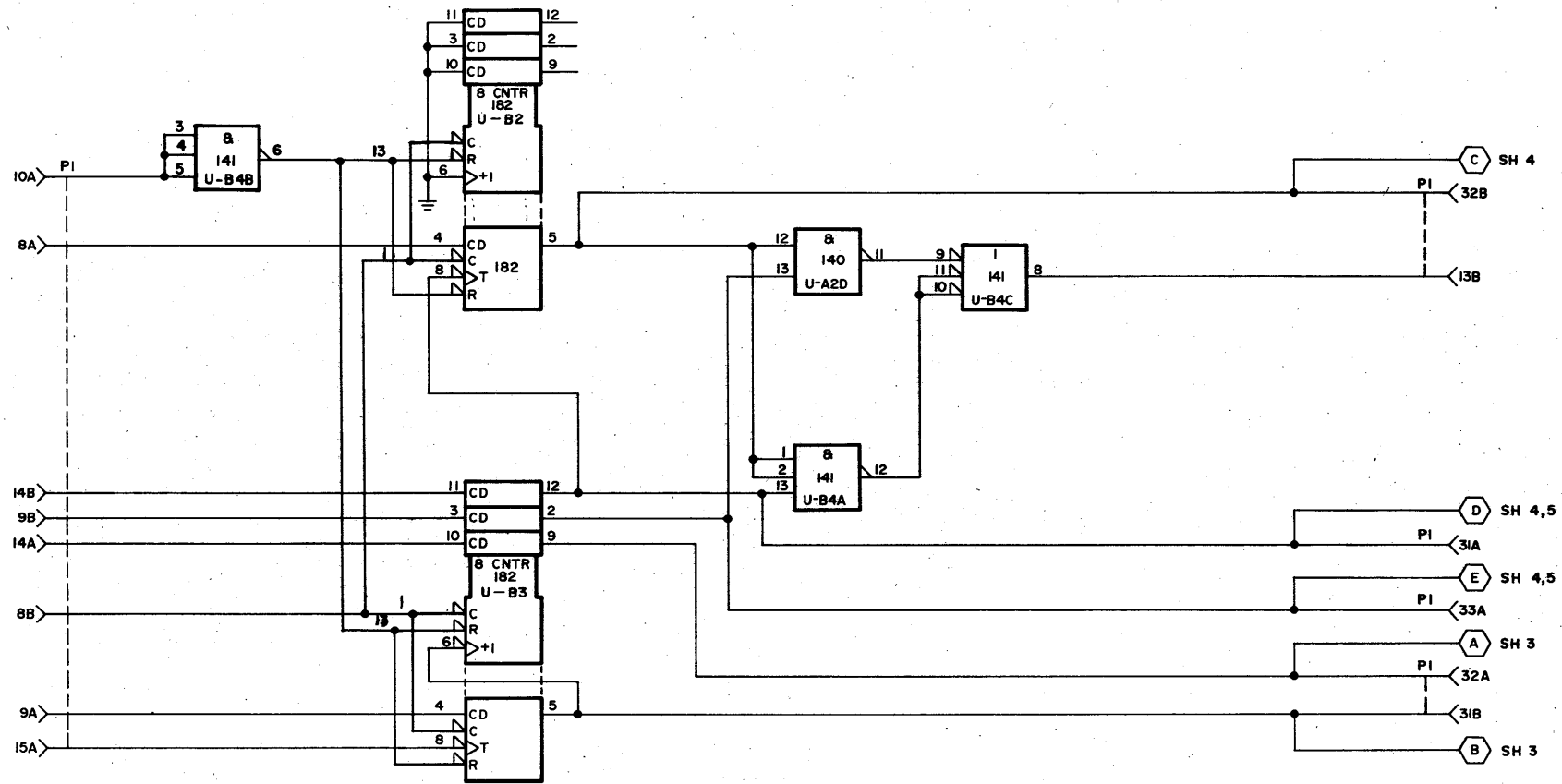
1

VCD

83302400 A

5-79

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
		SEE SHT 1 FOR REV				



CONTROL DATA  
NORMANDEALE  
DIVISION

**SCHEMATIC DIAGRAM**  
**TYPE 2KQV**

CODE IDENT  
19333

**C**

DWG NO  
**54265800**

CD  
**0**

SHEET 2

W 54265800 ↑

5-80

83302400 A

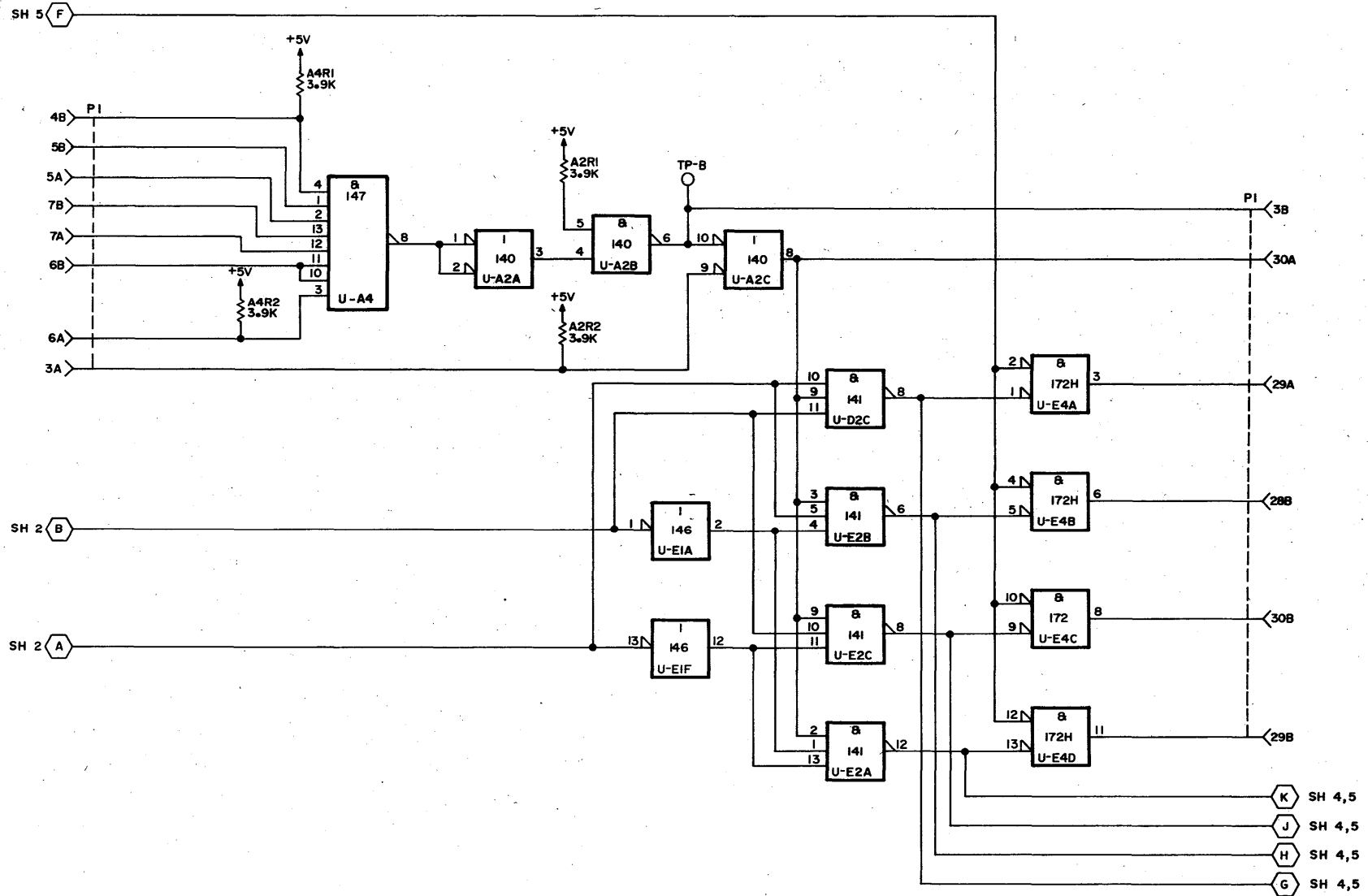
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3

2

1

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHT 1 FOR REV				



CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE 2KQV		CODE IDENT 19333	DWG NO 54265800	CD 0
			SHEET 3		

4

3

2

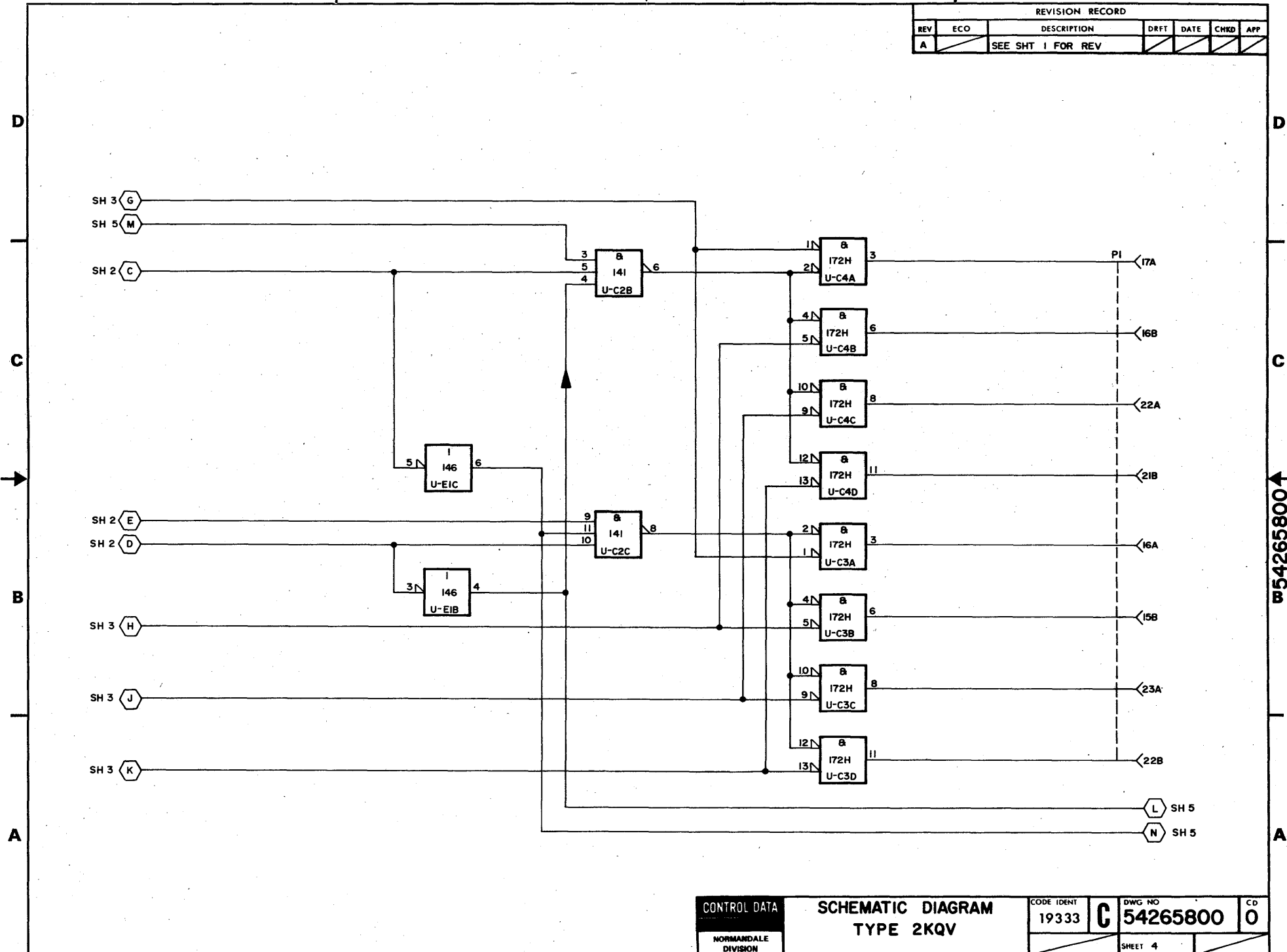
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54265800

83302400 A

5-81

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHT 1 FOR REV				



CONTROL DATA NORMAN DALE DIVISION	SCHEMATIC DIAGRAM TYPE 2KQV		CODE IDENT 19333	DWG NO 54265800	CD 0
				SHEET 4	

W54265800

5-82

4

3

2

1

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHT 1 FOR REV				

D

D

C

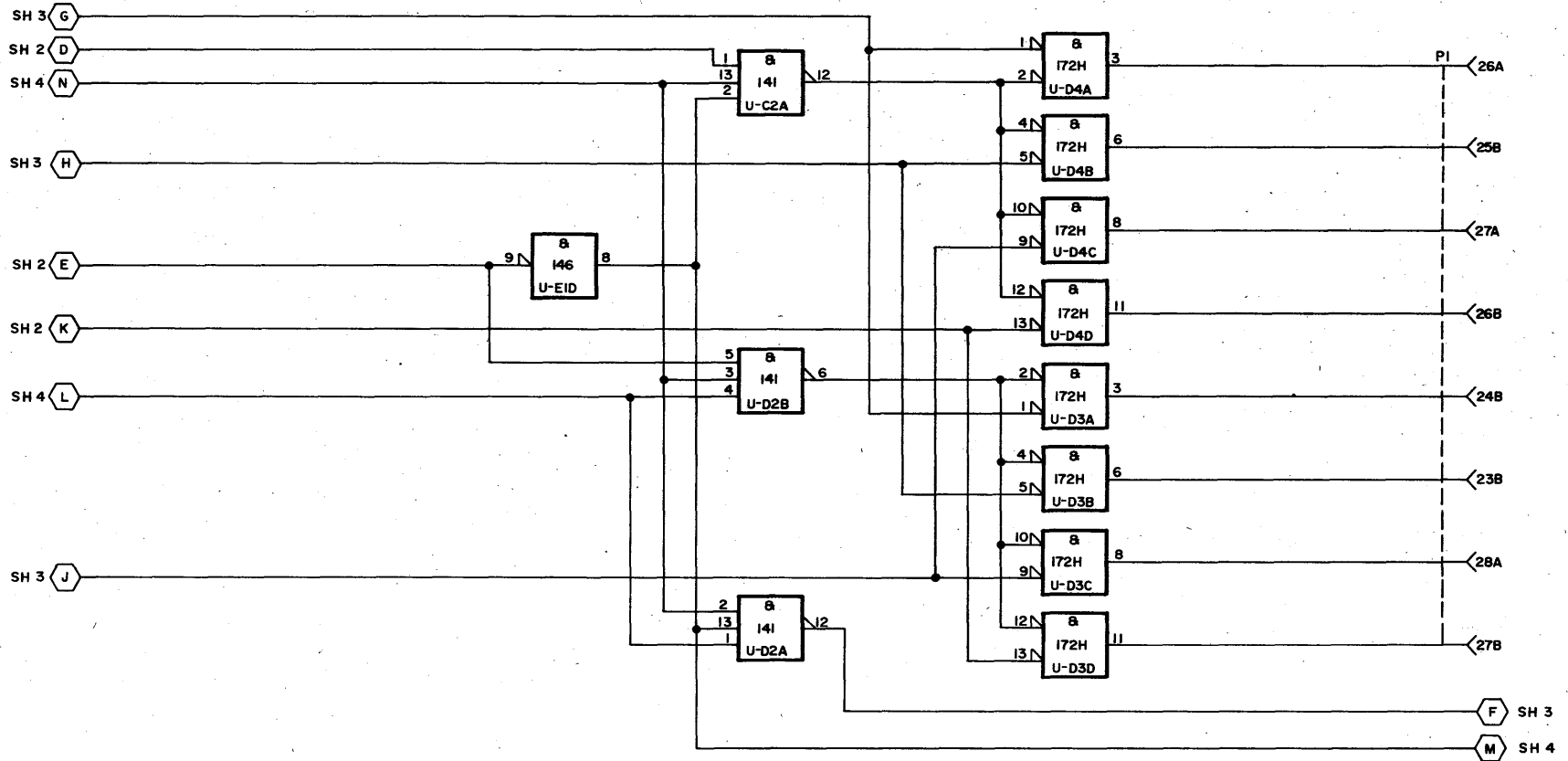
C

B

B

A

A



W54265800

83302400

A

CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE 2KQV		CODE IDENT 19333	DWG NO 54265800	CD 0
				SHEET 5	

4

3

2

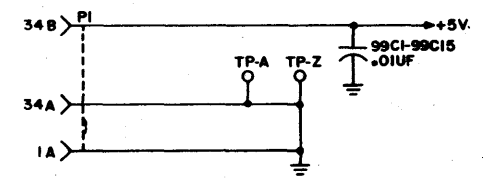
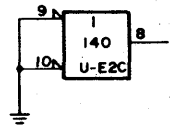
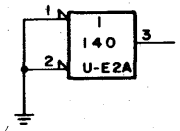
1



83302400 A

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DR	DATE	CHKD	APP	
A	PE23000	RELEASED		12-7-73		CK	

NOTE 1  
 1. UNLESS OTHERWISE SPECIFIED  
 ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO  
 GROUND AND PIN 14 CONNECTED TO +5V.  
 2. DELAY TIME FOR REFERENCE ONLY.



REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		TITLE	
COMP ASSY 54266901		FIRST USED ON BR5A5		DWN V. WILSON 11-27-73		SCHEMATIC DIAGRAM	
		CHK <i>[Signature]</i> 11-28-73		ENGR <i>[Signature]</i> 11-28-73		DIFFERENCE COUNTER	
		MFG <i>[Signature]</i> 11-30-73		APPR <i>[Signature]</i> 12-5-73		TYPE 3KTV	
COMPONENTS, EXCEPT AS NOTED				CODE IDENT		DRAWING NUMBER	
TOLERANCE		VALUE		19333		C 54267001	
RES ± 1%		OHMS 1/4 W				3	
CAP - 30%							
SHEET 1 OF 4							

5-83

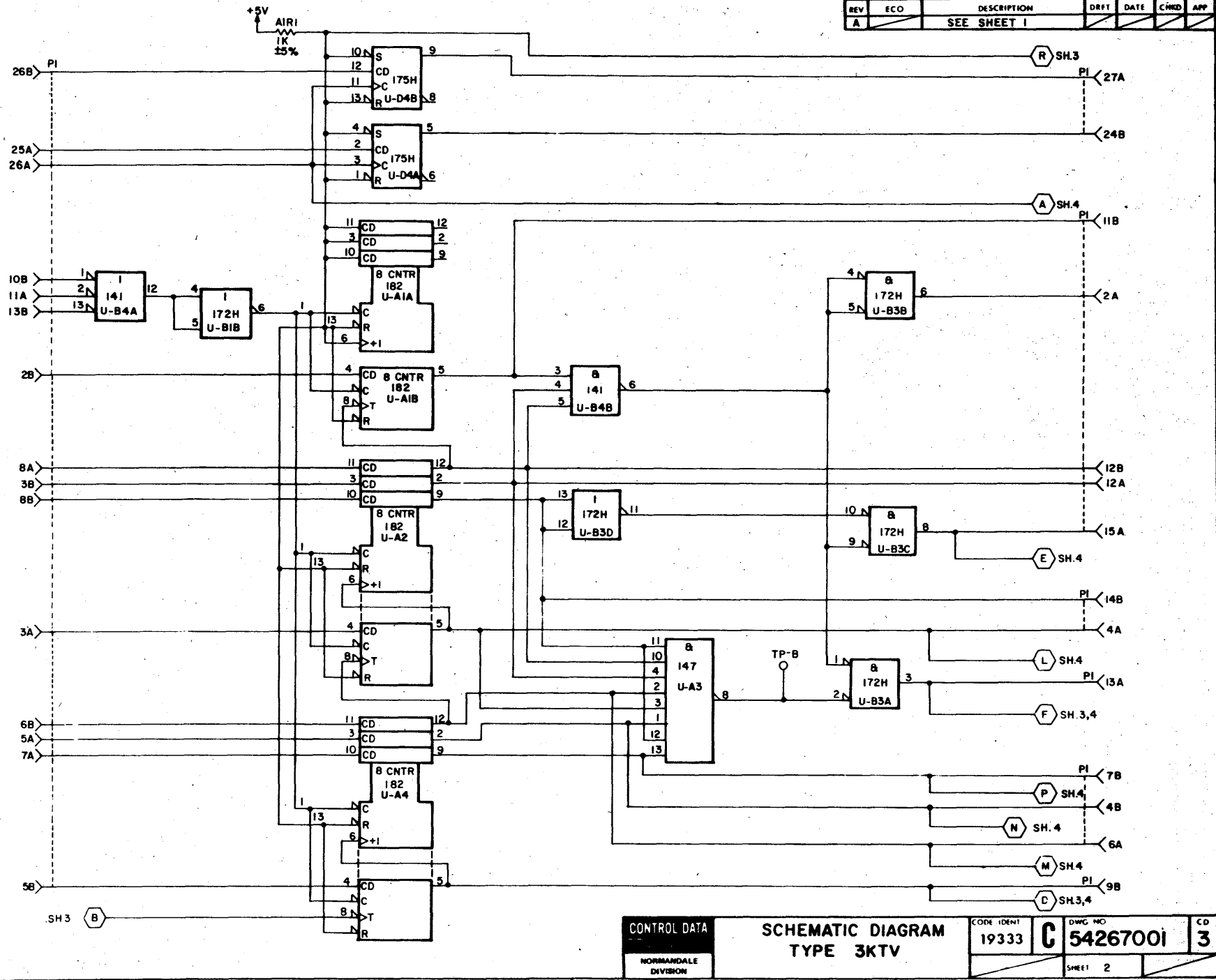
54267001

VCD

5-84

83302400

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1				

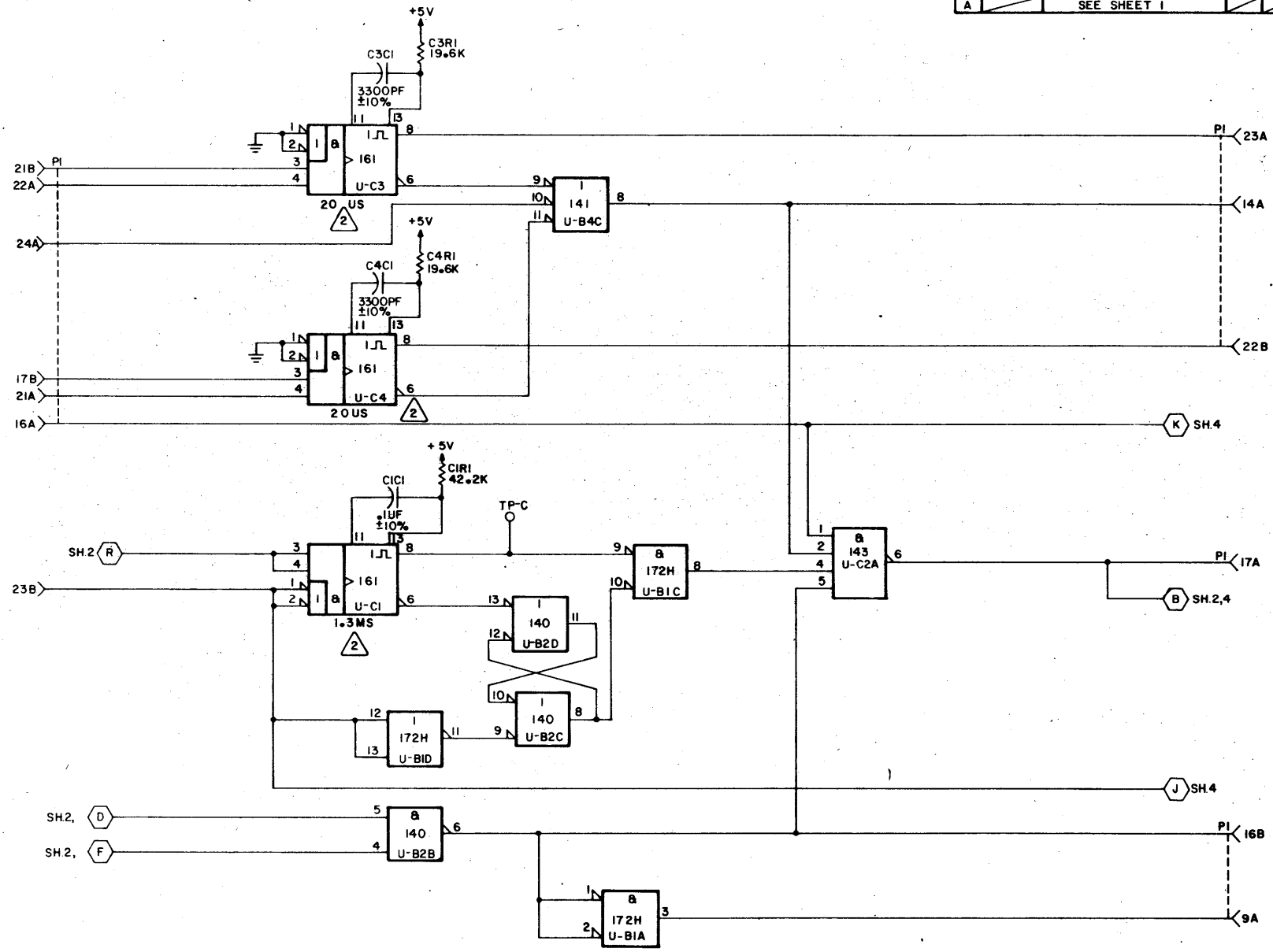


CONTROL DATA NORMANDE DIVISION	SCHEMATIC DIAGRAM TYPE 3KTV		CODE IDENT 19333	DWG NO 54267001	CD 3
				SHEET 2	

83302400 A

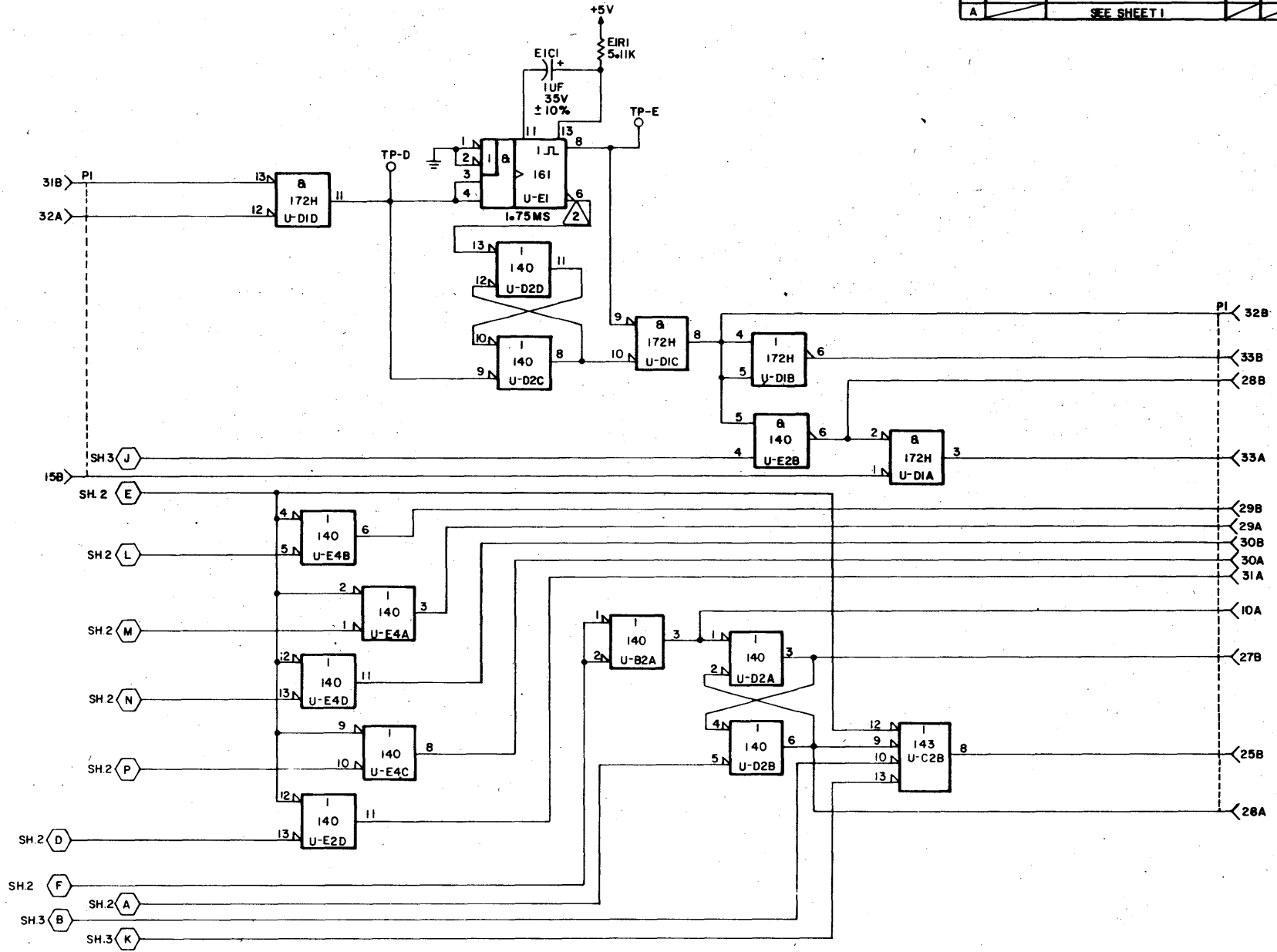
5-85

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1				



CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE 3KTV		CODE IDENT 19333	C	DWG NO 54267001	CD 3
			SHEET 3			

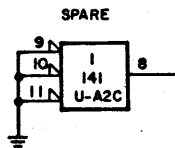
REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1				



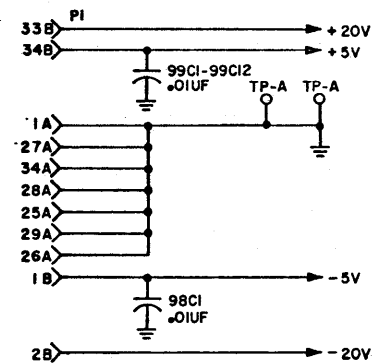
CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CD
	TYPE 3KTV		19333	C 54267001	3
NORMANDEALE DIVISION			SHEET 4		

83302400 A

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DFT	DATE	CHKD	APP	
A	PE23 000	RELEASED	KMN	2-12-74	MAK	MO	



- NOTE 1**  
 UNLESS OTHERWISE SPECIFIED:  
 ALL 14 PIN I.C.'S HAVE PIN 7 CONNECTED TO GND  
 AND PIN 14 CONNECTED TO +5V.
- ALL DIODES SILICON, 92115021.  
 TRANSISTOR, SNPN, 2N2221, 50210102.
- 2.** TEST SELECT RESISTOR TO BE SELECTED FROM  
 DRAWING 94357500 AND INSERTED DURING CARD  
 TEST PER RECOMMENDED TEST PROCEDURE.
- 3.** TRANSISTOR, SNPN, NN3568, 50210810.
- 4.** DELAY TIME FOR REFERENCE ONLY.

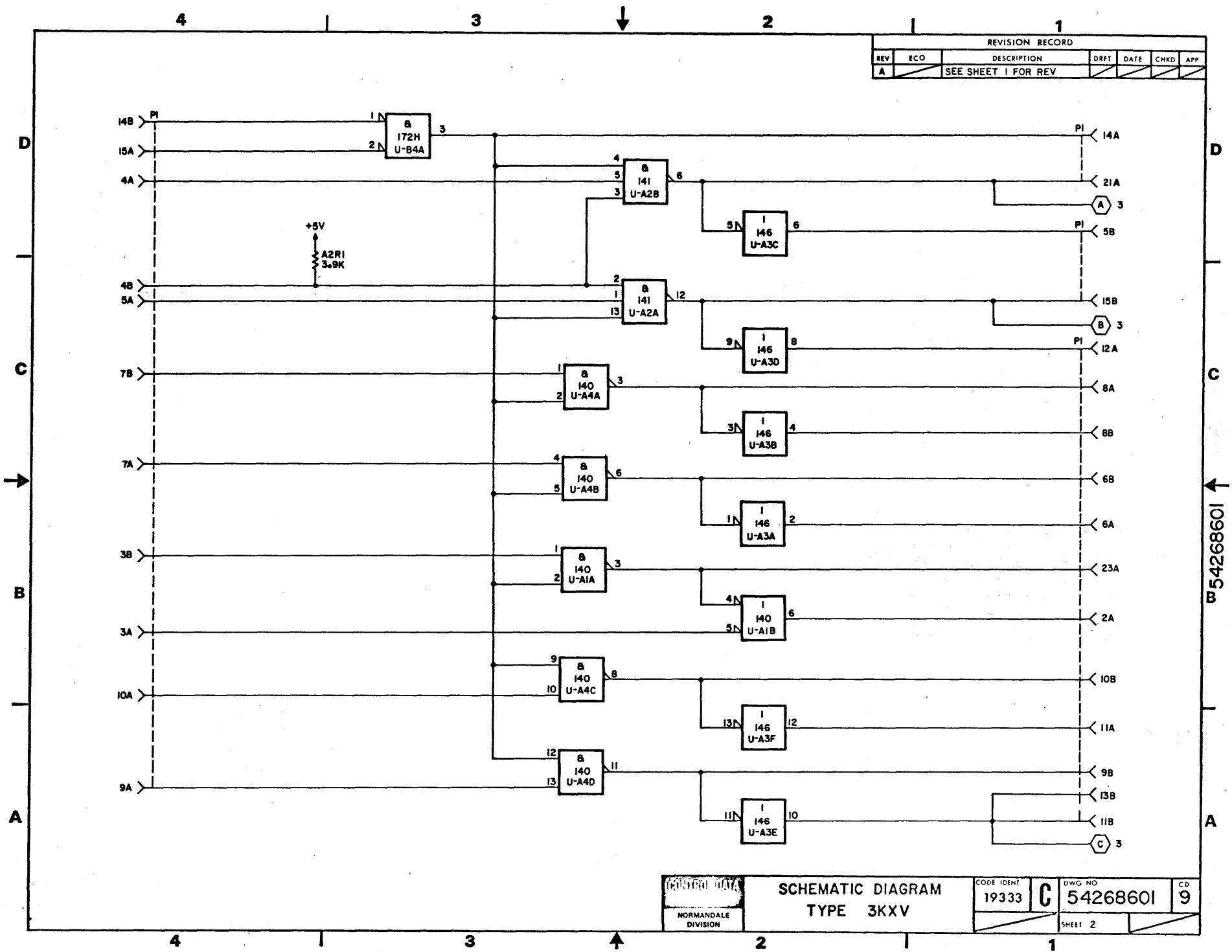


REFERENCE DRAWINGS		CONTROL DRAWING		NORMANDALE DIVISION		TITLE	
COMP ASSY : 54268501		BR 5A5		MON BAKER		SCHEMATIC DIAGRAM	
		DWN		I-23-74		FAULT & SPEED DETECTION	
		CHK				TYPE 3KXV	
COMPONENTS, EXCEPT AS NOTED		ENGR				DRAWING NUMBER	
TOLERANCE		VALUE		RATING		19333 C 54268601	
RES	+ 5%	OHMS	1/4 W			CD	
CAP	- 30%					9	
						SHEET 1 OF 4	

5-87

W54268601

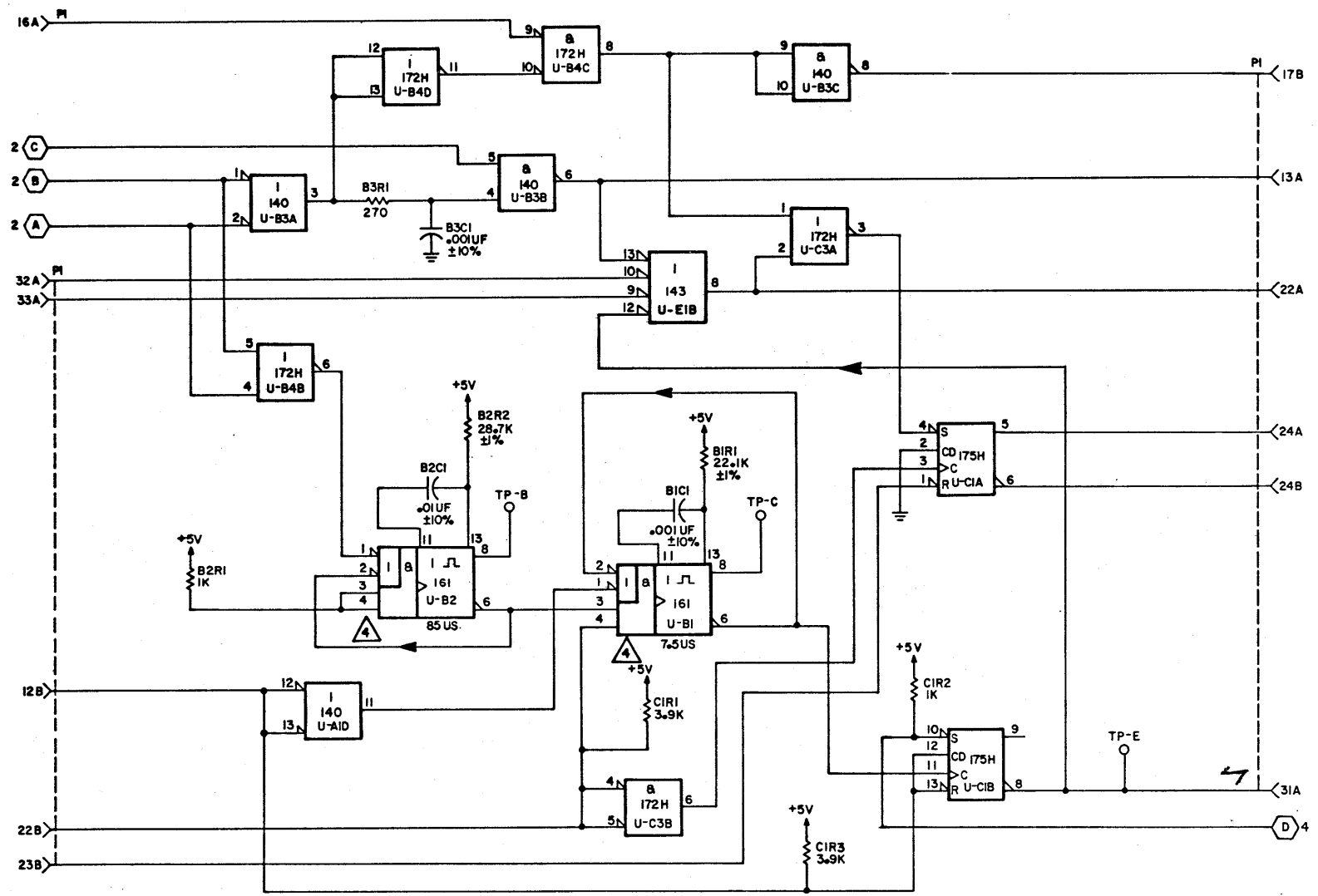
REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



 NORMANDALE DIVISION	<b>SCHEMATIC DIAGRAM</b> TYPE 3KXV	CODE IDENT 19333	DWG NO <b>54268601</b>	CD <b>9</b>
		SHEET 2		

54268601

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				

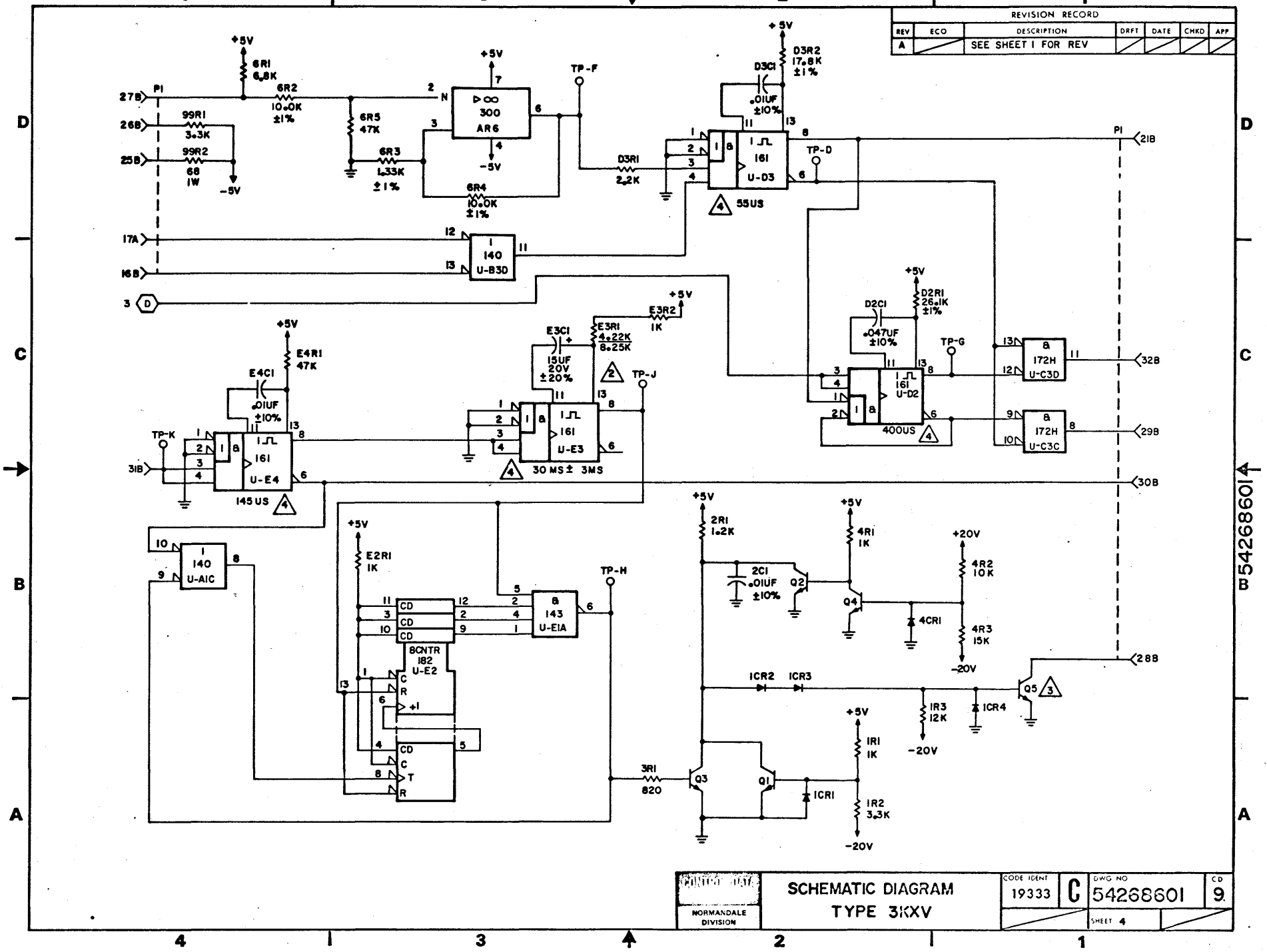


NORMANDE DIVISION	SCHEMATIC DIAGRAM		CODE IDENT:	DRWG NO	CD
	TYPE 3KXV		19333	C 54268601	9
			SHEET 3		

5-90

83302400 A

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



W 54268601 A

NORMANDALE DIVISION	SCHEMATIC DIAGRAM TYPE 3KXV		CODE IDENT 19333	C	DWG NO 54268601	CD 9
					SHEET 4	



83302400 A

5-91

4

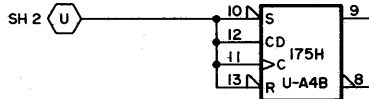
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2

1

SHEET REVISION STATUS				REVISION RECORD				
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A	PE2300	RELEASED		10-19-73		CR	92	

SPARE GATES



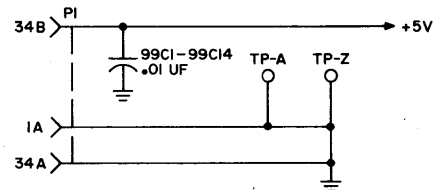
NOTE :

1. UNLESS OTHERWISE SPECIFIED :

ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.

ALL 16 PIN IC'S HAVE PIN 12 CONNECTED TO GND AND PIN 5 CONNECTED TO +5V.

⚠ DELAY TIME FOR REFERENCE ONLY.



REFERENCE DRAWINGS		CONTROL DATA		NORMANDEALE DIVISION		TITLE	
COMP ASSY 54269300		CORPORATION		BR5A5		SCHEMATIC DIAGRAM ABSOLUTE ADDRESS TYPE 2KZV	
		FIRST USED ON	9-25-73		CODE IDENT		DRAWING NUMBER
		DWN	10/6/73		19333		54269400
		CHK	10-8-73		C		CD
COMPONENTS, EXCEPT AS NOTED		ENGR	10-10-73				5
RES	TOLERANCE	VALUE	RATING				
	± 1%	OHMS	1/4 W				
CAP	-30%						
		MFG	10-10-73				
		APPR	10-10-73				
						SHEET 1 OF 4	

4

3

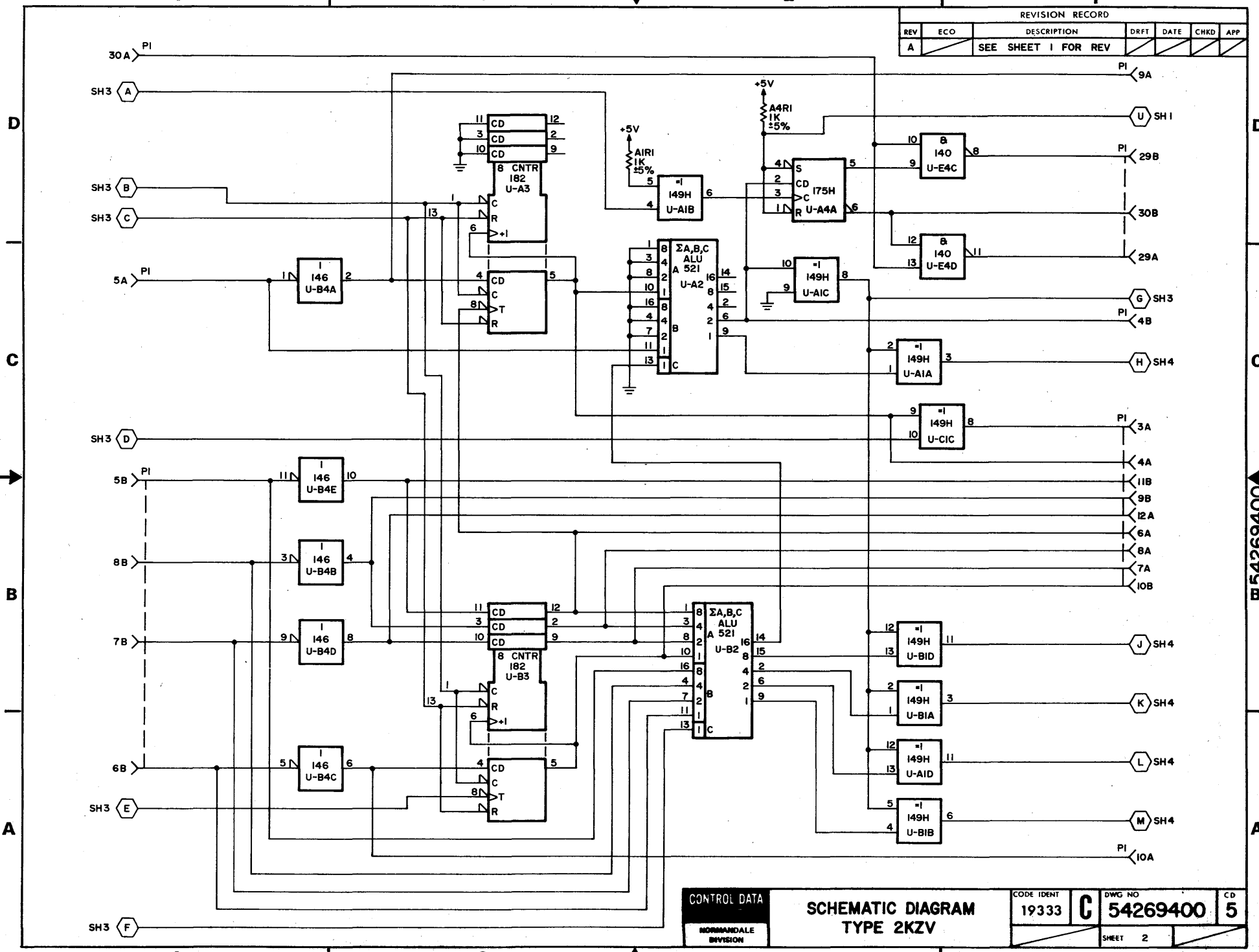
2

1

V.C.D

W 54269400 ↑

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA  
NORMANDELE DIVISION

**SCHEMATIC DIAGRAM**  
**TYPE 2KZV**

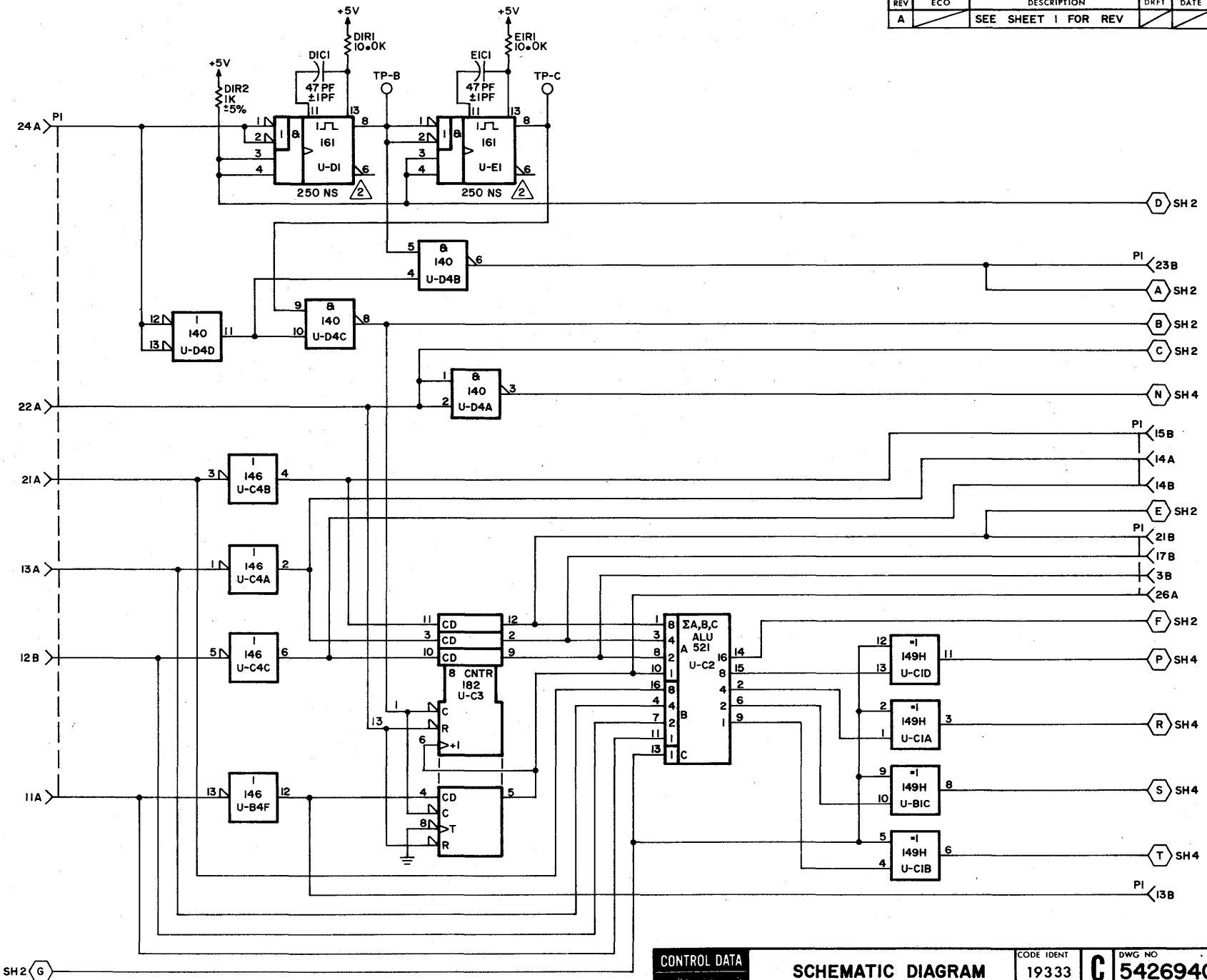
CODE IDENT 19333	DWG NO <b>C 54269400</b>	CD <b>5</b>
SHEET 2		

54269400

83302400 A

5-93

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



CONTROL DATA NORMAN DALE DIVISION	SCHEMATIC DIAGRAM TYPE 2KZV		CODE IDENT 19333	DWG NO <b>C</b> 54269400	CD 5
			SHEET 3		

54269400

5-94

83302400 A

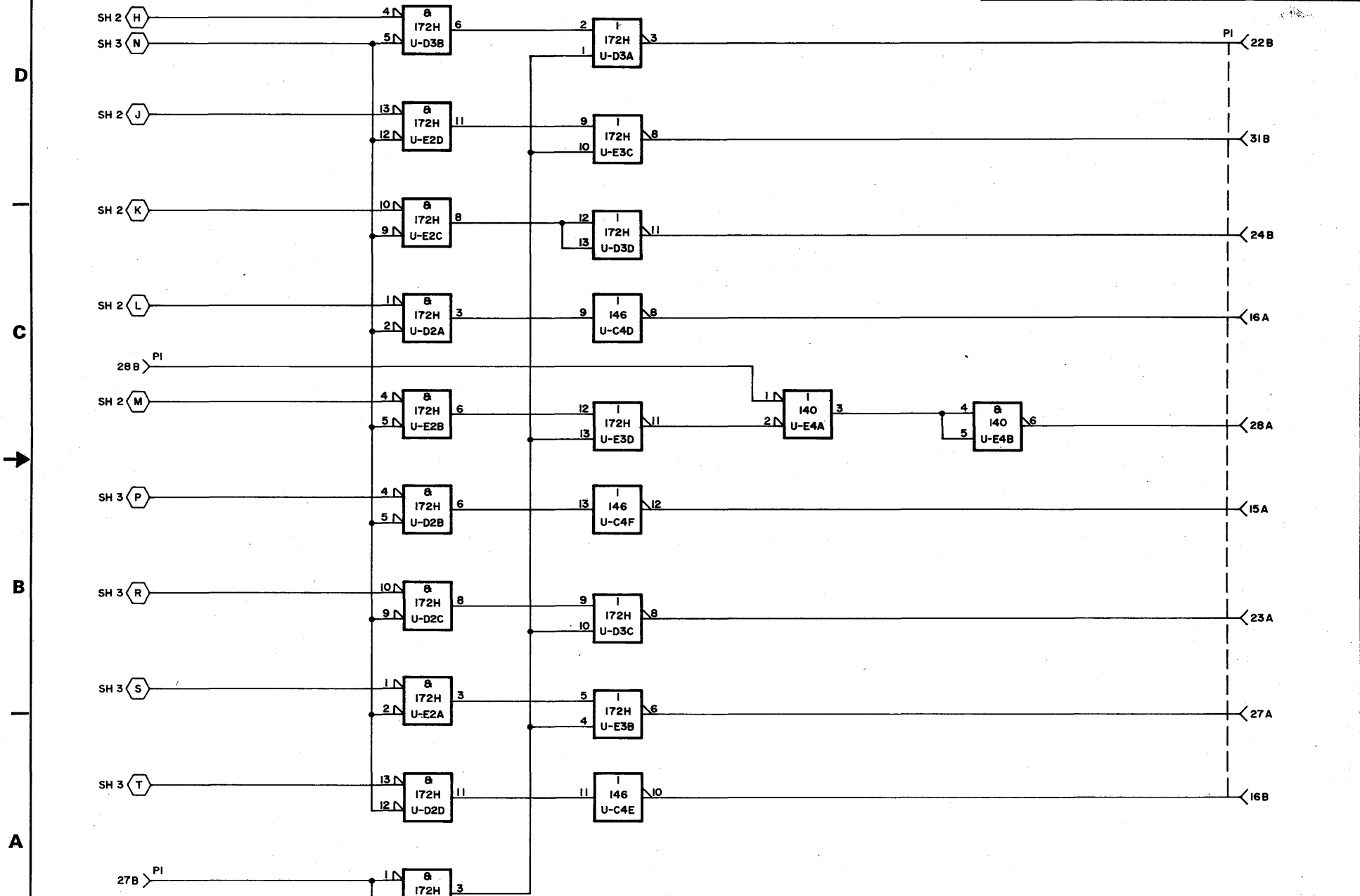
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3

2

1

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A		SEE SHEET 1 FOR REV				



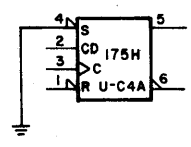
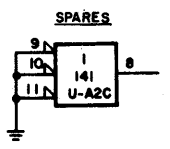
CONTROL DATA	SCHEMATIC DIAGRAM		CODE IDENT	DWG NO	CD
	TYPE 2KZV		19333	54269400	5
NORMANDEALE DIVISION			SHEET 4		

B54269400↑

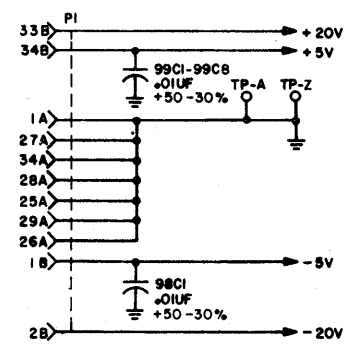
83302400 F

54268607

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP	
A		RELEASED				fcc	

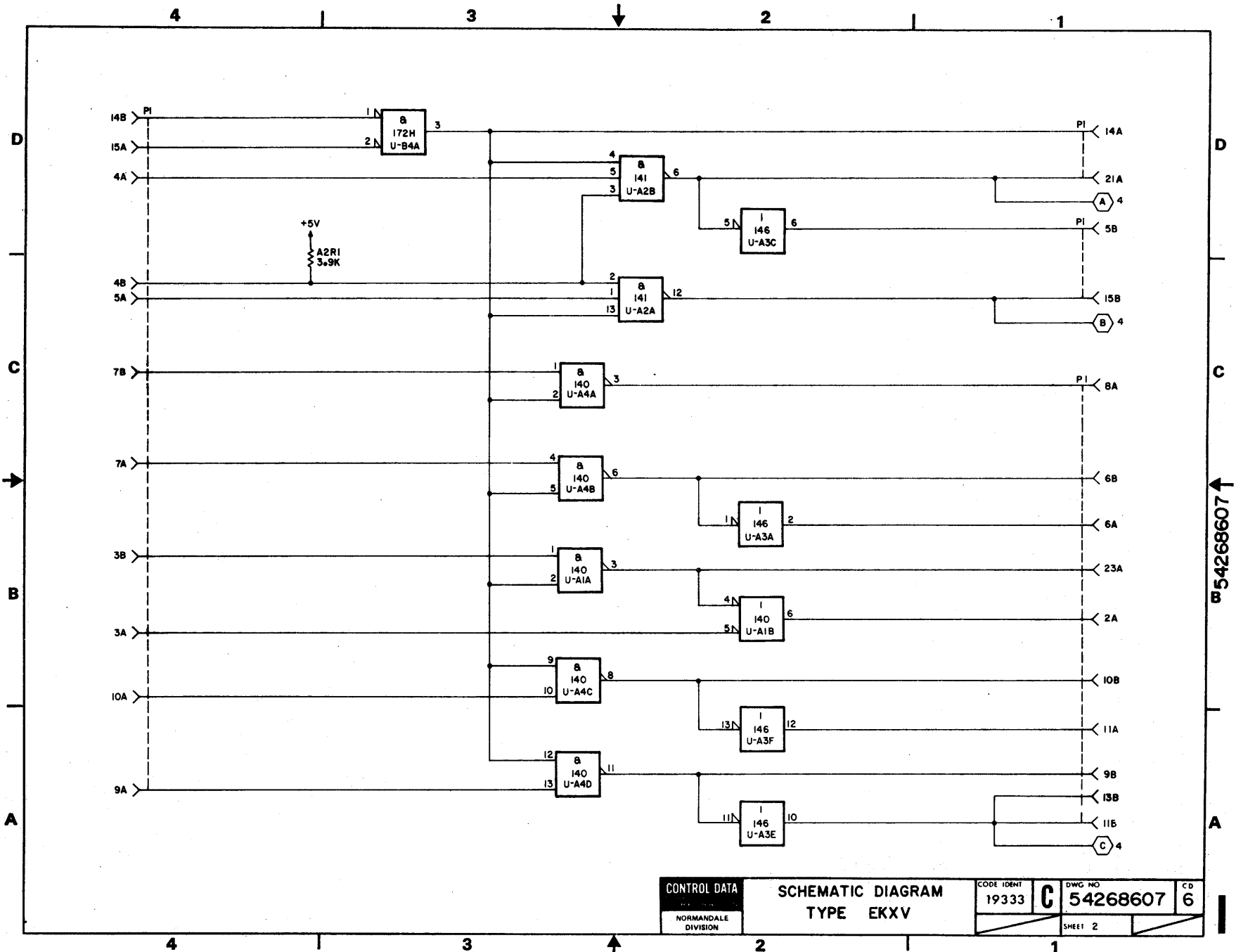


- NOTE:
- UNLESS OTHERWISE SPECIFIED:  
ALL 14 PIN IC'S HAVE PIN 7 CONNECTED TO GND AND PIN 14 CONNECTED TO +5V.  
ALL 16 PIN IC'S HAVE PIN 8 CONNECTED TO GND AND PIN 16 CONNECTED TO +5V. EXCEPT S-D3, WHICH IS A DUAL INLINE 16 PIN SWITCH.  
ALL DIODES SILICON, 9215021.  
TRANSISTOR, SNPN 2N2221, 50210102.
  - TEST SELECT RESISTOR TO BE SELECTED FROM DRAWING 94357500 AND INSERTED DURING CARD TEST PER RECOMMENDED TEST PROCEDURE
  - TRANSISTOR, SNPN 2N3568, 5021080.
  - DELAY TIME FOR REFERENCE ONLY.

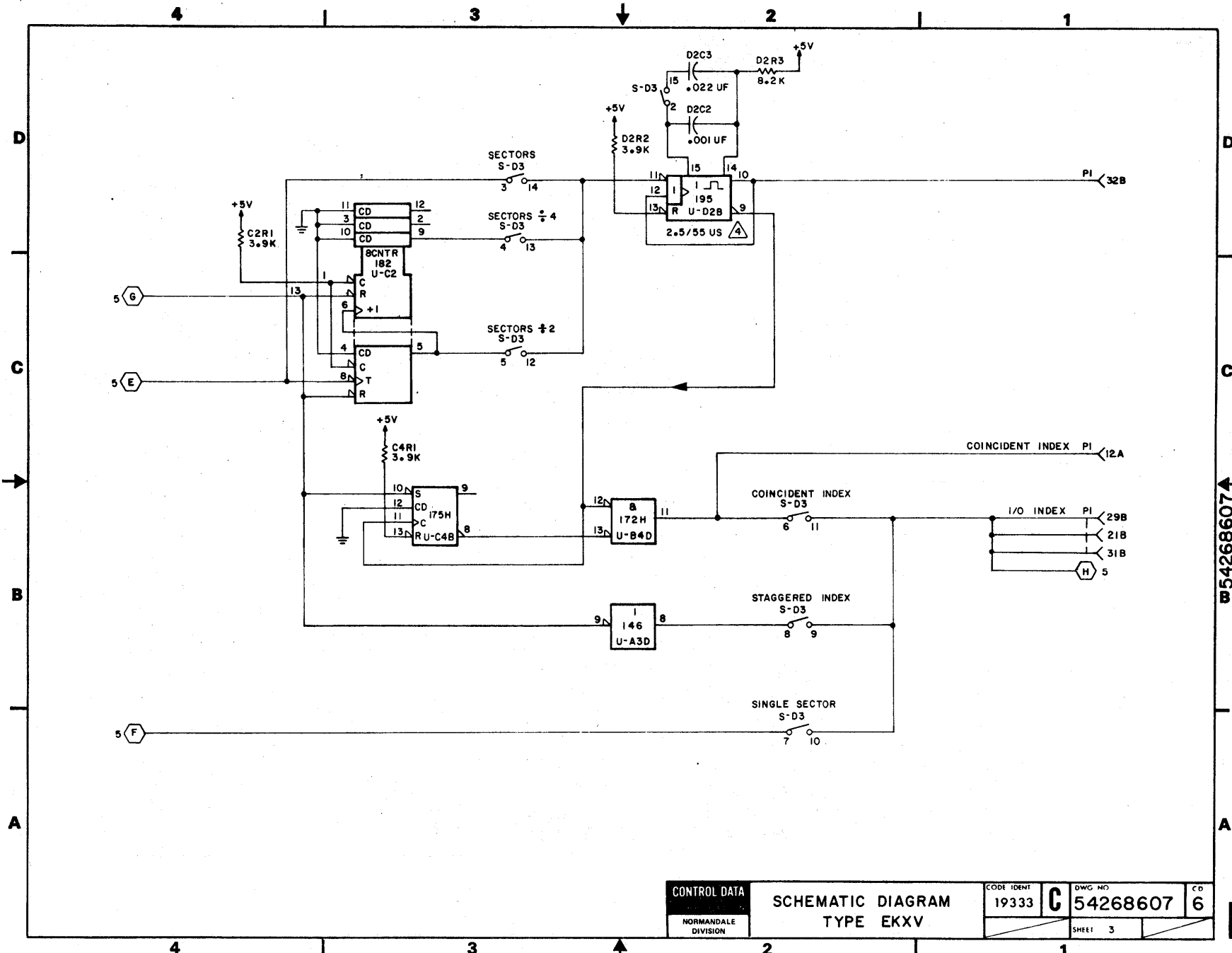


REFERENCE DRAWINGS		CONTROL DATA		NORMANDALE DIVISION		SCHEMATIC DIAGRAM			
COMP ASSY : 54268507		FIRST USED ON	BR56A,B			FAULT & SPEED DETECTION			
		DWN	R. TAPPER	8-28-75		TYPE EKXV			
		CHK		8-15-75		DRAWING NUMBER			
		ENGR		9-5-75		19333	C	54268607	
COMPONENTS, EXCEPT AS NOTED		MFG		9-10-75		CD			
		APPR		9-11-75		6			
TOLERANCE	VALUE	RATING							
RES	± 5%	OHMS	1/4 W						
CAP	± 10%								
						SHEET 1 of 5			

5-95



CONTROL DATA NORMANDALE DIVISION	SCHEMATIC DIAGRAM TYPE EKXV		CODE IDENT 19333	DWG NO <b>C</b> 54268607	CD 6
			SHEET 2		



CONTROL DATA

NORMANDALE DIVISION

SCHMATIC DIAGRAM  
TYPE EKXV

CODE IDENT  
19333

C

DWG NO

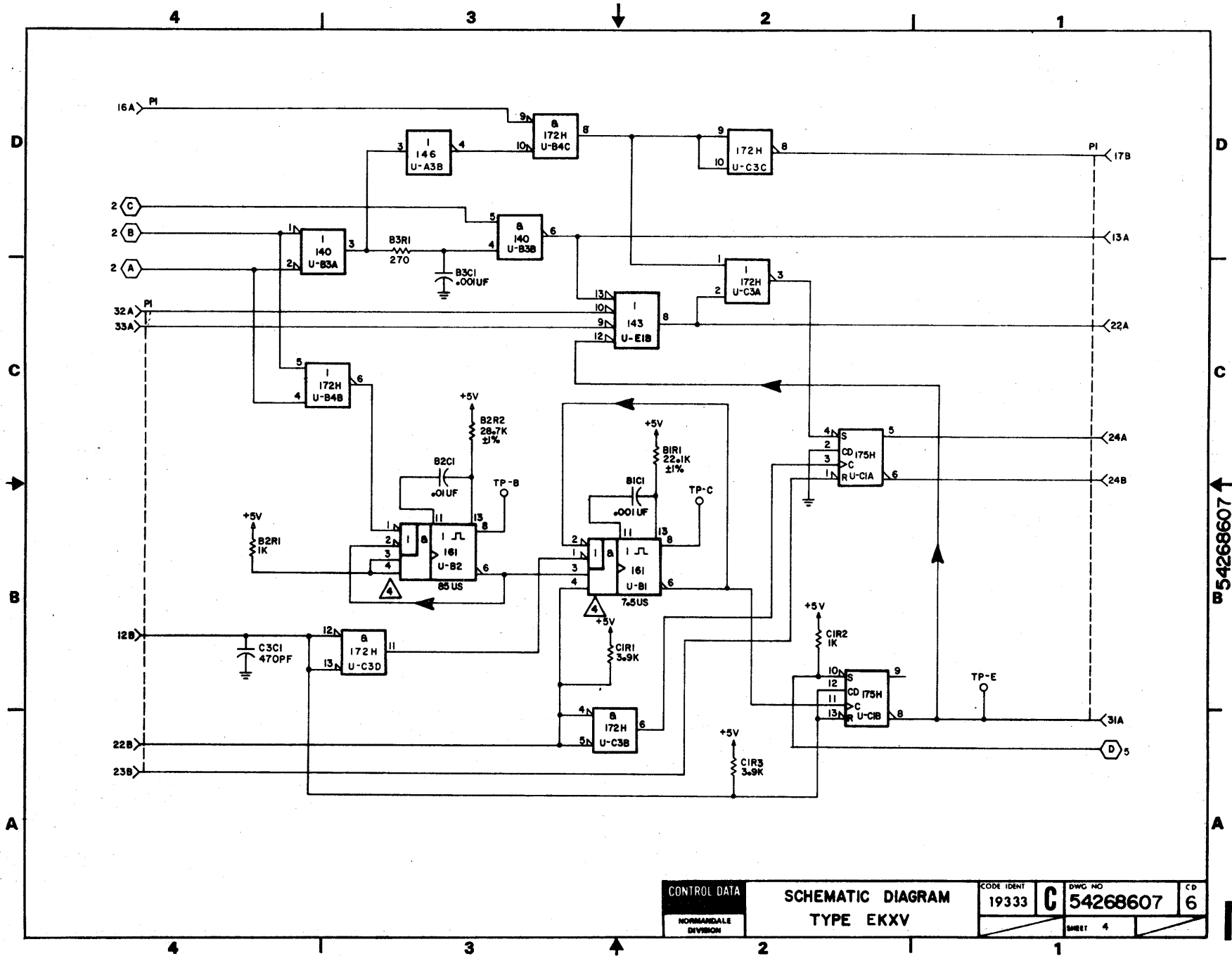
54268607

CD

6

SHEET 3

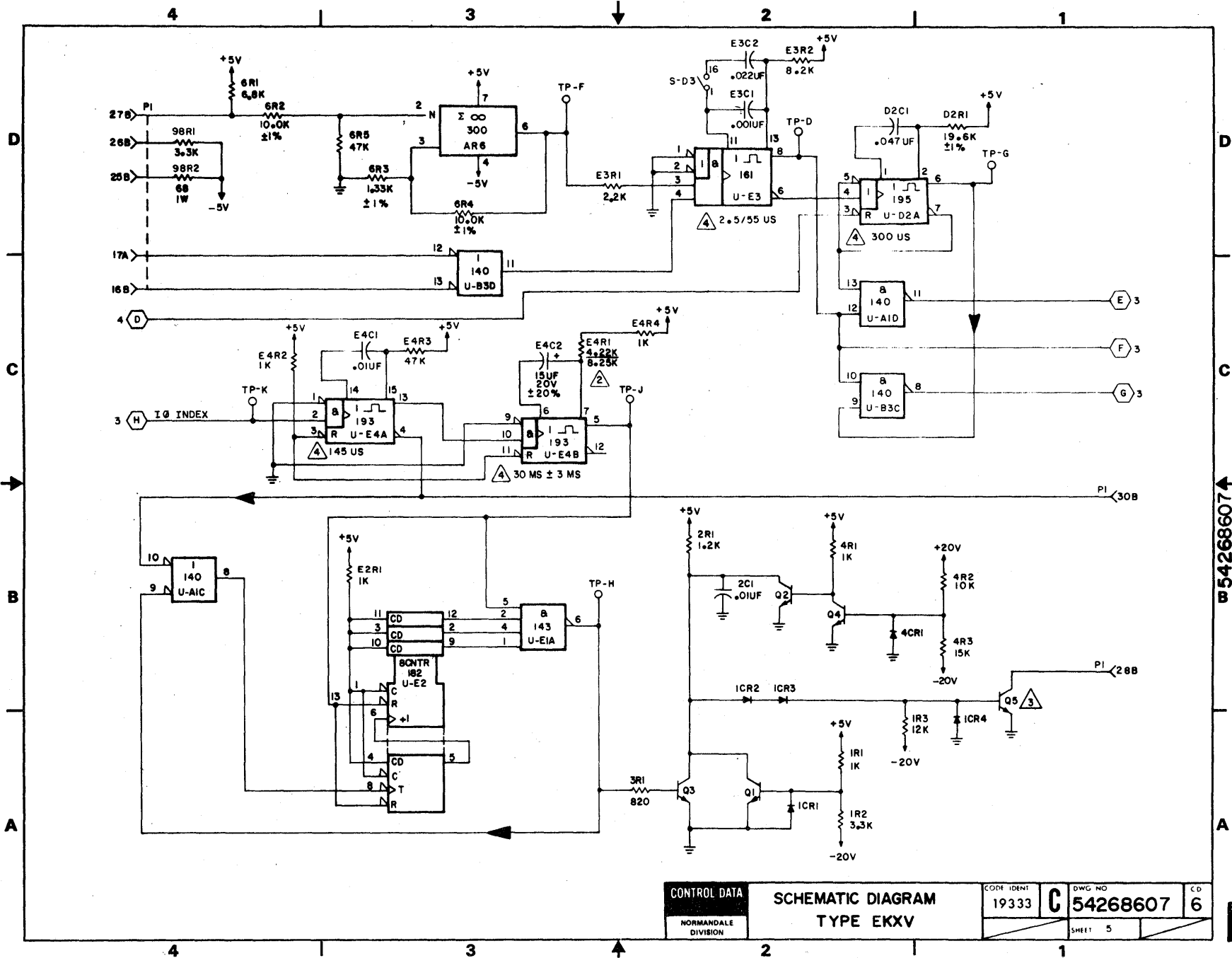
54268607



CONTROL DATA NORMANDALE DIVISION	SCHEMATIC DIAGRAM TYPE EKXV		CODE IDENT 19333	DWG NO 54268607	CD 6
				SHEET 4	

54268607





CONTROL DATA NORMANDEALE DIVISION	SCHEMATIC DIAGRAM TYPE EKXV		CODE IDENT 19333	DWG NO <b>C</b> 54268607	C.D. 6
				SHEET 5	

54268607

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0

SECTION 6

MAINTENANCE

Information for this section is included in BR5A5  
Disk Storage Unit, Publication No. 83302300.



SECTION 7

MAINTENANCE AIDS



## MAINTENANCE AIDS

### GENERAL

Section 7 contains information on logic circuits, the criteria used in determining the further usability of read/write heads and disk packs.

### LOGIC

The logic used in this device consists of two styles of circuits: discrete component and integrated circuits. Discrete component circuits individually identifiable resistors, capacitors, transistors, etc.

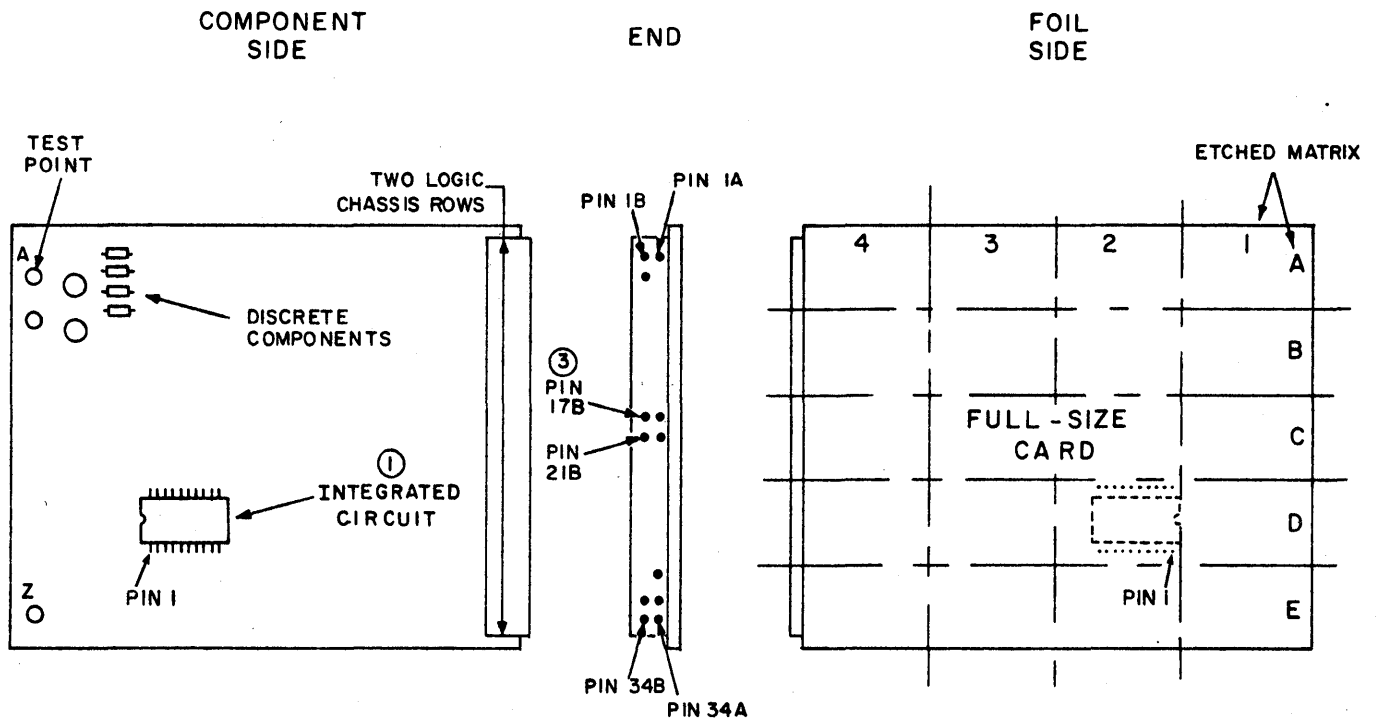
### PHYSICAL DESCRIPTION

All components of the logic cards (Figure 7-1) are mounted on one side of a printed circuit board (PCB). The PCB card is 6.075 x 4.85 inch. The female connector of the cards mate with wire wrap pins extending through the chassis wire wrap board. The logic cards functions are dispersed from the reverse ends of these pins through wiring installed using the wire wrap technique. Cards installed in the logic chassis are restricted from vertical and horizontal movement by card guide spacers.

Numerical designators (1 through 99) are etched on the non-component side of the board to identify each transistor. A 4-character alphanumeric designator is etched on the non-component side of the board to identify the card type. A matrix code (alphanumeric) also appears on this side. Non-amplifying components such as integrated circuits, resistors, capacitors, diodes, etc., are not marked.

### Pin Assignments

The PCB card contains a 62-pin connector. Connectors are mounted along the shorter dimension on the component side of the board.



NOTES:

- ① INTEGRATED CIRCUIT LOCATED AT BOARD MATRIX D2 .
- 2. ON LOGIC DRAWINGS, CARD PINS AND MATRIX LOCATIONS, ARE PRECEDED BY 3 DIGITS THAT IDENTIFY LOCATION OF CARD IN LOGIC CHASSIS (A23, POSITION 23 IN CHASSIS ROW A).
- ③ PINS 18, 19, 20, (A AND B) NOT PRESENT.

8J38

Figure 7-1. Logic Card Detail



## Test Points

Test points are located near the edge of the card opposite the connector and in other strategic places on the component side of the board. Test points are identified alphanumerically starting with A on the top, outer edge. In most cases, test points A and Z are available for ground reference.

## USE OF RELATIVE LEVEL INDICATORS

The relative level indicator is a small circle located at the origin or termination of a signal line, and tangent to a logic symbol. The presence or absence of this indicator tells the conditions that are necessary to satisfy the function of the logic symbol. The presence of the circle indicates a 0 logic level on that line is needed to satisfy the function. The absence of the circle represents a logical 1 as needed to satisfy the function.

The relative level indicator depicts the occurrence of inversion. Figure 7-2 shows some representative examples of the relative level indicator being used in this manner.

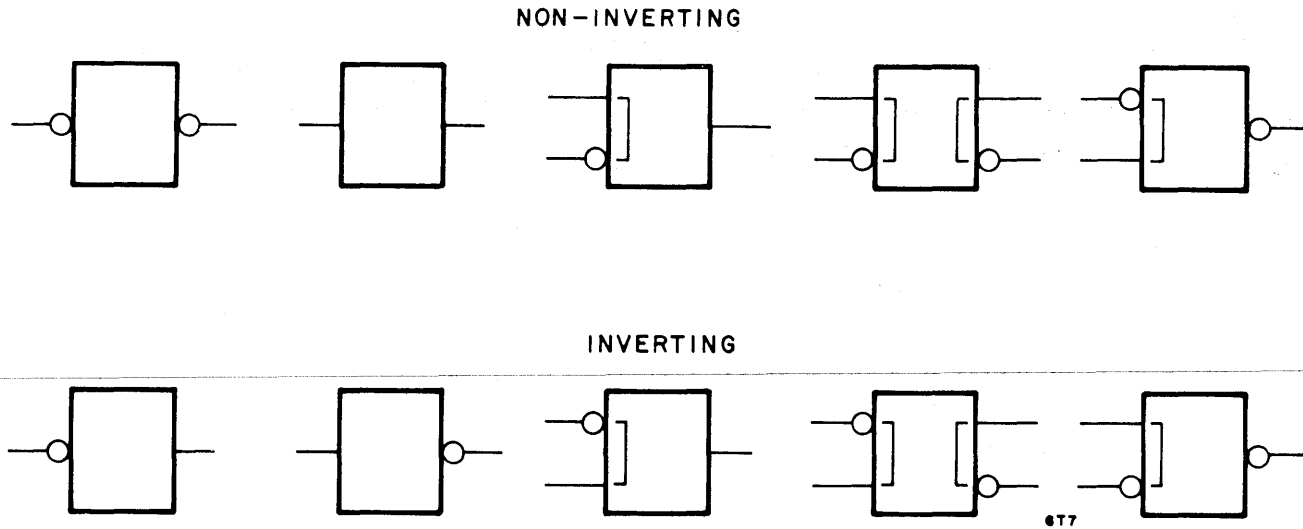


Figure 7-2. Inversion Conventions

677

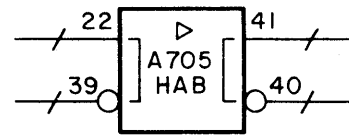
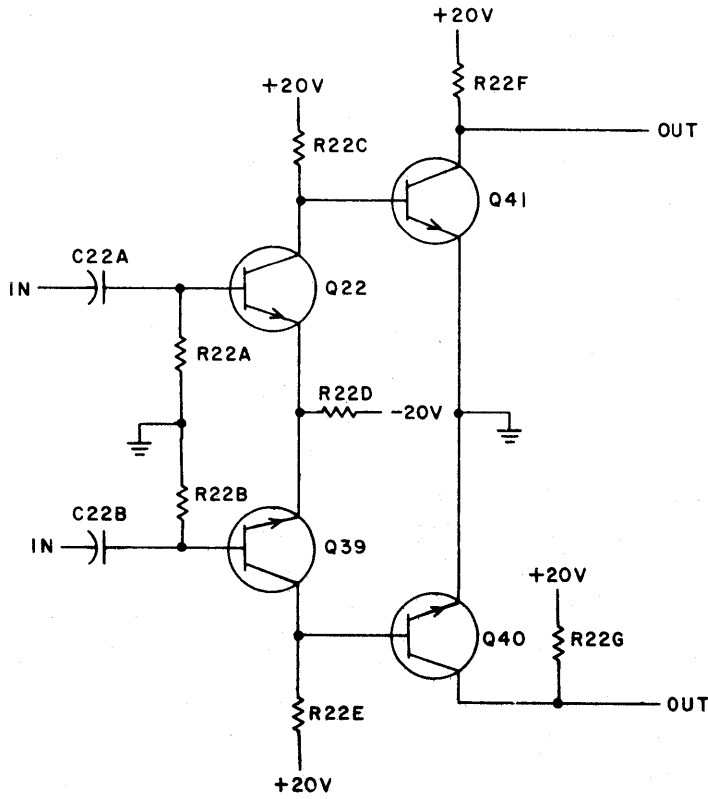
INFORMATION CONTAINED WITHIN LOGIC SYMBOLS

Discrete Component Circuits

Figure 7-3 shows a schematic (as shown on card schematic diagram) and the logical representation (as shown on logic diagrams) for the same theoretical discrete component circuit. Four lines of information are contained within the logic symbol. The top line is the function symbol and designates the board logic function of that particular symbol. In this case,  $\triangleright$  represents an amplifier, the logic function performed by the circuit. The third line, also an alphabetic code, designates the circuit type being used (HAB). The circuit type is a subdivision of the function identifier (specifically a high level amplifier). By using the circuit type designator, detailed information on that particular circuit can be derived in the following paragraphs (see Discrete Component Circuit Descriptions).

The second line within the symbol is used to differentiate that particular symbol from similar symbols that appear on the logic diagram. It is called the logic term and consists of a one-letter prefix and an assigned identification number (in this case, A705).

The numbers on the input lines to the symbol indicate which transistor is driven by that input line. For example, the upper input has a number 22 on its line, showing that it drives transistor number 22 (ie., Q22 on the card schematic diagram).



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Figure 7-3. Discrete Component Circuit

The output lines also have numbers associated with them. These numbers indicate which transistor directly feeds the output line. For example, the lower output line has a number 40 above it, indicating that the output from transistor number 40 (Q40 on the card schematic diagram) drives the lower output line.

The lines on the interior of the logic block that bracket both inputs and both outputs show that the input lines and the output lines are differentials. The relative level indicators show that the amplifier does not invert the signal. Slashes on the inputs and outputs show that the signal levels are non-standard.

### Integrated Circuits

Figure 7-4 shows the schematic version (as shown on card schematic diagram) and the logical representation (as shown on logic diagrams) for the same representative integrated circuit.

The most apparent difference occurs in the outline shapes for the circuit. The logic drawings use a four sided block to depict all logic circuits. Two lines of information appear in the logic version that do not appear on the schematic block. They are the function symbol which identifies the block as an OR gate and the logic term which provides specific identification for the circuit. Points of similarity include the package pin numbers and the Control Data element number. Refer to Table 7-1 for manufacturers information of the various element numbers.

The last item of information regarding these two representations involves the location code which borrows part of the schematic symbols reference designator. In the reference designator (U-A4B), the U specifies a non-amplifying integrated circuit, the A4 is the circuits board matrix location for the package, and the B indicates the section of the package. (A 140 package is a four section package. Each section is a separate circuit. Sections are identified A through D.) The location code (on logic drawings) borrows the matrix location and additionally specifies the location of the card in the logic chassis: position 5 of row B.

### WIRED FUNCTIONS

The logical representation for wired functions is shown in Figure 7-5. These functions are used where circuits have the capability of being combined as an AND or an OR function by having the outputs connected. This is simply a physical connection and no electrical or electronic components are involved. The logical interpretation of a wired OR function simply requires that one of the inputs be a logic 0 before the output can be a logic 0. The wired AND output will be a logic 1 only when both inputs are logic 1's.

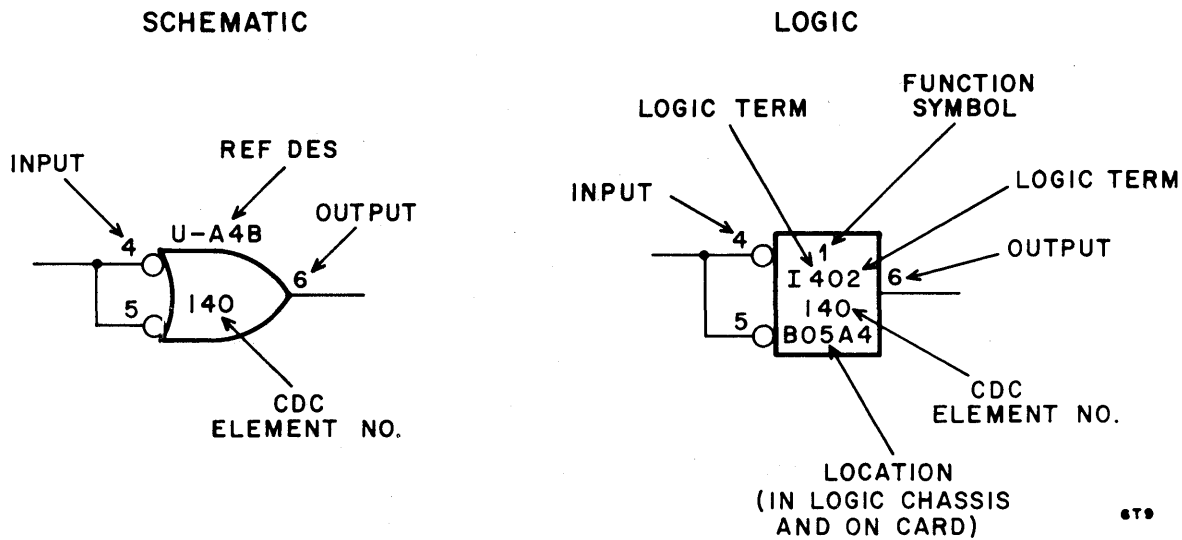


Figure 7-4. Integrated Circuit

TABLE 7-1. CDC ELEMENT NUMBER CROSS REFERENCE

CEC Element Number	Manufacturer, Type	Description
140	Fairchild, 9002	Quad, 2-input NAND
141	Fairchild, 9003	Triple, 3-input NAND
143	Fairchild, 9009	Dual, 4-input buffer
145	Fairchild, 9005	Dual, AND/OR inverter
146	Fairchild, 9016	Hex, inverter
147	Fairchild, 9007	8-input NAND
149H	Motorola, 3021	2-input exclusive OR
161	Fairchild, 9601	Retriggerable multi-vibrator
162	Texas Instrument, 75107	Dual differential receiver
164H	Motorola, 3062	Dual type J-K flip-flop
172H	Motorola, 3002	Quad, 2-input NOR
173H	Motorola, 3004	Quad, 2-input NAND
175H	Motorola, 3060	Dual type-D flip-flop
182	Signetics, 8291 or Texas Instrument, 74197	4 bit presettable counter
200	Texas Instrument, 7406	Hex, inverter
300	Fairchild, 709	Operational Amplifier
306	Fairchild, 747C	Operational Amplifier
308	Signetics, NE531T	Operational Amplifier
316	National Semi Conductor, H0002CH	Current Amplifier
521	Motorola, FC18929L	4-bit binary, full adder



6T10

Figure 7-5. Wired Functions

#### STANDARD/NON-STANDARD LOGIC LEVEL INDICATOR

The input to a logic function at a voltage other than the standard logic level is represented by a slash across the non-standard level line. Absence of the slash (or absence of an X, see below) indicates a standard logic level on that line.

When the input signal to a logic function is an analog signal, the input line will have an X across it. The analog designator is used on lines that normally operate at more than two voltage levels.

#### INTEGRATED CIRCUIT DESCRIPTIONS

Basic functional information for integrated circuits is provided on the Key to Logic Symbols sheet of the logic diagrams.

Detailed functional descriptions and schematic diagrams for integrated circuits is available in the circuit manufacturers handbook, Table 7-1.

#### DISCRETE COMPONENT CIRCUIT DESCRIPTIONS

Figures 7-6 through 7-31 are the schematic diagrams for the discrete component circuits used in this device. A verbal description supports each circuit diagram. The order of presentation is in accordance with the 3-letter alphabetical circuit type designator.

### Gated Amplifier - FAB

The FAB circuit (Figure 7-6) is a low level amplifier that amplifies the analog read signal from the head. Input B is a gate input.

When input B is +20v, diodes CRNA, CRNB, CRNC, CRND, CRNE and CRNF are forward biased. The voltage between CRNC and CRNE and between CRND and CRNF is clamped at approximately +2.0v. With all diodes forward biased, the read signal can pass to the amplifier.

When input B is ground, diodes CRNG and CRNH clamp the voltage at +0.6v. This reverse biases the input diodes. No read signal can enter.

The preamplifier is a three stage amplifier using an emitter follower output stage for low output impedance. The integrated preamplifier has discrete component ac and dc feedback.

AC feedback is provided by CNE and RNH in the top half and CNF and RNJ in the lower half of the circuit. The signal is brought back to the emitters of the input stage to increase input impedance.

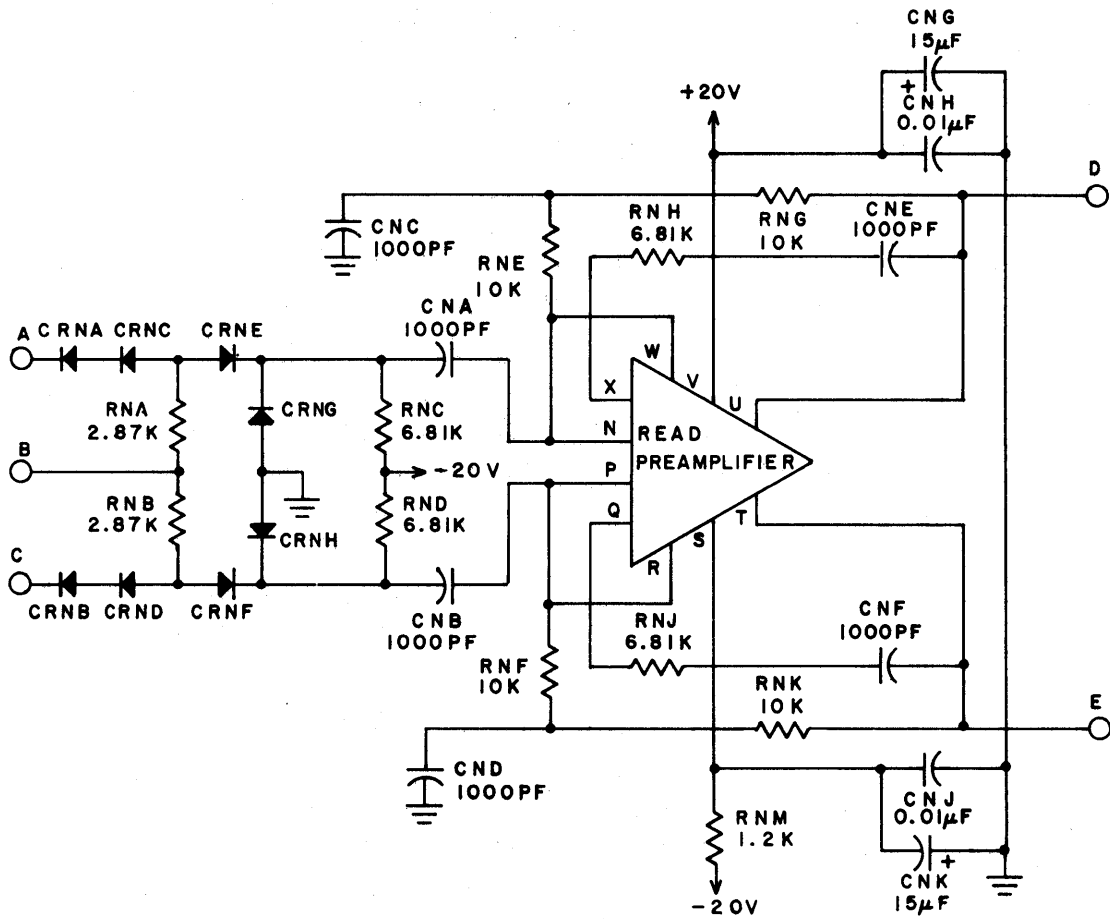
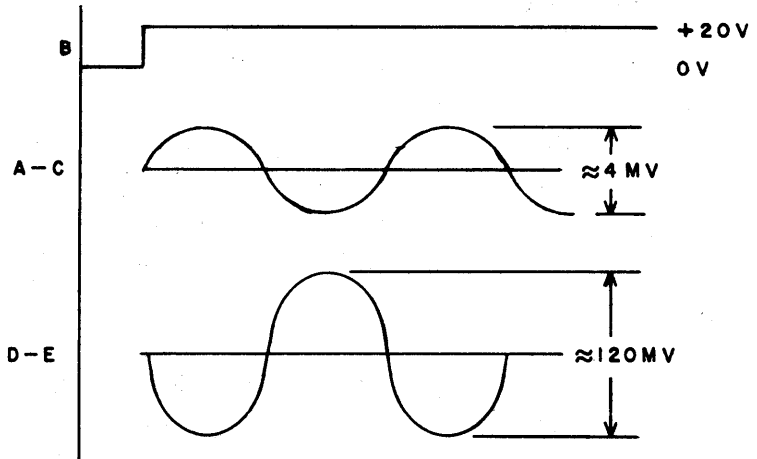
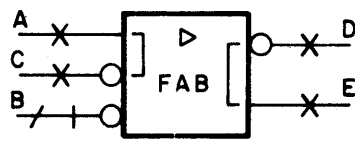
DC feedback is provided by RNG, RNE and CNC (to ground) in the upper half and RNK, RNF and CND (to ground) in the lower half of the circuit. This feedback helps to stabilize the output.

Capacitors CNG, CNH and CNJ, and CNK filter noise from the +20v and -20v power supplies, respectively. The electrolytic capacitors filter low frequency noise. The paper capacitors filter high frequency noise.

Open loop gain in the amplifier is approximately 180. Closed loop gain in the amplifier is approximately 30.

### Current Amplifier - FAD

The FAD circuit (Figure 7-7) provides a voltage drop from A to C of either 0.5 or 5.0 volts which is selected with a "1" or a "0", respectively, at B. A "1" at B turns transistor QNA on. This provides base drive through RNC to QNB which turns on. The output at C is now the same as the input at A except for the emitter-collector drop (0.5v) across QNB. With input B at ground, "0", QNA is off and base drive to QNB is provided through the 4.7-volt Zener diode, CRNC. The voltage drop from A to C is  $V_{be}$  plus  $V_z$ . Resistor RND improves circuit operation by increasing the Zener current.

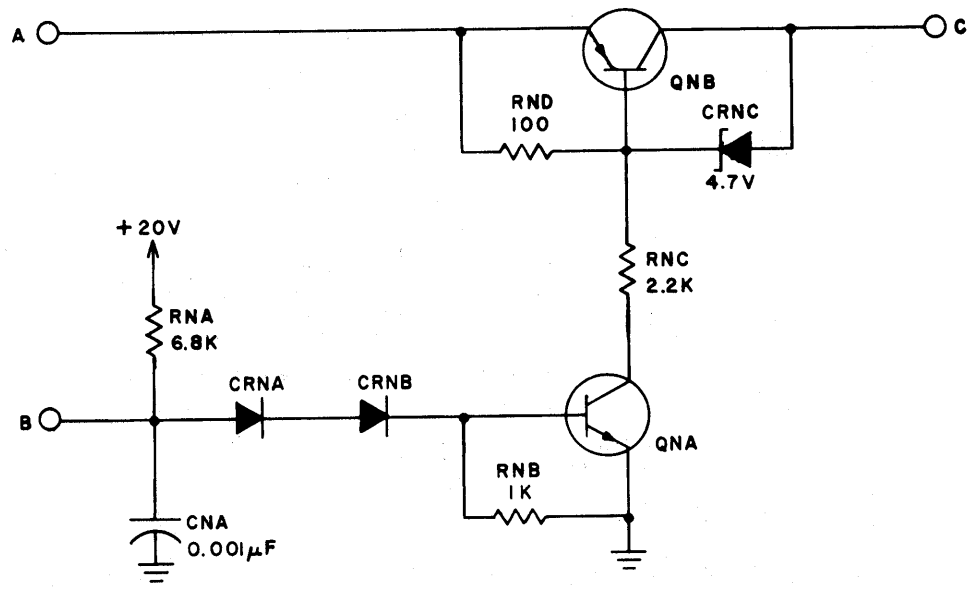
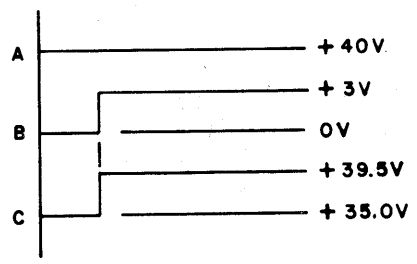
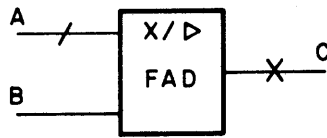


NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

8T100

Figure 7-6. Gated Amplifier - FAB





6T101

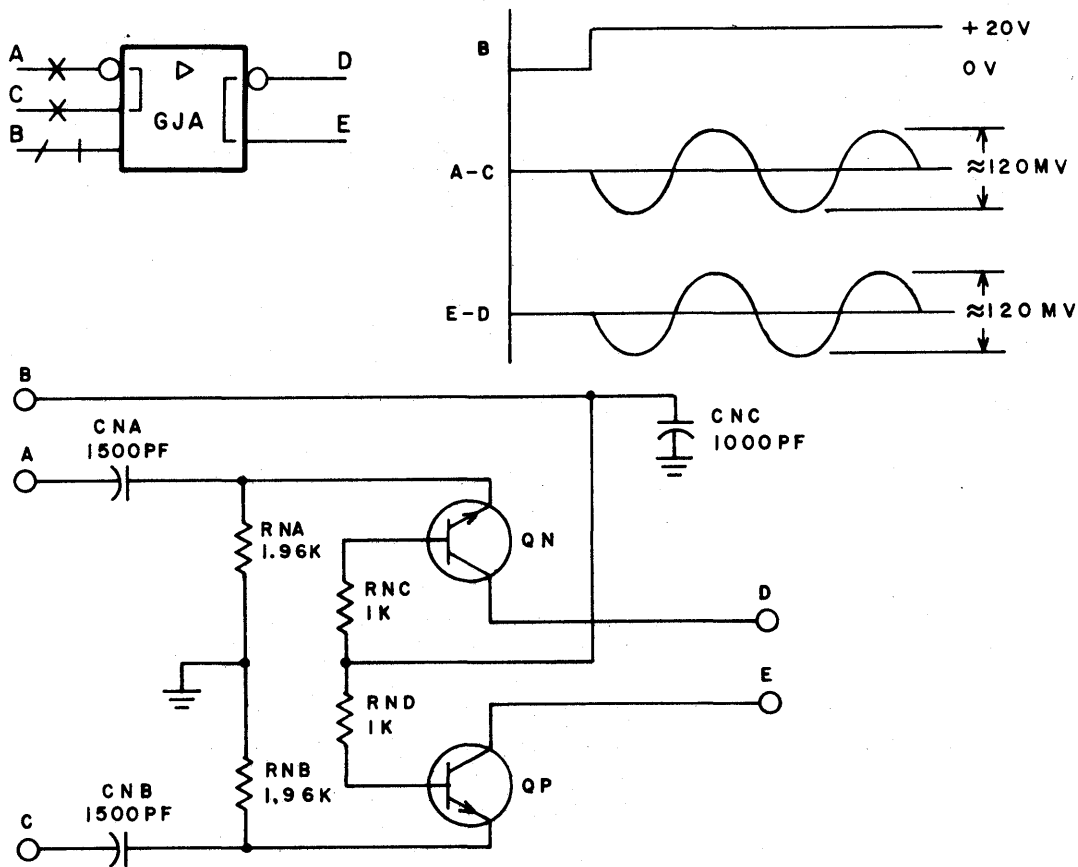
NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

Figure 7-7. Current Amplifier - FAD

Gated Intermediate Level Amplifier - GJA

The GJA circuit (Figure 7-8) is an analog gate that is controlled by input B. When input B is +20v, both transistors are on. All analog signals pass through the circuit. Capacitors CNA and CNB ensure that only analog signals are passed. CNC filters noise spikes from the gating signal. Dc power for the transistors is supplied by the circuit in the next stage.

When input B is +0.2v, both transistors are off. No signals pass through the circuit.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

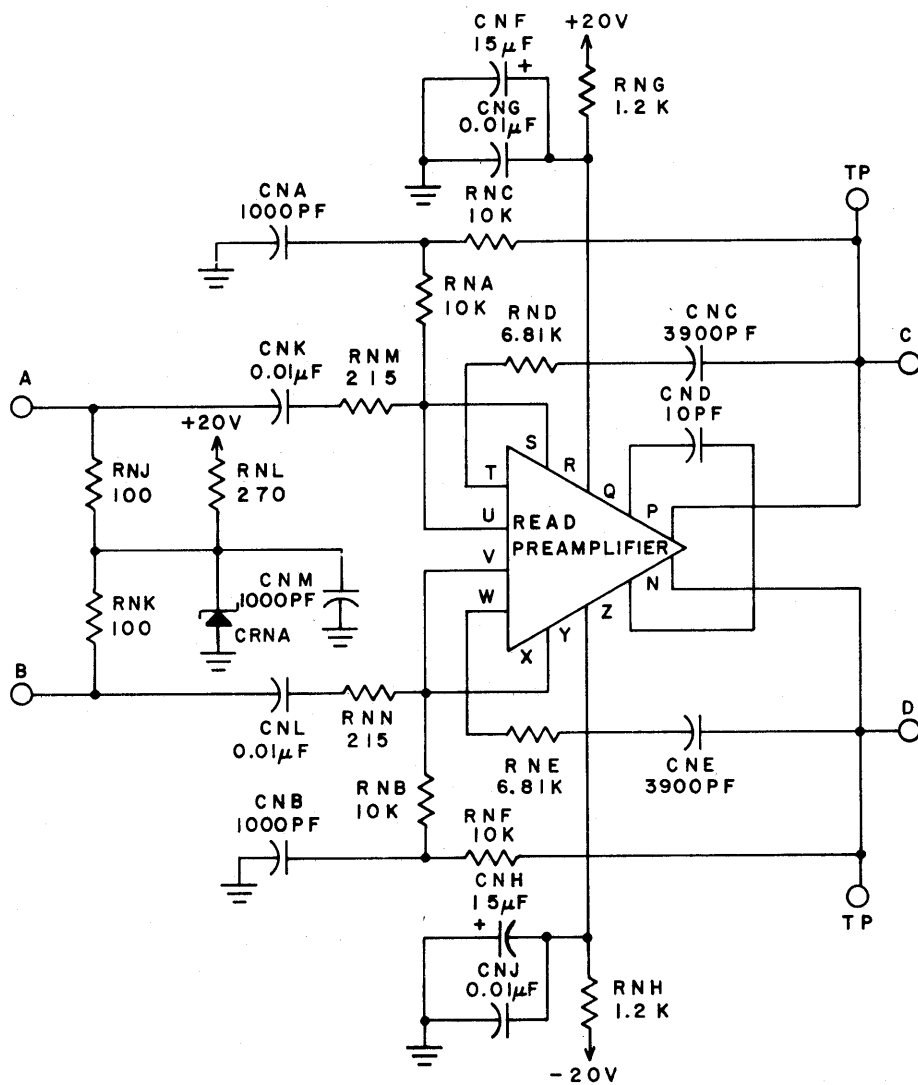
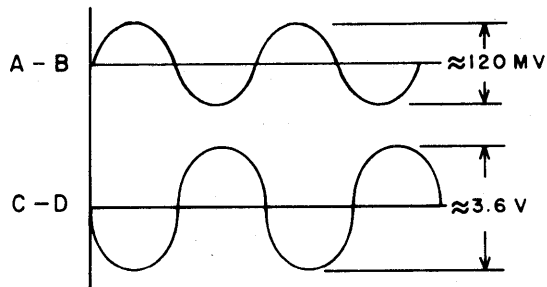
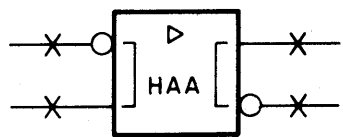
6T102

Figure 7-8. Gated Intermediate Level Amplifier - GJA

### High Level Amplifier - HAA

The HAA circuit (Figure 7-9) is gated by an analog gate circuit (GJA) and provides the load and biasing for that circuit.

The preamplifier, ac feedback and dc feedback are identical to the FAB circuit. Capacitor CND is added to the output of the second stage to decouple high frequency noise.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

6T103

Figure 7-9. High Level Amplifier - HAA

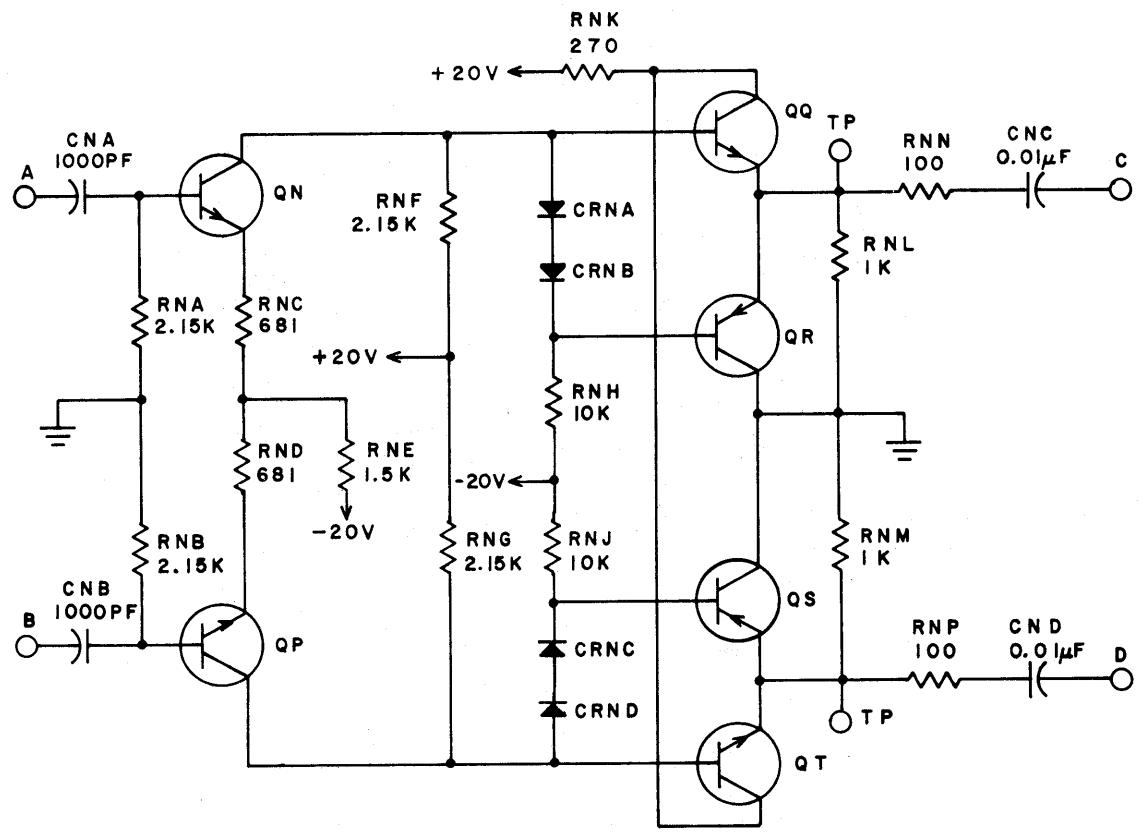
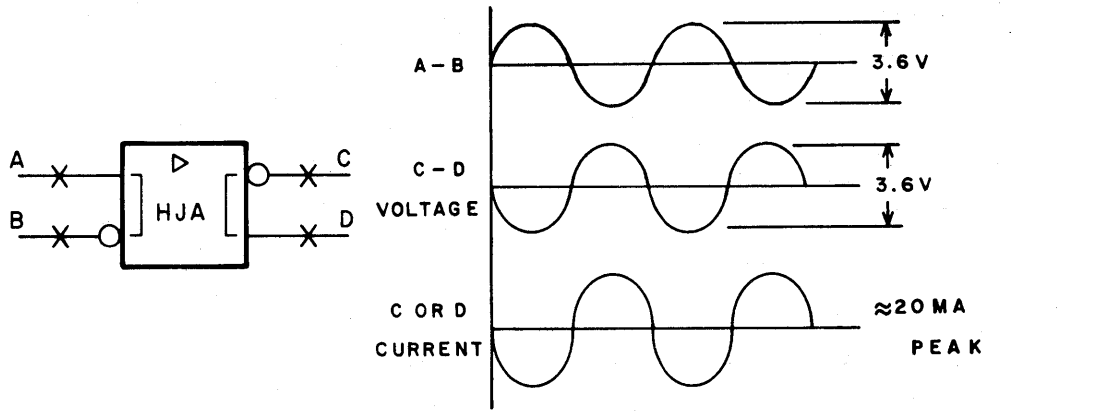
### High Level Amplifier - HJA

The HJA circuit (Figure 7-10) increases the input signal power to transmit over a coaxial cable. The input is a differential signal of approximately 3.6v peak to peak.

The input signal across A and B is divided between resistors RNA and RNB. Transistors QN and QP are forward biased with a gain of 3. The -20v through resistor RNH and diodes CRNA and CRNB and through resistor RNJ and diodes CRNC and CRND forward biases QQ and QT, respectively. Transistors QQ and QT are in a common collector configuration to provide a current gain.

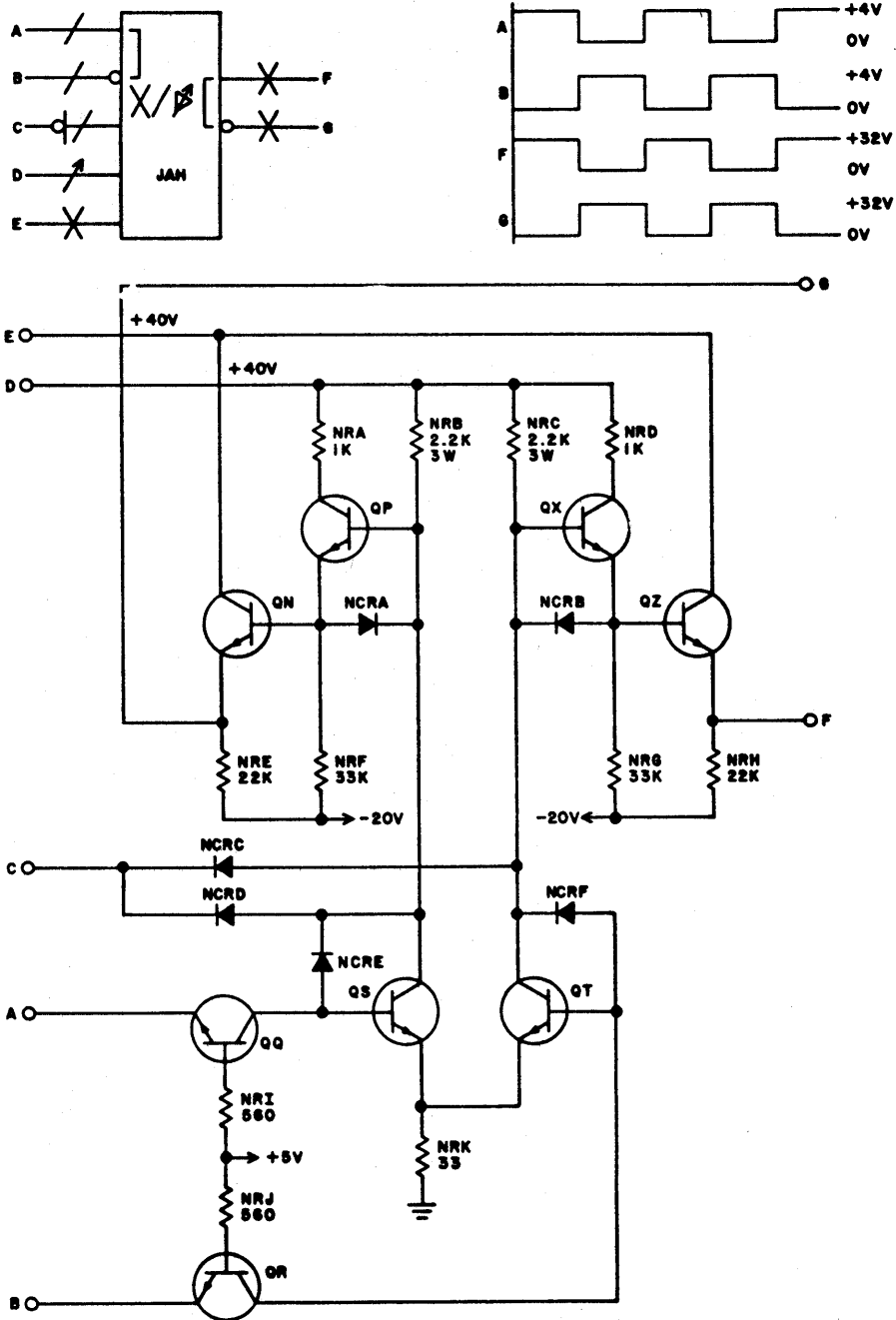
Transistors QR and QS are emitter followers that draw very little current from QQ and QT. They provide low impedance for discharging CNC and CND, thus reducing delay time when crossing the zero volt point.

Output voltage is approximately the same as input voltage. Output current is 20 ma maximum.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.  
 6T105

Figure 7-10. High Level Amplifier - HJA



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

7K35

Figure 7-11. Write Driver - JAH

## Write Driver - JAH

The JAH circuit is a symmetrical driver that amplifies the write signal for recording on the disk. Points A and B are inputs to the driver. Points F and G are outputs. Point C is the write gate input. Points D and E go to +40 vdc switched through an external resistor.

Transistors QQ and QR connect to a toggle FF as an interface to the driver transistor QS and QT. With the input at A high (+4 vdc), QQ is reverse biased, base to emitter. Current flows from base to collector and turns on QS. At the same time, input B is low (ground) which turns QR on. This puts a ground at the base of QT, holding it off.

Transistors QN and QP are a darlington pair with the drive for QN coming from QP. When QS is on, QN is off because the base of QP is pulled to ground by QS. QZ, QX, and QT work in the same manner.

Diodes NCRA and NCRB speed up the turn off of QN and QZ by removing the base-emitter charge.

Diodes NCRC and NCRD are gating diodes that put a clamp to ground at the base of QP and QX when a ground is placed at point C.

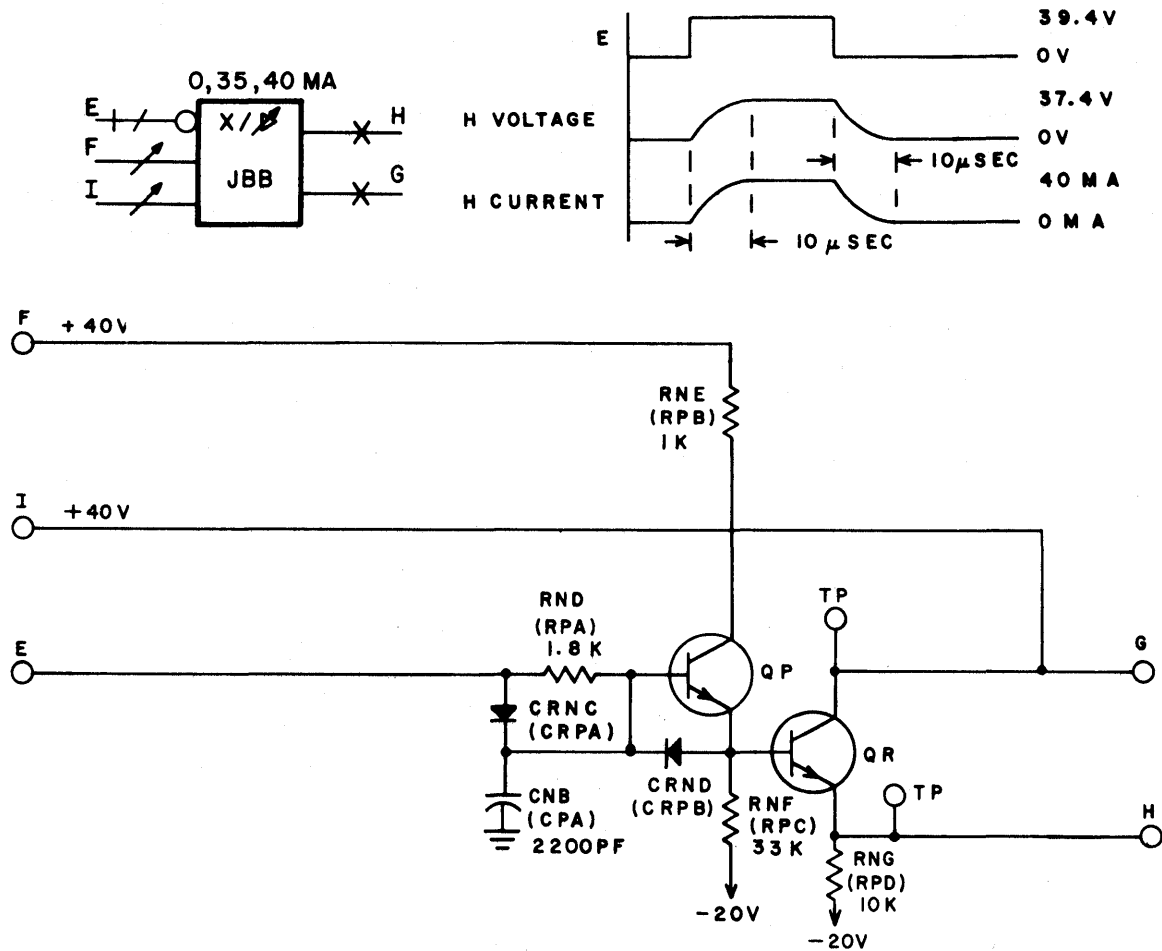
Diodes NCRE and NCRF are antisaturation diodes that keep transistors QS and QT from saturation.

## Erase Driver - JBB

The JBB circuit controls the current driving the erase heads. When input E (Figure 7-12) is a high voltage, output H provides current to erase heads.

When input E goes to a high voltage, capacitor CPA charges, causing a 10-usec delay before transistors QR and QP turn on completely. Output G is connected to a +40v supply in a fault detect circuit. When QR is on, current flows from G through QR to the erase head connected to output H. The ramp output protects the information on neighboring tracks from being destroyed.

When E drops to 0v, CPA discharges through RPA. After 10 usec, QP and QR are off. Output H is at 0v.



NOTES:

- VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

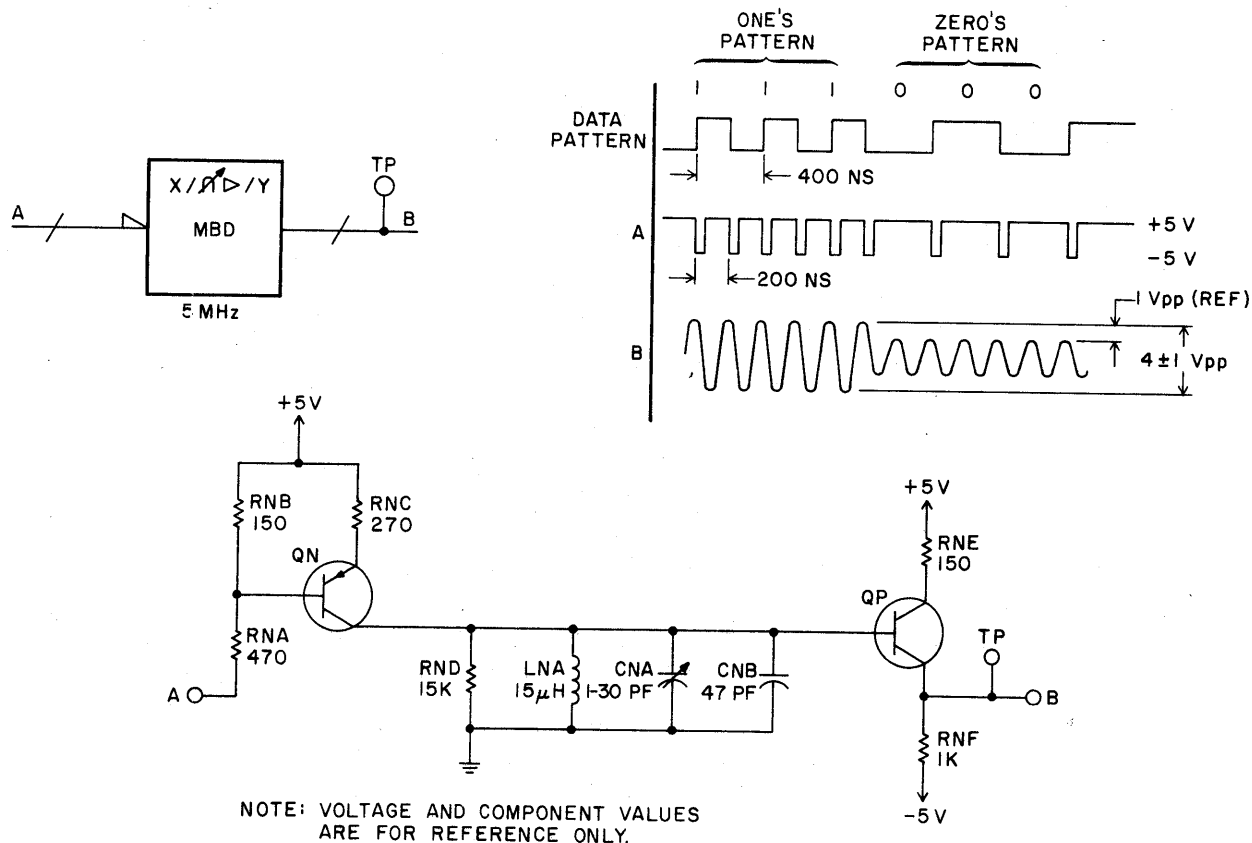
6T107

Figure 7-12. Erase Driver - JBB

Ringing Amplifier - MBD

The MBD circuit is a tuned amplifier which rings at twice the frequency of the "1's" data in the double frequency pattern. The "1's" data occurs at 2.5 MHz, therefore, the ringing amplifier is tuned to 5 MHz. Energy to ring the amplifier is received at each transition of the data pattern. For a "1's" pattern the ringing amplifier is reinforced once each cycle. For a "0's" pattern every other cycle is reinforced with a current pulse through transistor QP.



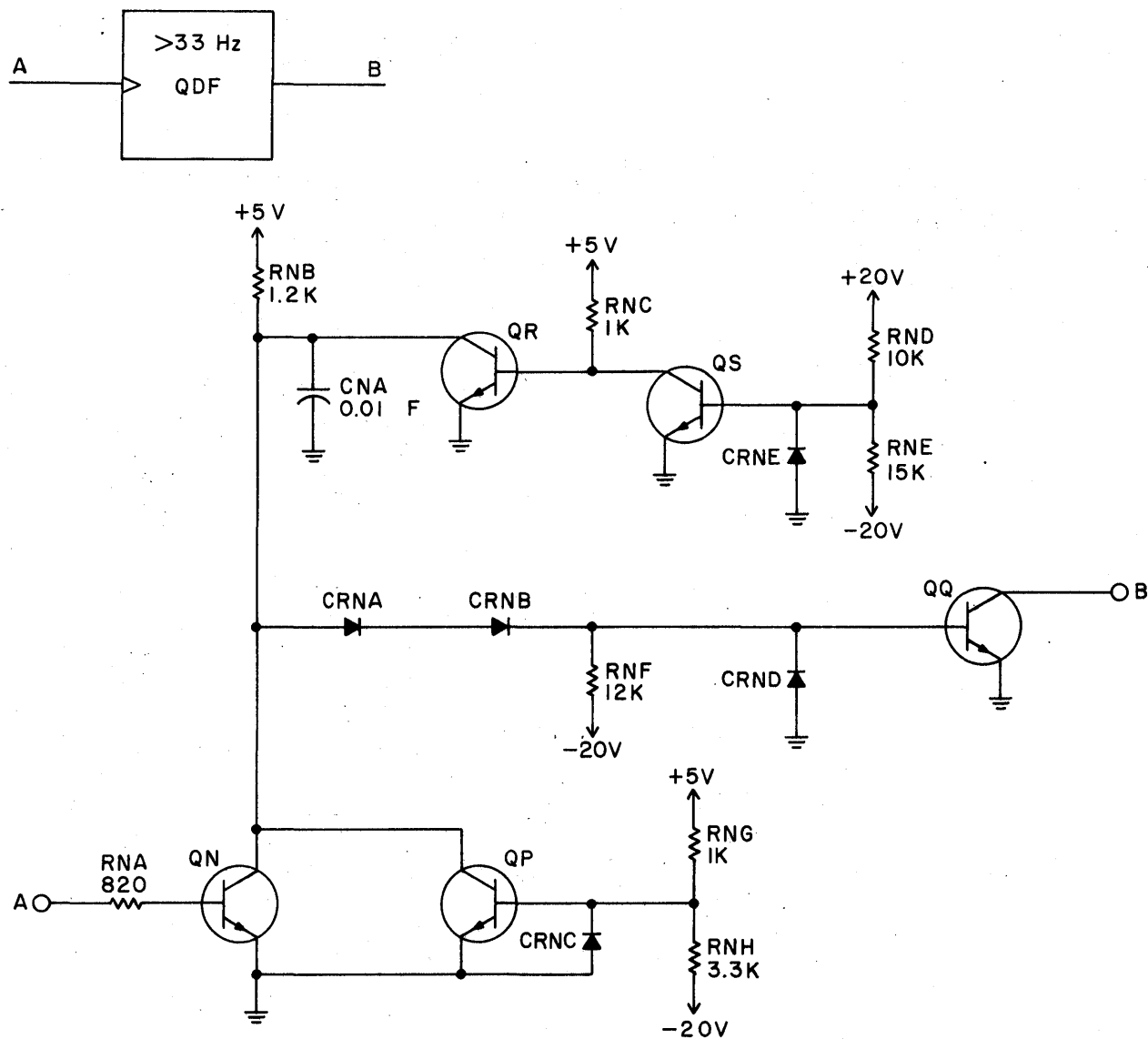


8N9

Figure 7-13. Ringing Amplifier - MBD

The tuned circuit consists of LNA, CNA and CNB. CNA is tuned to 5 MHz. RND lowers the Q of the tuned amplifier to make it less susceptible to frequency changes of the data. The inertia of the tuned circuit does not permit it to respond to small shifts in the data edges (peak shift), consequently the clock pulses reconstructed from the output of the ringing amplifier have approximately 1/3 of the peak shift present at the input.

Transistor QN is an emitter follower necessary to buffer the tuned circuit.



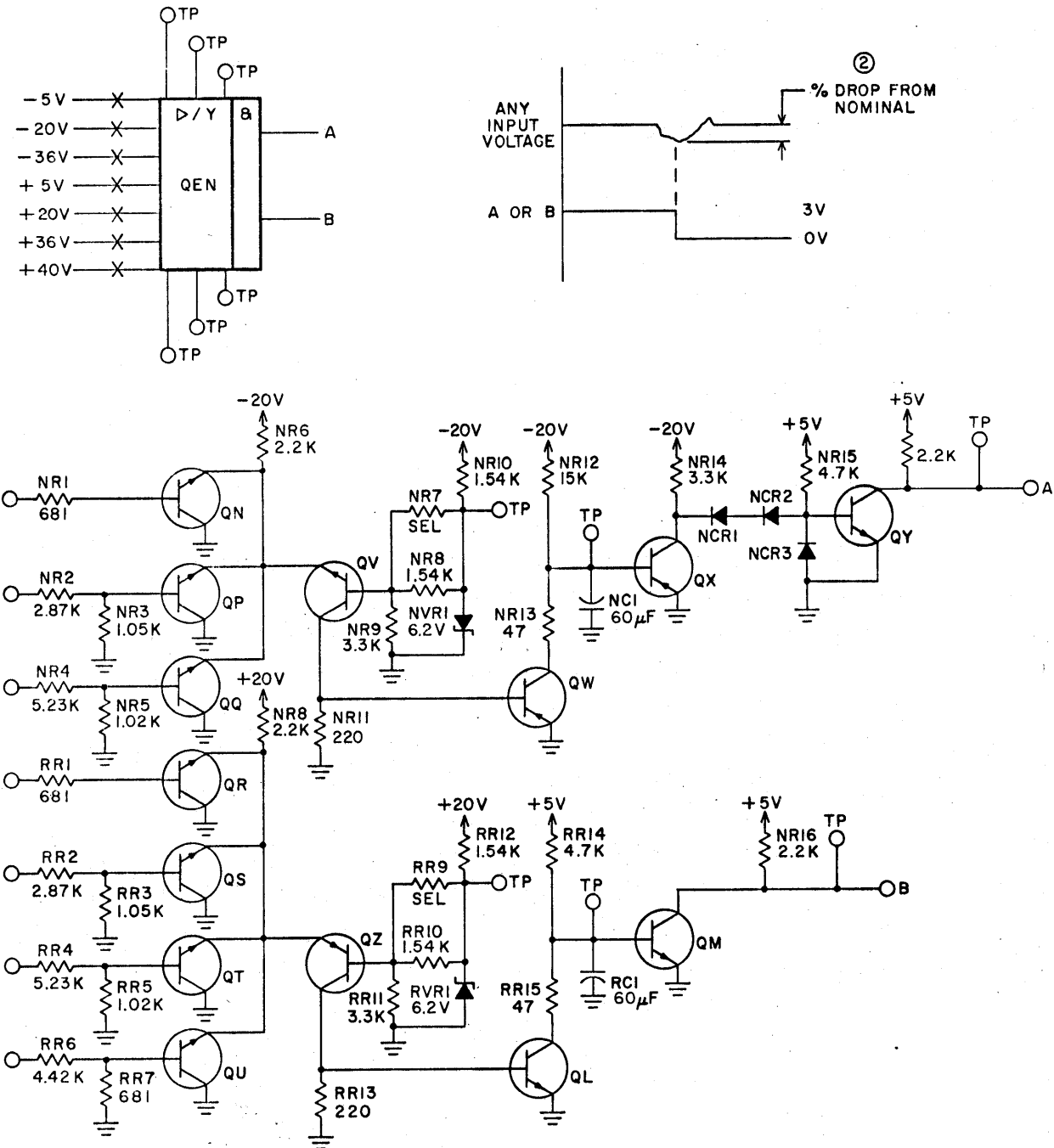
NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

8N10

Figure 7-14. Relay Puller - QDF

Relay Puller - QDF

The QDF circuit energizes the speed relay when voltage and speed conditions are met. The input at A must be at ground, indicating that the spindle is up to speed. Resistors RNG and RNH bias the base of QP negative to -20v, turning QP off. Resistors RND and RNE bias the base of QS positive to +20v. With QS turned on, it holds the base of QR at ground. Transistor QR is then turned off allowing RNB (QN, QP and QR common collector resistor) to rise toward +5v. CRNA and CRNB are then forward biased and pull the base of QQ positive. Transistor QQ turns on and pulls its collector to ground. This ground energizes the speed relay.



NOTES:

- 1. VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.
- ② 5% DECREASE FROM NOMINAL ± 5V, 10% DECREASE FROM NOMINAL ± 20V OR +40V, OR 20% DECREASE FROM NOMINAL ± 36V.

8N11

Figure 7-15. Voltage Checker - QEN

### Voltage Checker - QEN

The QEN circuit (Figure 7-15) detects any decrease in voltage supply greater than a specified percentage. A fault condition will occur at point A for a negative voltage fault and at point B for a positive voltage fault if:

1. -20 supply decreases below -18v
2. +20 supply decreases below +18v
3. +40v supply decreases below +36v
4. -36v supply decreases below -28.8v
5. +36v supply decreases below +28.8v
6. -5v supply decreases below -4.75v
7. +5v supply decreases below +4.75v

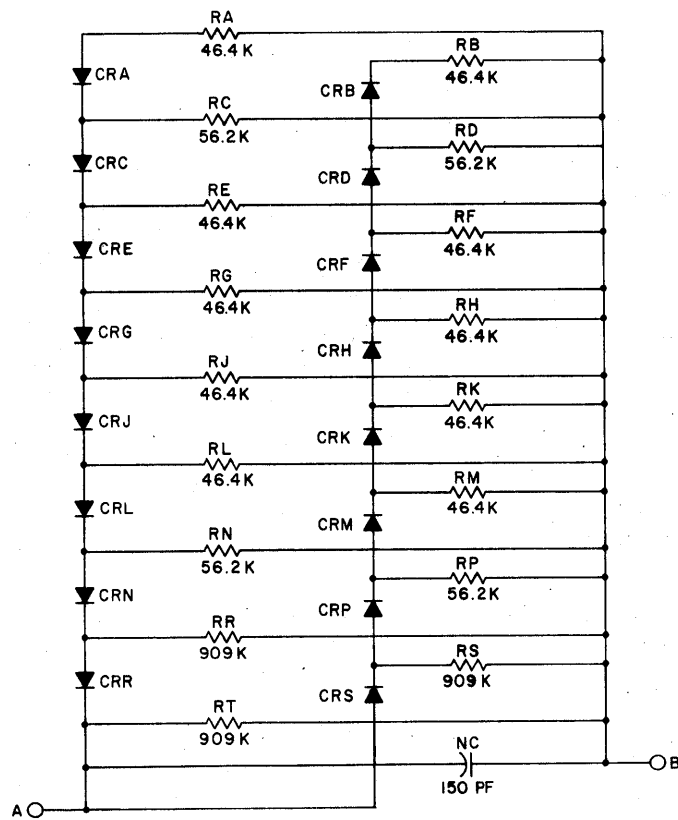
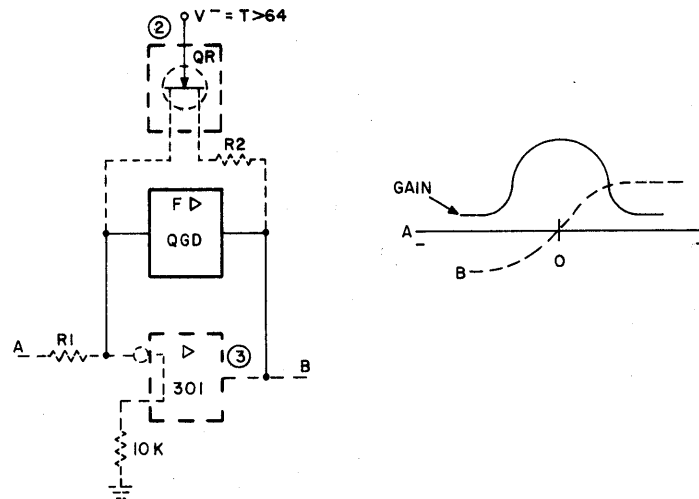
If all positive supplies are normal, QR, QS, QT, and QU are off. Their emitters are held at +6.2v by Zener diode RVR1 and the value of RR9 (determined by testing to give a precise collector voltage). Current is pulled through QZ, causing a voltage drop across resistor RR13. This voltage drop turns QL on. Transistor QM turns off. If any of the voltage supplies drop below the specified percentage of their operating values, the respective transistor turns on. Transistor QZ will then be off. Transistor QL turns off. Transistor QM turns on, driving the output to ground.

The negative voltage segment of the circuit is similar to the positive section. A decrease in the -20v supply below -18v will turn QP on. Transistor QV turns off, causing QW to turn off. Transistor QX turns on causing a voltage drop across NR14 which turns QY on. The output drops to ground.

### Function Generator - QGD

The QGD circuit (Figure 7-16) is a non linear feedback network used as the gain determining element for an operational amplifier.

With a 10K input resistor, an amplifier with the QGD circuit will exhibit high gain characteristics for amplifier output voltages of less than  $\pm 2$  volts. A gain of unity is achieved at output voltages  $\pm 5$  volts with this gain persisting at higher voltages.



- NOTES: 1 VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.  
 ② PART OF GJB CIRCUIT (REF ONLY), NEG INPUT TURNS QR OFF.  
 ③ SHOWN FOR REFERENCE ONLY.

6T139A

Figure 7-16. Function Generator - QGD

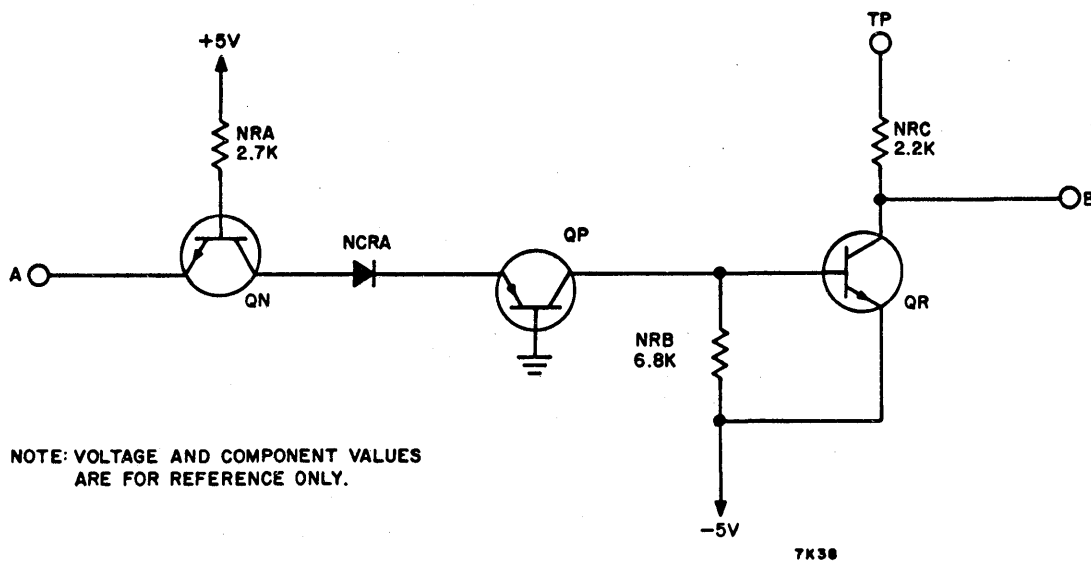
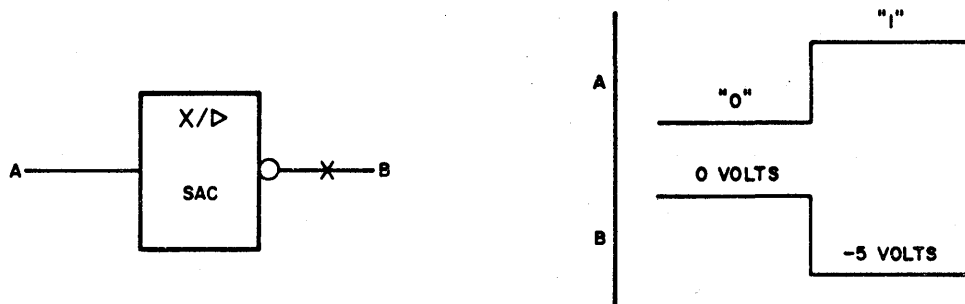


Figure 7-17. Fwd EOT Clamp - SAC

Fwd EOT Clamp - SAC

The SAC Circuit (Figure 7-17) is a TTL level operated current sink. The circuit sinks current from the position transducer demodulator circuit to prevent erroneous FWD EOT signals from appearing.

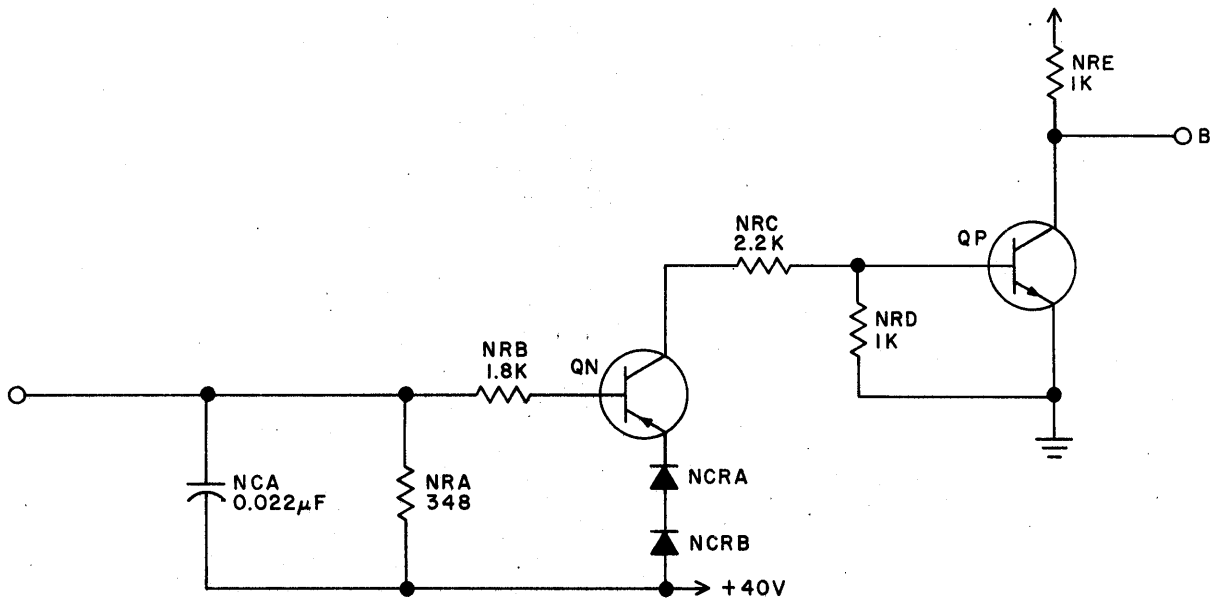
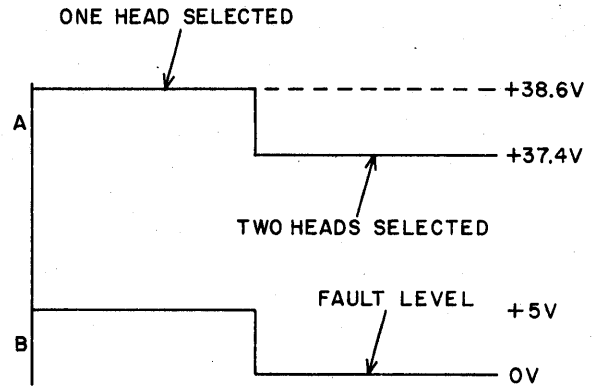
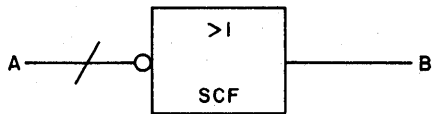
## Multiple Head Select Detector - SCF

The SCF circuit indicates +5 vdc at output B when no more than one head is selected. If two or more heads are selected, output B is 0 vdc.

Capacitor NCA filters transient voltages preventing a false indication of more than one head selected. Diodes NCRA and NCRB provide a voltage bias on the emitter of QN. Resistors NRA and NRB are a voltage divider network.

Input A is fed by all heads, each through 10K of resistance. When one head is selected, only one 10K resistor goes to ground through a head select transistor. The current flow through NRA will not cause sufficient voltage drop across NRB to forward bias QN.

When two or more heads are selected, two or more 10K resistors are switched to ground. This causes increased current through NRA. The voltage drop across NRB then decreases enough to forward bias QN. QN turns on, passing collector current through NRC into the base of QP. QP turns on, bringing output C from +5 vdc to 0 vdc.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

7K30

Figure 7-18. Multiple Head Select Detector - SCF



## Delay - UB

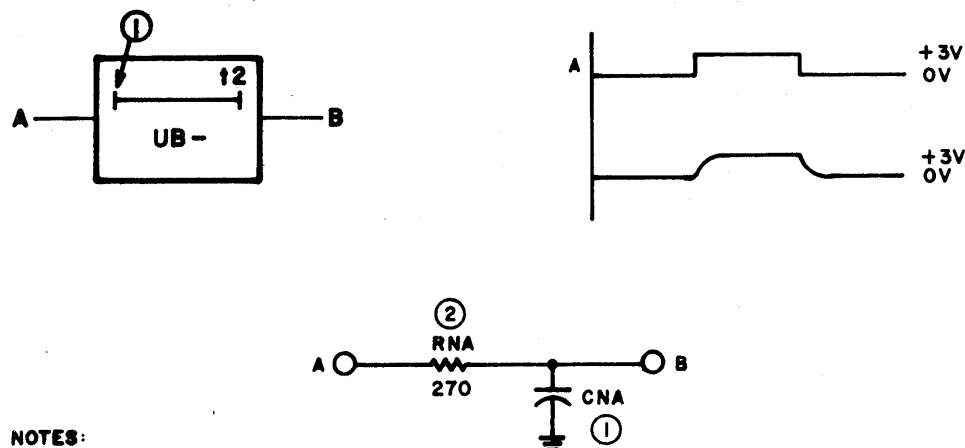
The capacitor delay circuits (**Figure 7-19**) delay a "1" input at A for a specified period of time before providing a "1" output at B. Delay time for a "0" pulse is negligible.

Assume a "0", ground, enters at A. If the capacitor is discharged, it remains discharged and the output remains "0". If the capacitor is charged when the "0" signal appears, the capacitor discharges almost instantaneously, and the "0" appears with no noticeable delay.

If a "1", +3 volts, enters A while the capacitor is discharged, the capacitor must first charge to a minimum "1" voltage before a "1" can appear at B. The required charge time is the delay time of the circuit. The charge time is dependent on the capacitor value, the resistance between the source voltage and the capacitor, and the minimum voltage required to produce a "1" output.

Delay times for capacitive delays used in the DSU are as follows:

Delay type	Time
UBD	200 nsec
UBE	0.5 ms
UBF	0.2 ms

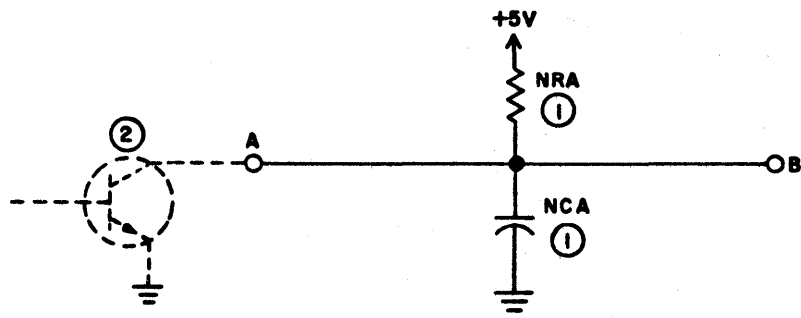
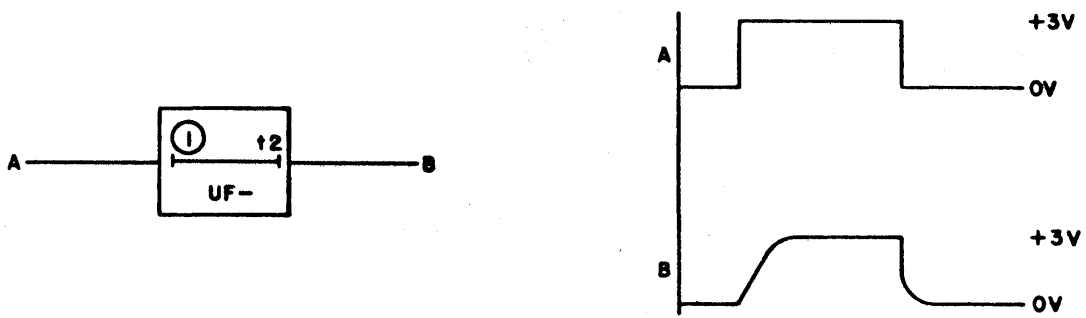


NOTES:

- ① VARIES WITH TYPE
- ② NOT USED ON UBF

6T155

Figure 7-19. Delay - UB



- NOTES: ① VALUE DEPENDENT ON CIRCUIT TYPE  
 ② OPEN COLLECTOR TRANSISTOR IN PRECEDING STAGE

7K36

Figure 7-20. Delay - UF -

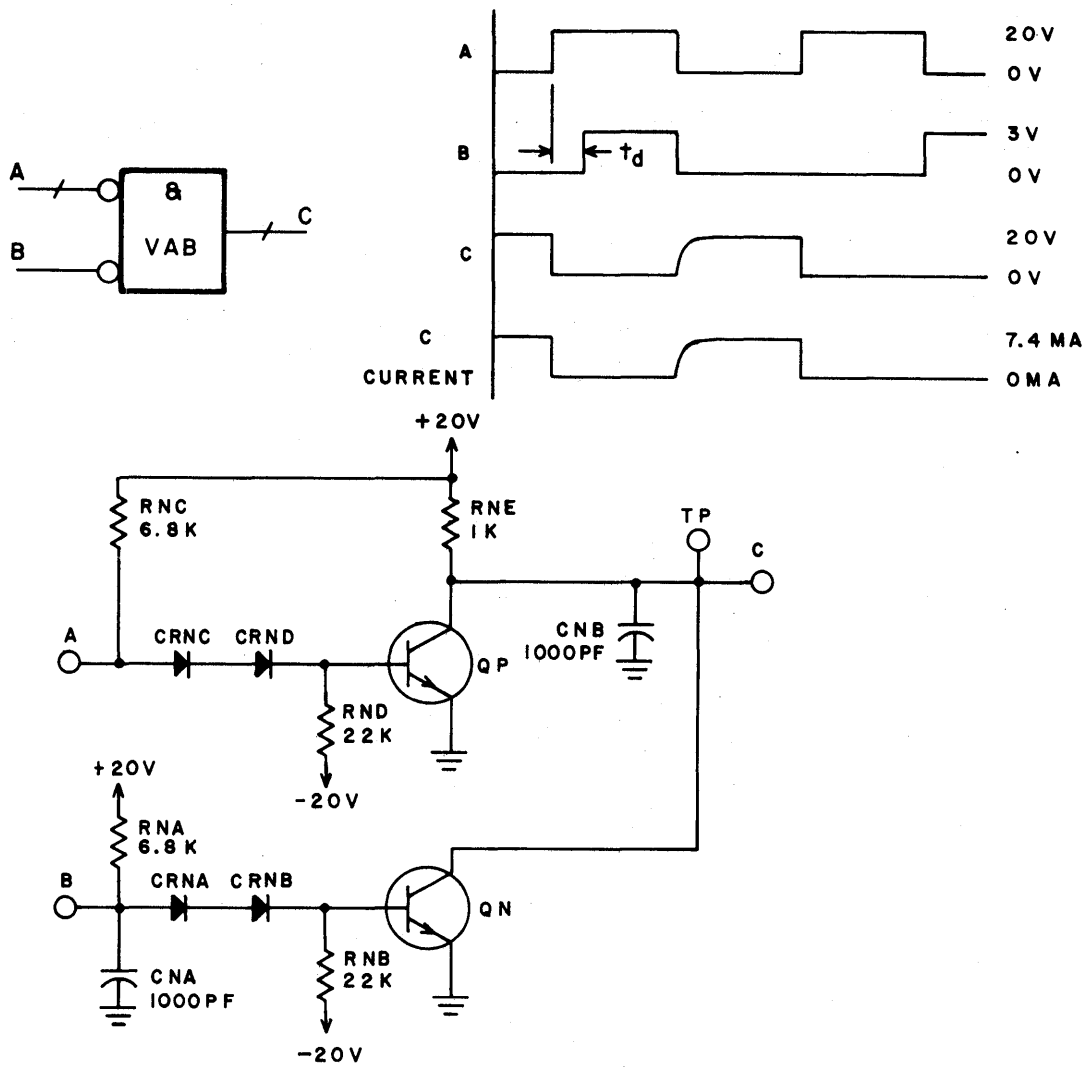
Delay - UF-

The UF- delay circuit is used to delay open collector integrated circuits. The circuit delays a "1" input before providing a "1" output at B. The delay time for a "0" pulse is negligible. The delay circuit consists of a resistor connected to +5v and a capacitor connected to ground.

Assume that a "0" (ground) enters at A. If the capacitor is discharged, it remains discharged. The output is an immediate "0". If the capacitor is charged when the "0" signal enters, it discharges almost instantaneously. The "0" appears at output B with no noticeable delay.

If a "1" (+3.0v) enters at A, and the capacitor is discharged, the capacitor must first charge to a minimum "1" voltage (typically +0.7v) before the "1" appears at output B. The time necessary to charge the capacitor to this minimum voltage is the delay time of the circuit. The charge time is dependent on the value of the capacitor, the value of the resistor, and the minimum voltage required to produce a "1" response.

Delay Type	Time
UFA	1.3 $\mu$ sec
UFB	0.5 $\mu$ sec
UFC	0.2 $\mu$ sec
UFD	6.0 $\mu$ sec



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

6T117

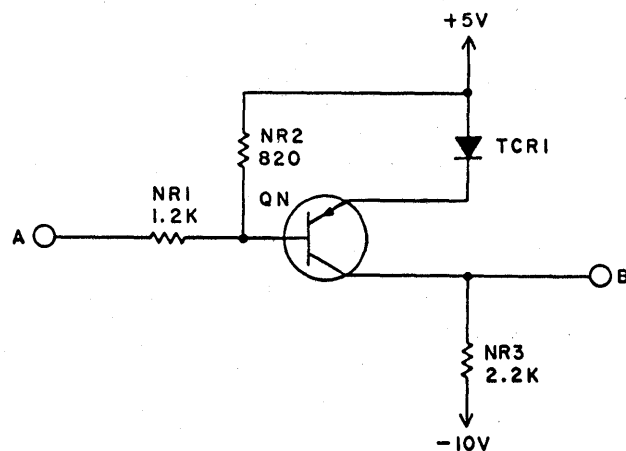
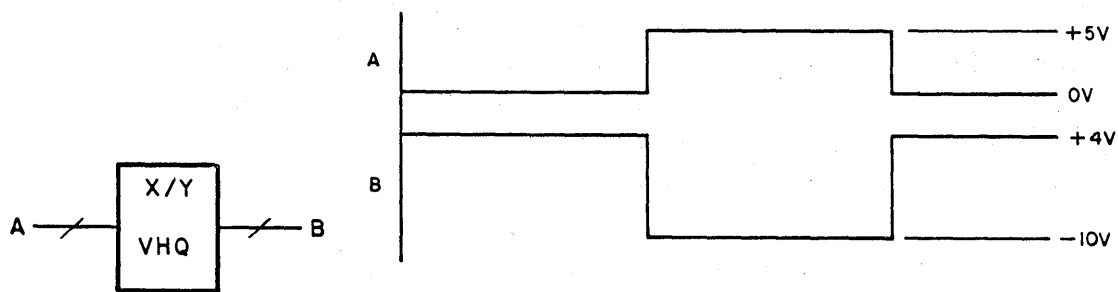
Figure 7-21. And - VAB

### And - VAB

The VAB circuit (Figure 7-21) consists of two silicon peripheral logic inverters whose outputs share a common load resistor, RNE. When both inputs A and B are "0" (ground), the output at C will be a "1" (+3v). If either or both of the inputs are a "1", the output at C will be a "0". This is an AND gate for zeroes, or a NAND function.

When both A and B are at ground, QN and QP are off. The output at C is supplied from the +20v source through RNE. The output is a positive voltage, representing a non-logical "1". If input A experiences a positive voltage while B is at ground, QP turns on and conducts current from the +20v supply through RNE to ground. The "0" on B has no effect, as all the supply voltage is tapped to ground. The output at C is ground, or a "0". The situation is similar if A is "0" and B is "1". The output is "0". If both A and B have positive voltage applied to them, QN and QP both conduct. The output is "0".

Capacitors CNA and CNB provide a one's delay on input B and output C, respectively. They also maintain a noise barrier to isolate the circuit from stray pulses on the lines.



NOTE:  
VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY. 7J94

Figure 7-22. Level Translator - VHQ

### Level Translator - VHQ

The VHQ circuit translates digital signal levels of 0V and +5V to digital levels of +4V and -10V respectively.

A "0" (0V to +.5V) at input A causes QN to turn on and apply +5V minus  $V_{TCR1}$  or about +4 volts at output B.

A "1" (input open or +5 volts) at input A causes QN to turn off and output B goes to -10 volts through load resistor NR3.

An open collector IC or discrete transistor is used to provide the described input conditions at input A.

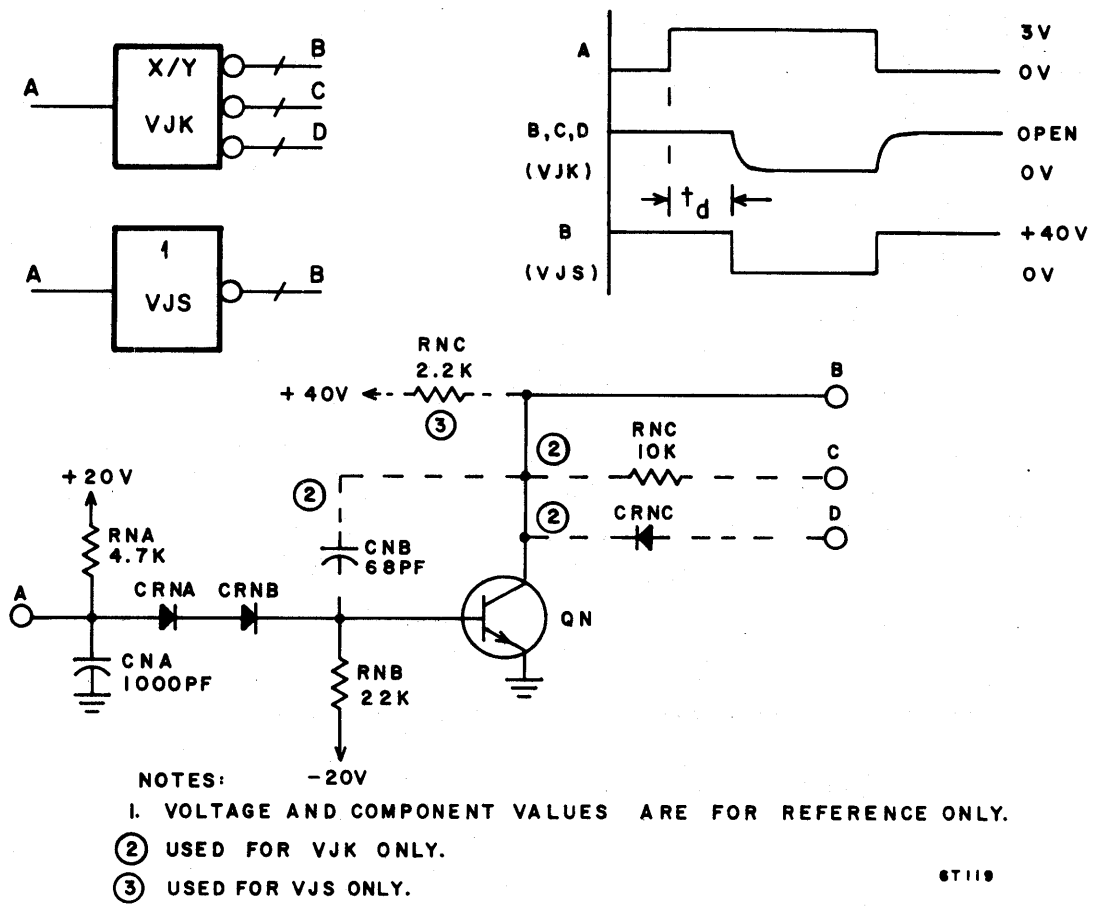
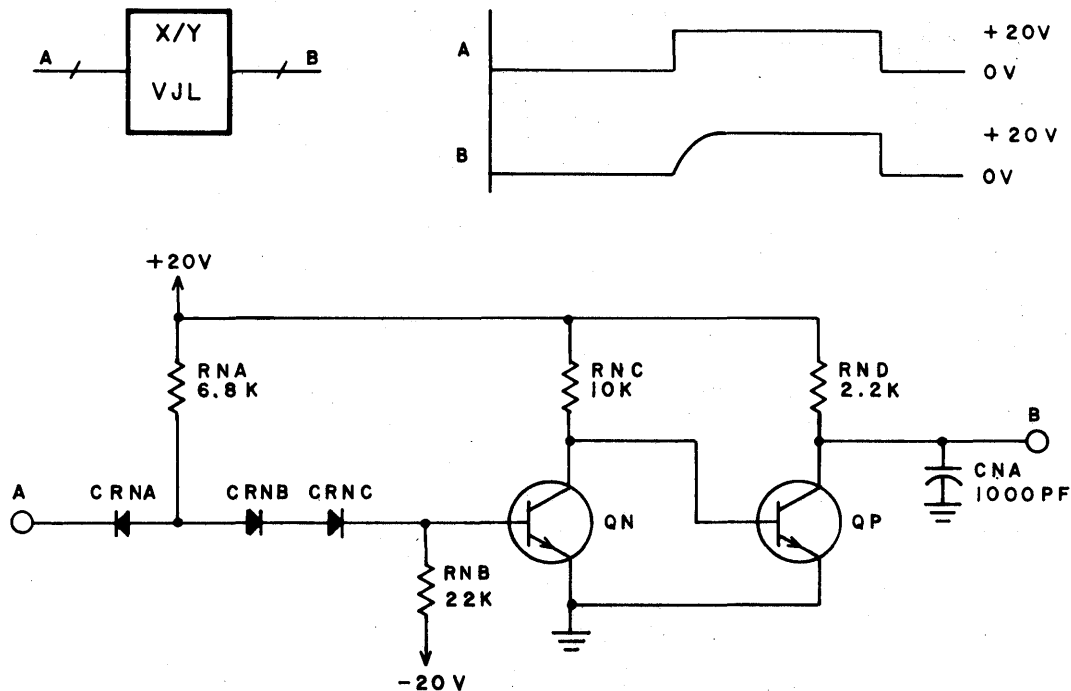


Figure 7-23. Power Driver - VJK, VJS

Power Driver - VJK

The VJK circuit (Figure 7-23) is similar to the VJS circuit with the addition of capacitor CNB and two outputs. CNB slows the switching time of QN and provides a ramp output. Output B connects to the center tap of the head. Output C contains a 10K resistor and is connected to a voltage supply in a fault detect circuit. If two heads are selected the effective resistance falls to 5K (two 10K resistors in parallel). The increase in current causes a Fault signal. Output D contains a diode that isolates each Write Gate.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

6T120

Figure 7-24. Power Driver - VJL

#### Power Driver - VJL

The VJL circuit (Figure 7-24) is a gate used to bias an analog gate.

If +20v appears at A, QN turns on. The base of QP goes to ground. Transistor QP is off. Capacitor CNA charges through RND to +20v. Output at B is a ramp to +20v.

A +0.2v signal at A turns QN off. When QP turns on, the collector voltage of QN clamps at +0.7v. CNA discharges rapidly through QP. Output B drops to ground.

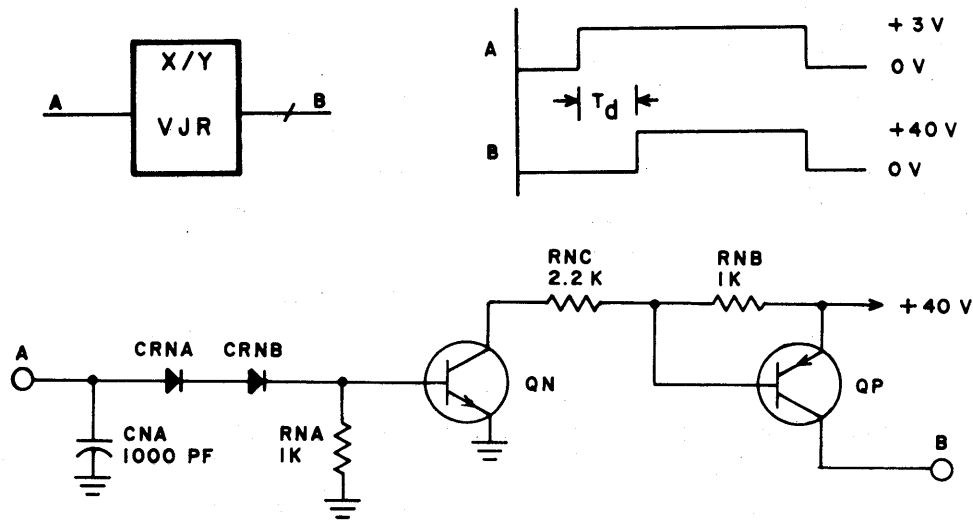


Power Driver - VJR

The VJR circuit (Figure 7-25) is a +40v switch. A "1" on input A produces +40v at output B. A "0" on input A stops current flow.

A "1" input turns QN on. Transistor QN conducts current from the +40v supply, causing a voltage drop across resistor RNB. This voltage drop turns on QP. Output B is at +40v.

A "0" input turns QN off. Since current no longer flows, the emitter and base of QP are at equal voltage. Transistor QP is off. Output B goes to ground.



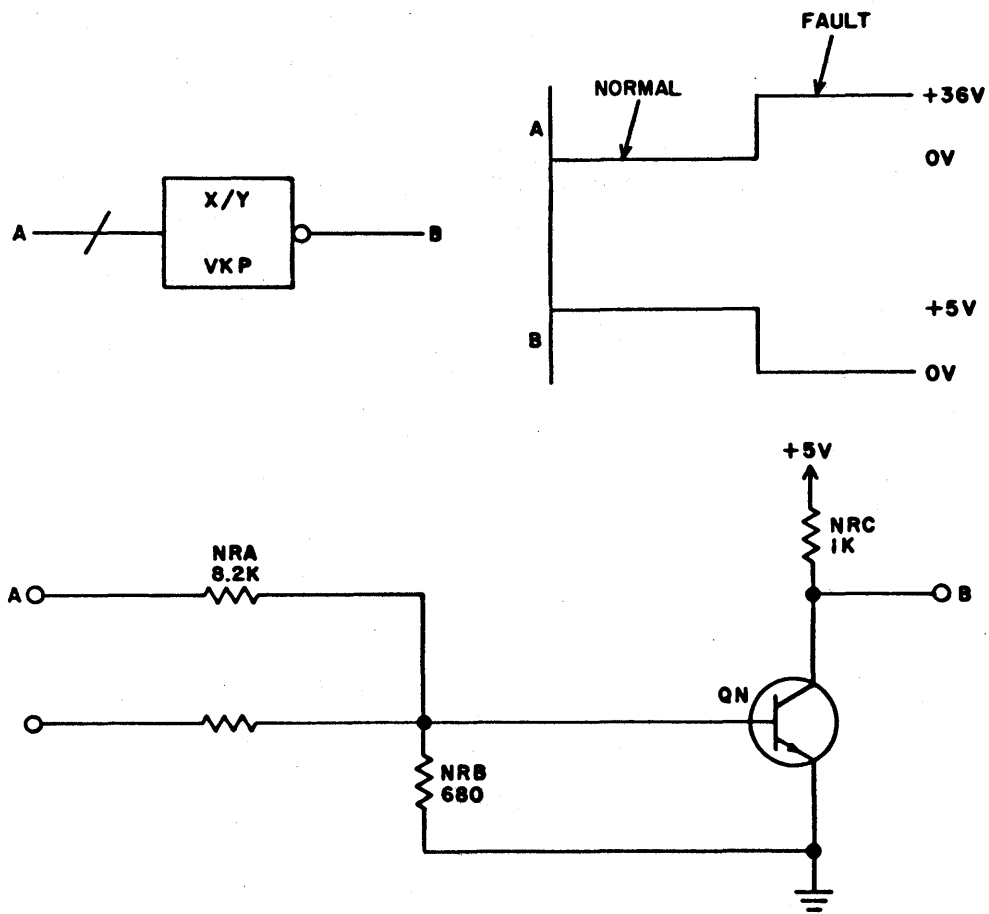
NOTE:  
VOLTAGE AND COMPONENT VALUES  
ARE FOR REFERENCE ONLY.

6T124

Figure 7-25. Power Driver - VJR

Or - VJS

The VJS circuit (Figure 7-23) is a standard inverter with a capacitor delay at the input. A "1" at input A pulls the output at B to ground. A "0" produces a +40v output.

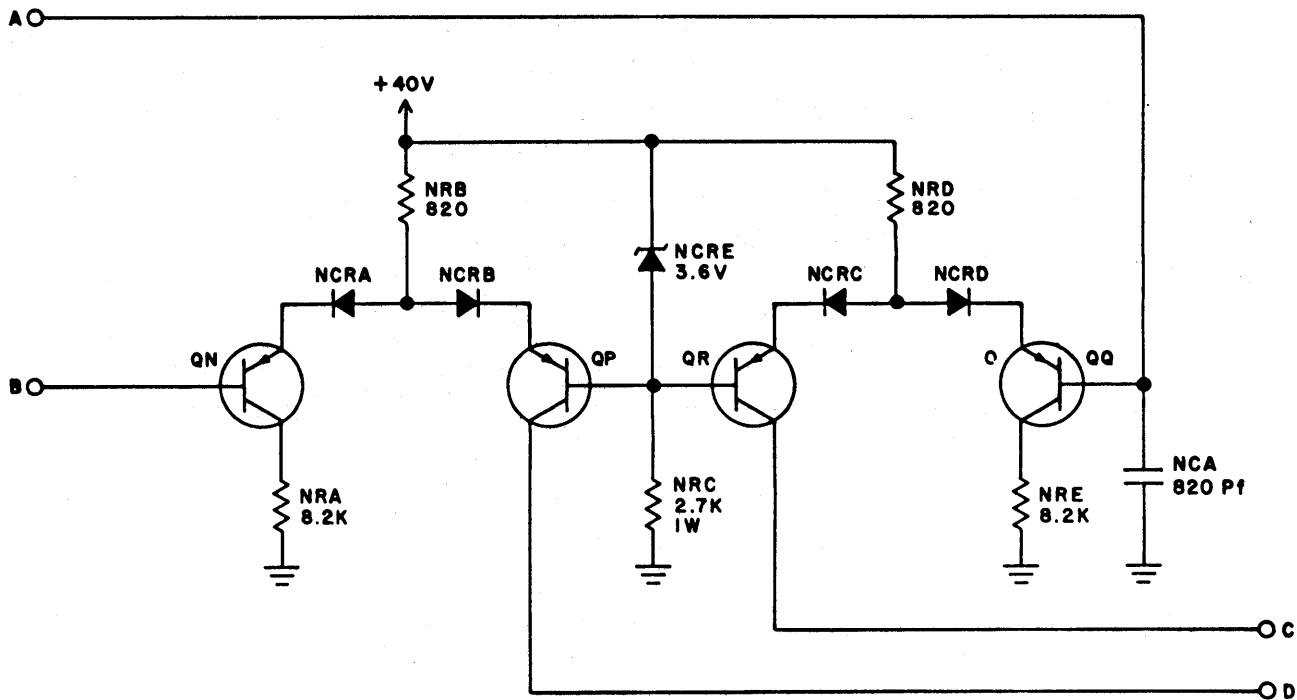
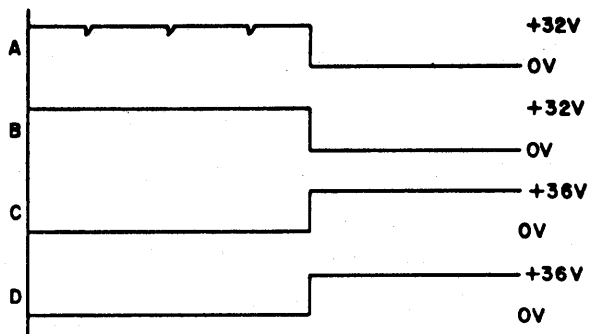
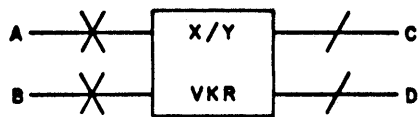


NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY. 7K32

Figure 7-26. Level Translator - VKP

Level Translator - VKP

The VKP circuit connects input A to the writer side of the DC Current Detector (VKR). It converts the non-standard input level to a standard TTL level at output C.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

7K31

Figure 7-27. DC Current Detector - VKR

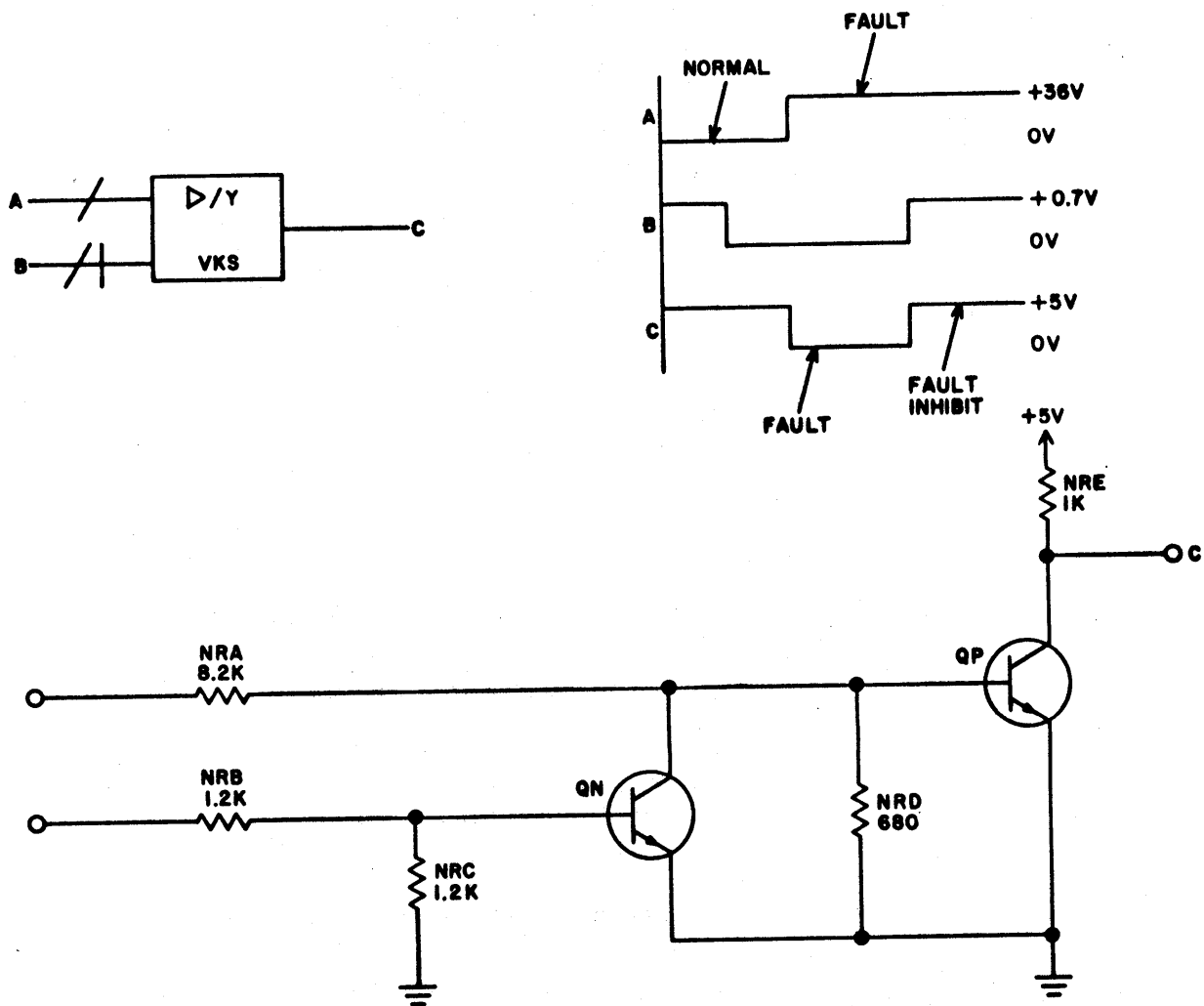
### DC Current Detector - VKR

The VKR circuit is made up of two comparator stages. The write current detection stage consists of transistors QR and QQ, resistors NRD and NRE, diodes NCRC and NCRD, and capacitor NCA. The erase current detection stage consists of transistors QN and QP, resistors NRA and NRB, and diodes NCRA and NCRB. A reference voltage for both stages is provided by zener diode NCRE and resistor NRC.

Input A comes from the write driver circuit where the two driver transistor collectors are common. With the write driver circuit operating properly, input A is less positive than the reference voltage, QQ is on, and QR is off. Hence output C is at 0 vdc.

As the write current drops, input A becomes more positive until QQ is turned off. This turning QR on, causing output C to go to +36 vdc. Capacitor NCA filters out switching transients.

Input B comes from the erase driver circuit. Output D is used for this comparator stage. Operation of the erase comparator is identical to the write comparator.



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY.

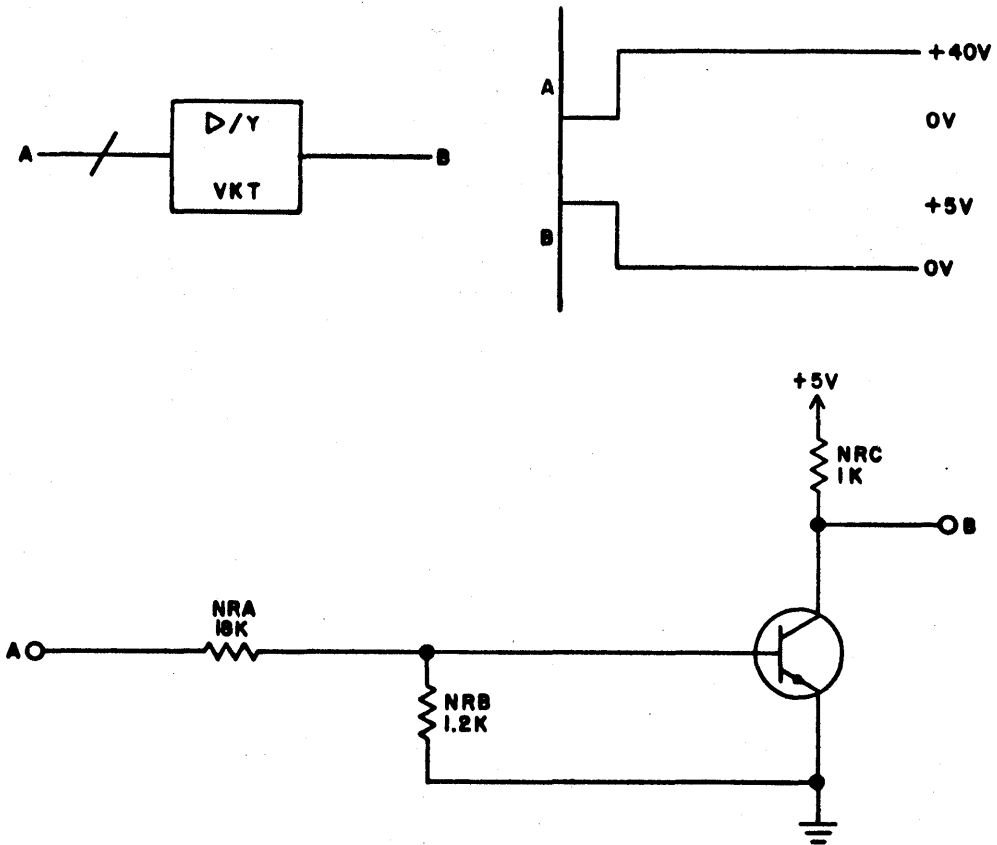
7K33

Figure 7-28. Gated Level Translator - VKS

### Gated Level Translator - VKS

The VKS circuit connects input A to the erase side of the DC Current Detector (VKR). It converts the non-standard input level to a standard TTL level.

Transistor QN and resistors NRB and NRC form an inhibit gate. A fault indication is passed on when input B is 0 vdc, and inhibited when input B is +0.7 vdc.

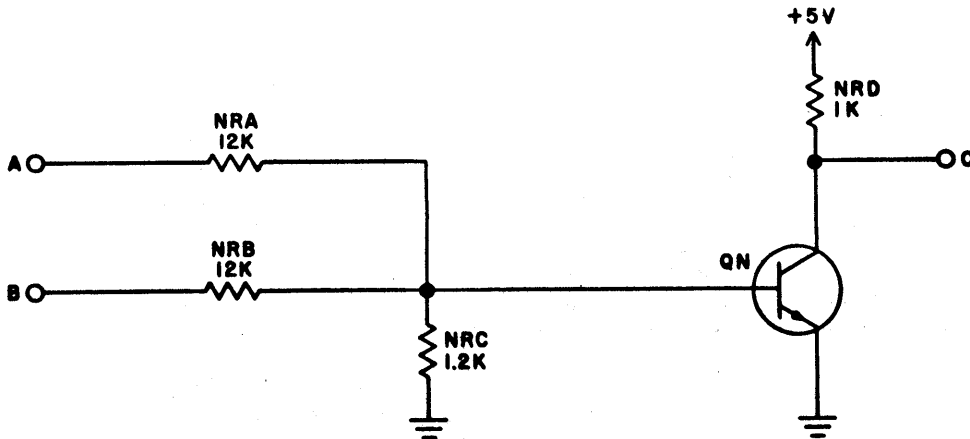
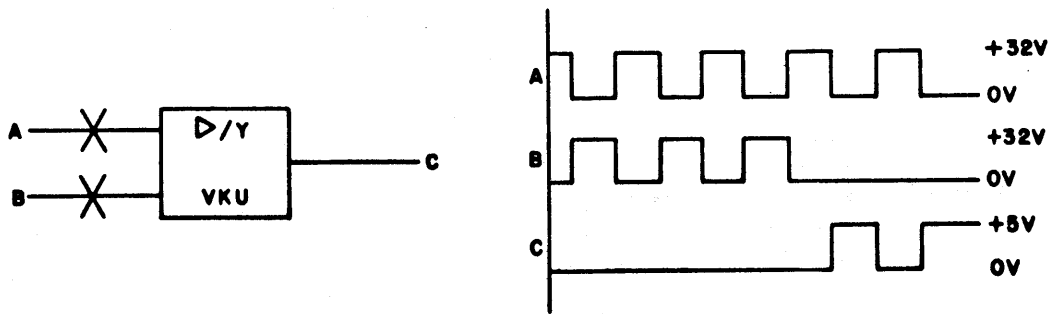


NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY. 7K54

Figure 7-29. Erase Cutoff Detector - VKT

Erase Cutoff Detector - VKT

The VKT circuit converts a non-standard input A to a standard TTL level at output B. When the erase circuit is on, input A is +40 vdc, QN is on, and output B is 0 vdc. When erase is off, input A is 0 vdc, QN is off and output B is +5 vdc.

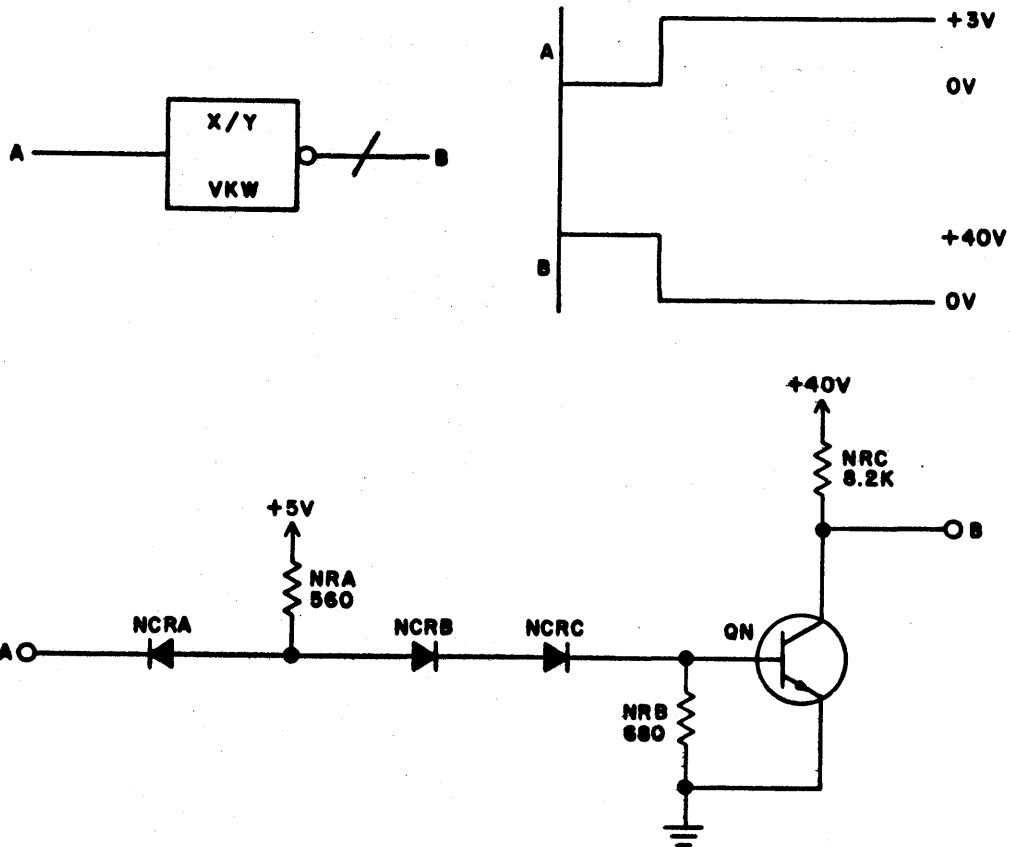


NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY. 7K27

Figure 7-30. Write Shutoff Detector - VKU

Write Shutoff Detector - VKU

The VKU circuit is an "or" function that outputs 0v under normal write operations. Inputs A and B come from the output of the Write Driver. A voltage present on either A or B turns QN on. If only half of the write driver is functioning, output C toggles. If neither side of the write driver is functioning, output C is a static "1".



NOTE: VOLTAGE AND COMPONENT VALUES ARE FOR REFERENCE ONLY. 7K26

Figure 7-31. Level Translator - VKW

Level Translator - VKW

The VKW circuit converts a logic "0" to a +40v (nominal) level used in the write circuitry. When a logic "1" is present at input A, transistor QN saturates and the output goes to 0v.



## HEAD AND DISK PACK REPLACEMENT CRITERIA

### HEAD REPLACEMENT CRITERIA

Heads of the DSU have been designed so that they should not need replacement if given proper preventive maintenance and care. If a head requires replacement refer to the Preface of this manual for the publication containing the Maintenance section. Refer to that section for Head/Arm Replacement procedure. A head is defective and needs replacing if any of the following conditions exist:

1. Consistent oxide buildup on head indicating repeated head/disk impact.
2. Appreciable oxide buildup located primarily on the edge of the ferrite insert, indicating a warped head.
3. Oxide or wear over 1/2 of the head face surface.
4. A head which is scratched over 1/2 of the head face surface.
5. Concentric scratches on disk surface. Inspect the head for imbedded particles.
6. Audible ping indicating that the head is hitting the disk surface.

### DISK PACK REPLACEMENT CRITERIA

The disk pack is designed to last the lifetime of the equipment. Replacement of the disk pack is required only if excessive runout (see Disk Pack Runout Check) is encountered or physical damage to the pack results in the loss of recording ability.

A disk pack is defective and needs replacement if any of the following conditions exist:

1. Damage to the disk pack resulting in a bent or broken disk. If a disk is bent perform Disk Pack Runout Check procedure.
2. Gouged or scored disk surface causing the loss of stored data.
3. Imbedded particles in a disk surface that cannot be removed by cleaning and are causing damage to the heads.

## Disk Pack Runout Check

This procedure determines whether a bent disk pack may remain in use. If the disk pack fails to meet the requirements of the procedure, it should be returned to the manufacturer for reconditioning.

1. Open cabinet top cover.
2. Install the disk pack to be checked on a DSU spindle.
3. Grasp the pack cleaning brushes, override the shaft detent mechanism, and rotate the brushes into the disk pack.
4. Place the disk pack runout gage (P/N 84357600) base on the DSU deck base plate (Figure 7-32) adjacent to disk cleaner cutout in shroud.
5. Turn the bezel of the dial indicator to indicate zero. Orient the dial indicator so that the plastic tip is not only contacting a disk surface but is deflected for an indication of approximately 0.020 inch. Tighten dial indicator in this position. Turn the bezel to set the dial indicator to zero.

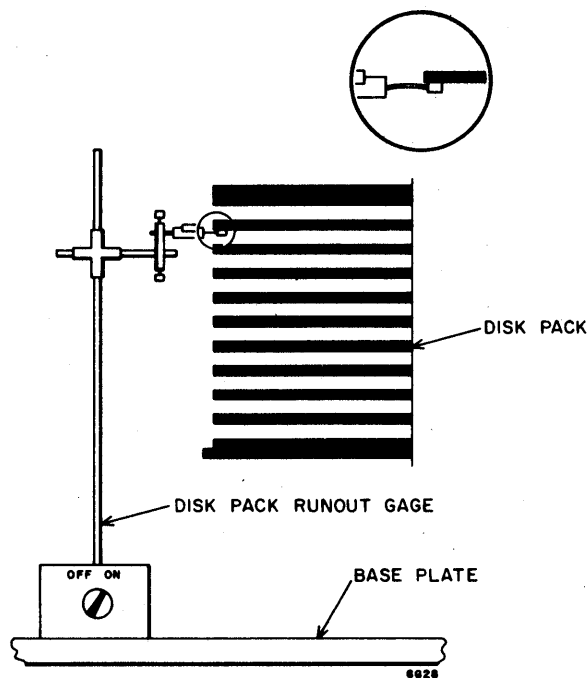


Figure 7-32. Disk Pack Runout Check

NOTE

A mirror is required to observe dial indicator when some disk surfaces are checked.

6. Manually and slowly rotate the disk pack one full revolution while carefully observing the dial indicator. The sum of the deviations (to either side of zero) should not exceed 0.012 inch.
7. If a total deflection of 0.012 inch is encountered in step 6, recheck the indication. The total deflection must occur in a disk circumference of 4 inches or more.
8. Repeat steps 5 through 7 for the 19 remaining disk surfaces.
9. Rotate the pack cleaning brushes clear of the disk surfaces.
10. Remove the disk pack and the disk pack runout gage.



SECTION 8

PARTS DATA

Information for this section is included in BR5A5  
Disk Storage Unit, Publication No. 83302500.



SECTION 9

WIRE LISTS





## WIRE LISTS

### DESCRIPTION OF WIRE LISTS

#### LOGIC WIRE LISTS

The following is an example of the logic wire lists with an explanation of the columns.

TITLE			WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC WIRE LIST				VCD-7866	1	A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	A627	A1231B	A1708B		1	
2	A650	A1814B	A2007B		1	
3	A661	A1809B	A2022B		1	
4	A664	A1221B	A1808B		1	
5	A665	A1222A	A1807B		1	

#### General

Back panels are machine wired according to the following paragraphs. The wiring operation prepares the unit for a number of operational options. A wire is installed for each entry in the list even if the unit does not contain the logic card types or complement to make full use of these options.

#### Wire Identification/Comment

If the identifier begins with a letter, the signal on the wire originates at the listed logic term. A multiple output is indicated when a term is repeated on successive line entries. An additional digit at the end of the identifier denotes a second and different (generally a differential of the first) signal being originated by the term.

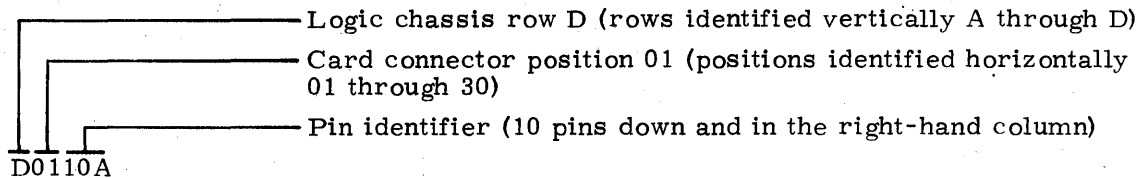
T023 - signal source is term T023

T0231 - last digit identifies a second and different signal being originated

If the identifier begins with a numeral, the signal on the wire generally originates at some point other than a logic term (switch, bus, test point, etc.). In this case, the adjacent Comment column provides a clarifying entry. A multiple output is indicated when the identifier is repeated on successive line entries.

### Origin

This column locates the logic chassis wire wrap pin from which the identified wire originates.



If this column is preceded by the letter J, the origin is from one of the connectors above, below, or to either side of the area where the cards are installed. The locator (same as first four digits in this column) is etched alongside each connector.

### Destination

This column locates the logic chassis wire wrap pin to which the identified wire is terminated. The location information provided for the Origin column is also applicable for this column.

### Z Level

The Z level denotes the vertical separation which an installed wire has relative to the surface of the wire wrap pin board. This vertical separation is maintained at both ends of the installed wire when it is wrapped on the pins. Three vertical separation distances are possible. A numeral 1 in this column indicates the smallest separation. A 3 in the column indicates the smallest separation. A 3 in the column indicates the largest separation. A level of 2 is the intermediate separation level.

### Wire Color

Not applicable.

# NON-LOGIC WIRE LISTS

The following is an example of a non-logic wire list with an explanation of the columns.

TITLE				WL	SHEET NO.	DOCUMENT NO.	REV	
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS
				LOCATION	PIN NO.	LOCATION	PIN NO.	
1	18	2		P5	1	TB100	1	
2	20	0		PD5	2	TB100	2	
3	18	3		PD5	3	TB100	3	
4	20	4		PD5	6	TB100	4	
5	20	2		PD5	5	TB100	5	
6	18	5		PD5	4	SHIELD		

- Conductor Ident. - Not applicable to field usage
- Wire Size - Size of conductor (AWG)
- Color Code - Color information
- Wire Length - Length of conductor in inches
- Origin - Origin point of conductor
- Destination - Destination point of conductor
- Remarks - Useful comments

## Color Code

Solid colored wires are identified by a one digit number in this column. Multicolored wires are identified by a number having two or three digits. Each digit of the number identifies one of the colors. The code numbers are identified as follows:

- |           |            |            |            |           |            |
|-----------|------------|------------|------------|-----------|------------|
| 0 - Black | 2 - Red    | 4 - Yellow | 6 - Blue   | 8 - Gray  | S - Shield |
| 1 - Brown | 3 - Orange | 5 - Green  | 7 - Violet | 9 - White |            |

In multi-digit color codes, the first digit denotes base color and the remaining digits denote tracer colors.

TITLE LOGIC WIRE LIST			WL	DOCUMENT NO. VCD-7866	SHEET NO. 1	REV. A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	A627	A1231B	A1708B		1	
2	A650	A1814B	A2007B		1	
3	A661	A1809B	A2022B		1	
4	A664	A1221B	A1808B		1	
5	A665	A1222A	A1807B		1	
6	A671	A1827B	A2024B		1	
7	A674	A1221A	A1830B		1	
8	A675	A1217B	A1826B		1	
9	A683	A1123A	A1805B		1	
10	A693	A1129A	A1832B		1	
11	A697	A1715B	A2031B		1	
12	I000	A0103B	A1011A		1	
13	I001	A0102B	A1012B		1	
14	I002	A0109A	A1013A		1	
15	I003	A0108A	A1021A		1	
16	I004	A0214A	A1006B		1	
17	I005	A0203B	A1007B		1	
18	I006	A0202B	A1008B		1	
19	I007	A0209A	A1005B		1	
20	I008	A0208A	A1005A		1	
21	I009	A0303B	A1333B		1	
22	I010	A0302B	A0908B		1	
23	I011	A0309A	A1614B		1	
24	I011	A1614B	A1615A		2	
25	I012	A0315A	A1311A		1	
26	I100	A1326A	A1604B		1	
27	I101	A0207A	A1327B		1	
28	I102	A1331B	A1707A		2	
29	I102	A1707A	A2013B		1	
30	I102	A1113B	A1331B		1	
31	I102	A1710B	A2013B		2	
32	I103	A1122A	A1315A		2	
33	I103	A1122A	A1330A		1	
34	I105	A1126A	A1324B		1	

TITLE LOGIC WIRE LIST			WL	DOCUMENT NO. VCD-7866	SHEET NO. 2	REV. A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	I105	A1114A	A1126A		2	
2	I105	A1324B	A1617A		2	
3	I106	A1325B	A1616B		1	
4	I112	A1329B	A1622B		1	
5	I115	A0312B	A1321A		1	
6	I119	A1024A	A1309A		1	
7	I121	A0304B	A1305B		2	
8	I121	A0207B	A0307B		1	
9	I121	A0207B	A0211B		2	
10	I121	A0112A	A0112B		2	
11	I121	A1314A	JA8108A		1	
12	I121	A0306B	A1314A		2	
13	I121	A0112A	A0211B		1	
14	I121	A0305B	A0306B		1	
15	I121	A0112B	A0304B		1	
16	I125	A0210B	A0212B		1	
17	I125	A0309B	A0311B		1	
18	I125	A0303A	A0309B		2	
19	I125	A0311A	A1308B		1	
20	I125	A0210B	A0302A		2	
21	I125	A0311A	A0311B		2	
22	I125	A0302A	A0303A		1	
23	I127	A0110B	A0111B		1	
24	I127	A0104B	A0105B		1	
25	I127	A0104B	A0204B		2	
26	I127	A0204B	A0205B		1	
27	I127	A0105B	A0106B		2	
28	I127	A0206B	A1313B		1	
29	I127	A0106B	A0107B		1	
30	I127	A0205B	A0206B		2	
31	I127	A0107B	A0110B		2	
32	I129	A0310B	A1312A		1	
33	I130	A1131A	A1310B		1	
34	I130	A1310B	A1521B		2	

TITLE		WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC WIRE LIST			VCD-7866	3	D
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL
1	I134	A0312A	A1309B		1
2	I145	A0210A	A1313A		1
3	I200	A0909A	A1013B		1
4	I200	A1013B	A1607B		2
5	I201	A0914A	A1014B		1
6	I201	A1014B	A1607A		2
7	I202	A0909B	A1014A		1
8	I202	A0905B	A0909B		2
9	I203	A1015B	A1605A		2
10	I203	A0914B	A1015B		1
11	I204	A0908A	A101A		1
12	I204	A101A	A1603B		2
13	I205	A1012A	A1610A		1
14	I206	A1009B	A1609A		1
15	I207	A1011B	A1604A		1
16	I211	A1029B	A1108B		1
17	I212	A1029A	A1107B		1
18	I216	A1023B	A1213B		1
19	I218	A1003A	JA8108B		1
20	I260	A1016B	A1205B		1
21	I261	A1027A	A1207A		1
22	I262	A1023A	A1205A		1
23	I263	A1015A	A1206B		1
24	I264	A1028A	A1203A		1
25	I265	A1016A	A1208B		1
26	I266	A1024B	A1203B		1
27	I267	A1031B	A1208A		1
28	I268	A1022B	A1202B		1
29	I383	A0211A	A0913B		1
30	I417	A0304A	A1632B		1
31	I420	A1514B	A1613A		1
32	I423	A1515B	A1617B		1
33	I462	A0907A	A1616B		1
34	I463	A1621A	JA8109B		1

TITLE LOGIC WIRE LIST			WL	DOCUMENT NO. VCD-7866	SHEET NO. 4	REV. A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	I464	A1615B	JA8109A		1	
2	I465	A1308A	A1609B		1	
3	I465	A0828B	A1308A		2	
4	I466	A0906B	A1623A		1	
5	I467	A0906A	A1608A		1	
6	I467	A0906A	A0915A		2	
7	I470	A1030A	A1611A		1	
8	I472	A1126B	A1606A		1	
9	I472	A1126B	A1305A		2	
10	I473	A1605B	JA8106A		1	
11	I473	JA8106A	JA8206A		2	
12	I473	A0306A	A1605B		2	
13	I476	A0910A	A1602A		1	
14	I481	A0905A	A1614A		1	
15	I507	A1123B	A1310A		2	
16	I507	A1102A	A1310A		1	
17	I507	A1123B	A1127B		1	
18	I508	A1109A	A1307B		1	
19	I508	A1307A	A1307B		2	
20	I509	A1104A	A1226A		1	
21	I513	A1113A	A1721B		1	
22	I514	A1105A	A1716B		1	
23	I516	A1216A	A1603A		2	
24	I516	A1115A	A1216A		1	
25	I516	A1022A	A1115A		2	
26	I518	A1131B	A1210B		2	
27	I518	A1028B	A1131B		1	
28	I526	A1317B	A1522B		1	
29	I526	A1215B	A1317B		2	
30	I526	A1112A	A1215B		1	
31	I527	A1125A	A1304A		1	
32	I528	A1111B	A1128B		1	
33	I560	A1231A	A1713B		1	
34	I561	A1230A	A1713A		1	

TITLE			WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC WIRE LIST				VCD-7866	5	A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	I562	A1230B	A1712B		1	
2	I563	A1229A	A1711B		1	
3	I564	A1229B	A1712A		1	
4	I565	A1202A	A1709B		1	
5	I566	A1225B	A1710A		1	
6	I575	A1110B	A1210A		1	
7	I576	A1104B	A1216B		1	
8	I626	A1232A	A1705B		1	
9	I631	A1304B	A1616A		1	
10	I631	A1110A	A1232B		1	
11	I631	A1232B	A1616A		2	
12	I631	A0907B	A1110A		2	
13	I632	A1121A	A1233B		1	
14	I634	A1227B	A1722B		1	
15	I635	A1228A	A1717B		1	
16	I636	A1228B	A1306A		1	
17	I636	A1306A	A1306B		2	
18	I637	A0307A	A1233A		1	
19	I737	A0212A	A0813B		1	
20	I743	A1612B	JA8110A		1	
21	I801	A1511B +	A1632A		1	
22	I801	A1632A	A1633A		2	
23	I824	A1516B X	A1623B		1	
24	K290	A0104A	A1026A		1	
25	K290	A1026A	A1226B		2	
26	K291	A0105A	A1003B		1	
27	K291	A1003B	A1225A		2	
28	K292	A0106A	A1017B		1	
29	K293	A0107A	A1021B		1	
30	K294	A0110A	A1010B		1	
31	K295	A0111A	A1007A		1	
32	K296	A0204A	A1008A		1	
33	K297	A0205A	A1006A		1	
34	K298	A0206A	A1004A		1	



TITLE		WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC WIRE LIST			VCD-7866	6	D
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL
1	K400	A0310A	A1314B		1
2	K400	A1322B	A1624A		1
3	K400	A1314B	A1322B		2
4	K401	A1624B	JA8110B		1
5	K401	A1315B	A1624B		2
6	K403	A1517B	A1631A		1
7	K501	A1103A	A1223B		1
8	K507	A1027B	A1121B		1
9	K570	A1224B	A2028B		1
10	K572	A1227A	A2026B		1
11	L400	A1628B	JA8405B		1
12	M105	A1114B	A1324A		1
13	Y404	A0304A	A1631B		1
	Y404	A1621B	A1631B		2
14	Y500	A1109B	A1224A		1
15	Y503	A1122B	A1211A		1
16	Y591	A1129B	A1222B		1
17	Y592	A1124B	A1223A		1
18	10000	A1533A	JA8403A		1
19	10010	A1532B	JD9314B		1
20	10020	A1503B	JD9313B		1
21	10030	A1727B	A1729B		2
22	10040	A1728B	A1805A		1
23	10050	A1728A	A1806A		1
24	10060	A1809A	A2009B		1
25	10070	A1810A	A2010B		1
26	10080	A1833A	A1833B		1
27	10090	A1802A	A1802B		1
28	10100	A1321B	A1334A		2
29	10110	A0810B	A0834A		1
30	10111	A0807B	A0810B		2
31	10120	A0113B	A0133A		1
32	10130	A0213B	A0233A		1
33	10140	A0128A	A0128B		1
34	10150	A0313B	A0333A		1

TITLE LOGIC WIRE LIST			WL	DOCUMENT NO. VCD-7866	SHEET NO. 7	REV. C
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	10160	A0328A	A0328B		1	
2	10170	A0330A	A0330B		1	
3	10175	A1816B	A2011B		1	
4	10180	A0316A	JA8001A		1	
5	10190	A0316B	JA8001B		1	
6	10200	A0116A	JA8002A		1	
7	10210	A0116B	JA8002B		1	
8	10220	A0216A	JA8003A		1	
9	10230	A0216B	JA8003B		1	
10	10240	A0327A	JA8004A		1	
11	10250	A0327B	JA8004B		1	
12	10260	JA8005A	JA8111A		1	
13	10270	JA8005B	JA8111B		1	
14	10280	JA8011A	JD9410A		1	
15	10290	JA8011B	JD9410B		1	
16	10300	JA8012A	JA8401A		1	
17	10310	JA8012B	JA8407A		1	
18	10320	JA8013A	JD9301B		1	
19	10330	JA8013B	JA8413A		1	
20	10340	JA8014A	JD9408B		1	
21	10350	JA8014B	JA8414B		1	
22	10360	JA8011A	JD9411A		2	
23	10370	JA8011B	JD9411B		2	
24	10380	A0916B	JA8101A		1	
25	10390	A0922A	JA8101B		1	
26	10400	A0915B	JA8102A		1	
27	10410	A0923A	JA8102B		1	
28	10420	A0925B	JA8103A		1	
29	10430	A0927A	JA8103B		1	
30	10440	A0923B	JA8104A		1	
31	10450	A0928A	JA8104B		1	
32	10460	A0928B	JA8105A		1	
33	10470	A0930B	JA8105B		1	
34	10480	A1933B	JA8106B		1	

TITLE			WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC WIRE LIST				VCD-7866	8	A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	10481	JA8106B	JD9211B		2	
2	10482	A1533B	JD9211B		1	
3	10490	A1902B	JA8107A		1	
4	10491	JA8107A	JD9209A		2	
5	10492	A1502B	JD9209A		1	
6	10500	A0901A	JA8107B		1	
7	10510	JA8113B	JD9404A		1	
8	10511	JA8113B	JD9404B		2	
9	10520	JA8114A	JD9401A		1	
10	10521	JA8114A	JD9401B		2	
11	10530	JA8114B	JA9403B		1	
12	10531	JA8114B	JA8403A		2	
13	10540	A0929B	JA8201A		1	
14	10550	A0929A	JA8201B		1	
15	10560	A0927B	JA8202A		1	
16	10570	A0924B	JA8202B		1	
17	10580	A0926B	JA8203A		1	
18	10590	A0926A	JA8203B		1	
19	10600	A0922B	JA8204A		1	
20	10610	A0916A	JA8204B		1	
21	10620	A0921B	JA8205A		1	
22	10630	A0917A	JA8205B		1	
23	10640	A2033B	JA8206B		1	
24	10641	JA8206B	JD9211A		2	
25	10642	A1633B	JD9211A		1	
26	10650	A2002B	JA8207A		1	
27	10651	JA8207A	JD9209B		2	
28	10652	A1602B	JD9209B		1	
29	10660	A1001A	JA8207B		1	
30	10670	A0801A	JA8208A		1	
31	10680	A0804B	JA8208B		1	
32	10690	A0802A	JA8209A		1	
33	10700	A0805B	JA8209B		1	
34	10710	A0803A	JA8210A		1	

TITLE LOGIC WIRE LIST			WL	DOCUMENT NO. VCD-7866	SHEET NO. 9	REV. C
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	10720	A0804A	JA8210B		1	
2	10730	A0805A	JA8211B		1	
3	10740	A0806A	JA8212B		1	
4	10750	A0807A	JA8213A		1	
5	10760	A1733B	JA8213B		1	
6	10761	A1833A	JA8213B		2	
7	10770	A1702B	JA8214A		1	
8	10771	A1802A	JA8214A		2	
9	10780	A0701A	JA8214B		1	
10	10790	A1334A	JA8301A		1	
11	10800	A1317A	JA8302B		1	
12	10810	A1316B	JA8303A		1	
13	10820	A1328B	JA8303B		1	
14	10830	A1326B	JA8304A		1	
15	10840	A1328A	JA8304B		1	
16	10850	A1329A	JA8305A		1	
17	10860	JA8305B	JD9311B		1	
18	10870	A1331A	JA8306A		1	
19	10880	JA8306B	JA8407B		1	
20	10890	JA8307B	JD9301A		1	
21	10900	JA8308A	JD9311A		1	
22	10910	A1332A	JA8308B		1	
23	10920	JA8309A	JA8406A		1	
24	10930	JA8301B	JD9310B		1	
25	10940	A1323B	JA8310A		1	
26	10950	A1312B	JA8310B		1	
27	10960	A1323A	JA8311A		1	
28	10970	A1322A	JA8311B		1	
29	10980	JA8313B	JA8411A		1	
30	10990	A1301A	JA8314A		1	
31	11000	JA8314B	JD9405A		1	
32	11010	A1327A	JA8401B		2	
33	11020	JA8402B	JD9402A		1	
34	11030	JA8404B	JD9304B		1	

TITLE LOGIC WIRE LIST			WL	DOCUMENT NO. VCD-7866	SHEET NO. 10	REV. A
LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	11031	JA8404B	JD9213A		2	
2	11032	JD9213A	JD9213B		1	
3	11033	JD9213B	JD9304B		2	
4	11040	JA8408A	JD9408A		1	
5	11050	JA8408B	JD9314A		1	
6	11060	JA8409A	JD9409A		1	
7	11070	A1725B	JA8409B		1	
8	11080	JA8410A	JD9303B		1	
9	11081	JD9302B	JD9303B		2	
10	11090	A1333A	JA8410B		1	
11	11100	JA8412A	JD9313A		1	
12	11110	JA8412B	JD9312B		1	
13	11120	JA8413B	JD9303A		1	
14	11130	JA8414A	JD9407A		1	
15	11140	A1330B	JD9305A		1	
16	11150	A1327A	JD9305B		1	
17	11160	A1729B	JD9306A		1	
18	11170	A1724B	JD9306B		1	
19	11180	A1734A	JD9307A		1	
20	11190	JD9307B	JD9408A		1	
21	11200	A1726B	JD9310A		1	
22	11210	A1325A	JD9312A		1	
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						

TITLE READ/WRITE CABLE ASSEMBLY						WL	SHEET NO. 1	DOCUMENT NO. VCD-7958	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS	
				LOCATION	PIN NO.	LOCATION	PIN NO.		
1	24	8							
1A				PA81	1A	E01	1A		
1B				↑	1B	↑	1B		
1C					2A		2A		
1D					2B		2B		
1E					3A		3A		
1F					3B		3B		
1G					4A		4A		
1H					4B		4B		
1J					5A		5A		
1K					5B		5B		
1L					6A		6A		
1M					6B		6B		
1N					7A	▼	7A		
1P					7B	E01	7B		
1Q					8A	E02	1A		
1R					8B	↑	1B		
1S					9A		2A		
1T					9B		2B		
1U					10A		3A		
1V					10B		3B		
1W					11A		4A		
1X					11B		4B		
1Y					12A		5A		
1Z					12B		5B		
1AA					13A		6A		
1AB					13B		6B		
1AC				▼	14A	▼	7A		
1AD				PA81	14B	E02	7B		
2	24	8							
2A				E02	8A	E01	8A		
2A				E01	8A	F02	8A		
2B				E02	8B	E01	8B		
2B				E01	8B	F02	8B		
2C				E02	9A	E01	9A		
2C				E01	9A	F02	9A		
2D				E02	9B	E01	9B		
2D				E01	9B	F02	9B		
2E				E02	10A	E01	10A		
2E				E01	10A	F02	10A		
2F				E02	10B	E01	10B		

TITLE READ/WRITE CABLE ASSEMBLY								WL	SHEET NO. 2	DOCUMENT NO. VCD-7958	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS			
				LOCATION	PIN NO.	LOCATION	PIN NO.				
2F				E01	10B	F02	10B				
2G				E02	11A	E01	11A				
2G				E01	11A	F02	11A				
2H				E02	11B	E01	11B				
2H				E01	11B	F02	11B				
2J				E02	12A	E01	12A				
2J				E01	12A	F01	12A				
2K				E02	12B	E01	12B				
2K				E01	12B	F01	12B				
2L				E02	13A	E01	13A				
2L				E01	13A	F01	13A				
2M				E02	13B	E01	13B				
2M				E01	13B	F01	13B				
2N				E02	14A	E01	14A				
2N				E01	14A	F01	14A				
2P				E02	14B	E01	14B				
2P				E01	14B	F01	14B				
3	24	8									
3A				F01	9A	F02	12A				
3B				▲	9B	▲	12B				
3C				▲	10A	▲	13A				
3D				▲	10B	▲	13B				
3E				▼	11A	▼	14A				
3F				F01	11B		14B				
4	24	8									
4A				PA82	1A		1A				
4B				▲	1B		1B				
4C				▲	2A		2A				
4D				▲	2B		2B				
4E				▲	3A		3A				
4F				▲	3B		3B				
4G				▲	4A		4A				
4H				▲	4B		4B				
4J				▲	5A		5A				
4K				▲	5B		5B				
4L				▲	6A		6A				
4M				▲	6B		6B				
4N				▲	7A	▼	7A				
4P				▲	7B	F02	7B				
4Q				▼	8A	F01	1A				
4R				PA82	8B	F01	1B				





TITLE W4 HARNESS ASSEMBLY								WL	SHEET NO. 1	DOCUMENT NO. VCD-7900	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS			
				LOCATION	PIN NO.	LOCATION	PIN NO.				
1	20	6		P4	J	PD93	01A				
2	20	2		PD93	14A	P4	L				
3	20	0		P4	V	PD93	02A				
4	20	0		PD93	02B	P4	R				
5	20	0		P4	W	PD93	03A				
6	20	2		PD93	04B	P4	S				
7	20	4		P4	F	PD93	08A				
8	20	0		PD93	09A	P4	H				
9	20	4		P4	E	PD93	10A				
10A				PD93	07A	P4	C				
10B	20	2		P4	A	PD93	06A				
10C	20	0		PD93	06B	P4	B				
11A	20	2		P4	P	J305	1				
11B	20	0		P4	N	J305	2				
11C		SHLD		P4	M	FLOATING					
12	20	0		P4	K	J306	2				
13	20	0		S301	C	S300A	C				
14	20	0		S300A	C	S300B	C				
15	20	0		PD93	5A	S300A	NO				
16	20	0		S300B	C	PD93	07B				
17	20	6		PD93	11A	S303	NC				
18	20	6		S303	C	PD93	11B				
19	20	6		PD93	10B	J306	01				
20	20	0		S300B	NC	PD93	01B				
21	20	0		PD93	12A	S301	NO				
22	20	0		S300A	NC	PD93	05B				
23	20	0		PD93	12B	J322	01				
24	20	0		PD93	03B	S301	NC				
25	20										
25A		2		J300	1	PA18	09A				
25B		0		J300	2	PA18	10A				
25C		SHLD		FLOATING		PA18	08A				
26	24										
26A		9		P301	5	PA18	04B				
26B		0		P301	6	PA18	03B				
26C		SHLD		FLOATING		PA18	04A				
27	24										
27A		9		P301	7	PA18	11B				
27B		0		P301	8	PA18	10B				
27C		SHLD		FLOATING		PA18	11A				

TITLE W4 HARNESS ASSEMBLY								WL	SHEET NO. 2	DOCUMENT NO. VCD-7900	REV B
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS			
				LOCATION	PIN NO.	LOCATION	PIN NO.				
28	24										
28A		9		P301	9	PA18	25B				
28B		0		P301	10	PA18	24B				
28C		SHLD		FLOATING		PA18	25A				
29											
29A		9		P301	11	PA18	29B				
29B		0		P301	12	PA18	28B				
29C		SHLD		FLOATING		PA18	29A				
30	24	6		P301	13	PA18	02A				
31	24	0		P301	14	PA18	01A				
32	24	2		P301	15	PA18	33A				
33	24										
33A		4		J303	1	PA16	25B				
33B		0		J303	2	PA16	25A				
34											
34A		9		J303	03	PA16	26B				
34B		0		J303	04	PA16	27B				
34C		SHLD		FLOATING		PA16	26A				
35	24										
35A		9		J304	02	PA18	05A				
35B		0		J304	01	PA18	06A				
35C		SHLD		FLOATING		PA18	07A				
36	20	6		S303	NO	J322	02				
37	24	6		PD93	13B	P4	Y				
38	24	2		P4	T	PD93	14B				
39	20	2		P4	D	PD93	13A				
40	14	2		P6	3	REG	+V				
41	14	0		P6	4	REG	GRD				
42	14	6		P6	5	REG	-V				
43	14	5		P6	6	CHASSIS	GRD				
44	14	2		P6	7	BACK PANEL	+20V				
45	14	0		P6	8	GRD	01				
46	14	6		P6	9	BACK PANEL	-20V				

TITLE W7 CABLE ASSEMBLY						WL	SHEET NO. 1	DOCUMENT NO. VCD-7890	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS	
				LOCATION	PIN NO.	LOCATION	PIN NO.		
1	24								
1A		4		PA01	26B	J100	40		
1B		0		PA01	26A	J100	41		
2	24								
2A		L		PA01	26B	J101	40		
2B		0		PA01	26A	J101	41		
3	24								
3A		4		PA01	25B	J100	42		
3B		0		PA01	25A	J100	41		
4	24								
4A		4		PA01	25B	J101	42		
4B		0		PA01	25A	J101	41		
5	24								
5A		4		PA01	23B	J100	43		
5B		0		PA01	23A	J100	44		
6	24								
6A		4		PA01	23B	J101	43		
6B		0		PA01	23A	J101	44		
7	24								
7A		4		PA01	24B	J100	45		
7B		0		PA01	24A	J100	44		
8	24								
8A		4		PA01	24B	J101	45		
8B		0		PA01	24A	J101	44		
9	24								
9A		4		PA01	22B	J100	46		
9B		0		PA01	22A	J100	47		
10	24								
10A		4		PA01	22B	J101	46		
10B		0		PA01	22A	J101	47		
11	24								
11A		4		PA01	21B	J100	48		
11B		0		PA01	21A	J100	47		
12	24								
12A		4		PA01	21B	J101	48		
12B		0		PA01	21A	J101	47		
13	24								
13A		4		PA01	31B	J100	14		
13B		0		PA01	31A	J100	13		
14	24								
14A		4		PA01	31B	J101	14		

TITLE W7 CABLE ASSEMBLY					WL	SHEET NO. 2	DOCUMENT NO. VCD-7890	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS
				LOCATION	PIN NO.	LOCATION	PIN NO.	
14B		0		PA01	31A	J101	13	
15	24							
15A		4		PA01	29B	J100	11	
15B		0		PA01	29A	J100	10	
16	24							
16A		4		PA01	29B	J101	11	
16B		0		PA01	29A	J101	10	
17	24							
17A		4		PA01	30B	J100	8	
17B		0		PA01	30A	J100	10	
18	24							
18A		4		PA01	30B	J101	8	
18B		0		PA01	30A	J101	10	
19	24							
19A		4		PA01	32B	J100	12	
19B		0		PA01	32A	J100	13	
20	24							
20A		4		PA01	32B	J101	12	
20B		0		PA01	32A	J101	13	
21	24							
21A		4		PA02	21B	J100	60	
21B		0		PA02	21A	J100	59	
22	24							
22A		4		PA02	21B	J101	60	
22B		0		PA02	21A	J101	59	
23	24							
23A		4		PA02	22B	J100	58	
23B		0		PA02	22A	J100	59	
24	24							
24A		4		PA02	22B	J101	58	
24B		0		PA02	22A	J101	59	
25	24							
25A		4		PA02	23B	J100	75	
25B		0		PA02	23A	J100	74	
26	24							
26A		4		PA02	23B	J101	75	
26B		0		PA02	23A	J101	74	
27	24							
27A		4		PA02	24B	J100	24	
27B		0		PA02	24A	J100	23	
28	24							

TITLE W7 CABLE ASSEMBLY								WL	SHEET NO. 3	DOCUMENT NO. VCD-7890	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS			
				LOCATION	PIN NO.	LOCATION	PIN NO.				
28A		4		PA02	24B	J101	24				
28B		0		PA02	24A	J101	23				
29	24										
29A		4		PA02	25B	J100	51				
29B		0		PA02	25A	J100	50				
30	24										
30A		4		PA02	25B	J101	51				
30B		0		PA02	25A	J101	50				
31	24										
31A		4		PA02	26B	J100	49				
31B		0		PA02	26A	J100	50				
32	24										
32A		4		PA02	26B	J101	49				
32B		0		PA02	26A	J101	50				
33	24										
33A		4		PA02	28B	J100	07				
33B		0		PA02	28A	J100	05				
34	24										
34A		4		PA02	28B	J101	07				
34B		0		PA02	28A	J101	05				
35	24										
35A		4		PA02	29B	J100	01				
35B		0		PA02	29A	J100	02				
36	24										
36A		4		PA02	29B	J101	01				
36B		0		PA02	29A	J101	02				
37	24										
37A		4		PA02	30B	J100	70				
37B		0		PA02	30A	J100	71				
38	24										
38A		4		PA02	30B	J101	70				
38B		0		PA02	30A	J101	71				
39	24										
39A		4		PA02	31B	J100	04				
39B		0		PA02	31A	J100	05				
40	24										
40A		4		PA02	31B	J101	04				
40B		0		PA02	31A	J101	05				
41	24										
41A		4		PA02	32B	J100	03				
41B		0		PA02	32A	J100	02				

TITLE W7 CABLE ASSEMBLY							WL	SHEET NO. 4	DOCUMENT NO. VCD-7890	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS		
				LOCATION	PIN NO.	LOCATION	PIN NO.			
42	24									
42A		4		PA02	32B	J101	03			
42B		0		PA02	32A	J101	02			
43	24									
43A		4		PA03	21B	J100	54			
43B		0		PA03	21A	J100	53			
44	24									
44A		4		PA03	21B	J101	54			
44B		0		PA03	21A	J101	53			
45	24									
45A		4		PA03	22B	J100	57			
45B		0		PA03	22A	J100	56			
46	24									
46A		4		PA03	22B	J101	57			
46B		0		PA03	22A	J101	56			
47	24									
47A		4		PA03	23B	J100	64			
47B		0		PA03	23A	J100	63			
48	24									
48A		4		PA03	23B	J101	64			
48B		0		PA03	23A	J101	63			
49	24									
49A		4		PA03	24B	J100	52			
49B		0		PA03	24A	J100	53			
50	24									
50A		4		PA03	24B	J101	52			
50B		0		PA03	24A	J101	53			
51	24									
51A		4		PA03	25B	J100	55			
51B		0		PA03	25A	J100	56			
52	24									
52A		4		PA03	25B	J101	55			
52B		0		PA03	25A	J101	56			
53	24									
53A		4		PA03	26B	J100	62			
53B		0		PA03	26A	J100	63			
54	24									
54A		4		PA03	26B	J101	62			
54B		0		PA03	26A	J101	63			
55	24									
55A		4		PA03	29B	J100	21			

TITLE								WL	SHEET NO.	DOCUMENT NO.	REV
W7 CABLE ASSEMBLY									5	VCD-7890	A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS			
				LOCATION	PIN NO.	LOCATION	PIN NO.				
55B		0		PA03	29A	J100	20				
56	24										
56A		4		PA03	29B	J101	21				
56B		0		PA03	29A	J101	20				
57	24										
57A		4		PA03	31B	J100	17				
57B		0		PA03	31A	J100	16				
58	24										
58A		4		PA03	31B	J101	17				
58B		0		PA03	31A	J101	16				
59	24										
59A		4		PA03	32B	J100	18				
59B		0		PA03	32A	J100	20				
60	24										
60A		4		PA03	32B	J101	18				
60B		0		PA03	32A	J101	20				
61	24										
61A		4		PA80	13A	J100	65				
61B		0		PA80	14A	J100	66				
62	24										
62A		4		PA80	13A	J101	65				
62B		0		PA80	14A	J101	66				
63	24	0		PA80	12A	J100	76				
64	24	0		PA80	12A	J101	76				
65	20	2		PA80	14B	J100	77				
66	20	2		PA80	12B	J101	77				
67	20	2		PA80	13B	J100	78				
68	20	2		PA80	11B	J101	79				
69	20	2		PA80	11A	J101	79				

TITLE W8 CABLE ASSEMBLY						WL	SHEET NO. 1	DOCUMENT NO. VCD-7944	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS	
				LOCATION	PIN NO.	LOCATION	PIN NO.		
1	24								
1A		4		PA80	1B	J102	21		
1B		0		PA80	1A	J102	26		
2	24								
2A		4		PA80	2B	J102	22		
2B		C		PA80	2A	J102	27		
3	24								
3A		4		PA80	4B	J102	23		
3B		0		PA80	4A	J102	28		
4									
4A	COAX			COND IDENT 5		J102	12		
4B	SHLD			COND IDENT 6		J102	12		
5	24	4	2	PA80	3B	COND IDENT 4A			
6	24	0	3	PA80	3A	COND IDENT 4B			
7									
7A	COAX			COND IDENT 8		J102	5		
7B	SHLD			COND IDENT 9		J102	5		
8	24	4	2	PA80	5B	COND IDENT 7A			
9	24	0	3	PA80	5A	COND IDENT 7B			
10	14	0		GND	03	J102	10		
11	14	0		GND	04	J102	11		



TITLE W15 CABLE ASSEMBLY						WL		SHEET NO. 1	DOCUMENT NO. VCD-7956	REV. A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS	
				LOCATION	PIN NO	LOCATION	PIN NO			
1	24									
1A		8		PA83	1A	P1	1A			
1B				↑	1B	↑	1B			
1C					2A		2A			
1D					2B		2B			
1E					3A		3A			
1F					3B		3B			
1G					4A		4A			
1H					4B		4B			
1J					5A		5A			
1K					5B		5B			
1L					6A		6A			
1M					6B		6B			
1N					7A		7A			
1P					7B		7B			
1O					8A		8A			
1R					8B		8B			
1S					9A		9A			
1T					9B		9B			
1U					10A		10A			
1V					10B		10B			
1W					11A		11A			
1X					11B		11B			
1Y					12A		12A			
1Z					12B		12B			
1AA					13A		13A			
1AB					13B		13B			
1AC				↓	14A	↓	14A			
1AD				PA83	14B	P1	14B			

TITLE	77814700 - 60 HZ POWER SUPPLY 77814600 - 50 HZ	WL	SHEET NO. 1	DOCUMENT NO. VCD-7091	REV.
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IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO	
1	20	0		START SW	0V	SSW1	3	USED IN 50 HERTZ UNITS ONLY
2	20	6		SSW3	4	SSW1	4	USED IN 50 HERTZ UNITS ONLY
3	20	6		SSW3	4	START SW	-20	USED IN 50 HERTZ UNITS ONLY
4	20	6		START SW	OUT	SSW3	3	USED IN 50 HERTZ UNITS ONLY
5								
6	12	0		TB2	1	CB1A	LINE	
7	12	3		TB2	3	CB1B	LINE	
8	12	5		TB2	5	FILTER CHASSIS	GND	
9	12	5		TB2	5	TB1	3	
10	12	0		CB1A	LOAD	FL1	LINE	
11	12	3		CB1B	LOAD	FL2	LINE	
12	20	0		FL1	LOAD	J5	1	NOT USED IN BR5A5 D/E UNITS
13	12	0		FL1	LOAD	T6	1	
14	14	0		FL1	LOAD	SSW2	1	
15	20	3		FL2	LOAD	J5	3	
16	12	3		FL2	LOAD	T6	2	
17	14	3		FL2	LOAD	SSW1	1	
18	20	3		SSW1	2	TB3	4	
19	20	0		SSW1	3	SSW2	3	
20	20	6		SSW1	4	SSW2	4	
21	20	0		SSW2	2	TB3	3	
22	20	0		SSW2	3	TB1	8	USED IN 50 HERTZ UNITS ONLY
22	20	0		SSW2	3	SSW3	3	USED IN 60 HERTZ UNITS ONLY
23	20	6		SSW2	4	SSW4	4	
24	20	0		SSW3	3	TB1	8	USED IN 60 HERTZ UNITS ONLY
25	20	4		SSW4	1	F3	B	
26	16	0		J2	1	SSW3	1	
27	16	4		J2	2	SSW3	2	
28	20	6		J2	3	SSW3	4	USED IN 60 HERTZ UNITS ONLY
29	20	6		J2	4	SSW1	4	USED IN 60 HERTZ UNITS ONLY
30	14	0		J2	5	SSW2	2	
31	16	5		J2	6	TB1	3	
32	14	3		J2	7	SSW1	2	
33	20	5		J2	8	TB1	3	
34	16	4		J3	1	K2	1C	
35	16	4		J3	2	K2	1C	
36	16	5		J3	3	TB1	3	
37	16	0		J3	4	TB1	7	
38	16	0		J3	5	TB1	7	
39								
40								

TITLE POWER SUPPLY								WL	SHEET NO. 2	DOCUMENT NO. VCD-7091	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS			
				LOCATION	PIN NO.	LOCATION	PIN NO.				
41	20	0		J4	A	TB1	7				
42	20	0		J4	B	TB1	6				
43	20	0		J4	C	TB1	6				
44	20	2		J4	D	F6	B				
45	20	6		J4	E	TB1	11				
46	20	2		J4	F	TB1	1				
47	20	0		J4	H	K4	L2				
48	20	6		J4	J	F2	B				
49	20	0		J4	K	TB1	8				
50	20	2		J4	L	F1	B				
51	20	5		J4	M	TB1	3				
52	20	0		J4	N	C13	NEG				
53	20	6		J4	P	SSW4	2				
54	20	6		J4	R	SSW4	3				
55	20	2		J4	S	CB5	LOAD				
56	20	2		J4	T	CB4A	LOAD				
57	20	0		J4	V	K2	L2				
58	20	6		J4	W	SSW4	4				
59	20	6		J4	Y	CB4B	LOAD				
60	20	5		J5	2	TB1	3				
61											
62											
63	14	2		J6	3	CB6A	LOAD				
64	14	0		J6	4	C17	NEG				
65	14	6		J6	5	CB6B	LOAD				
66	14	5		J6	6	TB1	4				
67	16	2		J6	7	F4	B				
68	14	0		J6	8	C14	NEG				
69	16	6		J6	9	F5	B				
70	12	3		T1	1	T6	1				
71	12	3		T1	2	T6	2				
72	18	4		T1	4	C1	2				
73											
74	18	4		T1	7	C1	1				
75	18	4		T1	7	CR8	AC1				
76	18	4		T1	8	CR8	AC2				
77	14	4		T1	9	CR1B	AC				
78	14	0		T1	10	C12	POS				
79	14	0		T1	10	C17	NEG				
80	14	4		T1	11	CR1A	AC				

TITLE POWER SUPPLY					WL	SHEET NO. 3	DOCUMENT NO. VCD-7091	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS
				LOCATION	PIN NO.	LOCATION	PIN NO.	
81	20	4		T1	12	F3	T	
82	14	4		T1	12	CR3B	AC	
83	14	0		T1	13	C15	POS	
84	14	4		T1	14	CR3A	AC	
85								
86	20	3		T6	1	TB3	1	
87	20	3		T6	2	TB3	2	
88	18	4		T6	4	C8	1	
89	18	4		T6	5	C8	2	
90	14	4		T6	6	CR5	AC1	
91	14	0		T6	7	C4	POS	
92	14	4		T6	8	CR5	AC2	
93								
94	14	4		CR1A	AC	CR2A	AC	
95	14	2		CR1	POS	C17	POS	
96	14	4		CR1B	AC	CR2B	AC	
97	14	6		CR2	NEG	C12	NEG	
98	14	4		CR3A	AC	CR4A	AC	
99	14	4		CR3B	AC	CR4B	AC	
100								
101	14	2		CR3	POS	C13	POS	
102	14	6		CR4	NEG	C15	NEG	
103	14	4		CR5	AC1	CR6	AC1	
104	14	4		CR5	AC2	CR6	AC2	
105	14	2		CR5	DC	C5	POS	
106	14	6		CR6	DC	K2	2C	
107	14	6		CR7	AC	K2	1C	
108	14	2		CR7A	POS	C5	POS	
109	14	6		CR7B	NEG	C4	NEG	
110	18	2		CR8	POS	C2	POS	
111	20	0		CR8	NEG	C2	NEG	
112								
113	18	2		C2	POS	CB5	LINE	
114	20	0		C2	NEG	R1	T	
115	12	0		C2	NEG	C5	NEG	
116								
117	14	0		C4	POS	C5	NEG	
118	12	0		C4	POS	C17	NEG	
119	14	6		C4	NEG	CB4B	LINE	
120	14	6		C4	NEG	K2	2B	

TITLE					SHEET NO.		DOCUMENT NO.		REV.
POWER SUPPLY					WL		4		VCD-7091
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS	
				LOCATION	PIN NO	LOCATION	PIN NO		
121	20	2		C5	POS	K4	3C		
122	14	2		C5	POS	CB4A	LINE		
123	14	0		C5	NEG	TB1	8		
124	12	0		C12	POS	C13	NEG		
125	14	6		C12	NEG	CB6B	LINE		
126	14	2		C13	POS	L2	1		
127	20	2		C13	POS	F1	T		
128	14	0		C13	NEG	C15	POS		
129	16	2		C14	POS	F4	T		
130	20	2		C14	POS	R9	T		
131	14	4		C14	POS	L2	2		
132	20	2		F4	B	TP5			
133	14	0		C14	NEG	C16	POS		
134	14	0		C15	POS	C16	POS		
135	20	6		C15	NEG	F2	T		
136	14	2		C15	NEG	L3	1		
137	14	4		C16	NEG	L3	2		
138	16	6		C16	NEG	F5	T		
139	20	6		C16	NEG	R9	B		
140	20	6		F5	B	TP1			
141									
142	14	2		C17	POS	CB6A	LINE		
143	20	2		C24	POS	K4	L1		
144	20	0		C24	NEG	R29	L		
145									
146	20	2		CB4A	LINE	R18	B		
147	20	6		CB4B	LINE	R18	T		
148	14	6		CB4B	LINE	K2	1A		
149	14	2		CB4A	LOAD	TB1	2		
150	20	2		CB4A	LOAD	TP6			
151	14	6		CB4B	LOAD	TB1	10		
152	20	6		CB4B	LOAD	TP2			
153	20	2		CB5	LINE	R1	B		
154	20	2		CB5	LOAD	TP8			
155	20	2		CB5	3D	F1	B		
156	20	2		CB5	5B	CB6	3D		
157	20	2		CB6A	LINE	R2	T		
158	20	6		CB6B	LINE	R2	B		
159	20	2		CB6A	LOAD	TP7			

TITLE				ORIGIN	DESTINATION		REMARKS	
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH		LOCATION	PIN NO.		LOCATION
POWER SUPPLY				WL	SHEET NO. 5	DOCUMENT NO. VCD-7091	REV.	
160	20	6		CB6B	LOAD	TP3		
161	20	2		CB6	5B	K4	L1	
162	20	0		K4	L2	R29	R	
163	20	0		K4	3B	K2	L1	
164	14	4		K4	4A	TB1	5	
165	14	4		K4	4C	K2	1B	
166	20	0		TB1	8	TP4		
167	20	5		TB1	8	TB1	3	
168	20	2		F6	T	C5	POS	
169	12	0		CB1A	LOAD	AUTO-TRANS	1	USED IN BR5A5 D/E UNITS ONLY
170	12	3		CB1B	LOAD	AUTO-TRANS	6	USED IN BR5A5 D/E UNITS ONLY
171	12	1		FL2	LINE	AUTO-TRANS	2	USED IN BR5A5 D/E UNITS ONLY
172	12	5		TB2	5	AUTO-TRANS		USED IN BR5A5 D/E UNITS ONLY
173	20	5		TB2	SHLD	GND		USED IN BR5A5 D/E UNITS ONLY



TITLE POWER DISTRIBUTION							WL	SHEET NO. 1	DOCUMENT NO. VCD-7874	REV A
IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS		
				LOCATION	PIN NO.	LOCATION	PIN NO.			
1	12	5		TB2	5	TB12	5			
2	12	0		TB2	1	TB12	1			
3	12	9		TB2	3	TB12	3			
4	14	3		J1	A	TB12	3			
5	14	3		J1	B	TB12	2			
6	14	3		J1	C	TB12	1			
7	14	3		J1	D	J2	D			
8	14	3		J1	E	J2	E			
9	14	3		J1	F	J2	F			
10	14	3		J1	G	TB12	5			
11	14	3		J2	A	TB12	1			
12	14	3		J2	B	TB12	3			
13	14	3		J2	C	TB12	2			
14	14	3		J2	G	TB12	5			



SECTION 10

EQUATION SUMMARY

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(4) CITY AND STATE

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(6) PUBLICATION NO.	(7) REVISION
(8) FCO'S INCORPORATED INTO MANUAL	

## Equipment Information (From Equipment Nameplate & FCO Log)

(9) EQUIPMENT NO. AND DESCRIPTION
(10) SERIES CODE
(11) FCO'S INCORPORATED INTO EQUIPMENT

## Comments

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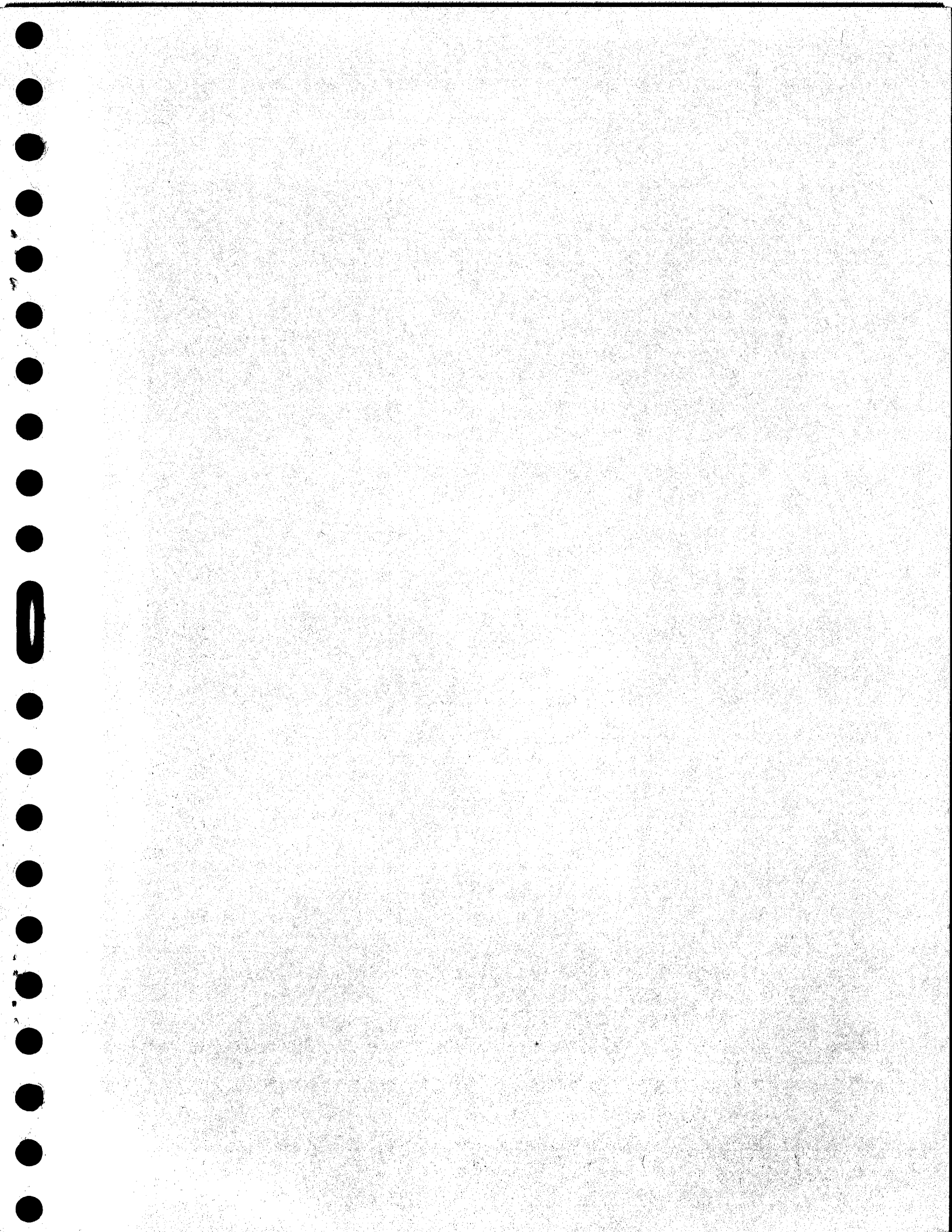
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