



เอกสารอ้างอิง

1. กฤษดา วิชาธิราชพนธ์, ชิน ภาววรรณ ไมโครโปรเซสเซอร์, พิมพ์ครั้งที่ 1.
พฤศจิกายน 2523
2. ศูนย์ฝึกโทรคมนาคม ศูนย์สายโทรศัพท์แบบอัตโนมัติทั่วไป, องค์การโทรศัพท์แห่งประเทศไทย,
2517
3. ศูนย์ฝึกโทรคมนาคม หลักการของศูนย์สายโทรศัพท์ S.P.C. เล่ม 5, องค์การ
โทรศัพท์แห่งประเทศไทย, 2526
4. ศูนย์ฝึกโทรคมนาคม หลักการของศูนย์สายโทรศัพท์ S.P.C. เล่ม 13, องค์การ
โทรศัพท์แห่งประเทศไทย, 2526
5. ไทศล เพ็ชรสุวรรณ, มร. ชิงกี ไซจิ เทคโนโลยีโทรคมนาคม, พิมพ์ครั้งที่ 3,
ตุลาคม 2527
6. ธวัชชัย เลื่อนฉวี, วิรัช เชาว์คำเน็ก เทคโนโลยีโทรศัพท์, พิมพ์ครั้งที่ 1,
พฤศจิกายน 2527
7. JOHN BELLAMY DIGITAL TELEPHONY, JOHN WILLEY & SONS, INC.
CANADA 1982
8. ITT "UNIMATE 4020" ITT. CO. LTD., 1978
9. ERICSSON "ASB 100 EPABX SYSTEM" ERICSSON. CO. LTD., 1982
10. ITT "TD - 100 EPABX" ITT. CO LTD., 1977
11. NEC "ELECTRONIC PABX SYSTEMS NEAX12 GENERAL DESCRIPTION"
NIPPON ELECTRIC CO., LTD., 1978
12. NEC "ELECTRONIC PABX SYSTEMS NEAX 22S/SA" NIPPON ELECTRIC
ELECTRIC CO., LTD., 1981
13. JAMES W. COFFRON Z80 APPLICATIONS, SYBEX INC., 1983
14. WILLIAM BARDEN, Ir. THE Z -80 MICROCOMPUTER HANDBOOK,

HOWARD W. SAM &., INC., 1979

15. RODNAY ZAKS PROGRAMMING THE Z80, SYBEX INC., 1980
16. ARMY DEPARTMENT FUNDAMENTAL OF TELEPHONY, U.S. ARMY, 1955
17. DON LANCASTER CMOS COOK BOOK, HOWARD W. SAM & CO., INC,
FIRST EDITION, USA, 1977
18. NATIONAL SEMICONDUCTOR CMOS DATA BOOK, N.S. CORPERATION,
CARIFONIA, U.S.A., 1978
19. NATIONAL SEMICONDUCTOR TTL DATA BOOK, N.S. CORPORATION,
CARIFONIA, U.S.A. 1973
20. MOTOROLA CMOS DATA BOOK, MOTOROLA SEMICONDUCTOR PRODUCT
INC. AUSTIN, TEXAS U.S.A. 1978

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



ผนวก ก.

ERLUNG TABLE

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

ЭННН. Erlang Table


Table of the Erlang loss formula
(Erlang No. 1 formula, also called Erlang B formula)

Loss probabilities: 1%, 3%, 5%, 7%.

Let p - the loss probability
 y - the traffic offered (in Erlang)
 n - the number of circuits

$$\text{Formula: } E_{1,n}(y) = p = \frac{\frac{y^n}{n!}}{1 + \frac{y}{1} + \frac{y^2}{2!} + \dots + \frac{y^n}{n!}}$$

n	$p = 1\%$	$p = 3\%$	$p = 5\%$	$p = 7\%$	n	$p = 1\%$	$p = 3\%$	$p = 5\%$	$p = 7\%$
1	0.01	0.03	0.05	0.08	51	38.80	42.89	45.53	47.72
2	0.15	0.28	0.38	0.47	52	39.70	43.85	46.53	48.76
3	0.46	0.72	0.90	1.06	53	40.60	44.81	47.53	49.79
4	0.87	1.26	1.53	1.75	54	41.50	45.78	48.54	50.83
5	1.36	1.88	2.22	2.50	55	42.41	46.74	49.54	51.86
6	1.91	2.54	2.96	3.30	56	43.31	47.70	50.54	52.90
7	2.50	3.25	3.74	4.14	57	44.22	48.67	51.55	53.94
8	3.13	3.99	4.54	5.00	58	45.13	49.63	52.55	54.98
9	3.78	4.75	5.37	5.88	59	46.04	50.60	53.56	56.02
10	4.46	5.53	6.22	6.78	60	46.95	51.57	54.57	57.06
11	5.16	6.33	7.08	7.69	61	47.86	52.54	55.57	58.10
12	5.88	7.14	7.95	8.61	62	48.77	53.51	56.58	59.14
13	6.61	7.97	8.84	9.54	63	49.69	54.48	57.59	60.18
14	7.35	8.80	9.73	10.48	64	50.60	55.45	58.60	61.22
15	8.11	9.65	10.63	11.43	65	51.52	56.42	59.61	62.27
16	8.88	10.51	11.54	12.39	66	52.44	57.39	60.62	63.31
17	9.65	11.37	12.46	13.35	67	53.35	58.37	61.63	64.35
18	10.44	12.24	13.39	14.32	68	54.27	59.34	62.64	65.40
19	11.23	13.11	14.31	15.29	69	55.19	60.32	63.65	66.44
20	12.03	14.00	15.25	16.27	70	56.11	61.29	64.67	67.49
21	12.84	14.89	16.19	17.25	71	57.03	62.27	65.68	68.53
22	13.65	15.78	17.13	18.24	72	57.96	63.24	66.69	69.58
23	14.47	16.68	18.08	19.23	73	58.88	64.22	67.71	70.62
24	15.29	17.58	19.03	20.22	74	59.80	65.20	68.72	71.67
25	16.13	18.48	19.99	21.21	75	60.73	66.18	69.74	72.72
26	16.96	19.39	20.94	22.21	76	61.65	67.16	70.75	73.77
27	17.80	20.31	21.90	23.21	77	62.58	68.14	71.77	74.81
28	18.64	21.22	22.87	24.22	78	63.51	69.12	72.79	75.86
29	19.49	22.14	23.83	25.22	79	64.43	70.10	73.80	76.91
30	20.34	23.06	24.80	26.23	80	65.36	71.08	74.82	77.96
31	21.19	23.99	25.77	27.24	81	66.29	72.06	75.84	79.01
32	22.05	24.91	26.75	28.25	82	67.22	73.04	76.86	80.06
33	22.91	25.84	27.72	29.26	83	68.15	74.02	77.87	81.11
34	23.77	26.78	28.70	30.28	84	69.08	75.01	78.89	82.16
35	24.64	27.71	29.68	31.29	85	70.02	75.99	79.91	83.21
36	25.51	28.65	30.66	32.31	86	70.95	76.97	80.93	84.26
37	26.38	29.59	31.64	33.33	87	71.88	77.96	81.95	85.31
38	27.25	30.53	32.62	34.35	88	72.81	78.94	82.97	86.36
39	28.13	31.47	33.61	35.37	89	73.75	79.93	83.99	87.41
40	29.01	32.41	34.60	36.40	90	74.68	80.91	85.01	88.46
41	29.89	33.36	35.58	37.42	91	75.62	81.90	86.04	89.52
42	30.77	34.30	36.57	38.45	92	76.56	82.89	87.06	90.57
43	31.66	35.25	37.57	39.47	93	77.49	83.87	88.08	91.62
44	32.54	36.20	38.56	40.50	94	78.43	84.86	89.10	92.67
45	33.43	37.16	39.55	41.53	95	79.37	85.85	90.12	93.73
46	34.32	38.11	40.54	42.56	96	80.31	86.84	91.15	94.78
47	35.22	39.06	41.54	43.59	97	81.24	87.83	92.17	95.83
48	36.11	40.02	42.54	44.62	98	82.18	88.82	93.19	96.89
49	37.00	40.98	43.53	45.65	99	83.12	89.80	94.22	97.94
50	37.90	41.93	44.53	46.69	100	84.06	90.79	95.24	98.99



พจนก ข.

รายละเอียด ไอซี สวิทซ์เน็ตเวิร์ค

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

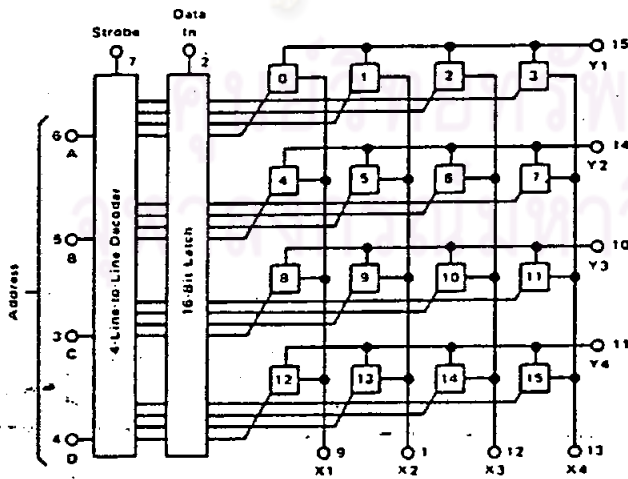
ผนวก. ข

Product Preview

4 X 4 CROSSPOINT SWITCH WITH CONTROL MEMORY

The MC142100 and MC145100 consist of 16 crosspoint switches (analog transmission gates) organized in 4 rows and 4 columns. Both devices have 16 latches, each of which control the state of a particular switch. Any of the 16 switches can be selected by applying its address to the device and a pulse to the strobe input. The selected crosspoint will turn on if during strobe, Data In was a one and will turn off if during strobe, Data In was a zero. In addition the MC145100 will reset all non-selected switches in the same row as the selected switch. Other switches are unaffected. In both devices, an internal power-on reset disables all switches as power is applied.

- Internal Latches Control State of Switches
- Power-On Reset
- Low On Resistance – Typically on $100 \Omega @ 10 \text{ Vdc}$
- Large Analog Range $\pm V_{DD}/2$
- All Inputs Are Diode Protected
- Matched Switch Characteristics
- High CMOS Noise Immunity
- MC142100 Pin-for-Pin Replacement for CD22100



This is advance information and specifications are subject to change without notice.

**MC142100
MC145100**

CMOS MSI

(LOW-POWER COMPLEMENTARY MOS)

4 X 4 CROSSPOINT SWITCH WITH CONTROL MEMORY



L SUFFIX
CERAMIC PACKAGE
CASE 620

P SUFFIX
PLASTIC PACKAGE
CASE 648

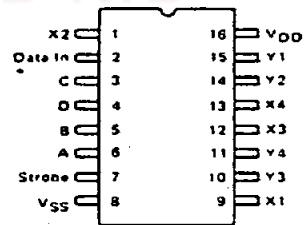
ORDERING INFORMATION

MC14XXXX

Suffix Denotes

- L Ceramic Package
- P Plastic Package
- A Extended Operating Temperature Range
- C Limited Operating Temperature Range

PIN ASSIGNMENTS



MC142100, MC145100

MAXIMUM RATINGS (Voltages referenced to V_{SS}, Pin 8)

Rating	Symbol	Value	Unit
DC Supply Voltage	V _{DD}	-0.5 to +18	Vdc
Input Voltage, All Inputs	V _{in}	V _{DD} to -0.5	Vdc
DC Current Drain per Pin	I	10	mAdc
Operating Temperature Range - AL Device CL/CP Device	T _A	-55 to +125 -40 to +85	°C
Storage Temperature Range	T _{stg}	-65 to +150	°C

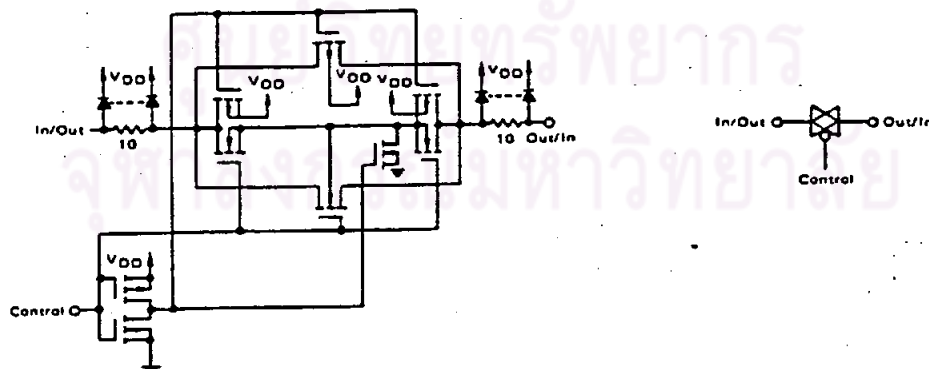
This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit. For proper operation it is recommended that V_{in} and V_{out} be constrained to the range V_{SS} ≤ V_{in} or V_{out} ≤ V_{DD}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}).

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V _{DD} Vdc	T _{low} *		25°C			T _{high} *		Unit
			Min	Max	Min	Typ	Max	Min	Max	
Input Voltage (Logic) "0" Level (V _O = 4.5 or 0.5 Vdc) (V _O = 9.0 or 1.0 Vdc) (V _O = 13.5 or 1.5 Vdc)	V _{IL}	5.0	-	1.5	-	2.25	1.5	-	1.5	Vdc
		10	-	3.0	-	4.50	3.9	-	3.0	
		15	-	3.75	-	6.75	3.75	-	3.75	
"1" Level (V _O = 0.5 or 4.5 Vdc) (V _O = 1.0 or 9.0 Vdc) (V _O = 1.5 or 13.5 Vdc)	V _{IH}	5.0	3.5	-	3.5	2.75	-	3.5	-	Vdc
		10	7.0	-	7.0	5.50	-	7.0	-	
		15	11.25	-	11.25	8.25	-	11.25	-	
Input Current	I _{in}	15	-	±0.3	-	±0.00001	±0.3	-	±1.0	µA
Input Capacitance (V _{in} = 0) Digital Inputs Switch Inputs	C _{in}	-	-	-	-	5.0	-	-	-	pF
		10	-	-	-	-	-	-	-	
Output Capacitance	C _{out}	10	-	-	-	-	-	-	-	pF
Feedthrough Capacitance	C _{in/out}	-	-	-	-	-	-	-	-	pF
Quiescent Current (Per Package)	I _Q	5.0	-	1.0	-	0.0005	1.0	-	7.5	Adc
		10	-	2.0	-	0.0010	2.0	-	15	
		15	-	4.0	-	0.0015	4.0	-	30	
On-State Resistance	R _{on}	5.0	-	-	-	-	-	-	-	Ω
		10	-	-	-	-	-	-	-	
		15	-	-	-	-	-	-	-	
On-State Resistance Difference Between Any Two Switches	ΔR _{on}	5.0	-	-	-	-	-	-	-	Ω
		10	-	-	-	-	-	-	-	
		15	-	-	-	-	-	-	-	
Input/Output Leakage Current Switch Off	I _{in/out}	15	-	±300	-	±0.01	±300	-	±1000	nAdc

ANALOG TRANSMISSION GATE
(CROSSPOINT) SCHEMATIC



MC142100, MC145100

SWITCHING CHARACTERISTICS

Characteristic	Symbol	V _{DD} V _{dc}	Min	Typ	Max	Unit
Propagation Delay Times Input to Control (R _L = 10 kΩ)	t _{PLH} , (PHL)	5.0	-	-	-	ns
		10	-	-	-	
		15	-	-	-	
Strobe to Output Output "1" to High Impedance	t _{PHZ}	5.0	-	-	-	ns
		10	-	-	-	
		15	-	-	-	
Output "0" to High Impedance	t _{PLZ}	5.0	-	-	-	ns
		10	-	-	-	
		15	-	-	-	
High Impedance to Output "1"	t _{PZH}	5.0	-	-	-	ns
		10	-	-	-	
		15	-	-	-	
High Impedance to Output "0"	t _{PZL}	5.0	-	-	-	ns
		10	-	-	-	
		15	-	-	-	
Setup Time Address or Data In to Strobe	t _{su}	5.0 10 15	- - -	- - -	- - -	ns
Hold Time Address or Data In to Strobe	t _h	5.0 10 15	- - -	- - -	- - -	ns
Strobe Pulse Width	t _{WH}	5.0 10 15	- - -	- - -	- - -	ns
Sine Wave Distortion (R _L = 10 kΩ, f = 1.0 kHz)	-	5.0 10 15	- - -	- - -	- - -	%
Frequency Response (Switch ON) (R _L = 1.0 kΩ, 20 Log ₁₀ $\frac{V_{out}}{V_{in}}$ = -3.0 dB)	-	5.0	-	-	-	MHz
		10	-	-	-	
		15	-	-	-	
Feedthrough Attenuation (Switch OFF) (R _L = 1.0 kΩ, 20 Log ₁₀ $\frac{V_{out}}{V_{in}}$ = -50 dB)	-	5.0	-	-	-	MHz
		10	-	-	-	
		15	-	-	-	
Crosstalk Between Any Two Switches (Switch A On, Switch B Off) (R _L = 1.0 kΩ, 20 Log ₁₀ $\frac{V_{out(B)}}{V_{in(A)}}$ = -50 dB)	-	5.0	-	-	-	MHz
		10	-	-	-	
		15	-	-	-	

This table lists all of the characteristics to be specified for this device. Final specifications were not available at the time of printing. For the latest data, contact CMOS Marketing, Motorola Semiconductor Products Inc., 3501 Ed Bluestein Blvd., Austin, Texas 78721.

TRUTH TABLE

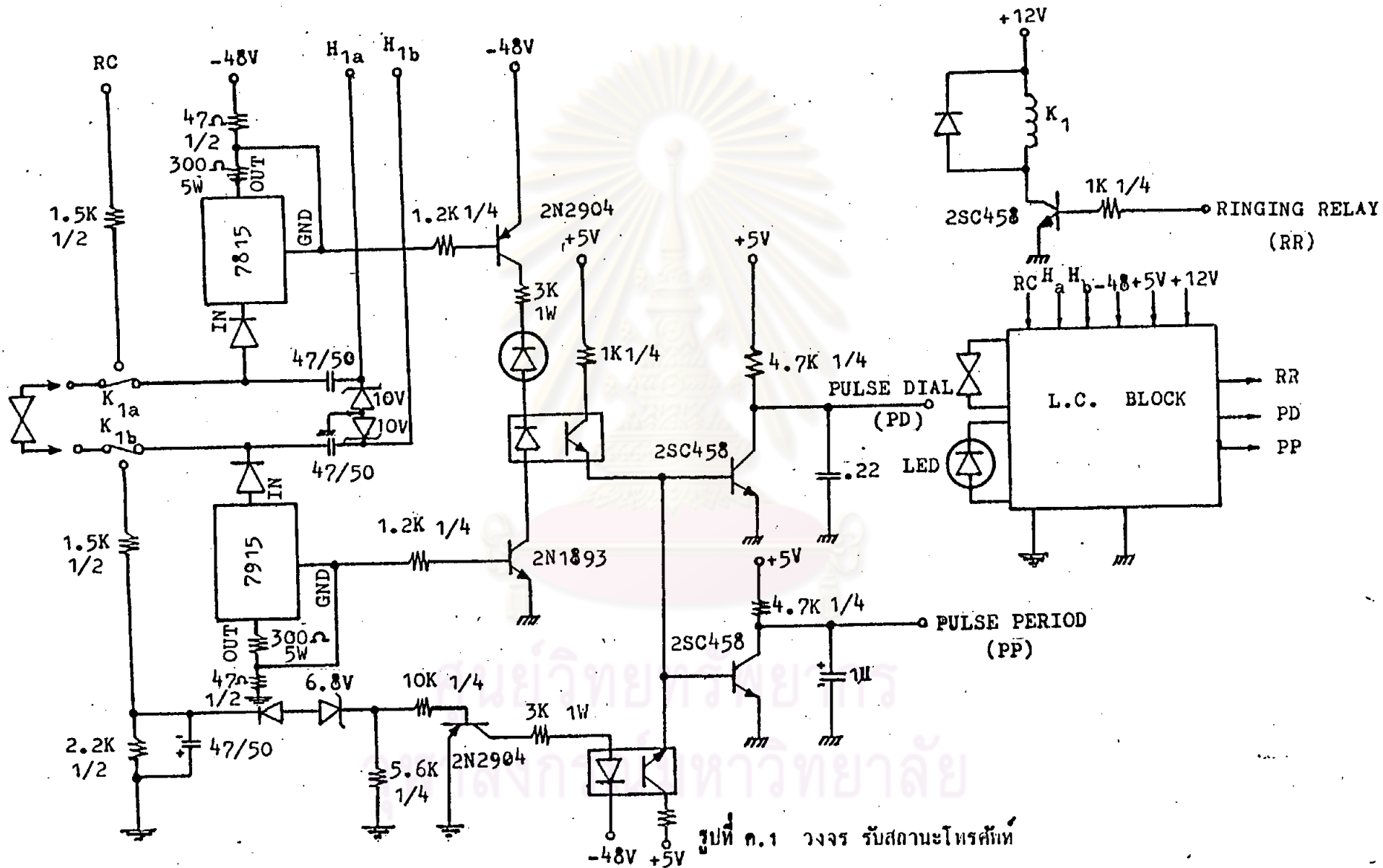
Address				Switch Selected	MC145100 Only Switches				Switch Selected	MC145100 Only Switches							
A	B	C	D		Cleared		Cleared			Cleared		Cleared					
0	0	0	0	X1Y1	0	1	2	3	0	0	0	1	X1Y3	8	9	10	11
1	0	0	0	X2Y1	1	0	2	3	1	0	0	1	X2Y3	9	8	10	11
0	1	0	0	X3Y1	2	0	1	3	0	1	0	1	X3Y3	10	8	9	11
1	1	0	0	X4Y1	3	0	1	2	1	1	0	1	X4Y3	11	8	9	10
0	0	1	0	X1Y2	4	5	6	7	0	0	1	1	X1Y4	12	13	14	15
1	0	1	0	X2Y2	5	4	6	7	1	0	1	1	X2Y4	13	12	14	15
0	1	1	0	X3Y2	6	4	5	7	0	1	1	1	X3Y4	14	12	13	15
1	1	1	0	X4Y2	7	4	5	6	1	1	1	1	X4Y4	15	12	13	14



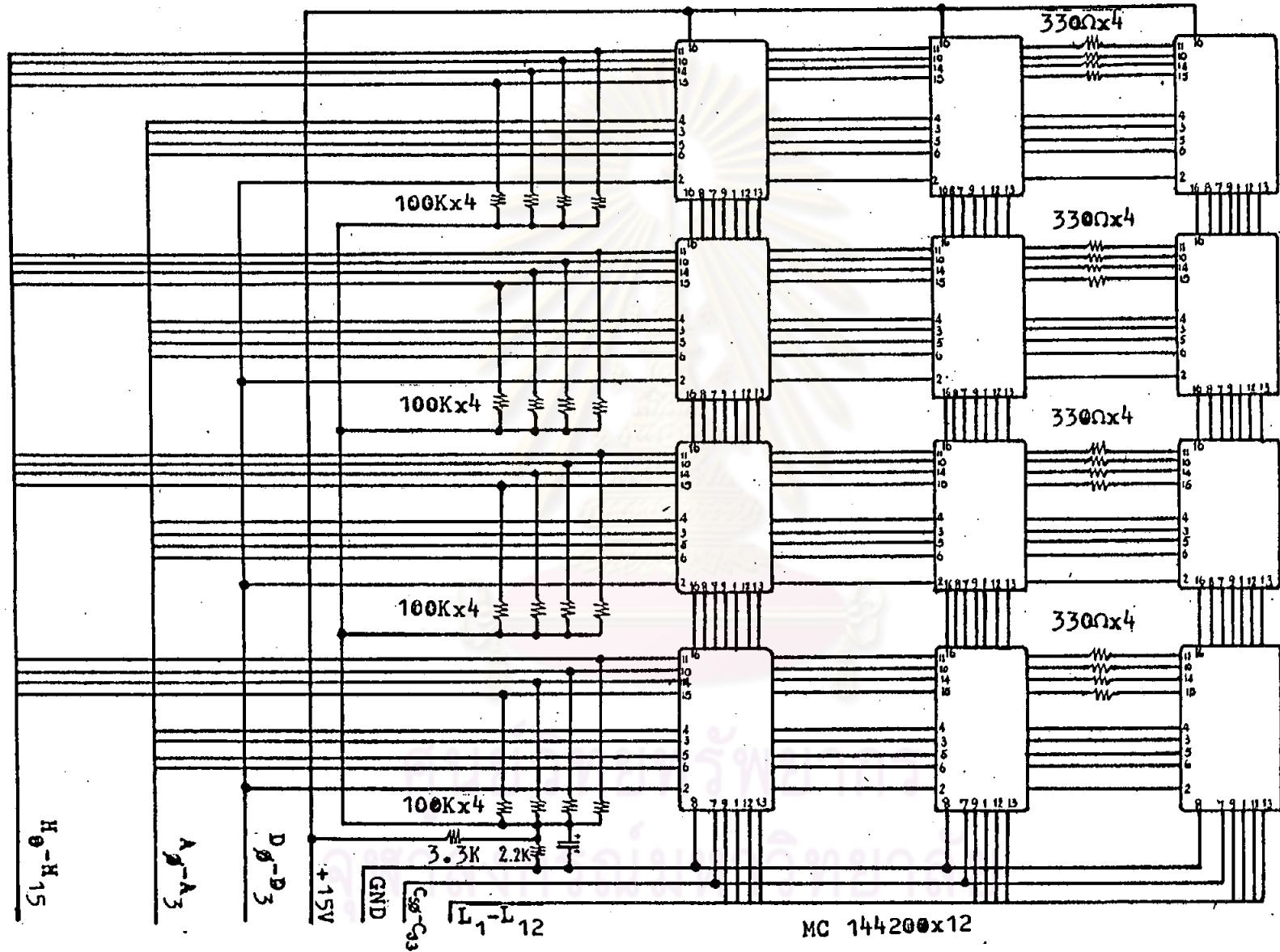
พจนานุกรม ค.

รายละเอียด วงจร

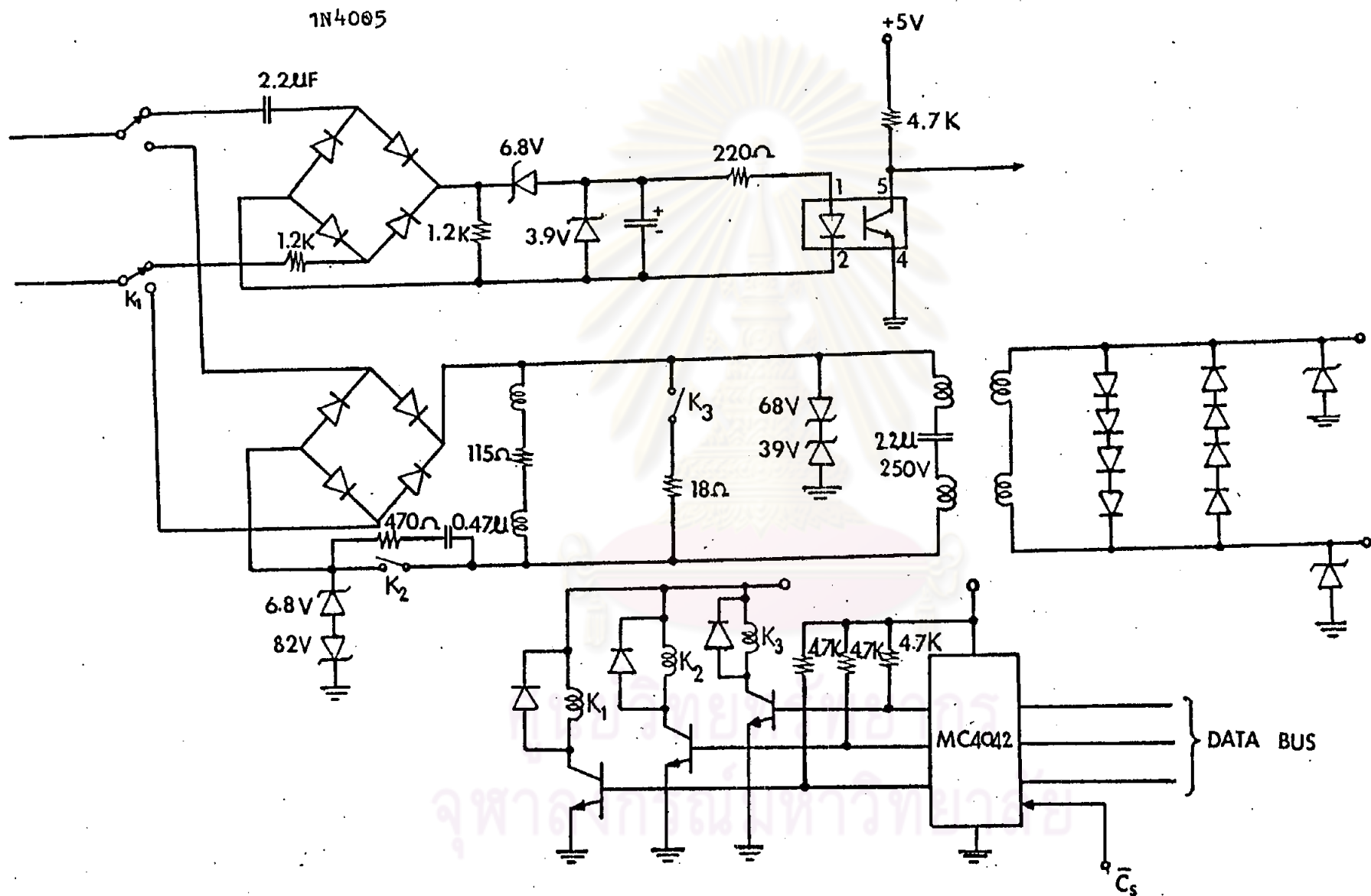
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



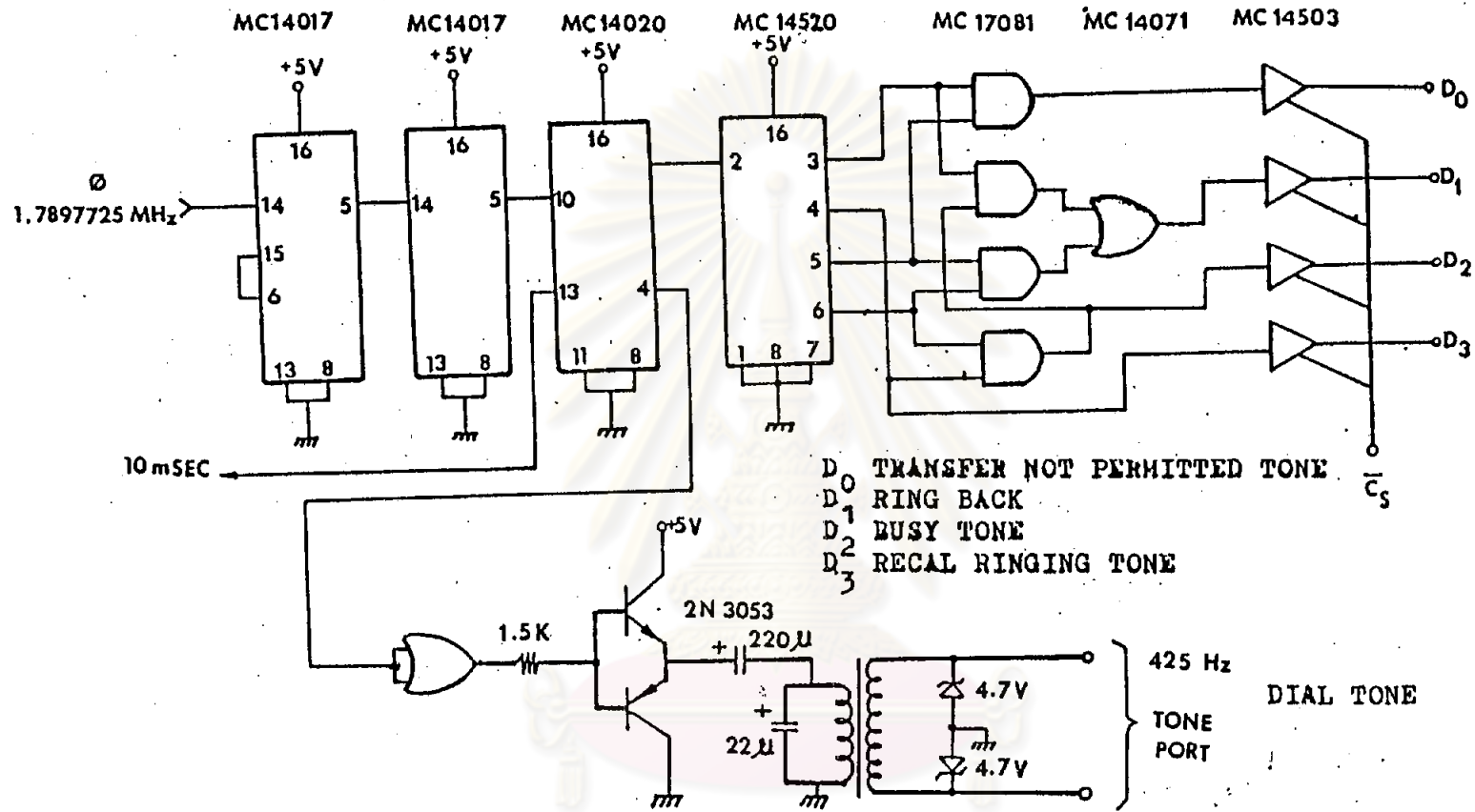
รูปที่ ก.1 วงจร รับสถานะโทรศัพท์



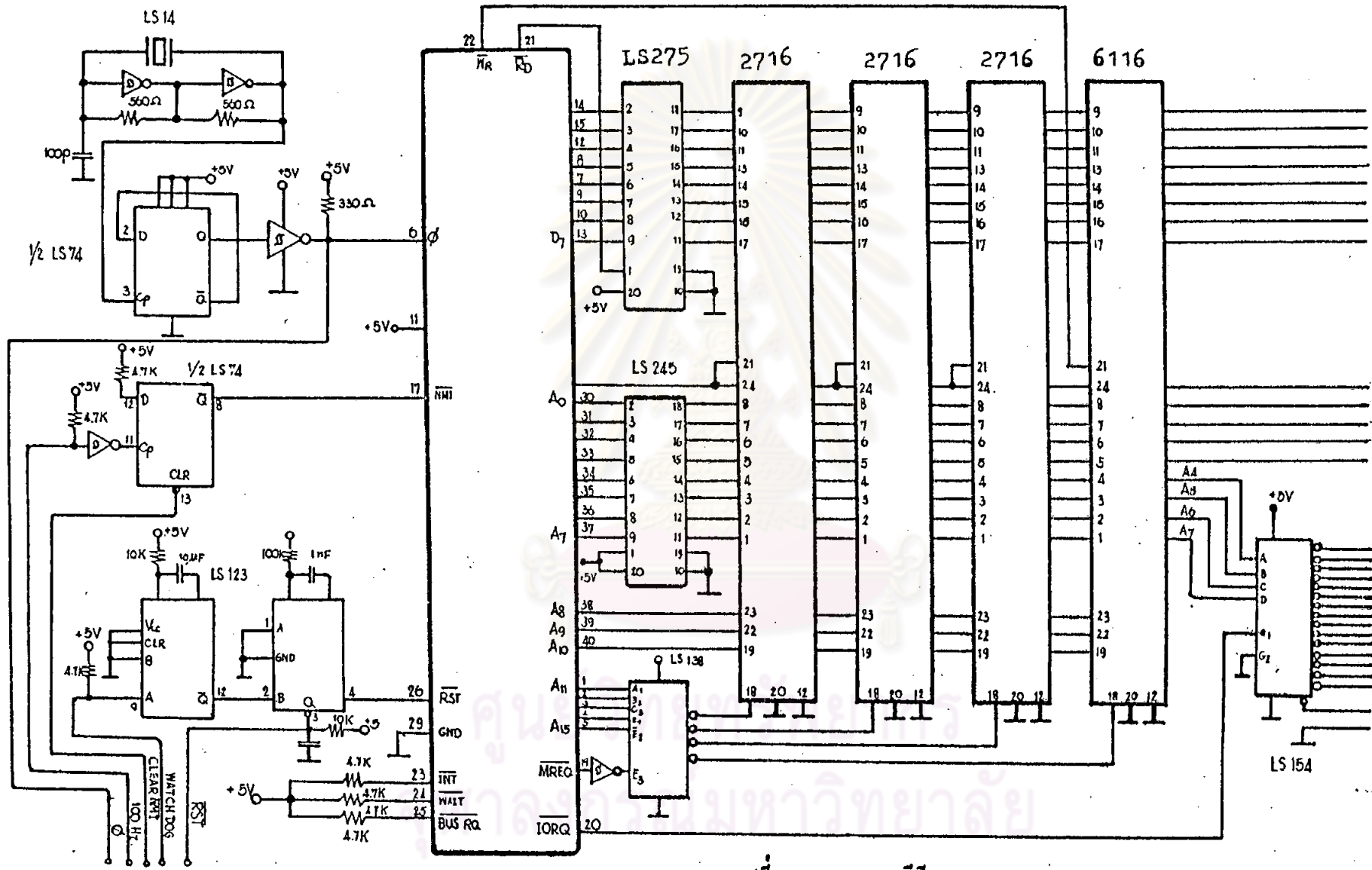
รูปที่ ๓.๒ วงจร สวิตชิงเมทริก



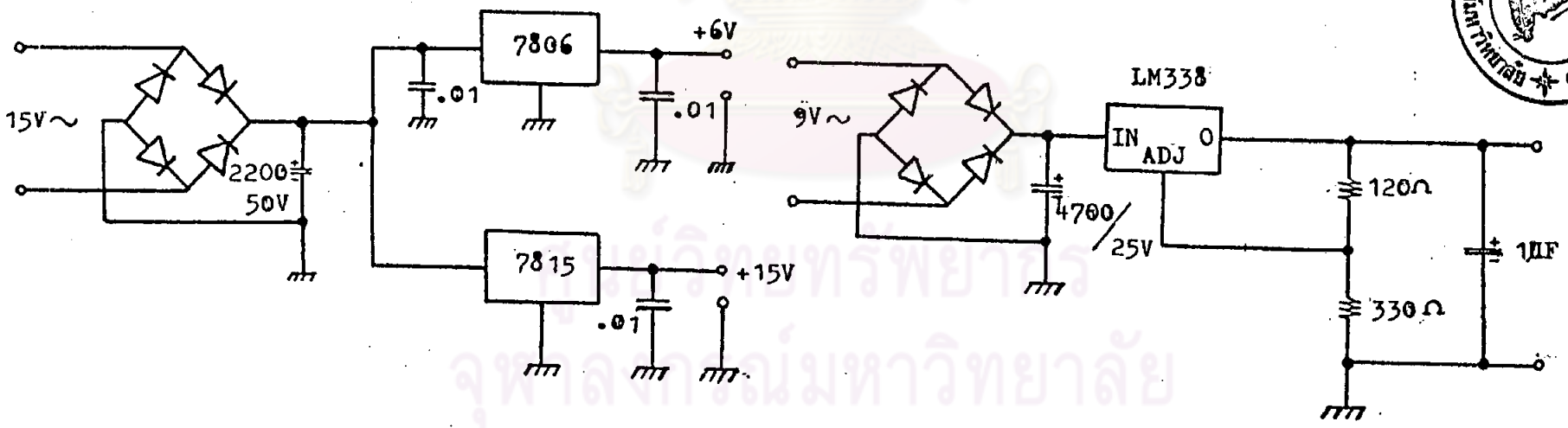
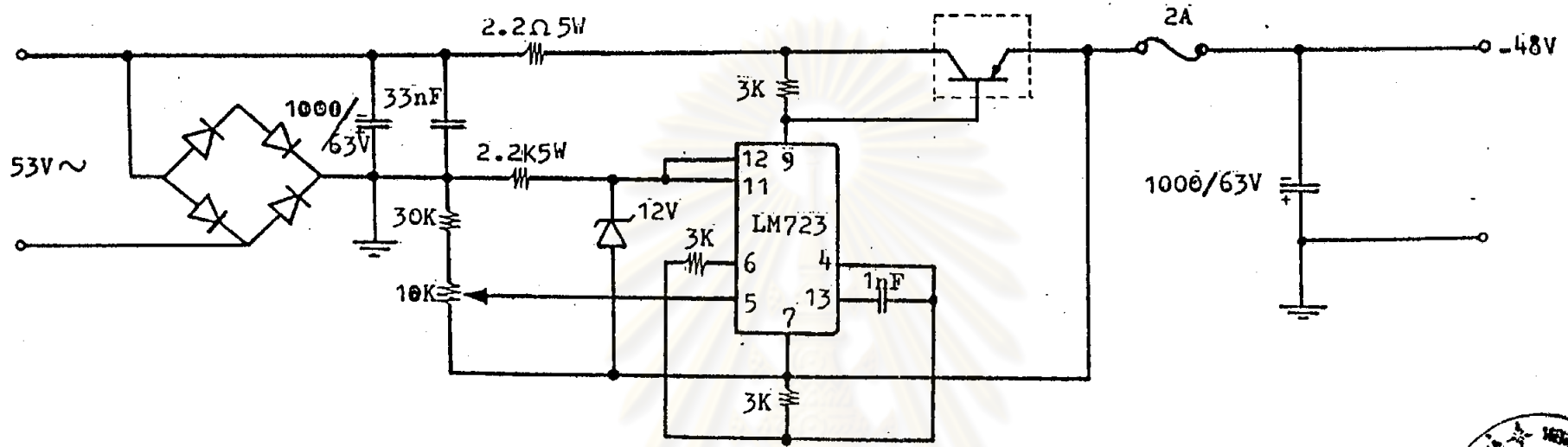
รูปที่ ๓.3 วงจร เพื่อต่อชุดสายภายนอก



ศูนย์วิทยุโทรพยากร
จุฬาลงกรณ์มหาวิทยาลัย
รูปที่ ค.4 วงจร กำหนดช่วงเวลา



รูปที่ ก.5 วงจร ซีพียู



ท.6 วงจร แหล่งจ่ายไฟ



พจนานุกรม

PROGRAM LISTING

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย


```

1000 *-----
1010 *   INITIAL PROGRAM
1020 *   STARTING THE PROGRAM
1030 *   SET STACK POINTER
1040 *   ERASE RAM WHEN RESET SWITCH
1050 *   PRESSED AND JUMP TO MAIN
1060 *-----

```

```

1070     .OR 0000H
1080     .TA 0800H
1090     LD SP,1DDFH
1100     IN A,(32H)
1110     BIT 7,A
1120     JR NZ,PASS
1130     LD HL,1800H
1140     LD B,04H
1150     XOR A
1160 LOOP PUSH BC
1170     LD B,OFFH
1180 LOOP1 LD (HL),A
1190     INC HL
1200     DJNZ LOOP1
1210     POP BC
1220     DJNZ LOOP
1230 PASS OUT (2FH),A
1240     IN A,(28H)
1250     XOR A
1260     JP 0100H

```

```

1000 *-----
1010 *   TEMPORARY PROGRAM
1020 *   TESTED ANY STATUS IN MEMORY
1030 *   INDEX BY TRUMBWHEEL SWITCH
1040 *-----

```

```

1050     .OR 0038H
1060     .TA 0B38H
1070     POP DE
1080     OUT (2FH),A ;OUT PUT WATCHDOG
1090     IN A,(32H) ;TEST RESET SW
1100     BIT 7,A
1110     JP Z,0000H
1120     IN A,(34H)
1130     LD L,A
1140     IN A,(35H)
1150     ADD A,10H
1160     LD H,A
1170     LD A,(HL)
1180     OUT (33H),A
1190     JP 0100H

```

```

1000 *-----
1010 *   MAIN PROGRAM
1020 *   CALL ANY SUBPROGRAM
1030 *-----
1040 MAIN .OR 0100H
1050      .TA 0900H
1060      CALL SEPER
1070      CALL SWAP
1080      CALL IMBB
1090      CALL HCHK
1100      CALL PDCHK
1110      CALL PCOUNT
1120      CALL FDGT
1130      CALL INCK
1140      CALL TBUFF
1150      CALL TFLAG
1160      CALL RGRC
1170      CALL INCHK
1180      CALL INMA
1190      CALL CEOHK
1200      CALL MLTF
1210      CALL DHTE
1220      CALL PLSTR
1230      CALL INONH
1240      CALL DGTK
1250      CALL DGIUT
1260      CALL INCOM
1270      CALL CRTRK
1280      CALL HTRK
1290      CALL TRAMN
1300      CALL DHTR
1310      CALL SECO
1320      RST 3BH
1330 SEPER .EQ 0200H
1340 SWAP  .EQ 0260H
1350 IMBB  .EQ 0270H
1360 HCHK  .EQ 0280H
1370 PDCHK .EQ 02E3H
1380 PCOUNT .EQ 0362H
1390 FDGT  .EQ 038EH
1400 INCK  .EQ 0424H
1410 TBUFF .EQ 0481H
1420 TFLAG .EQ 0494H
1430 RGRC  .EQ 0543H
1440 INCHK .EQ 05AFH
1450 INMA  .EQ 05F1H
1460 CEOHK .EQ 06C4H
1470 MLTF  .EQ 070CH
1480 DHTE  .EQ 0758H
1490 PLSTR .EQ 0797H
1500 INONH .EQ 0140H
1510 DGTK  .EQ 0850H
1520 DGIUT .EQ 095CH
1530 INCOM .EQ 09C4H
1540 CRTRK .EQ 0AB8H
1550 HTRK  .EQ 0ADEH
1560 TRAMN .EQ 0B00H
1570 DHTR  .EQ 0BB4H
1580 SECO  .EQ 0C70H

```

```

1000 *-----
1010 *   SEPERATED
1020 *   SEPERATED TELEPHONE STATUS
1030 *   FROM INPUT MAILBOX TO THE
1040 *   BUFFER
1050 *-----
1060      .OR 0200H
1070      .TA 0A00H
1080      LD HL,1852H
1090      CALL ROTAT
1100      CALL CMENT
1110      CALL SHIFT
1120      LD HL,1856H
1130      CALL ROTAT
1140      CALL SHIFT
1150      LD HL,185AH
1160      CALL ROTAT
1170      RET
1180 SHIFT .EQ 0220H
1190 ROTAT .EQ 0230H
1200 CMENT .EQ 0250H
1210 *-----
1220 *   SHIFT
1230 *-----
1240      .OR 0220H
1250      .TA 0A20H
1260      LD DE,1846H
1270      LD B,08H
1280 LOOP8 LD A,(DE)
1290      RLC A
1300      LD (DE),A
1310      INC DE
1320      DJNZ LOOP8
1330      RET
1340 *-----
1350 *   ROTATE
1360 *-----
1370      .OR 0230H
1380      .TA 0A30H
1390      LD DE,1846H
1400      LD B,02H
1410 LOOP6 PUSH BC
1420      LD B,04H
1430 LOOP7 LD A,(DE)
1440      RLC A
1450      RL (HL)
1460      RLC A
1470      RLC A
1480      RLC A
1490      RL (HL)
1500      INC DE
1510      DJNZ LOOP7
1520      DEC HL
1530      DEC HL
1540      POP BC
1550      DJNZ LOOP6
1560      RET

```

```

1570 *-----
1580 *   COMPLEMENT
1590 *-----
1600     .OR 0250H
1610     .TA 0A50H
1620     LD HL,1850H
1630     LD A,(HL)
1640     CPL
1650     LD (HL),A
1660     INC HL
1670     INC HL
1680     LD A,(HL)
1690     CPL
1700     LD (HL),A
1710     RET

```

```

1000 *-----
1010 *   SWAP
1020 *-----
1030     .OR 0260H
1040     .TA 0A60H
1050     LD HL,1850H
1060     LD DE,1851H
1070     LD B,06H
1080 SLOOP LD A,(HL)
1090     LD (DE),A
1100     INC HL
1110     INC HL
1120     INC DE
1130     INC DE
1140     DJNZ SLOOP
1150     RET

```

```

1000 *-----
1010 *   IMBB
1020 *-----
1030     .OR 0270H
1040     .TA 0270H
1050     LD HL,1800H   STARTING SOURCE
1060     LD DE,1846H   STARTING DISTRIN
1070     LD B,08H     SET COUNT
1080 BLOOP LD A,(HL)
1090     LD (DE),A
1100     INC HL
1110     INC DE
1120     DJNZ BLOOP
1130     RET

```

```

1000 *-----
1010 *   HOOK STATUS CHECK
1020 *   DETECTED ONHOOK ,OFFHOOK
1030 *   LOAD STATUS IN CARDNUMBER
1040 *-----
1050     .OR 0290H
1060     .TA 0A90H
1070     LD HL,(1E58H)
1080     LD IX,1F00H
1090     LD DE,0010H
1100     LD B,02H
1110 HCHK1 PUSH BC
1120     LD B,08H
1130 HCHK2 BIT 0,H
1140     JR Z,ONHK
1150     BIT 0,L
1160     JR Z,HKNEX
1170     BIT 2,(IX+0)
1180     JR NZ,HHOME
1190     BIT 0,(IX+0)
1200     JR NZ,HHOME
1210     SET 4,(IX+1)
1220     SET 3,(IX+0)
1230 HCLTM XOR A
1240     LD (IX+0EH),A
1250     LD (IX+0FH),A
1260 HHOME SET 0,(IX+0)
1270 HKNEX RRC H
1280     RRC L
1290     ADD IX,DE
1300     DJNZ HCHK2
1310     LD HL,(1E5AH)
1320     POP BC
1330     DJNZ HCHK1
1340     XOR A
1350     RET
1360 ONHK BIT 0,L
1370     JR NZ,HKNEX
1380     BIT 0,(IX+0)
1390     JR Z,HKNEX
1400     BIT 1,(IX+0)
1410     JR NZ,HKNEX
1420     SET 1,(IX+0)
1430     XOR A
1440     LD (IX+0EH),A
1450     LD (IX+0FH),A
1460     JR HKNEX

```

```

1000 *-----
1010 * PDCHK
1020 *
1030 * CHECKED DIALLING PERIOD
1040 *-----
1050 LD HL,(1E50H)
1060 LD IX,1F00H
1070 LD DE,0010H
1080 LD B,02H
1090 PDCK1 PUSH BC
1100 LD B,08H
1110 PDCK2 BIT 0,(IX+0)
1120 JR Z,PDNEX
1130 BIT 0,H
1140 JR NZ,ONPD
1150 BIT 0,L
1160 JR NZ,PDNEX
1170 BIT 2,(IX+1)
1180 JR NZ,PDNEX
1190 BIT 0,(IX+1)
1200 JR NZ,INCPD
1210 RES 4,(IX+1)
1220 SET 0,(IX+1)
1230 XOR A
1240 LD (IX+0DH),A
1250 INCPD XOR A
1260 LD (IX+0CH),A
1270 RES 7,(IX+0DH)
1280 SET 2,(IX+1)
1290 XOR A
1300 LD (IX+0EH),A
1310 LD (IX+0FH),A
1320 PDNEX RRC H
1330 RRC L
1340 ADD IX,DE
1350 DJNZ PDCK2
1360 LD HL,(1E52H)
1370 POP BC
1380 DJNZ PDCK1
1390 XOR A
1400 RET
1410 ONPD BIT 0,L
1420 JR Z,PDNEX
1430 BIT 0,(IX+1)
1440 JR Z,PDNEX
1450 BIT 7,(IX+0DH)
1460 JR NZ,PDNEX
1470 SET 1,(IX+1)
1480 RES 2,(IX+1)
1490 INC (IX+0DH)
1500 SET 7,(IX+0DH)
1510 JR PDNEX

```

```

1000 *-----
1010 * PULSE COUNT
1020 *
1030 * COUNTED DIAL PULSE
1040 *-----
1050 LD IX,1F00H
1060 LD DE,0010H
1070 LD HL,1E54H
1080 LD B,02H
1090 PCON1 PUSH BC
1100 LD B,08H
1110 LD A,(HL)
1120 PCON2 BIT 0,(IX+1)
1130 JR Z,PCONX
1140 BIT 1,(IX+1)
1150 JR NZ,PCONX
1160 BIT 2,(IX+1)
1170 JR Z,PCONX
1180 BIT 7,(IX+0)
1190 JR NZ,PCONX
1200 BIT 0,A
1210 JR Z,INCRP
1220 RES 7,(IX+0CH)
1230 JR PCONX
1240 INCRP BIT 7,(IX+0CH)
1250 JR NZ,PCONX
1260 INC (IX+0CH)
1270 SET 7,(IX+0CH)
1280 PCONX RRC A
1290 ADD IX,DE
1300 DJNZ PCON2
1310 INC HL
1320 INC HL
1330 POP BC
1340 DJNZ PCON1
1350 RET

```



ศูนย์วิทยุโทรพยากร
 ภาลงกรณ์มหาวิทยาลัย

```

1000 *-----
1010 *   FIRST DIGIT CHECKED
1020 *
1030 *   CHECKED FIRST DIGIT IN COUNT
1040 *
1050 *   TESTED ASSIGNMENT OF FIRST
1060 *   DIGIT AND SET FLAG IF MEET
1070 *   UNASSIGNED CODE THEN BUSY
1080 *-----
1090     LD IX,1F00H
1100     LD DE,0010H
1110     LD B,10H
1120 FDGT1 BIT 0,(IX+0)
1130     JR Z,FDGTN
1140     BIT 0,(IX+1)
1150     JR Z,FDGTN
1160     BIT 1,(IX+1)
1170     JR Z,FDGTN
1180     LD A,(IX+0DH)
1190     AND OFH
1200     CP 01H
1210     JR NZ,FDGTN
1220     LD A,(IX+0CH)
1230     CP 00H
1240     JR Z,FDGTN
1250     CP 0AH
1260     JR Z,EXT
1270     CP 01H
1280     JR Z,TRAN
1290     CP 02H
1300     JR Z,SPEC
1310     CP 03H
1320     JR Z,INTE
1330     CP 04H
1340     JR Z,INTE
1350     SET 5,(IX+1)
1360 FDGTN ADD IX,DE
1370     DJNZ FDGT1
1380     RET
1390 EXT  SET 7,(IX+0)
1400     JR STORD
1410 TRAN SET 6,(IX+0)
1420     JR STORD
1430 SPEC SET 3,(IX+1)
1440     JR STORD
1450 INTE SET 5,(IX+0)
1460 STORD LD A,(IX+0CH)
1470     LD (IX+0BH),A
1480     XOR A
1490     LD (IX+0CH),A
1500     RES 1,(IX+1)
1510     JR FDGTN

```

```

1000 *-----
1010 *   INTRA OFFICE CALL
1020 *
1030 *   SET INT.FLAG AND RECEIVE
1040 *   NEXT DIGIT CODE
1050 *-----
1060     LD IX,1F00H
1070     LD DE,0010H
1080     LD B,10H
1090 INCK1 BIT 0,(IX+0)
1100     JR Z,INNEX
1110     BIT 5,(IX+0)
1120     JR Z,INNEX
1130     BIT 1,(IX+1)
1140     JR Z,INNEX
1150     LD A,(IX+0DH)
1160     AND OFH
1170     CP 02H
1180     JR NZ,INNEX
1190     SLA (IX+0BH)
1200     SLA (IX+0BH)
1210     SLA (IX+0BH)
1220     SLA (IX+0BH)
1230     LD A,(IX+0BH)
1240     OR (IX+0CH)
1250     LD (IX+0BH),A
1260     XOR A
1270     LD (IX+0CH),A
1280     RES 0,(IX+1)
1290     RES 1,(IX+1)
1300 INNEX ADD IX,DE
1310     DJNZ INCK1
1320     XOR A
1330     RET
1000 *-----
1010 *   TONE SIGNALING BUFFER
1020 *
1030 *   SET TONE STATUS FROM TONE
1040 *   GENERATOR MAIL BOX TO BUFFER
1050 *-----
1060     .OR 0481H
1070     .TA 0CB1H
1080     LD A,(1E08H)
1090     LD D,A
1100     LD HL,1E74H
1110     LD B,04H
1120 TBUF1 BIT 0,D
1130     JR Z,TBCLR
1140     LD A,OFFH
1150     LD (HL),A
1160 TBHOM INC HL
1170     SRL D
1180     DJNZ TBUF1
1190     XOR A
1200     RET
1210 TBCLR XOR A
1220     LD (HL),A
1230     JR TBHOM

```

1000	-----	1480	LD HL,1E68H
1010	* TONE FLAG	1490	LD DE,1E75H
1020	*	1500	CALL GRID
1030	* CHECK TONE STATUS IN CARD	1510	LD HL,1E6CH
1040	* NUMBER AND SET IN TONE	1520	LD DE,1E77H
1050	* SWITCHING NETWORK	1530	CALL GRID
1060	-----	1540	LD IY,1E60H
1070	.OR 029CH	1550	LD IY,1E78H
1080	.TA 0C9CH	1560	LD B,04H
1090	LD HL,1E60H	1570	ORB XOR A
1100	LD B,10H	1580	LD A,(IY+0)
1110	XOR A	1590	OR (IY+04)
1120	CLRBF LD (HL),A	1600	OR (IY+08)
1130	INC HL	1610	OR (IY+0CH)
1140	DJNZ CLRBF	1620	LD (HL),A
1150	LD IX,1F00H	1630	INC HL
1160	LD DE,0010H	1640	INC IY
1170	LD B,04H	1650	DJNZ ORB
1180	TONE1 PUSH BC	1660	LD DE,1E33H
1190	LD B,04H	1670	LD HL,1E78H
1200	LD IY,1E60H	1680	LD B,04H
1210	TONE2 XOR A	1690	OSW LD A,(HL)
1220	LD A,(IX+1)	1700	LD (DE),A
1230	AND 0F0H	1710	INC HL
1240	SLA A	1720	INC DE
1250	RR (IY+0CH)	1730	INC DE
1260	SLA A	1740	INC DE
1270	RR (IY+08)	1750	INC DE
1280	SLA A	1760	DJNZ OSW
1290	RR (IY+04)	1770	RET
1300	SLA A	1780	GRID .EQ 0537H
1310	RR (IY+0)	1790	.OR 0537H
1320	INC IY	1800	.TA 0D37H
1330	ADD IX,DE	1810	LD B,04H
1340	DJNZ TONE2	1820	GRID1 LD A,(DE)
1350	POP BC	1830	AND (HL)
1360	DJNZ TONE1	1840	LD (HL),A
1370	LD HL,1E60H	1850	INC HL
1380	LD B,10H	1860	DJNZ GRD1
1390	TONE3 SRL (HL)	1870	RET
1400	SRL (HL)		
1410	SRL (HL)		
1420	SRL (HL)		
1430	INC HL		
1440	DJNZ TONE3		
1450	LD HL,1E64H		
1460	LD DE,1E74H		
1470	CALL GRID		

```

1000 *-----
1010 *   RGRC
1020 *
1030 *   CHECK THE RINGING FLAG
1040 *   CONTROL THE RINGING MAILBOX
1050 *-----
1060     .OR 0543H
1070     .TA 0D43H
1080     LD HL,1E70H
1090     LD B,04H
1100     XOR A
1110 RGRC LD (HL),A ;
1120     INC HL
1130     DJNZ RGRC
1140     LD IX,1F00H
1150     LD IY,1E70H
1160     LD DE,0010H
1170     LD B,02H
1180 RGRC1 PUSH BC
1190     LD B,08H
1200 RGRC2 XOR A
1210     LD A,(IX+2)
1220     SRL A
1230     RR (IY+0)
1240     SRL A
1250     RR (IY+2)
1260     ADD IX,DE
1270     DJNZ RGRC2
1280     INC IY
1290     POP BC
1300     DJNZ RGRC1
1310     LD HL,1E70H
1320     LD B,02H
1330 RGRC3 LD A,(1E76H)
1340     AND (HL)
1350     LD (HL),A
1360     INC HL
1370     DJNZ RGRC3
1380     LD HL,1E72H
1390     LD B,02H
1400 RGRC4 LD A,(1E75H)
1410     AND (HL)
1420     LD (HL),A
1430     INC HL
1440     DJNZ RGRC4
1450     LD IX,1E70H
1460     LD B,02H
1470 RGRC5 LD A,(IX+0)
1480     OR (IX+2)
1490     LD (IX+2),A
1500     INC IX
1510     DJNZ RGRC5
1520     LD DE,1E42H
1530     LD HL,1E72H
1540     LD BC,0002H
1550     LDIR
1560     RET

```

```

1000 *-----
1010 *   INTRA OFFICE CHECKED
1020 *
1030 *   CHECKED 2 DIGIT COUNT
1040 *   CHECKED INTRA FLAG
1050 *-----
1060     .OR 05AFH
1070     .TA 0DAFH
1080     LD IX,1F00H
1090     LD DE,0010H
1100     LD B,10H
1110 INCK1 BIT 0,(IX+0)
1120     JR Z,INNEX
1130     BIT 5,(IX+0)
1140     JR Z,INNEX
1150     BIT 1,(IX+1)
1160     JR Z,INNEX
1170     LD A,(IX+0DH)
1180     AND 0FH
1190     CP 02H
1200     JR NZ,INNEX
1210     SLA (IX+0BH)
1220     SLA (IX+0BH)
1230     SLA (IX+0BH)
1240     SLA (IX+0BH)
1250     LD A,(IX+0BH)
1260     OR (IX+0CH)
1270     LD (IX+0BH),A
1280     XOR A
1290     LD (IX+0CH),A
1300     RES 0,(IX+1)
1310     RES 1,(IX+1)
1320 INNEX ADD IX,DE
1330     DJNZ INCK1
1340     XOR A
1350     RET

```

ศูนย์วิทยุโทรพยากร
ศาลากลางกรมมหาวิทาลัย

```

1000 *-----
1010 *      INMA
1020 *
1030 *      INTRA OFFICE CALL PROCESSING
1040 *-----
1050      .OR 05F1H
1060      .TA 0DF1H
1070      PUSH DE
1080      PUSH BC
1090      LD  DE,0000H
1100      LD  HL,1E80H
1110      LD  BC,0010H
1120      LD  A,(IX+0BH)
1130      CPIR
1140      JR  NZ,BUSY
1150      DEC HL
1160      LD  A,L      ;LOOK UP TABLE
1170      RES 7,A
1180      LD  E,A      ;LOAD E WITH CALLED NO.
1190      SLA A
1200      SLA A
1210      SLA A
1220      SLA A
1230      LD  (IX+5),A ;SAVE CALLED ADDR.
1240      LD  L,A
1250      LD  H,1FH
1260      PUSH HL
1270      POP  IY      ;LOAD IY WITH CALLED CARD ADDR.
1280      BIT 0,(HL) ;CALLED OFFHOOK TEST
1290      JR  Z,PASS
1300 BUSY SET 5,(IX+1)
1310      POP  BC
1320      POP  DE
1330      RET
1340 PASS LD  B,04H
1350      LD  A,(1E0AH)
1360 INMA1 SRL A
1370      JR  NC,EMP
1380      DJNZ INMA1
1390      JR  BUSY ;NOT EMPTY THEN BUSY
1400 EMP LD  A,04H
1410      SUB B
1420      LD  HL,1EA0H
1430      ADD A,L
1440      LD  L,A
1450      LD  A,(HL) ;LINK LOOKUP TABLE
1460      LD  (IX+6),A ;SAVE LINK
1470      LD  (IY+6),A ;SAVE LINK
1480      AND OFH

```



```

1490 LD HL,1E0AH
1500 OR (HL)
1510 LD (HL),A ;SET BIT IN LINK BYTE
1520 PUSH IX
1530 POP HL
1540 LD (IY+5),L ;SAVE CALLING IN CALLED CARD
1550 LD D,L
1560 SRL D
1570 SRL D
1580 SRL D
1590 SRL D ;D=NO.
1600 LD HL,1E90H
1610 PUSH HL
1620 LD A,E
1630 ADD A,L
1640 LD L,A
1650 LD A,(HL)
1660 LD (IX+4),A ;LOAD CALLED DATA IN CALLED CARD
1670 POP HL
1680 LD A,D
1690 ADD A,L
1700 LD L,A
1710 LD A,(HL)
1720 LD (IX+4),A ;LOAD CALLING DATA IN CALLING CARD
1730 LD A,(IX+6)
1740 PUSH AF
1750 SLA A
1760 RL D
1770 SLA A
1780 RL D
1790 LD A,D
1800 AND OFH
1810 OR ODOH
1820 LD (IX+7),A ;SAVE CALLING ADDR. SWITCHING
1830 POP AF
1840 SLA A
1850 RL E
1860 SLA A
1870 RL E
1880 LD A,E
1890 AND OFH
1900 OR ODOH
1910 LD (IY+7),A ;SAVE CALLED ADDR. SWITCHING
1920 LD A,(IX+6)
1930 AND OFH ;GRID LINK ADDR D7,D6
1940 LD (IX+6),A ;SAVE LINK AGAIN
1950 LD (IY+6),A ;SAVE LINK AGAIN
1960 SET 6,(IX+1)
1970 SET 5,(IY+0)
1980 SET 1,(IY+2)
1990 SET 2,(IY+0)
2000 POP BC
2010 POP DE
2020 RET

```

```

1000 *-----
1010 *      CEONK
1020 *
1030 *      PROCESS WHEN MEET INTRA.
1040 *      CALLED OFF HOOK
1050 *-----
1060      .OR 0DEC4H
1070      .TA 0EC4H
1080      LD IX,1F00H
1090      LD DE,0010H
1100      LD B,10H
1110 CEONH1 BIT 0,(IX+0)
1120      JR Z,CEONX
1130      BIT 2,(IX+0)
1140      JR Z,CEONX
1150      BIT 1,(IX+2)
1160      JR Z,CEONX
1170      RES 1,(IX+2)
1180      SET 4,(IX+0)
1190      LD A,(IX+5)
1200      LD HL,1F00H
1210      LD L,A
1220      PUSH HL
1230      POP IY
1240      SET 4,(IY+0)
1250      RES 6,(IY+1)
1260 CEONX  ADD IX,DE
1270      DJNZ CEONH1
1280      RET

```

```

1000 *-----
1010 *      PLSTR
1020 *
1030 *      GET THE DIAL PULSE STATUS
1040 *      INTO CARD NUMBER FOR TRUNK
1050 *      RELAY
1060 *-----
1070      .OR 0797H
1080      .TA 0F97H
1090      LD IX,1F00H
1100      LD DE,0010H
1110      LD B,02H
1120      LD HL,1E54H
1130 PLST1  PUSH BC
1140      LD B,08H
1150      XOR A
1160      LD A,(HL)
1170 PLST2  SRL A
1180      JR NC,REST
1190      SET 2,(IX+2)
1200      JR PLSTX
1210 REST  RES 2,(IX+2)
1220 PLSTX  ADD IX,DE
1230      DJNZ PLST2
1240      INC HL
1250      INC HL
1260      POP BC
1270      DJNZ PLST1
1280      RET

```

```

1000 *-----
1010 *      INONH
1020 *
1030 *      INTRA OFFICE CALL ON HOOK
1040 *      PROCESS
1050 *-----
1060      .OR 0140H
1070      .TA 0940H
1080      LD IX,1F00H
1090      LD DE,0010H
1100      LD B,10H
1110 INONH BIT 1,(IX+0H)
1120      JR Z,INONX
1130      BIT 0,(IX+0H)
1140      JR NZ,INONX
1150      BIT 7,(IX+0H)
1160      JR NZ,INONX
1170      BIT 4,(IX+2H)
1180      JR NZ,INONX
1190      BIT 5,(IX+0H)
1200      JR Z,CLRCD
1210      BIT 5,(IX+1H)
1220      JR NZ,CLRCD
1230      BIT 6,(IX+1H)
1240      JR NZ,CRCAD
1250      BIT 4,(IX+0H)
1260      JR Z,CLRCD
1270      LD A,(IX+5H)
1280      LD L,A
1290      LD H,1FH
1300      INC HL
1310      SET 5,(HL)
1320      JR CLRRLK
1330 CRCAD LD A,(IX+5)
1340      LD H,1FH
1350      LD L,A
1360      XOR A
1370      PUSH BC
1380      LD B,10H
1390 CAD1  LD (HL),A
1400      INC HL
1410      DJNZ CAD1
1420      POP BC
1430 CLRRLK LD HL,1EOAH
1440      LD A,(IX+6H)
1450      CPL
1460      AND (HL)
1470      LD (HL),A
1480 CLRCD PUSH IX
1490      POP HL
1500      PUSH BC
1510      LD B,10H
1520      XOR A
1530 CAD2  LD (HL),A
1540      INC HL
1550      DJNZ CAD2
1560      POP BC
1570 INONX ADD IX,DE
1580      DJNZ INONH
1590      RET

```

1000 *-----
 1010 * OUT GOING TRUNK
 1020 *
 1030 * CHECKED OUT GOING FLAG AND
 1040 * PROCESS WHEN FLAG TOBE SET
 1050 *-----

1060 .OR 0850H
 1070 .JA 0850H
 1080 LD IX,1F00H
 1090 LD DE,0010H
 1100 LD B,10H
 1110 DSTRK BIT 7,(IX+0)
 1120 JR Z,NEXT
 1130 BIT 1,(IX+0)
 1140 JR NZ,CRTK
 1150 BIT 0,(IX+0)
 1160 JR Z,CRCO
 1170 BIT 4,(IX+0)
 1180 JR NZ,STATU
 1190 PUSH BC
 1200 LD B,04H
 1210 LD A,(1E0AH)
 1220 TRKCH SLA A
 1230 JR NC,FIND
 1240 DJNZ TRKCH
 1250 POP BC
 1260 SET 5,(IX+1)
 1270 JR NEXT
 1280 FIND LD A,04H
 1290 SUB B
 1300 POP BC
 1310 CP 00
 1320 JR Z,TRK4
 1330 CP 01H
 1340 JR Z,TRK3
 1350 CP 02H
 1360 JR Z,TRK2
 1370 LD A,10H
 1380 LD L,40H
 1390 LODTK LD (IX+6),A
 1400 LD (IX+5),L
 1410 LD HL,1EDAH
 1420 AND OFOH
 1430 OR (HL)
 1440 LD (HL),A
 1450 JR ADRSW
 1460 TRK2 LD A,21H
 1470 LD L,40H
 1480 JR LODTK
 1490 TRK3 LD A,42H
 1500 LD L,41H
 1510 JR LODTK
 1520 TRK4 LD A,83H
 1530 LD L,41H
 1540 JR LODTK
 1550 NEXT JR OGTNX
 1560 CRTK JR CLRTK
 1570 CRCO JR CLRCO
 1580 OGTR JR OGTRK
 1590 ADRSW PUSH IX
 1600 POP HL
 1610 SRL L
 1620 SRL L
 1630 SRL L
 1640 SRL L
 1650 LD A,0E0H

1660 ADD A,L
 1670 LD L,A
 1680 LD H,17H
 1690 LD A,(HL)
 1700 LD (IX+4),A
 1710 LD A,L
 1720 AND 03H
 1730 SLA A
 1740 SLA A
 1750 LD L,A
 1760 LD A,(IX+6)
 1770 PUSH AF
 1780 AND 03H
 1790 OR L
 1800 ADD A,0E0H
 1810 LD (IX+7),A
 1820 POP AF
 1830 AND OFOH
 1840 LD (IX+6),A
 1850 STATU XOR A
 1860 LD L,A
 1870 LD A,(IX+0)
 1880 SRL A
 1890 RL A
 1900 LD A,(IX+2)
 1910 SRL A
 1920 SRL A
 1930 SRL A
 1940 RL L
 1950 LD A,(IX+1)
 1960 SRL A
 1970 SRL A
 1980 SRL A
 1990 RL L
 2000 LD (IX+8),L
 2010 LD A,(IX+6)
 2020 BIT 7,A
 2030 JR NZ,SHIFT
 2040 BIT 5,A
 2050 JR NZ,SHIFT
 2060 FINIH SET 4,(IX+0)
 2070 OGTNX ADD IX,DE
 2080 DJNZ OGTR
 2090 RET
 2100 CLRCO JR CLRC
 2110 SHIFT LD A,(IX+8)
 2120 SLA A
 2130 SLA A
 2140 SLA A
 2150 LD (IX+8),A
 2160 JR FINIH
 2170 CLRTK LD A,(IX+6)
 2180 CPL
 2190 LD HL,1E0AH
 2200 AND (HL)
 2210 LD (HL),A
 2220 CLRC PUSH BC
 2230 LD B,10H
 2240 XOR A
 2250 PUSH IX
 2260 POP HL
 2270 CLRLP LD (HL),A
 2280 INC HL
 2290 DJNZ CLRLP
 2300 POP BC
 2310 JR OGTNX

```

1000 *-----*
1010 *   06JUT
1020 *
1030 *   CONNECTED TRUNK TO CENTRAL
1040 *   OFFICE LINE AND MAKE THE
1050 *   SWITCHING NETWORK FOR
1060 *   EXTERNAL CALLING
1070 *-----*
1080   .OR 095CH
1090   .TA 095CH
1100   XOR A
1110   LD (1E0EH),A
1120   LD (1E0FH),A
1130   LD HL,1EE0H
1140   LD B,10H
1150 LOOP1 LD (HL),A
1160   INC HL
1170   DJNZ LOOP1
1180   LD IX,1F00H
1190   LD DE,0010H
1200   LD B,10H
1210 LOOP2 BIT 7,(IX+0)
1220   JR Z,ICOM
1230 ICM  BIT 4,(IX+0)
1240   JR Z,NEXT
1250   BIT 0,(IX+0)
1260   JR Z,NEXT
1270   LD A,(IX+7)
1280   LD L,A
1290   LD A,(IX+4)
1300   OR (HL)
1310   LD (HL),A
1320   LD A,(IX+5)
1330   ADD A,OCEH
1340   LD L,A
1350   LD A,(IX+8)
1360   OR (HL)
1370   LD (HL),A
1380 NEXT ADD IX,DE
1390   DJNZ LOOP2
1400   RET
1410 ICOM BIT 3,(IX+2)
1420   JR Z,NEXT
1430   JR ICM

```

```

1000 *-----*
1010 *   ON HOOK TESTED
1020 *
1030 *   TESTED ON HOOK TIME IF NOT
1040 *   EXCEED 2 SECOND THEN RESET
1050 *   ON HOOK FLAG
1060 *-----*
1070   .OR 0758H
1080   .TA 0F58H
1090   LD IX,1F00H
1100   LD DE,0010H
1110   LD B,02H
1120   LD HL,1E58H
1130 ONHC1 PUSH BC
1140   LD B,08H
1150   LD A,(HL)
1160   LD C,A
1170 ONHC2 BIT 0,(IX+0)
1180   JR Z,ONHCN
1190   BIT 1,(IX+0)
1200   JR Z,ONHCN
1210   LD A,(IX+0EH)
1220   CP 00
1230   JR Z,ONHCN
1240   BIT 0,C
1250   JR NZ,ONCLR
1260   RES 0,(IX+0)
1270 ONHCN SRL C
1280   ADD IX,DE
1290   DJNZ ONHC2
1300   LD HL,1E5AH
1310   POP BC
1320   DJNZ ONHC1
1330   RET
1340 ONCLR RES 1,(IX+0)
1350   JR ONHCN

```

ศูนย์วิทยุโทรพยากร
 ภาควิชาวิศวกรรมมหาวิทาลัย

1000	-----		1600	SRL	L
1010	+	INCOMING	1610	SRL	L
1020	+		1620	SRL	L
1030	+	DETECTED INCOMING CALL	1630	SRL	L
1040	+	FIND THE OPERATOR NUMBER	1640	LD	A,OE0H
1050	+	AND CONNECTED TRUNK WITH	1650	ADD	A,L
1060	+	OPERATOR LINE	1660	LD	L,A
1070	+	-----	1670	LD	H,17H
1080		.OR 09C4H	1680	LD	A,(HL)
1090		.TA 09C4H	1690	LD	(IY+4),A
1100		LD HL,17D0H	1700	LD	A,L
1110		LD A,(1E0BH)	1710	AND	03H
1120		LD BC,0010H	1720	SLA	A
1130		CPIR	1730	SLA	A
1140		JR Z,FIND	1740	LD	L,A
1150		LD HL,1F00H	1750	LD	A,(IY+6)
1160		JR NEXT	1760	PUSH	AF
1170	FIND	DEC HL	1770	AND	03H
1180		LD H,1FH	1780	OR	L
1190		SLA L	1790	ADD	A,OE0H
1200		SLA L	1800	LD	(IY+7),A
1210		SLA L	1810	POP	AF
1220		SLA L	1820	AND	0F0H
1230	NEXT	PUSH HL	1830	LD	(IY+6),A
1240		POP IY	1840	SET	1,(IY+2)
1250		BIT 1,(IY+0)	1850	SET	2,(IY+0)
1260		RET NZ	1860	XOR	A
1270		BIT 0,(IY+0)	1870	LD	(IY+0FH),A
1280		JR NZ,OFFHK	1880	LD	(IY+0EH),A
1290		BIT 1,(IY+2)	1890	SET	3,(IY+2)
1300		RET NZ	1900	RET	
1310		LD A,(1E09H)	1910	OFFHK	BIT 3,(IY+2)
1320		BIT 0,A	1920	RET	Z
1330		JR Z,TRK1	1930	BIT	4,(IY+0)
1340		BIT 1,A	1940	JR	NZ,SWNW
1350		JR Z,TRK2	1950	SET	4,(IY+0)
1360		BIT 2,A	1960	RES	1,(IY+2)
1370		JR Z,TRK3	1970	S4NW	XOR A
1380		BIT 3,A	1980	LD	L,(IY+0)
1390		JR Z,TRK4	1990	SRL	L
1400		RET	2000	RL	A
1410	TRK1	LD A,10H	2010	LD	L,(IY+2)
1420		LD L,40H	2020	SRL	L
1430		JR LODTK	2030	SRL	L
1440	TRK2	LD A,21H	2040	SRL	L
1450		LD L,40H	2050	RL	A
1460		JR LODTK	2060	LD	L,(IY+1)
1470	TRK3	LD A,42H	2070	SRL	L
1480		LD L,41H	2080	SRL	L
1490		JR LODTK	2090	SRL	L
1500	TRK4	LD A,B3H	2100	RL	A
1510		LD L,41H	2110	BIT	7,(IY+6)
1520	LOOTK	LD (IY+6),A	2120	JR	NZ,SHIFT
1530		LD (IY+5),L	2130	BIT	5,(IY+6)
1540		LD HL,1E0AH	2140	JR	NZ,SHIFT
1550		AND 0F0H	2150	FINH	LD (IY+8),A
1560		OR (HL)	2160	RET	
1570		LD (HL),A	2170	SHIFT	RL A
1580		PUSH IY	2180	RL	A
1590		POP HL	2190	RL	A
			2200	JR	FINH



1000 *-----
 1010 * TRANSFER
 1020 *
 1030 * CHECKED TRANSFER FLAG IF
 1040 * FLAG TO BE SET THEN HOLD
 1050 * THE TRUNK STATUS. SAVE
 1060 * CARD NUMBER AND CLEARED.
 1070 * PROCESS INTRA CALLING WHEN
 1080 * COMPLETELY, TRANSFER THE
 1090 * OLD CARD NUMBER TO CALLED
 1100 * EXTENSION
 1110 *-----
 1120 .OR 0B00H
 1130 .TA 0B00H
 1140 LD IX,1F00H
 1150 LD DE,0010H
 1160 LD B,10H
 1170 TRAMN PUSH IX
 1180 PUSH DE
 1190 PUSH BC
 1200 BIT 6,(IX+0)
 1210 JR Z,TRANX
 1220 BIT 0,(IX+0)
 1230 JR Z,TRANX
 1240 BIT 1,(IX+0)
 1250 JR NZ,TRANX
 1260 RES 6,(IX+0H)
 1270 SET 4,(IX+2)
 1280 RES 0,(IX+1)
 1290 XOR A
 1300 LD (IX+0BH),A
 1310 LD (IX+0DH),A
 1320 PUSH IX
 1330 POP HL
 1340 LD H,19H
 1350 PUSH HL
 1360 POP IY
 1370 PUSH IX
 1380 POP HL
 1390 PUSH IY
 1400 POP DE
 1410 LD B,10H
 1420 ERCH LD A,(HL)
 1430 PUSH AF
 1440 LD A,(DE)
 1450 LD (HL),A
 1460 POP AF
 1470 LD (DE),A
 1480 INC HL

1490 INC DE
 1500 DJNZ EXCH
 1510 BIT 3,(IY+2)
 1520 JR NZ,HCLD
 1530 BIT 3,(IY+2)
 1540 JR Z,TPAS
 1550 LD H,1EH
 1560 LD A,(IX+5)
 1570 ADD A,70H
 1580 LD L,A
 1590 LD A,(IX+8)
 1600 CPL
 1610 AND (HL)
 1620 LD (HL),A
 1630 LD HL,1EOCH
 1640 LD A,(IX+6)
 1650 CPL
 1660 AND (HL)
 1670 LD (HL),A
 1680 JR TPAS
 1690 HOLD LD H,1EH
 1700 LD A,(IY+5)
 1710 ADD A,70H
 1720 LD L,A
 1730 LD A,(IY+8)
 1740 OR (HL)
 1750 LD (HL),A
 1760 LD HL,1EOCH
 1770 LD A,(IY+6)
 1780 OR (HL)
 1790 LD (HL),A
 1800 BIT 5,(IY+0)
 1810 JR Z,TRAN
 1820 LD A,(IX+6)
 1830 CPL
 1840 AND (HL)
 1850 LD (HL),A
 1860 TPAS BIT 5,(IY+0)
 1870 JR Z,TRANX
 1880 LD HL,1EOCH
 1890 LD A,(IY+6)
 1900 OR (HL)
 1910 LD (HL),A
 1920 TRAN POP BC
 1930 POP DE
 1940 POP IX
 1950 ADD IX,DE
 1960 DJNZ TRAMN
 1970 RET

```

1000 *-----
1010 *   TRANSFER ON HOOK
1020 *
1030 *   TRANSFER CALLING STATUS IN
1040 *   CARD NUMBER TO CALLED CARD
1050 *-----
1060   .OR 08B4H
1070   .TA 08B4H
1080   LD IX,1F00H
1090   LD DE,0010H
1100   LD B,10H
1110 OHTR BIT 4,(IX+2)
1120   JR Z,OHTR1
1130   BIT 1,(IX+0)
1140   JR Z,OHTR1
1150   BIT 0,(IX+0)
1160   JR NZ,OHTR1
1170   PUSH IX
1180   PUSH DE
1190   PUSH BC
1200   PUSH IX
1210   POP HL
1220   LD H,19H
1230   PUSH HL
1240   POP IY
1250   BIT 5,(IX+0)
1260   JR Z,OHTR2
1270   BIT 7,(IX+1)
1280   JR NZ,OHTR3
1290 -  PUSH IY
1300   LD H,1FH
1310   LD L,(IX+5)
1320   PUSH HL
1330   POP IY
1340   LD D,(IY+4)
1350   LD E,(IY+7)
1360   POP IY
1370   LD (IY+4),D
1380   LD A,OCH
1390   AND E
1400   LD E,A
1410   LD A,(IY+7)
1420   AND OFSH
1430   OR E
1440   LD (IY+7),A
1450   BIT 6,(IX+1)
1460   JR Z,OHTR4
1470   RES 4,(IY+0)
1480   RES 0,(IY+0)

```

```

1490   SET 1,(IY+2)
1500   JR OHTR7
1510 OHTR4 RES 4,(IY+2)
1520 OHTR7 LD D,1FH
1530   LD E,(IX+5)
1540   PUSH IY
1550   POP HL
1560   LD BC,0010H
1570   LDIR
1580   JR OHTR3
1590 OHTR1 JR OHTR5
1600 OHTR6 JR OHTR
1610 OHTR3 BIT 3,(IY+2)
1620   JR Z,OHTR2
1630   LD H,1EH
1640   LD A,(IY+5)
1650   ADD A,70H
1660   LD L,A
1670   LD A,(IY+8)
1680   CPL
1690   AND (HL)
1700   LD (HL),A
1710 OHTR2 LD HL,1EOCH
1720   LD A,(IY+6)
1730   CPL
1740   AND (HL)
1750   LD (HL),A
1760   PUSH IY
1770   POP HL
1780   LD B,10H
1790   XOR A
1800 CLR1 LD (HL),A
1810   INC HL
1820   DJNZ CLR1
1830   PUSH IX
1840   POP HL
1850   LD B,10H
1860   XOR A
1870 CLR2 LD (HL),A
1880   INC HL
1890   DJNZ CLR2
1900   POP BC
1910   POP DE
1920   POP IX
1930 OHTR5 ADD IX,DE
1940   DJNZ OHTR6
1950   RET

```

```

1000 *-----
1010 *      SECO
1020 *
1030 *      SUBPROGRAM OF TRANSFER
1040 *-----
1050      .OR 0C70H
1060      .TA 0C70H
1070      LD IX,1F00H
1080      LD DE,0010H
1090      LD B,10H
1100 SECO BIT 4,(IX+2H)
1110      JR Z,SECOX
1120      BIT 5,(IX+1H)
1130      JR NZ,BUSY
1140      BIT 1,(IX+2H)
1150      JR Z,SECOX
1160      BIT 0,(IX+0H)
1170      JR Z,HOLD
1180      RES 1,(IX+2H)
1190      SET 4,(IX+0H)
1200      RES 4,(IX+2H)
1210      LD H,1EH
1220      LD A,(IX+5H)
1230      ADD A,70H
1240      LD L,A
1250      LD A,(IX+8H)
1260      CPL
1270      AND (HL)
1280      LD (HL),A
1290      JR SECOX
1300 BUSY RES 5,(IX+1H)
1310      SET 7,(IX+1H)
1320      JR SECOX
1330 HOLD LD H,1EH
1340      LD A,(IX+5H)
1350      ADD A,70H
1360      LD L,A
1370      LD A,(IX+8H)
1380      OR (HL)
1390      LD (HL),A
1400 SECOX ADD IX,DE
1410      DJNZ SECO
1420      RET

```

```

1000 *-----
1010 *      MLTF
1020 *
1030 *      LOAD CONNECTING DATA IN
1040 *      CARD NUMBER TO SWITCHING
1050 *      NETWORK
1060 *-----
1070      .OR 070CH
1080      .TA 0F0CH
1090      LD HL,1ED0H
1100      LD E,10H
1110      XOR A
1120 MLTF1 LD (HL),A
1130      INC HL
1140      DJNZ MLTF1
1150      LD IX,1F00H
1160      LD DE,0010H
1170      LD B,10H
1180 MLTF2 BIT 5,(IX+1)
1190      JR NZ,MLTNX
1200      BIT 5,(IX+0H)
1210      JR Z,MLTNX
1220      BIT 4,(IX+0H)
1230      JR Z,MLTNX
1240      LD HL,1E00H
1250      LD A,(IX+7)
1260      ADD A,L
1270      LD L,A
1280      LD A,(IX+4)
1290      OR (HL)
1300      LD (HL),A -
1310 MLTNX ADD IX,DE
1320      DJNZ MLTF2
1330      LD DE,1E10H
1340      LD HL,1ED0H
1350      LD BC,0010H
1360      LDIR
1370      RET

```



```

1000 *-----
1010 *   CRTRK
1020 *
1030 *   CLEARED TRUNK STATUS IN
1040 *   TRUNK BUFFER
1050 *-----
1060   .OR 0288H
1070   .TA 0A88H
1080   LD IX,1F00H
1090   LD DE,0010H
1100   LD B,10H
1110   XOR A
1120 CRTR OR (IX+6)
1130   ADD IX,DE
1140   DJNZ CRTR
1150   LD HL,1E0CH
1160   OR (HL)
1170   LD (1E0AH),A
1180   RET

```

```

1000 *-----
1010 *   LOAD TRUNK
1020 *
1030 *   HOLD TRUNK STATUS IN TRANS
1040 *   FER PERIOD
1050 *-----
1060   .OR 0A08H
1070   .TA 0A08H
1080   LD HL,1E0CH
1090   LD DE,1E0EH
1100   LD B,02H
1110 LOOP LD A,(DE)
1120   OR (HL)
1130   LD (DE),A
1140   INC HL
1150   INC DE
1160   DJNZ LOOP
1170   LD A,(1E0EH)
1180   LD (1E40H),A
1190   LD A,(1E0FH)
1200   LD (1E41H),A
1210   LD DE,1E20H
1220   LD HL,1E0H
1230   LD BC,0010H
1240   LDIR
1250   RET

```

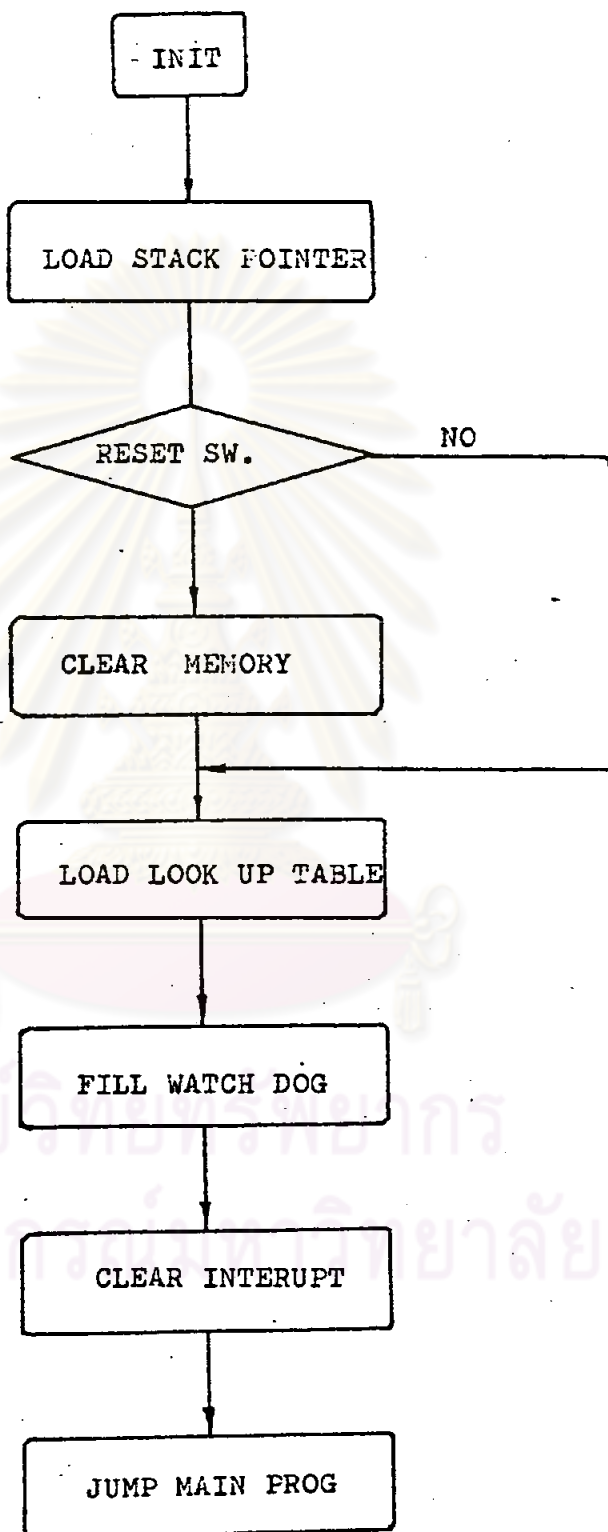


พจนานุกรม จ.

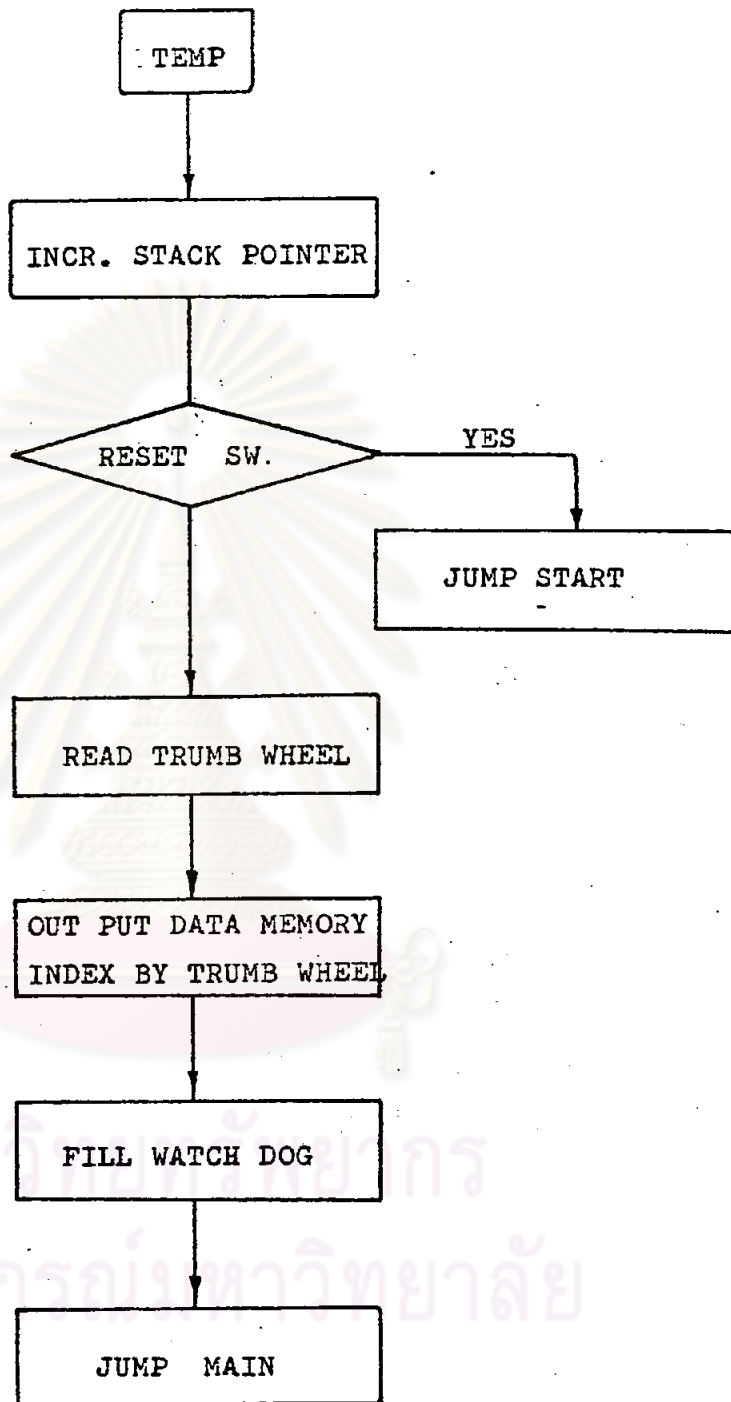
โพลีชาร์ต ของโปรแกรม

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

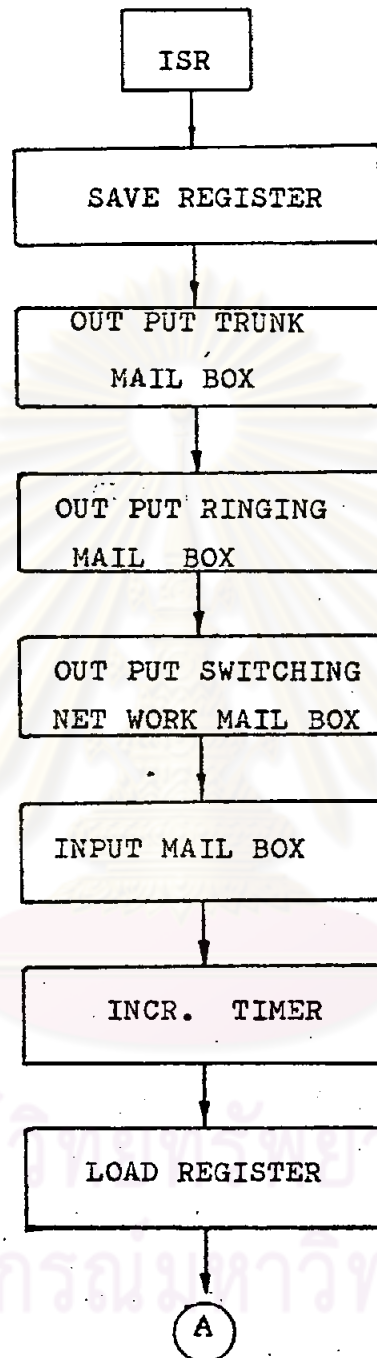
รูปที่ ๑.๑ โฟลวชาร์ตโปรแกรม INITIAL

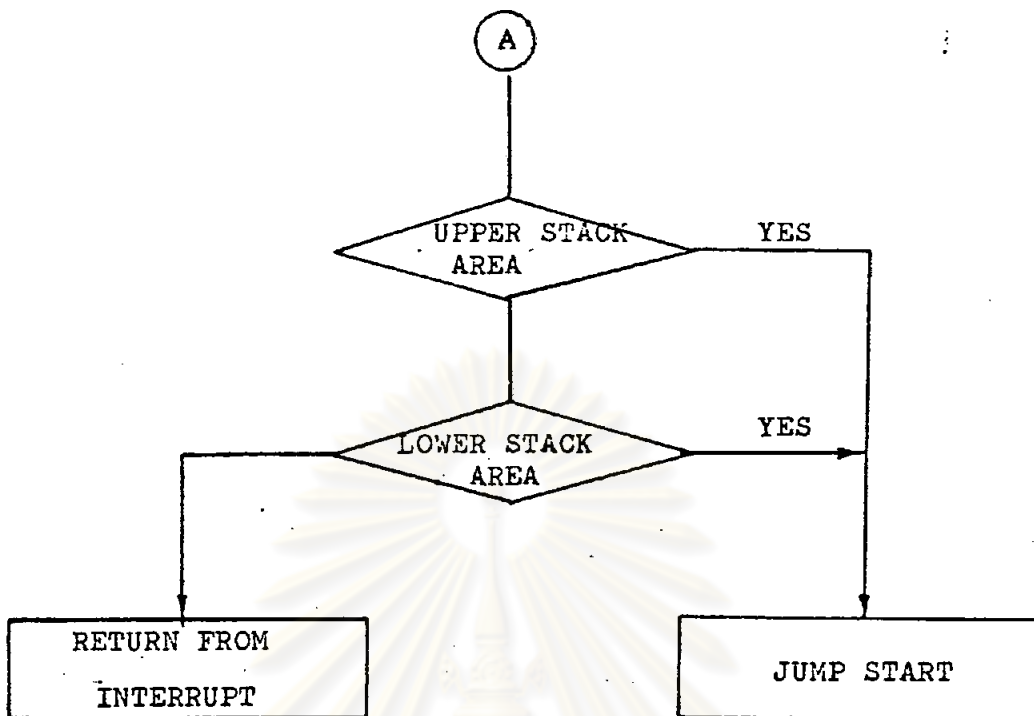


รูปที่ ๑.๒ ไหลชาร์ตโปรแกรม TEMPORARY



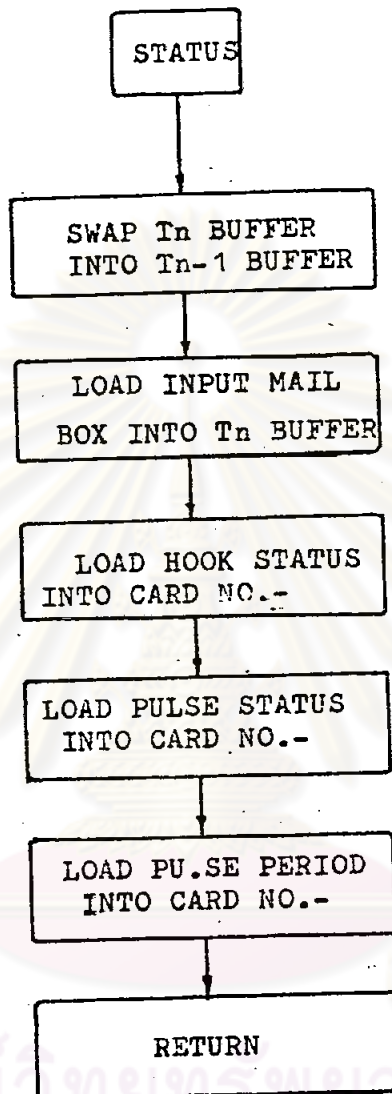
รูปที่ ๑.๓ โฟลวชาร์ตโปรแกรม INTERRUPT SERVICE ROUTINE



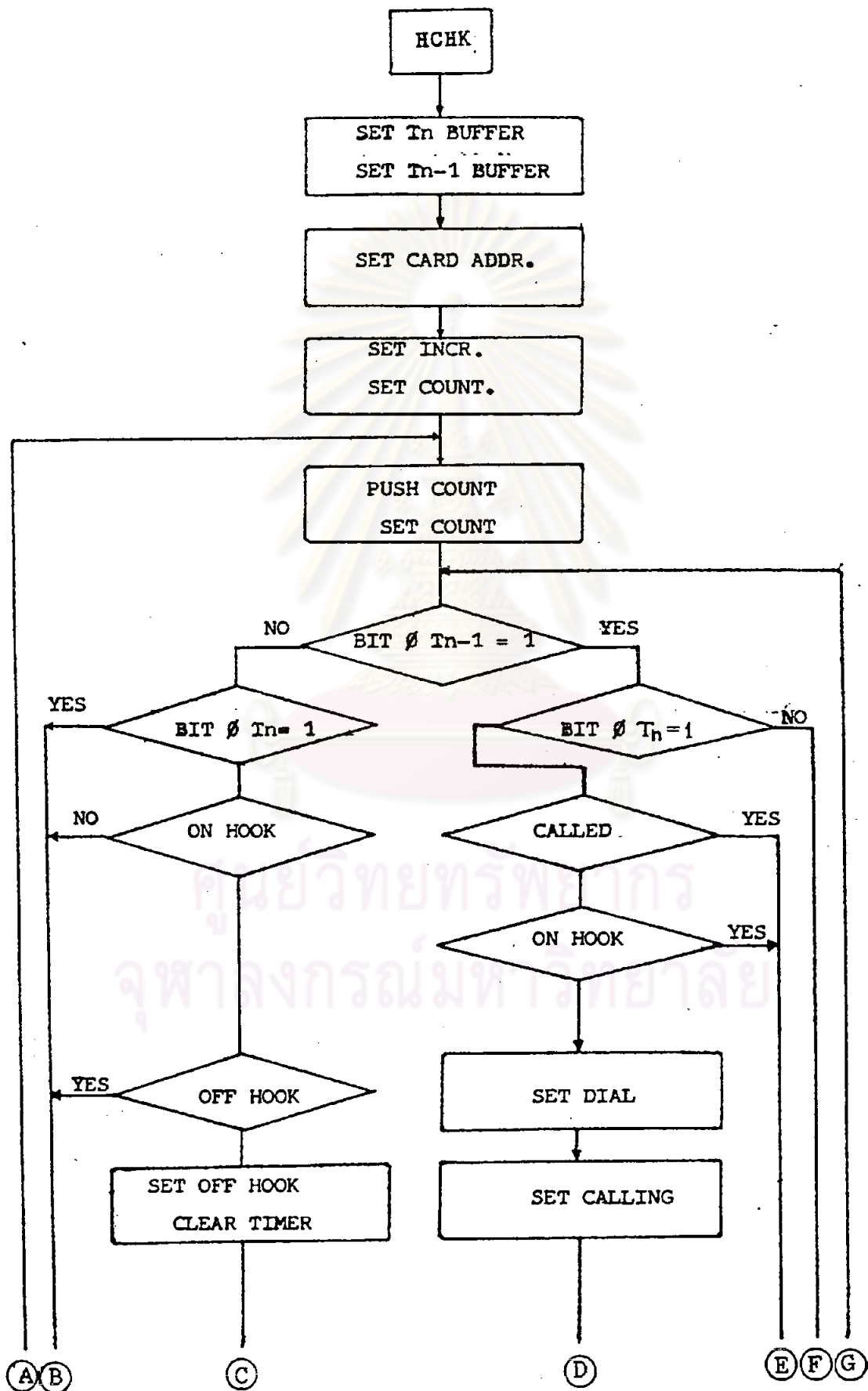


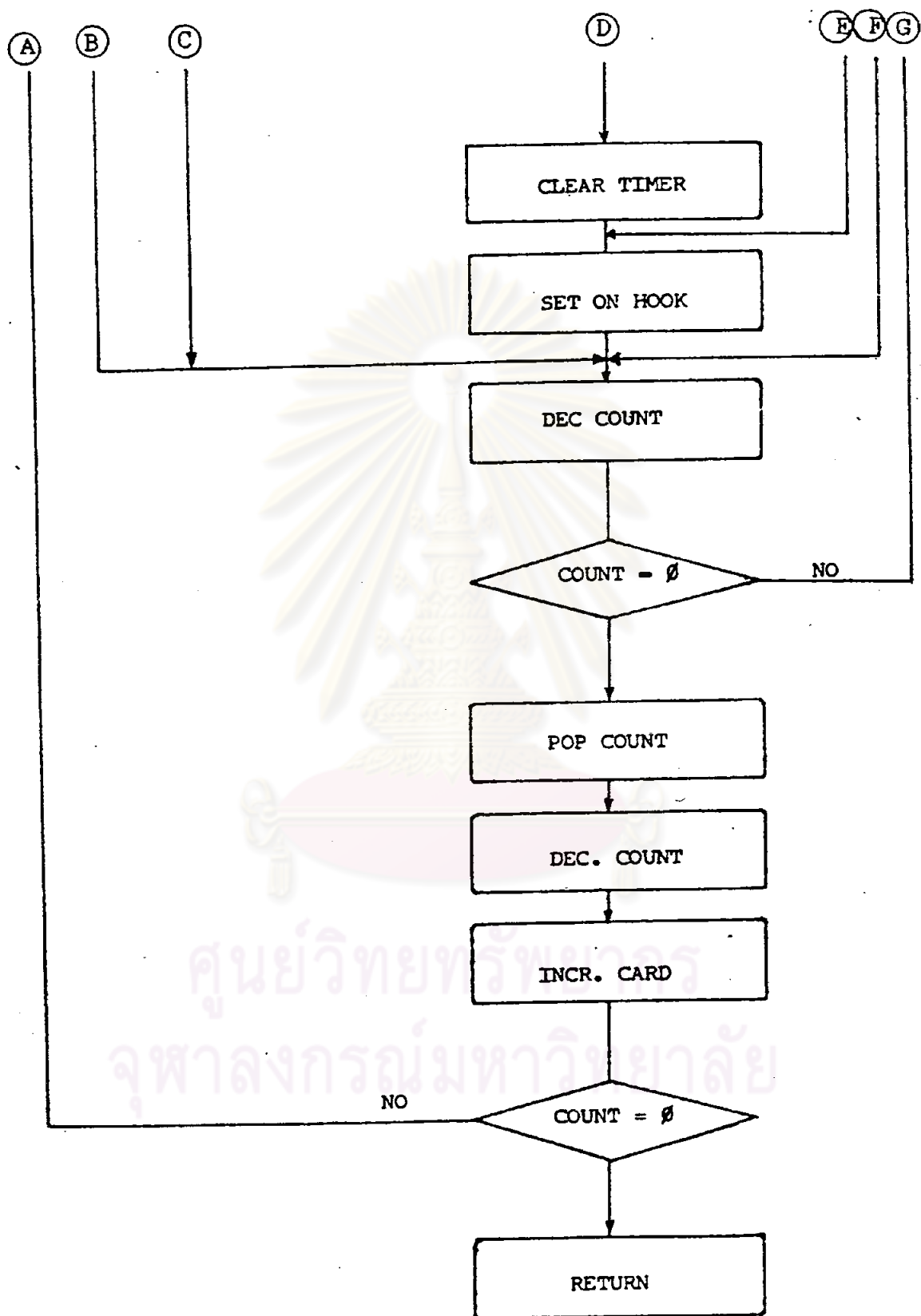
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

รูปที่ ๑.๔ โฟลวชาร์ตโปรแกรม LOAD STATUS

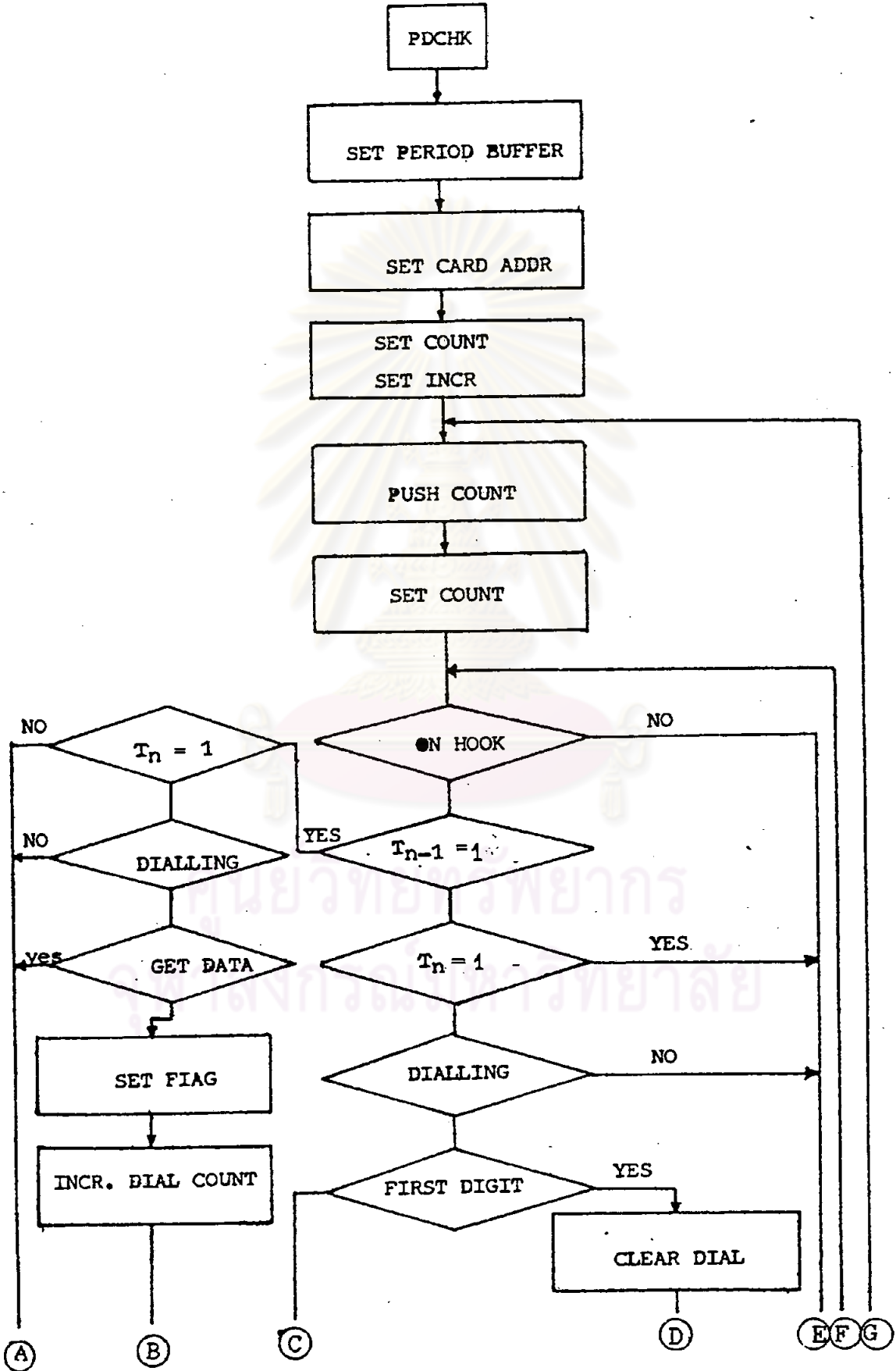


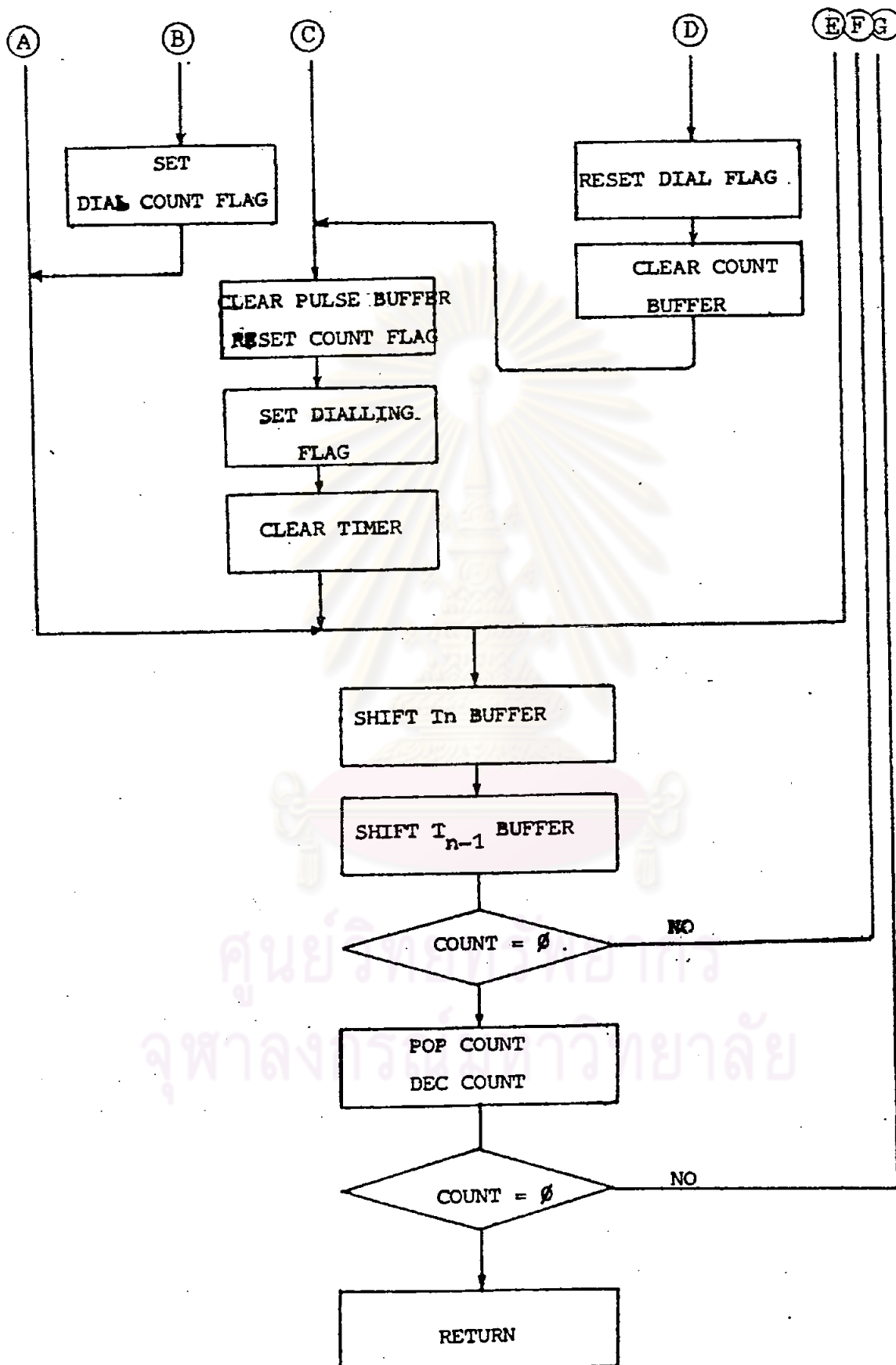
รูปที่ ๑.๕ โฟลวชาร์ตโปรแกรม HOOK_CHECKED



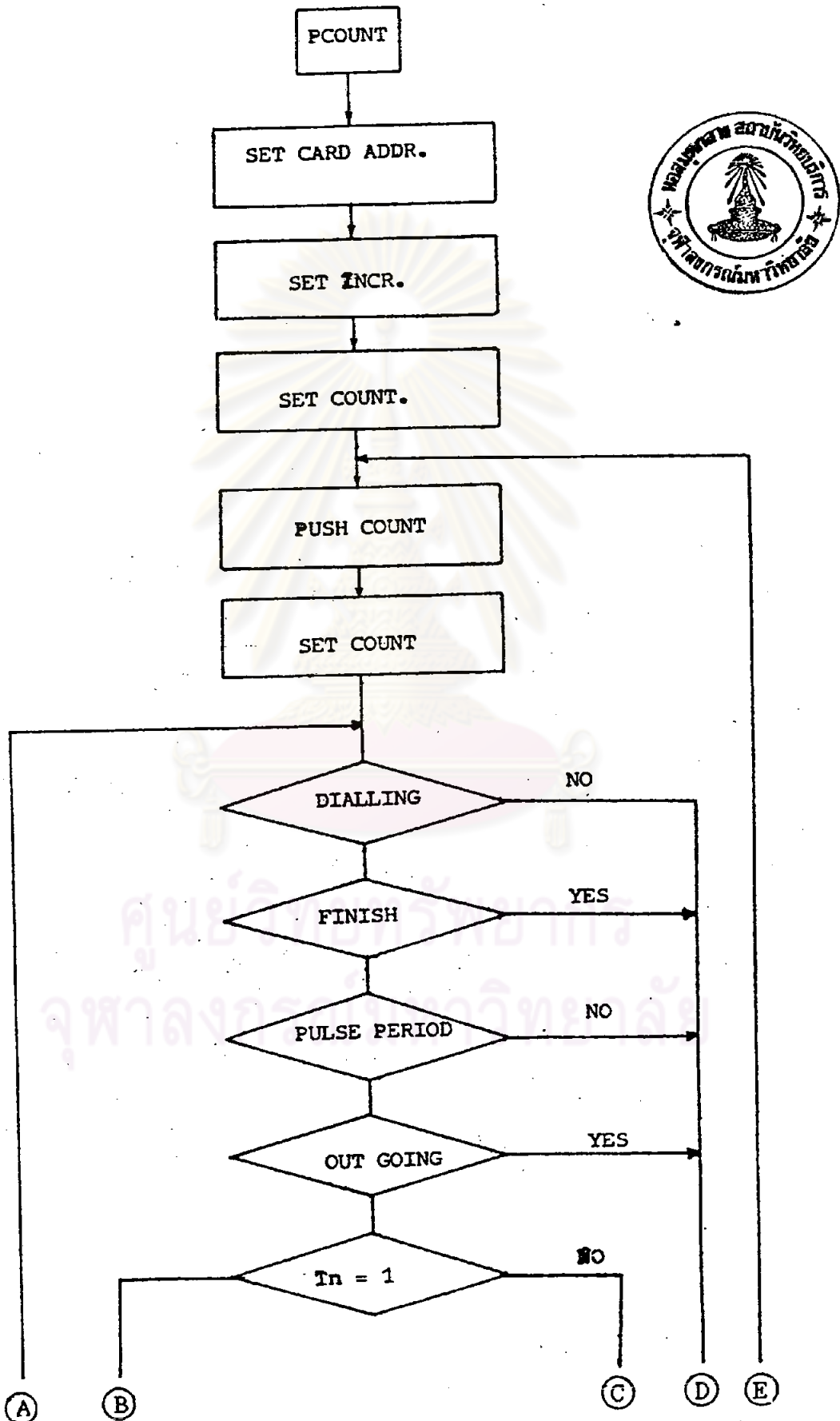


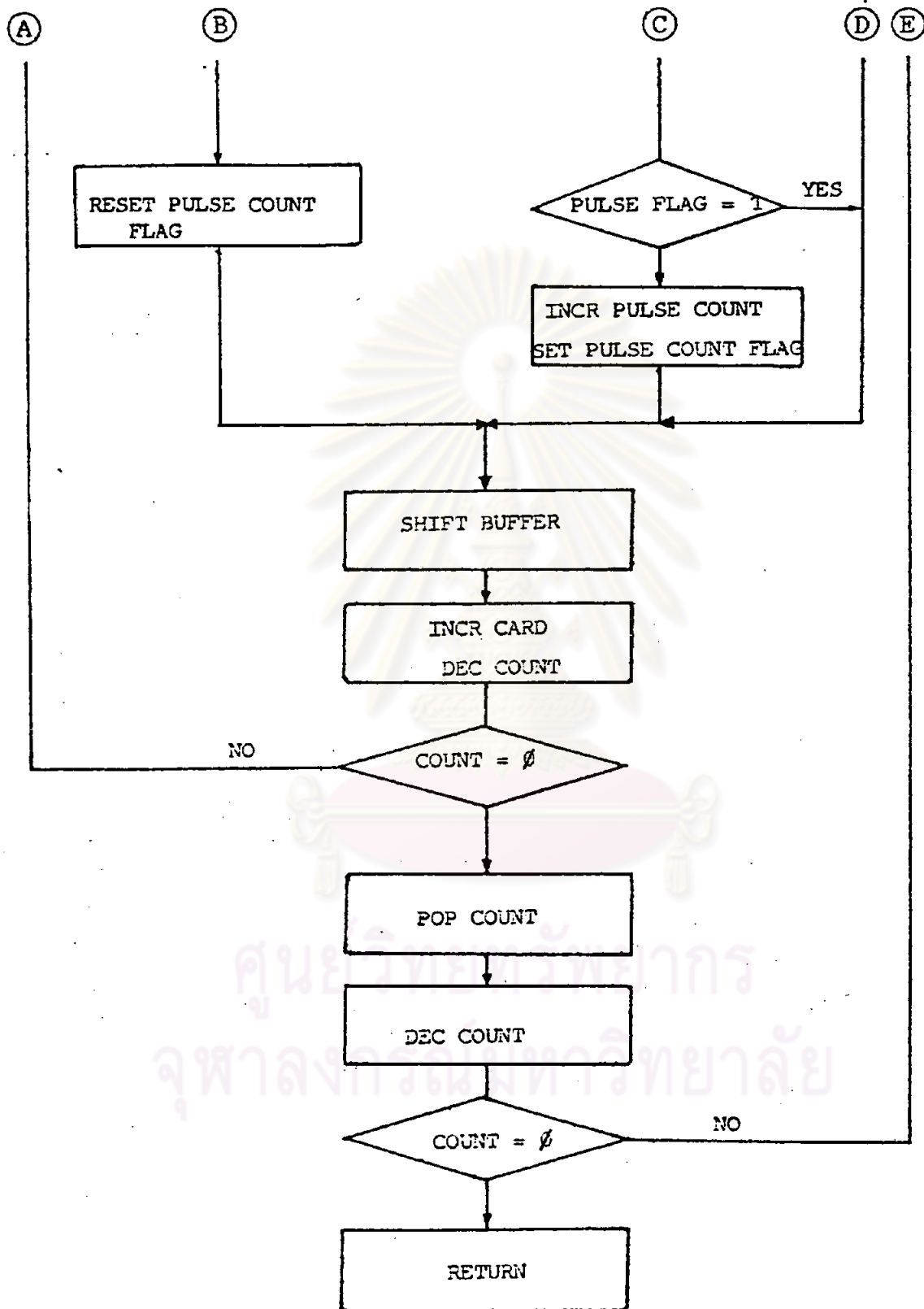
รูปที่ ๓.๖ ไพลวซาร์ทโปรแกรม PERIOD CHECKED



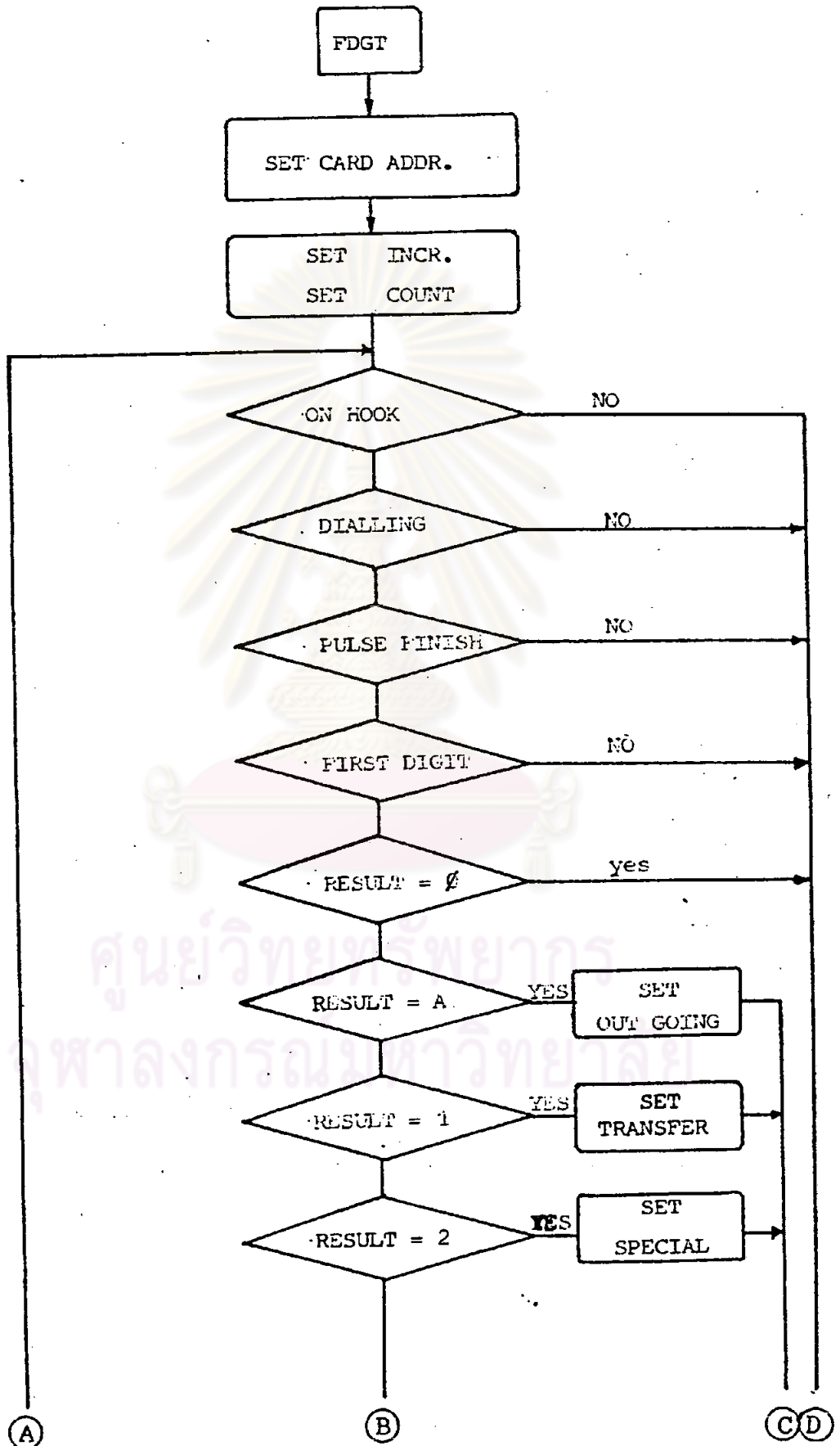


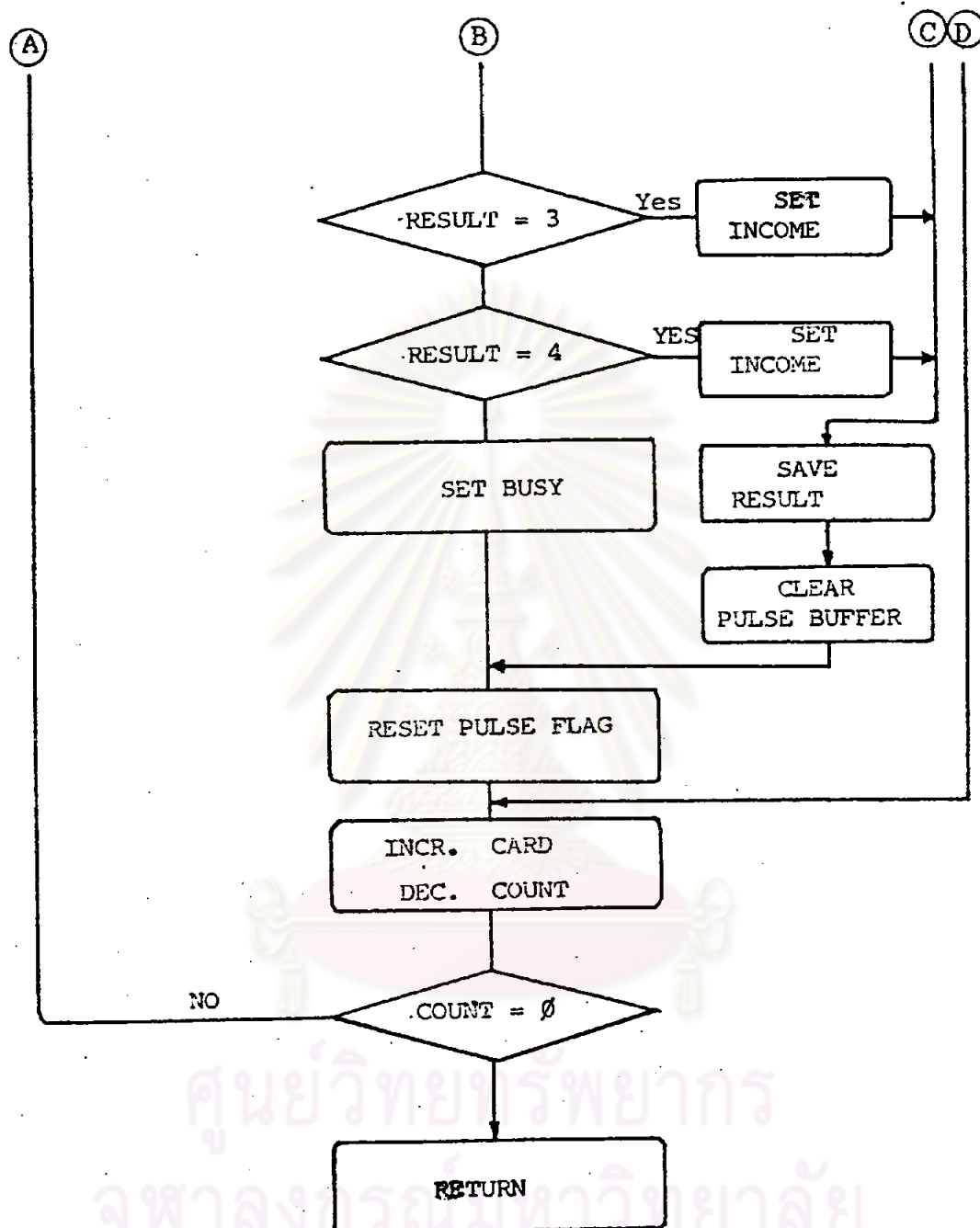
รูปที่ ๑.๗ โฟลวชาร์ตโปรแกรม PULSE COUNTER



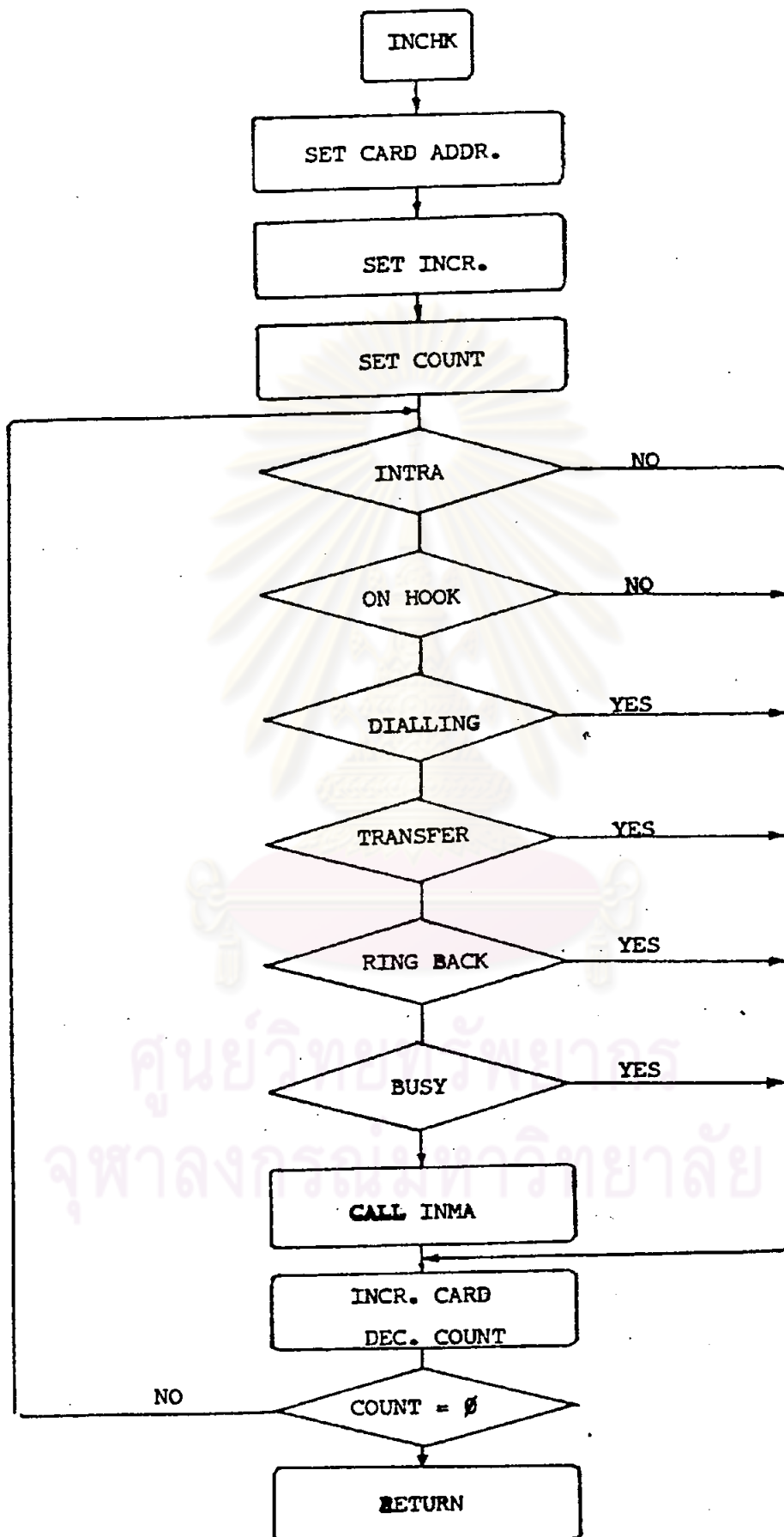


รูปที่ ๑.๘ โฟลวชาร์ตโปรแกรม FIRST DIGIT

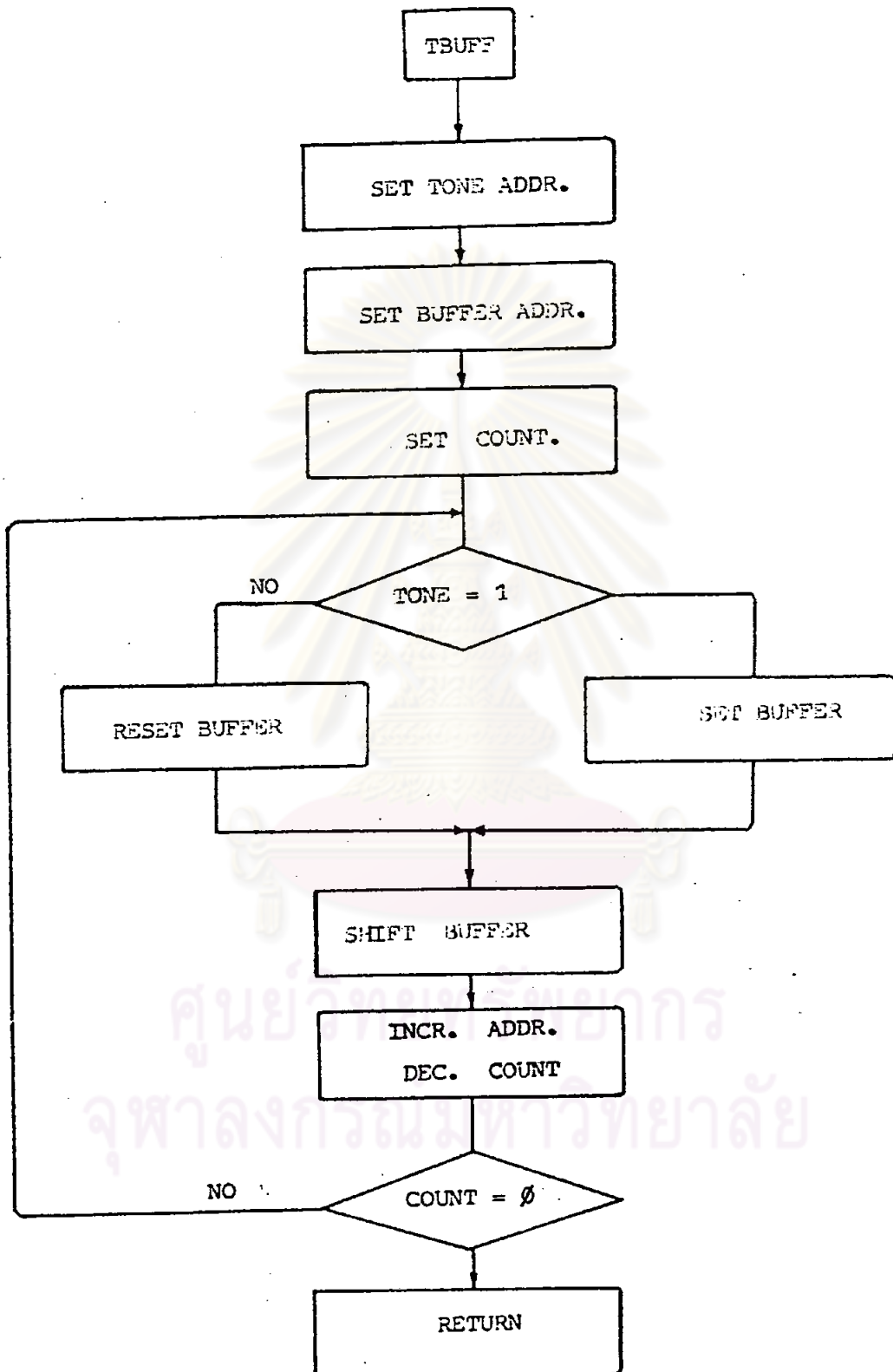




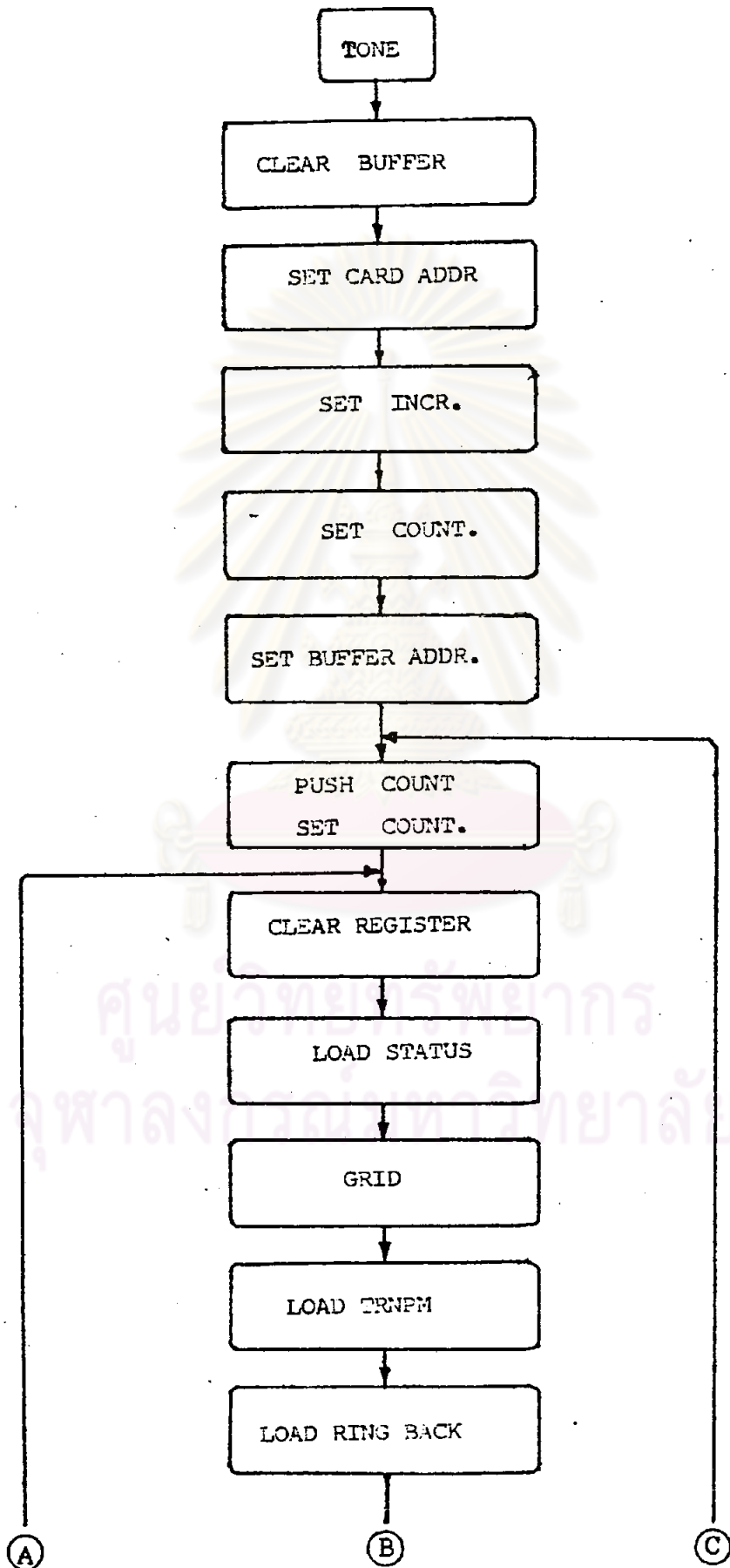
รูปที่ ๑.๙ ไพล์ชาร์ตโปรแกรม INTRA - OFFICE

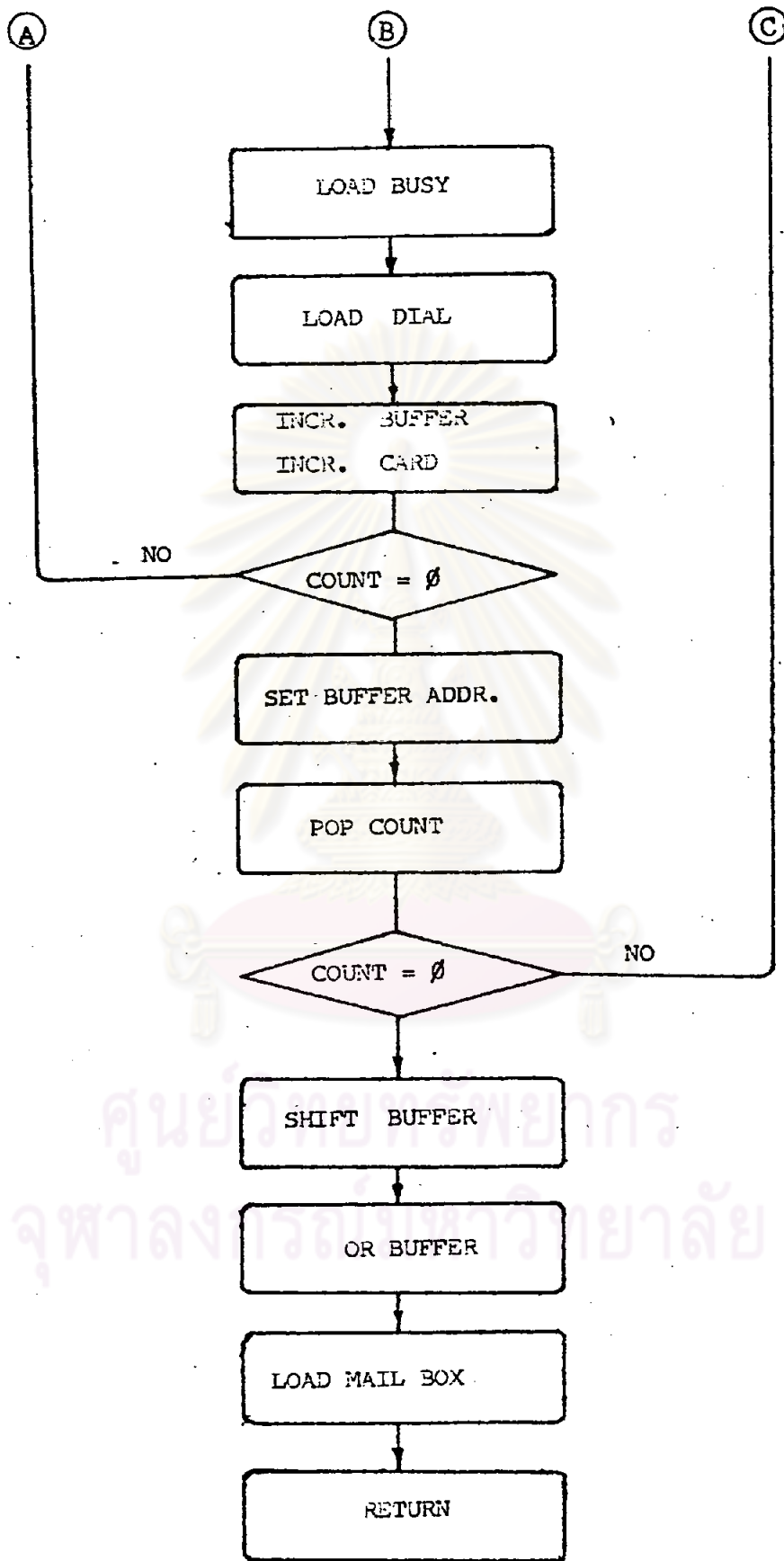


รูปที่ ๑.10 ไพลวซาร์ทโปรแกรม TONE BUFFER

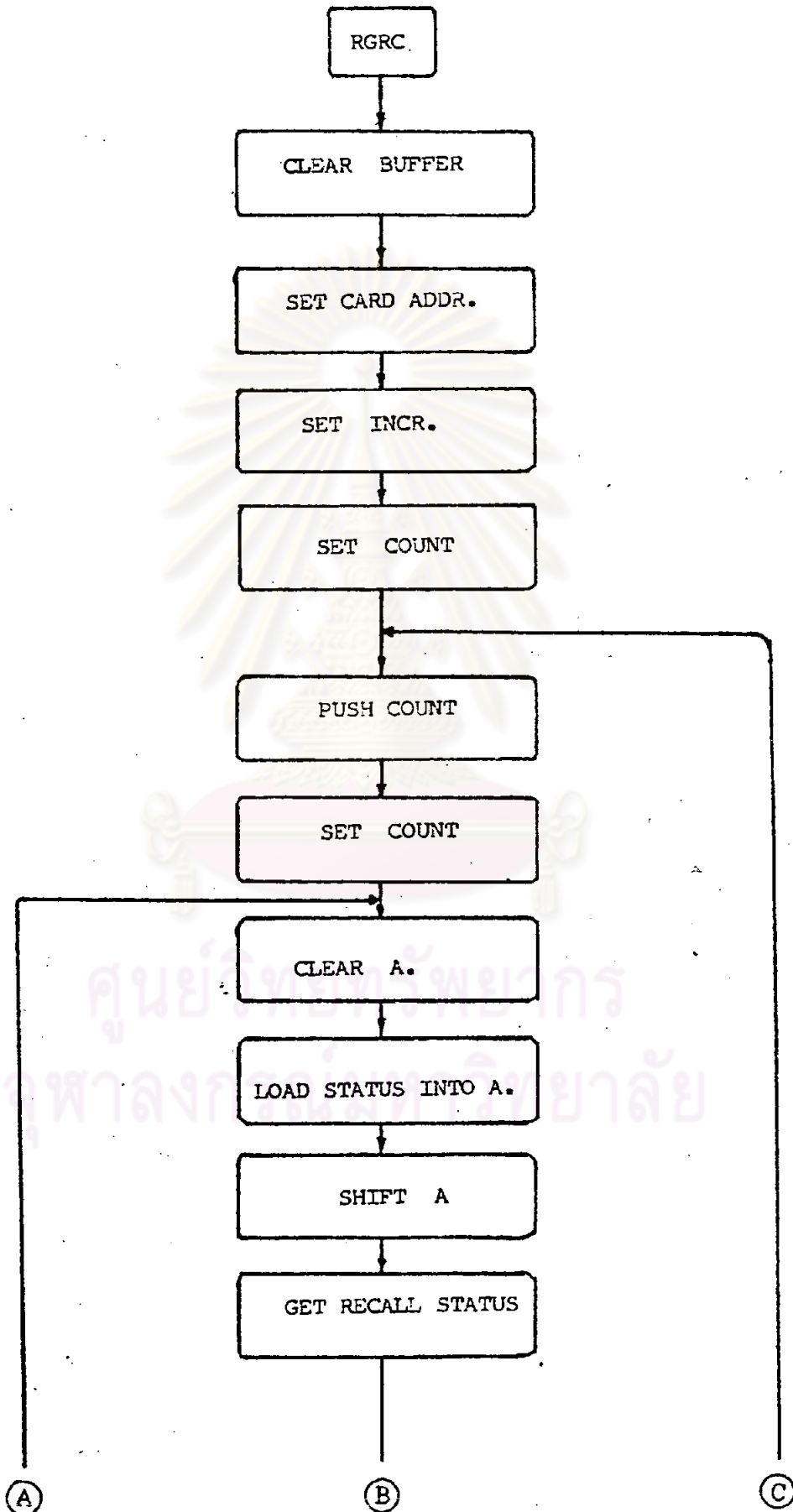


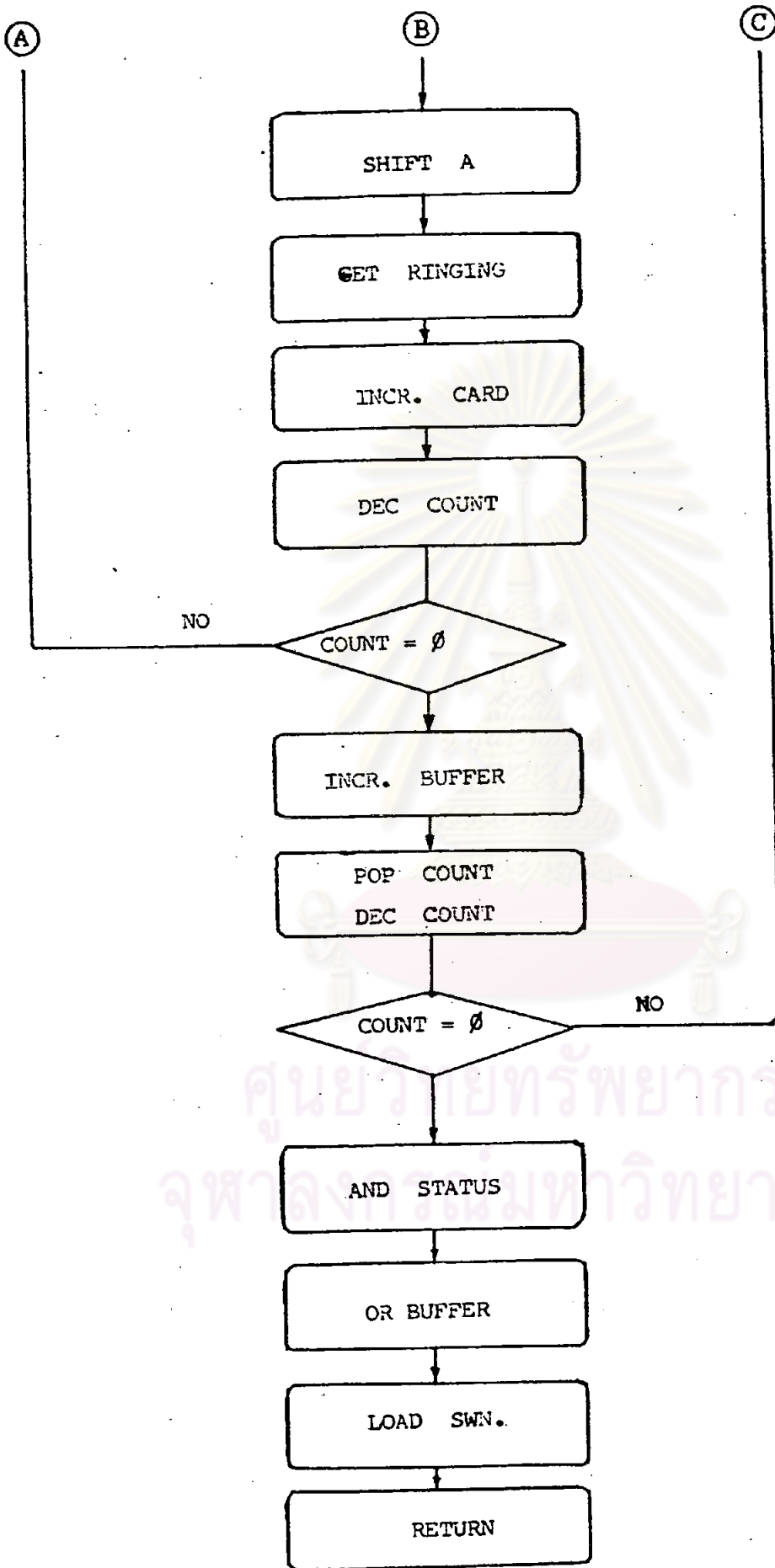
รูปที่ ๑.๑๑ โฟลวชาร์ตโปรแกรม LOAD TONE



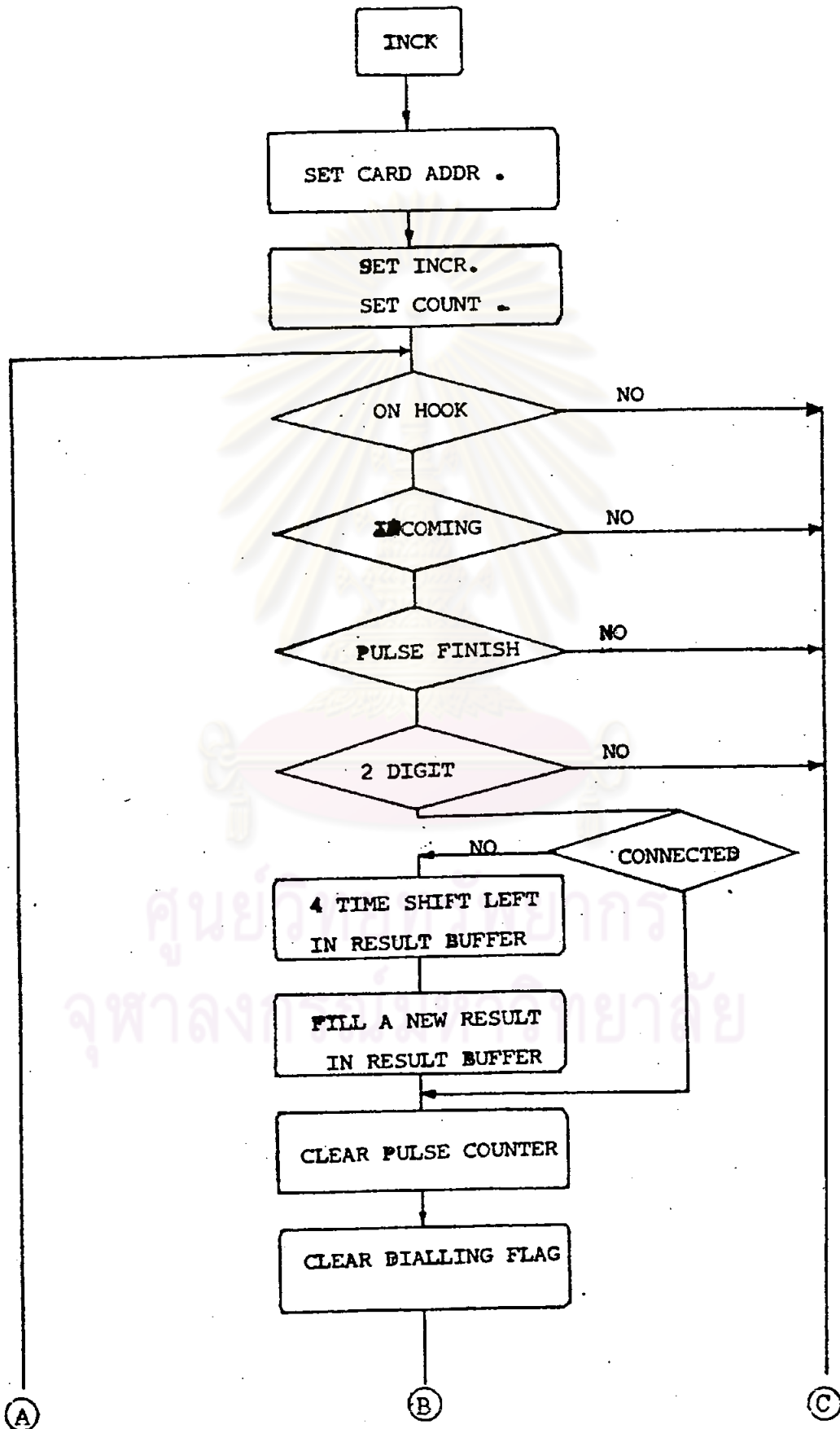


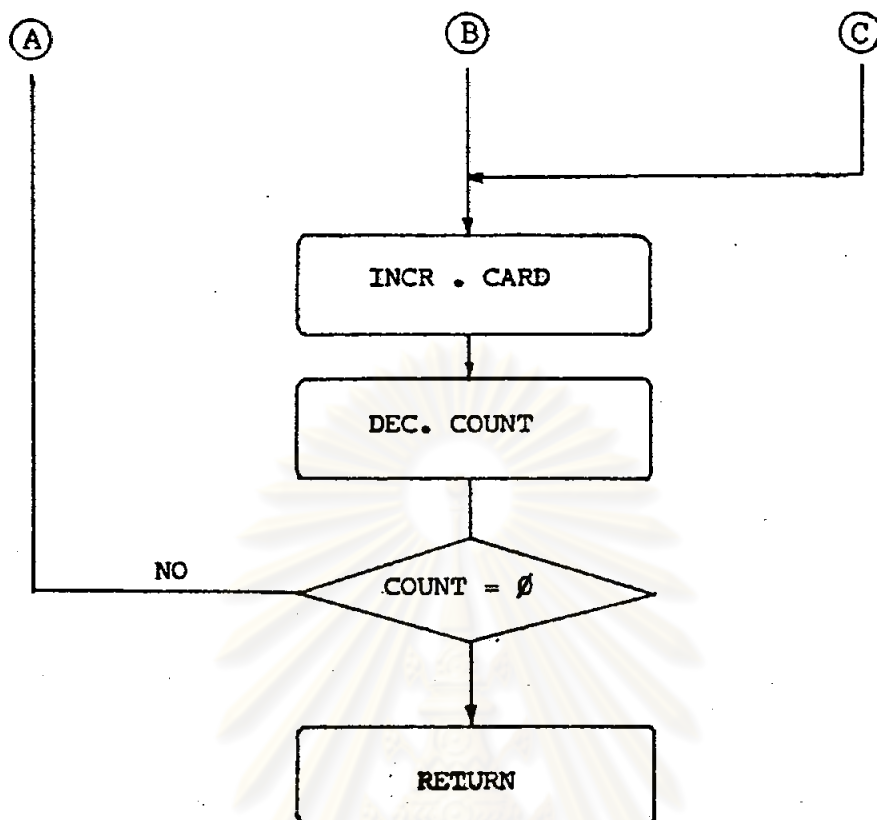
รูปที่ ๑.๑๒ ไพลวซาร์ตโปรแกรม RINGING TONE





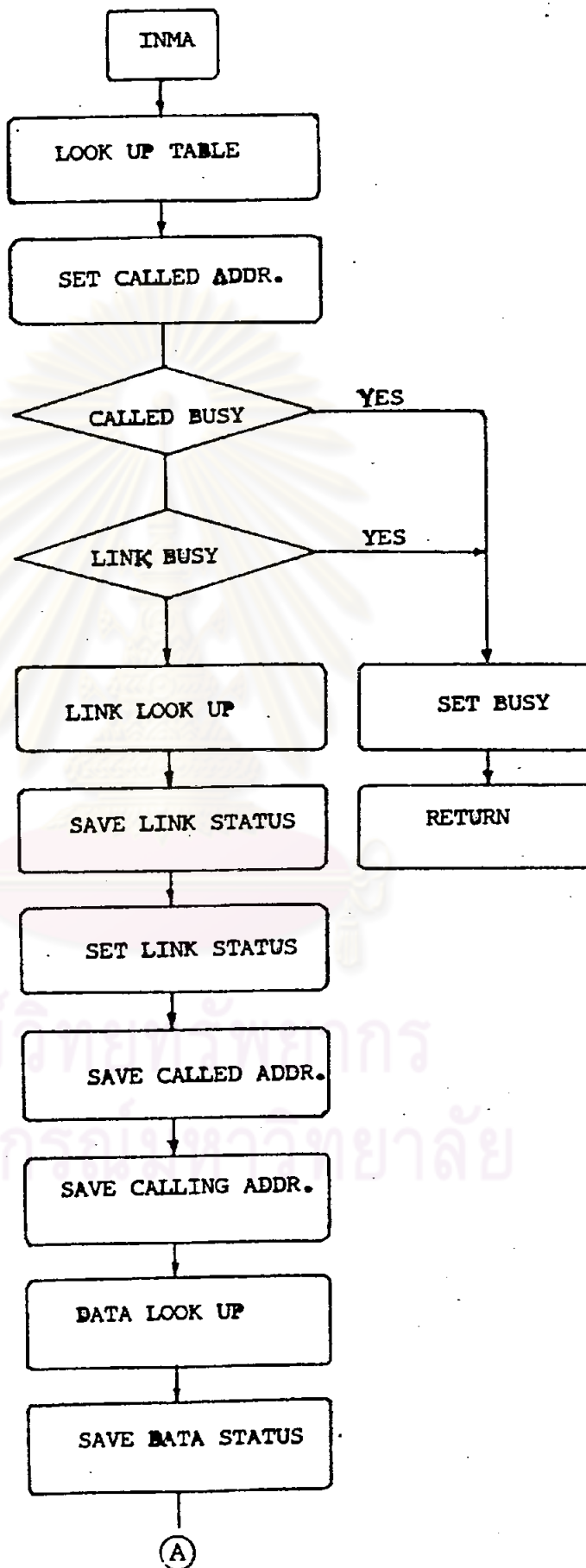
รูปที่ ๑.๑๓ โฟลวชาร์ตโปรแกรม INTRA CHECK

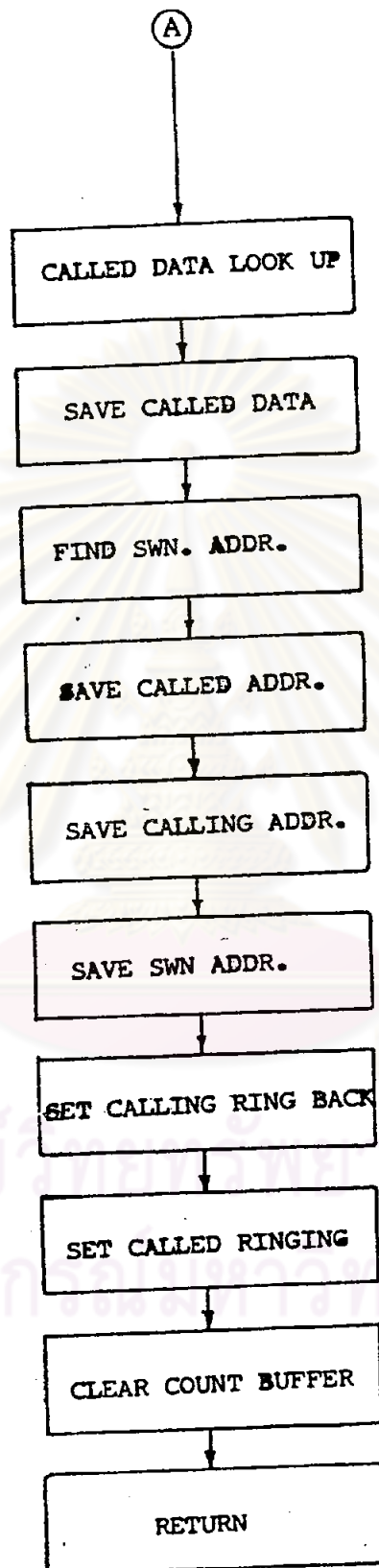




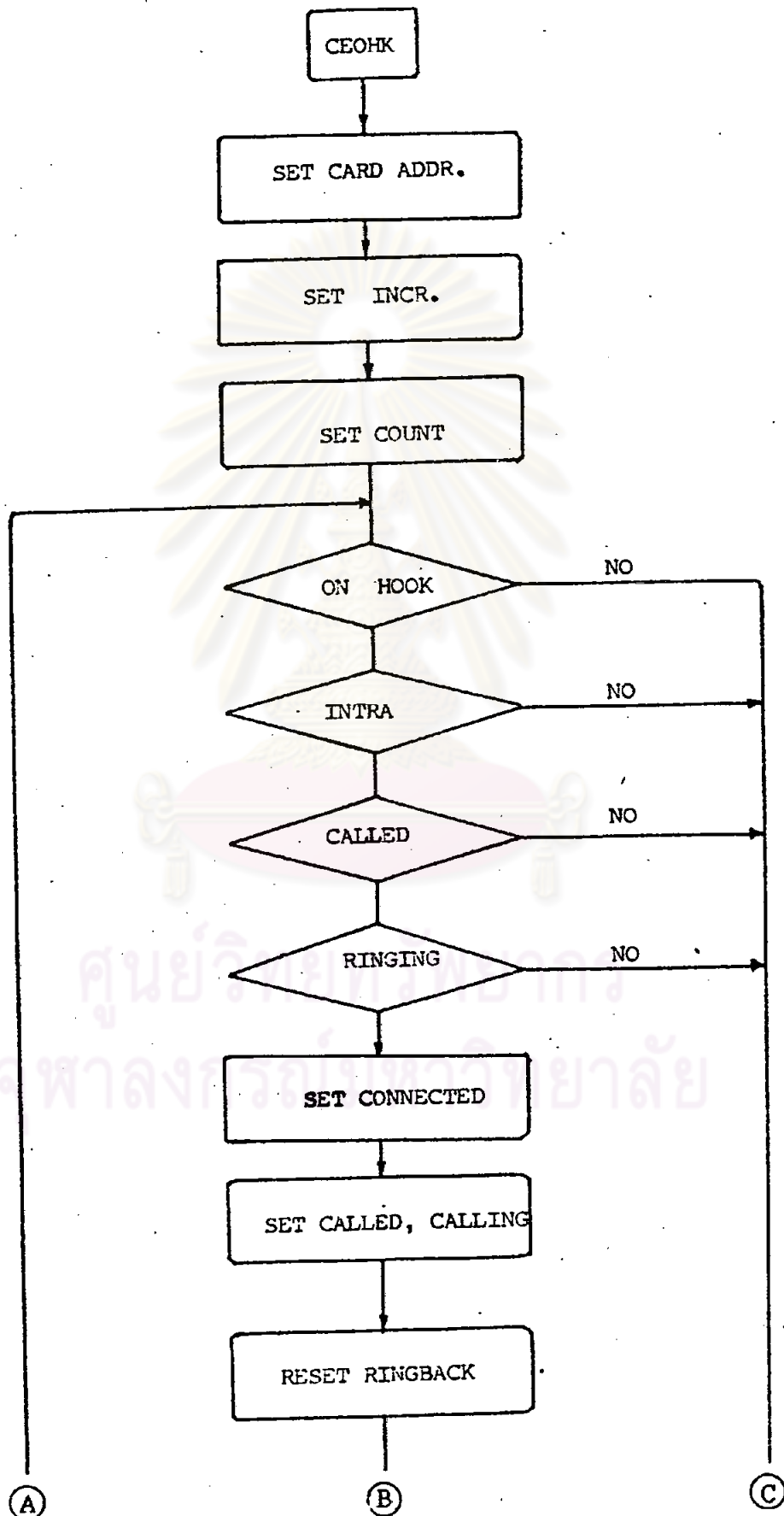
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

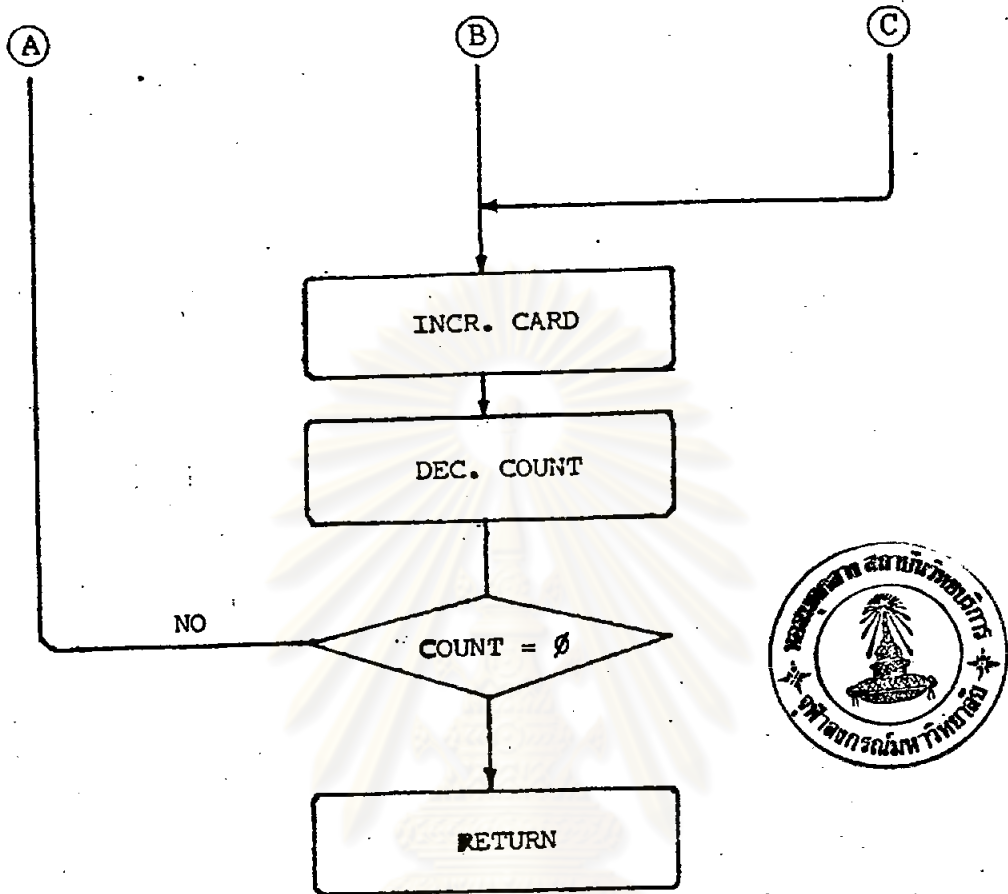
รูปที่ จ.14 โฟลวชาร์ตโปรแกรม INTRA MANAGED





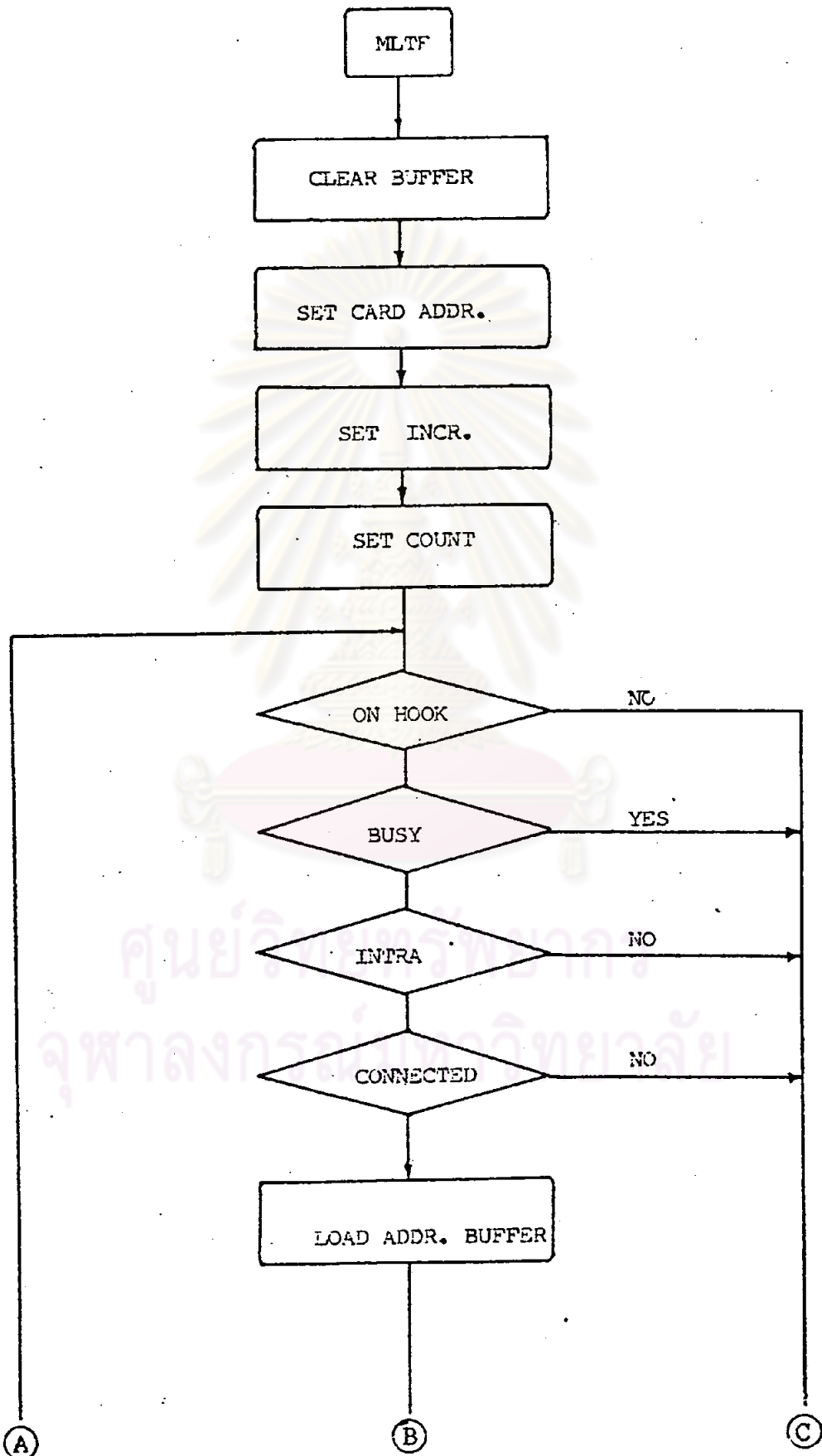
รูปที่ ๑.15 โฟลวชาร์ตโปรแกรม CALLED ON HOOK

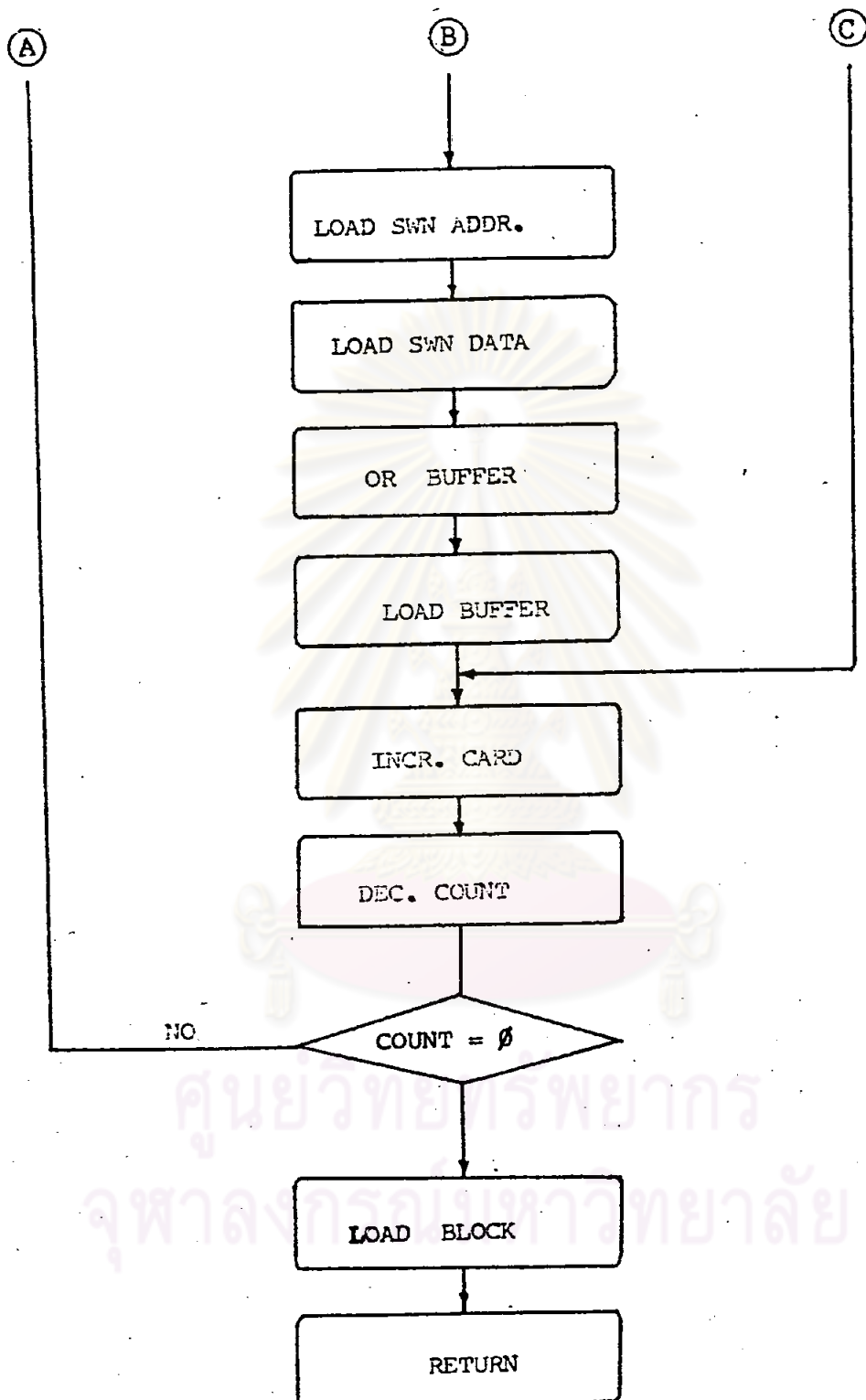




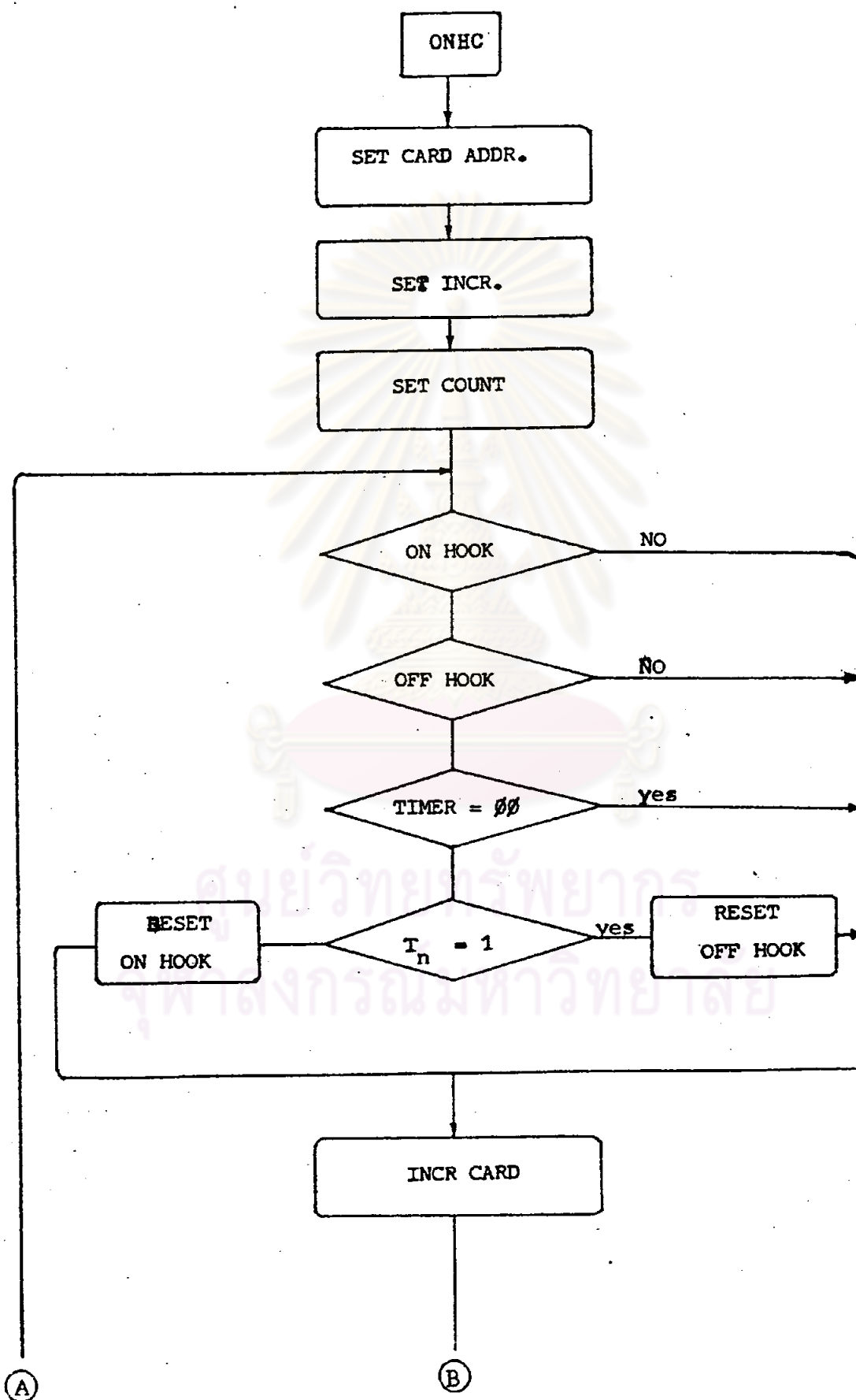
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

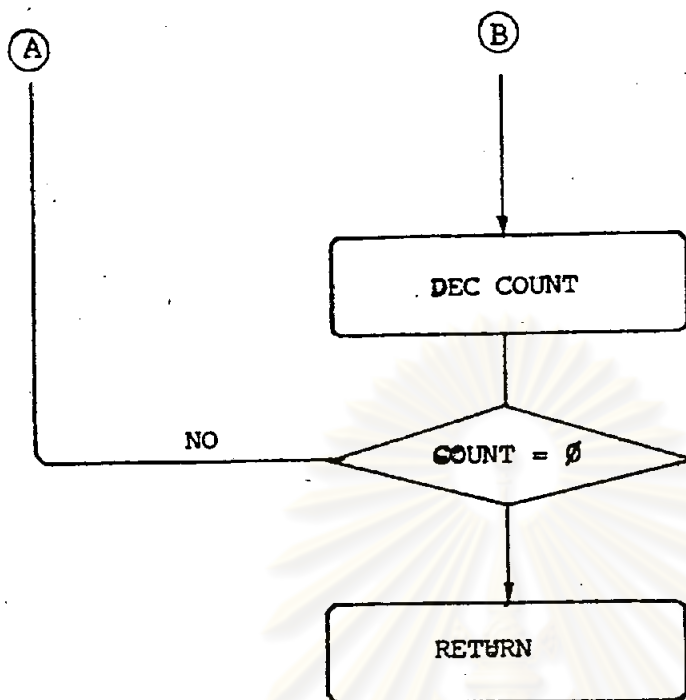
รูปที่ ๑.๑๖ โฟลวชาร์ตโปรแกรม MAIL BOX TRANSFER





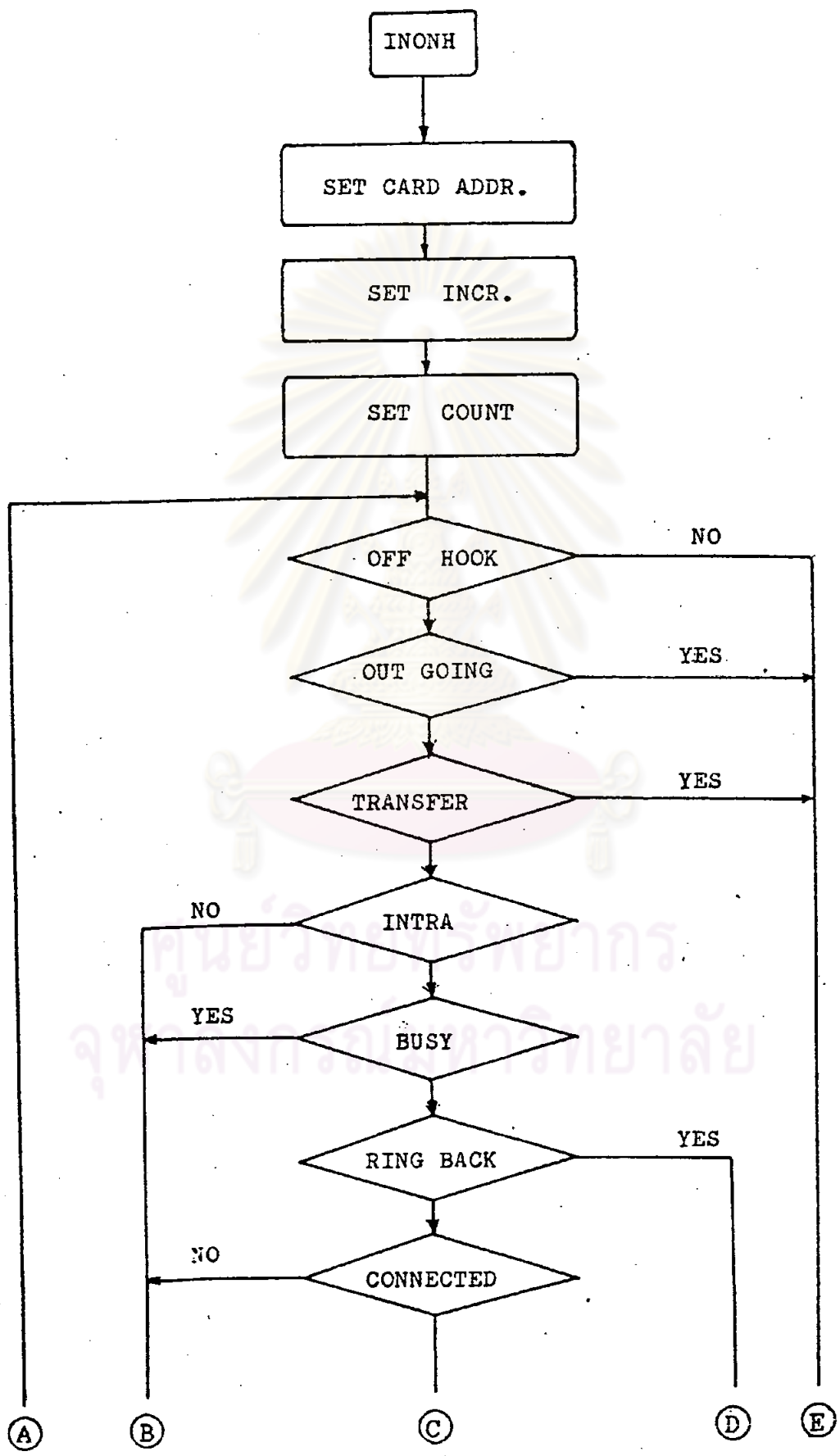
รูปที่ ๑.๑๗ โฟลวชาร์ตโปรแกรม ON HOOK CHECKED

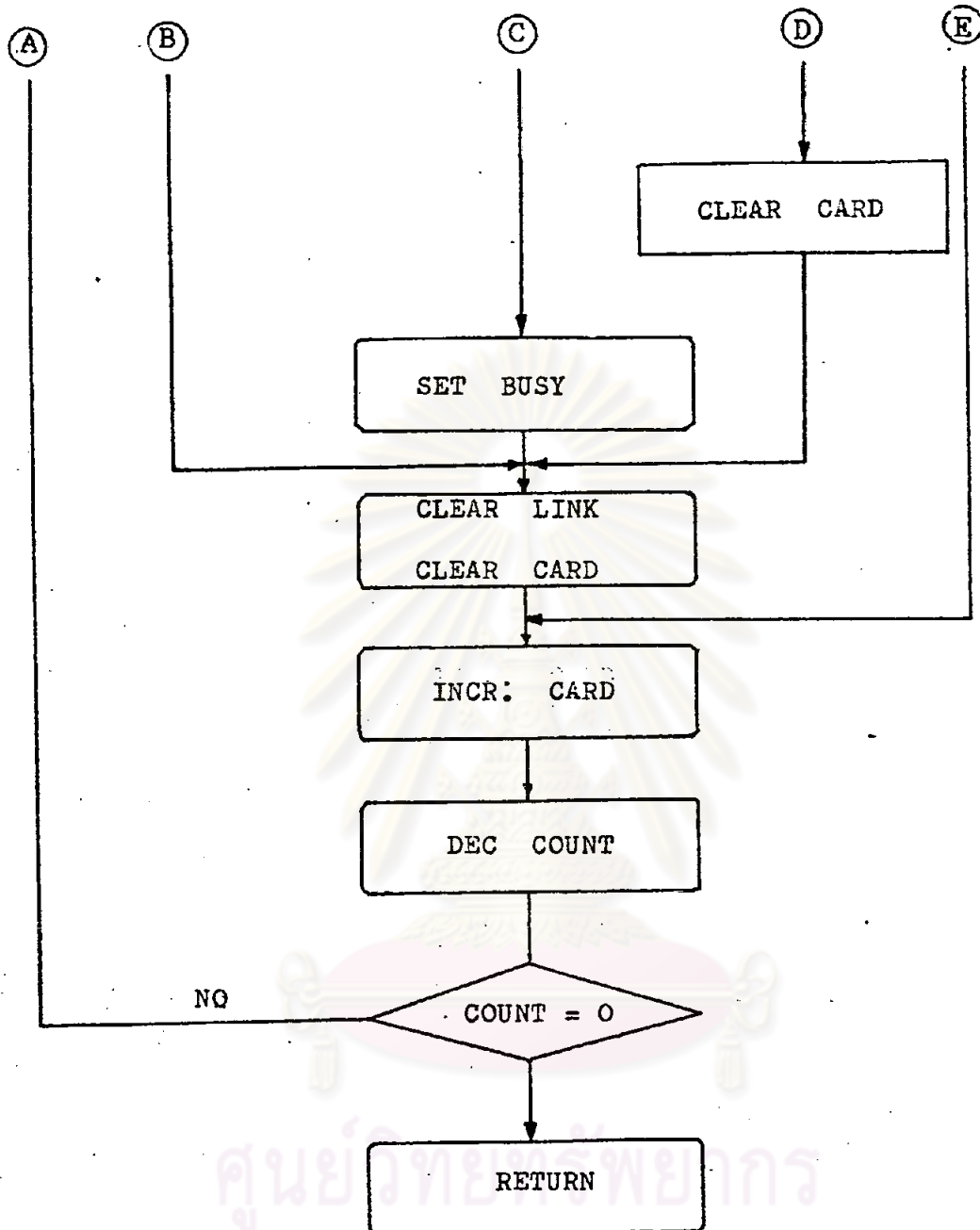




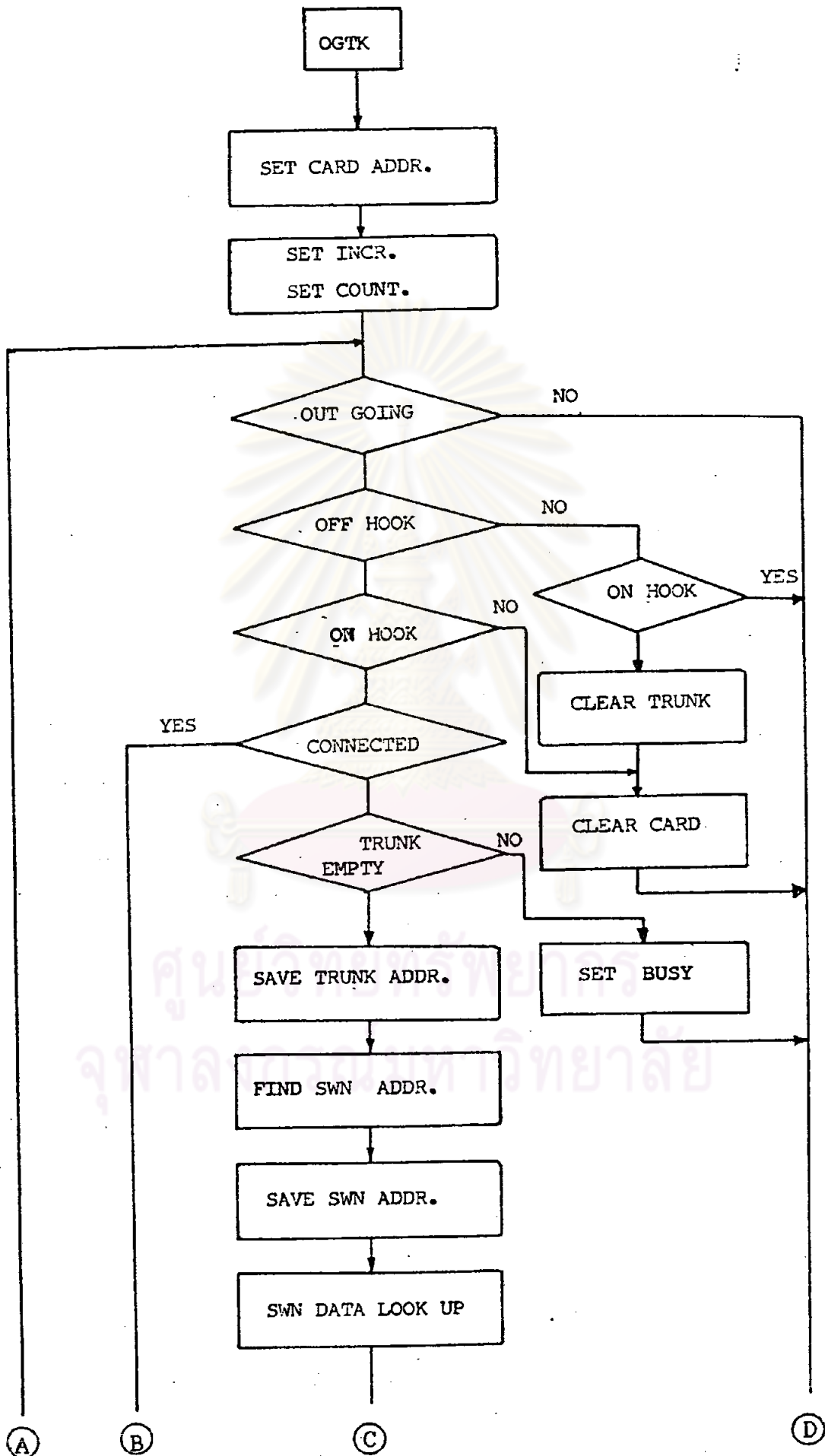
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

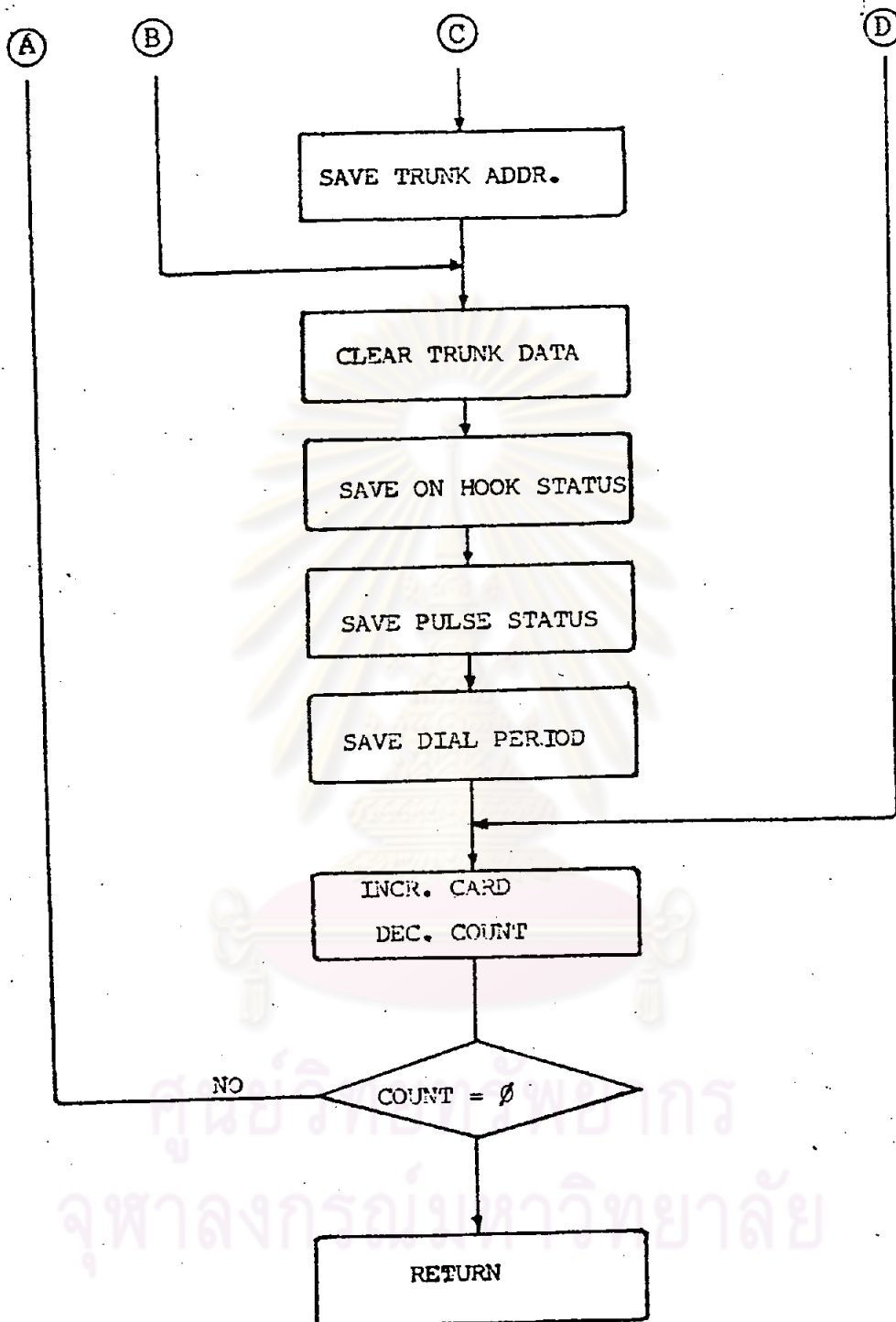
รูปที่ ๓.๑๘ โฟลวชาร์ตโปรแกรม OFF HOOK CHECKED



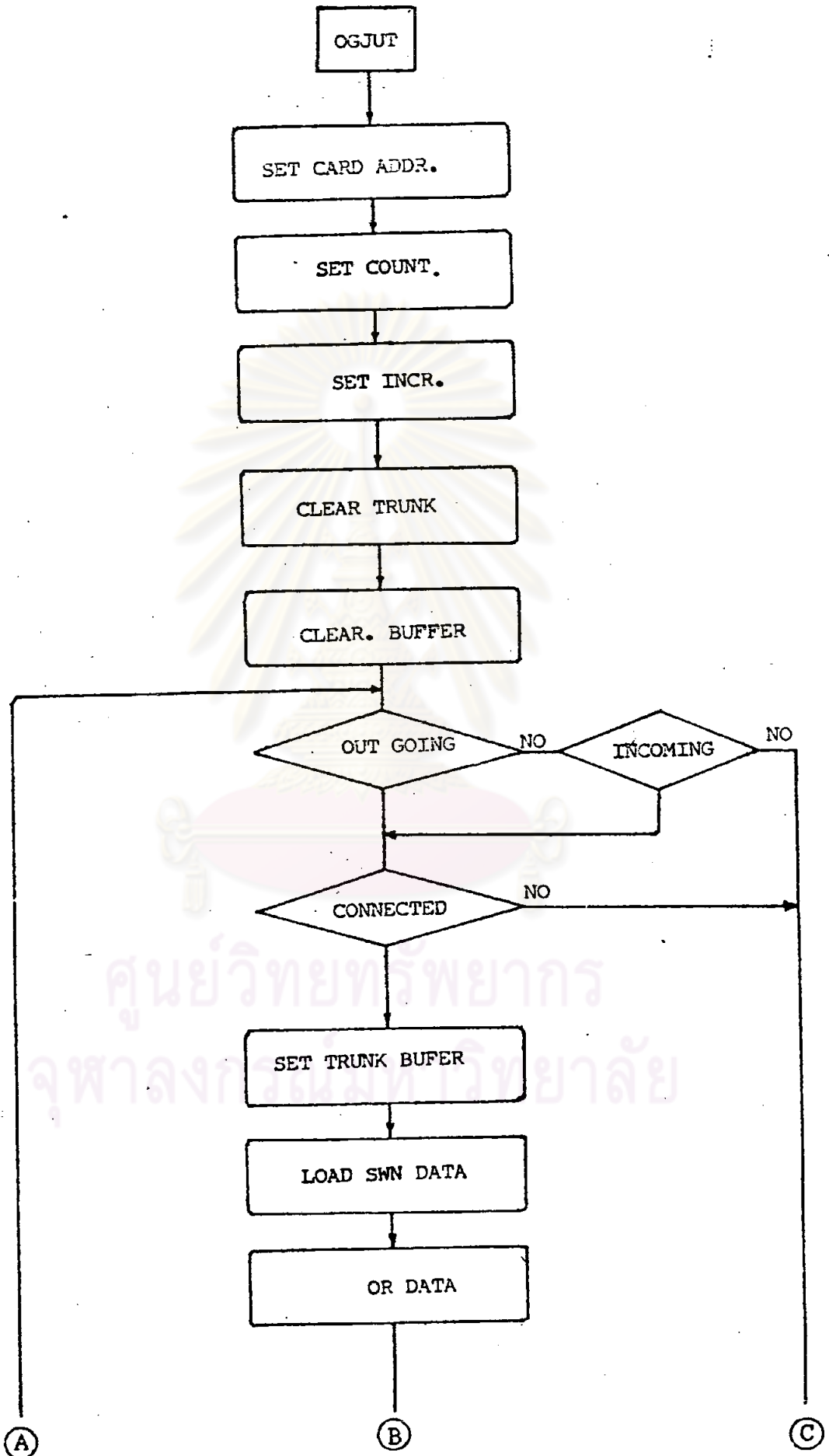


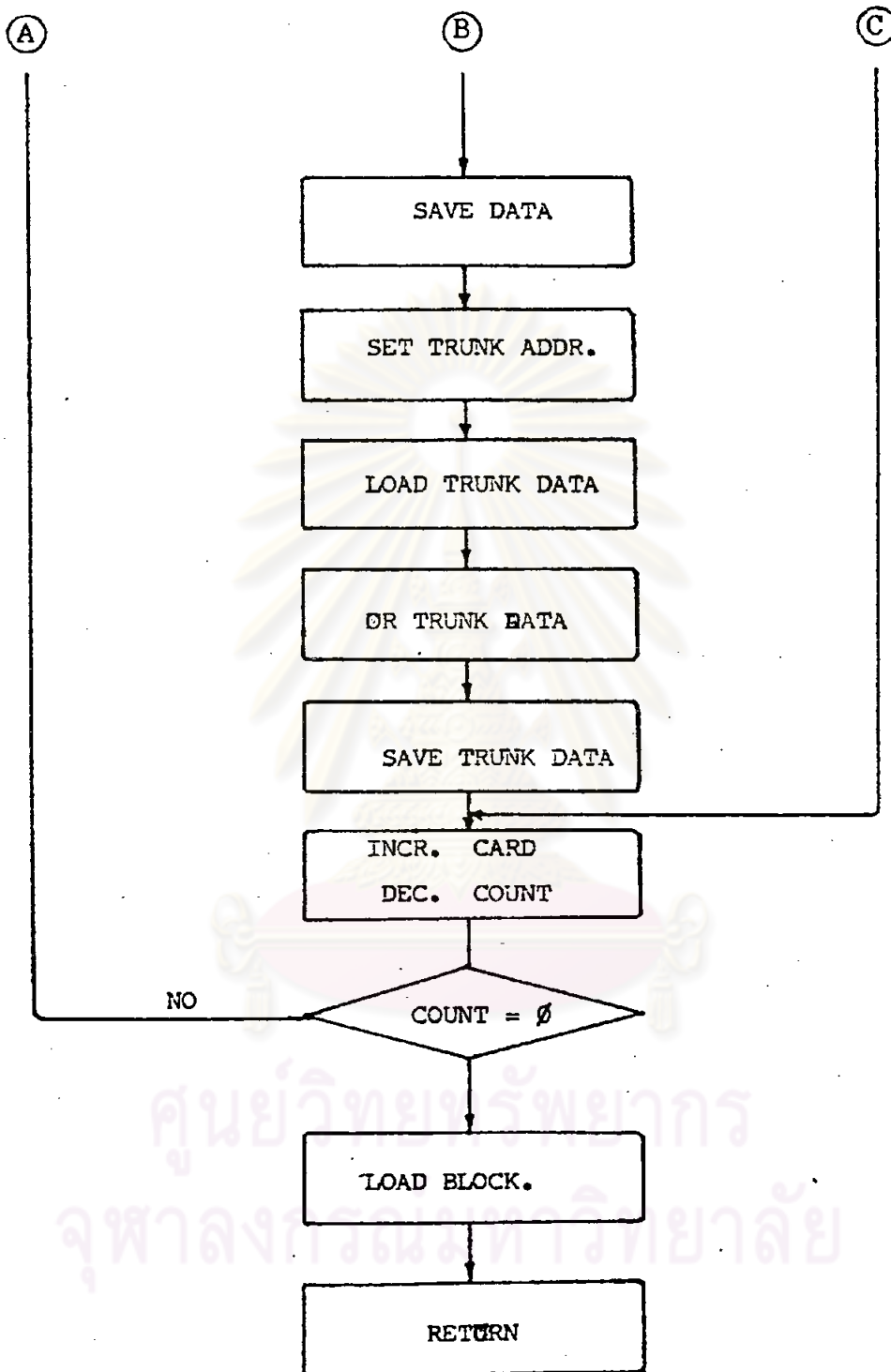
รูปที่ ๑.๑๙ โฟลวชาร์โปรแกรม OUT GOING TRUNK



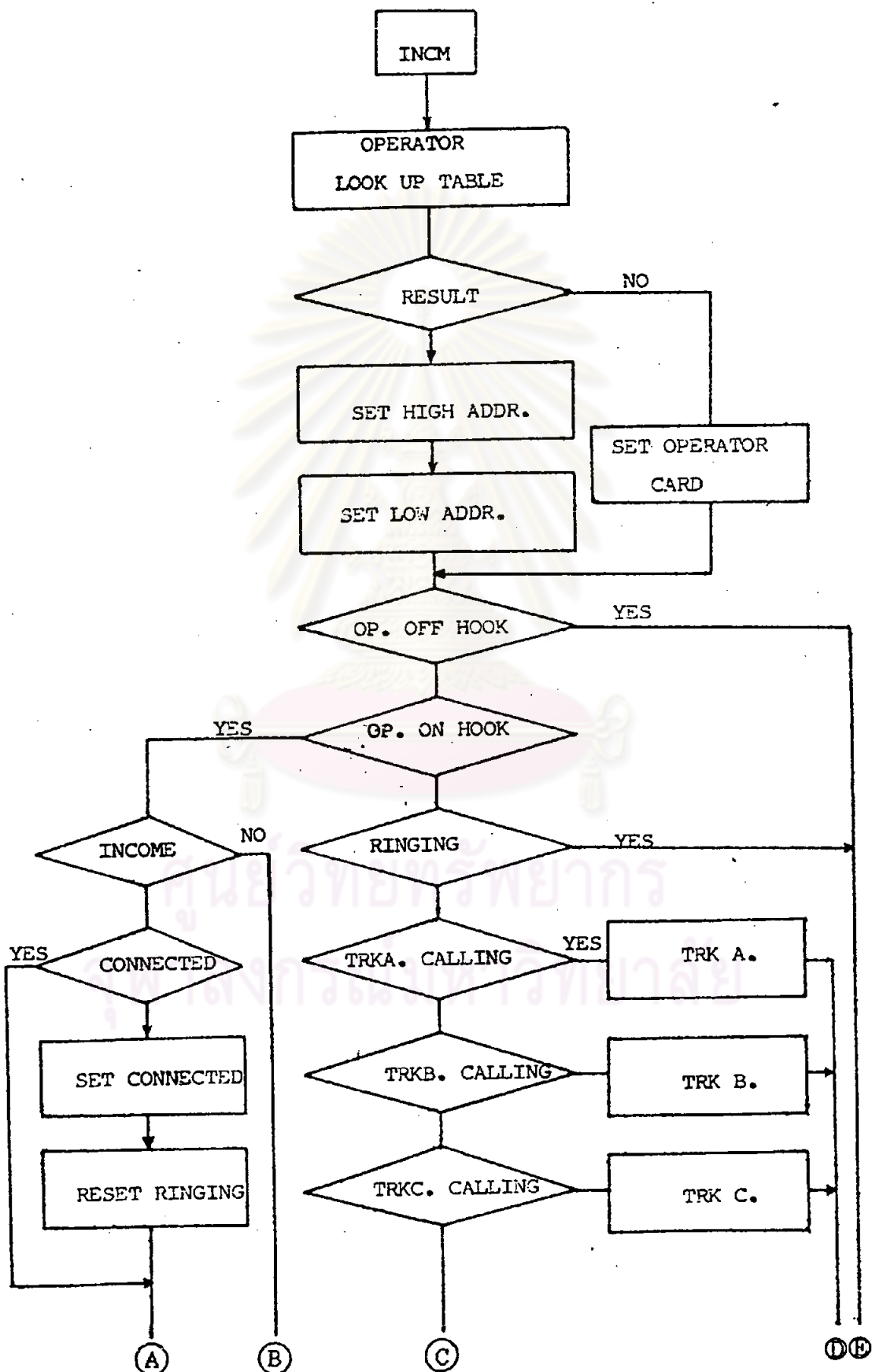


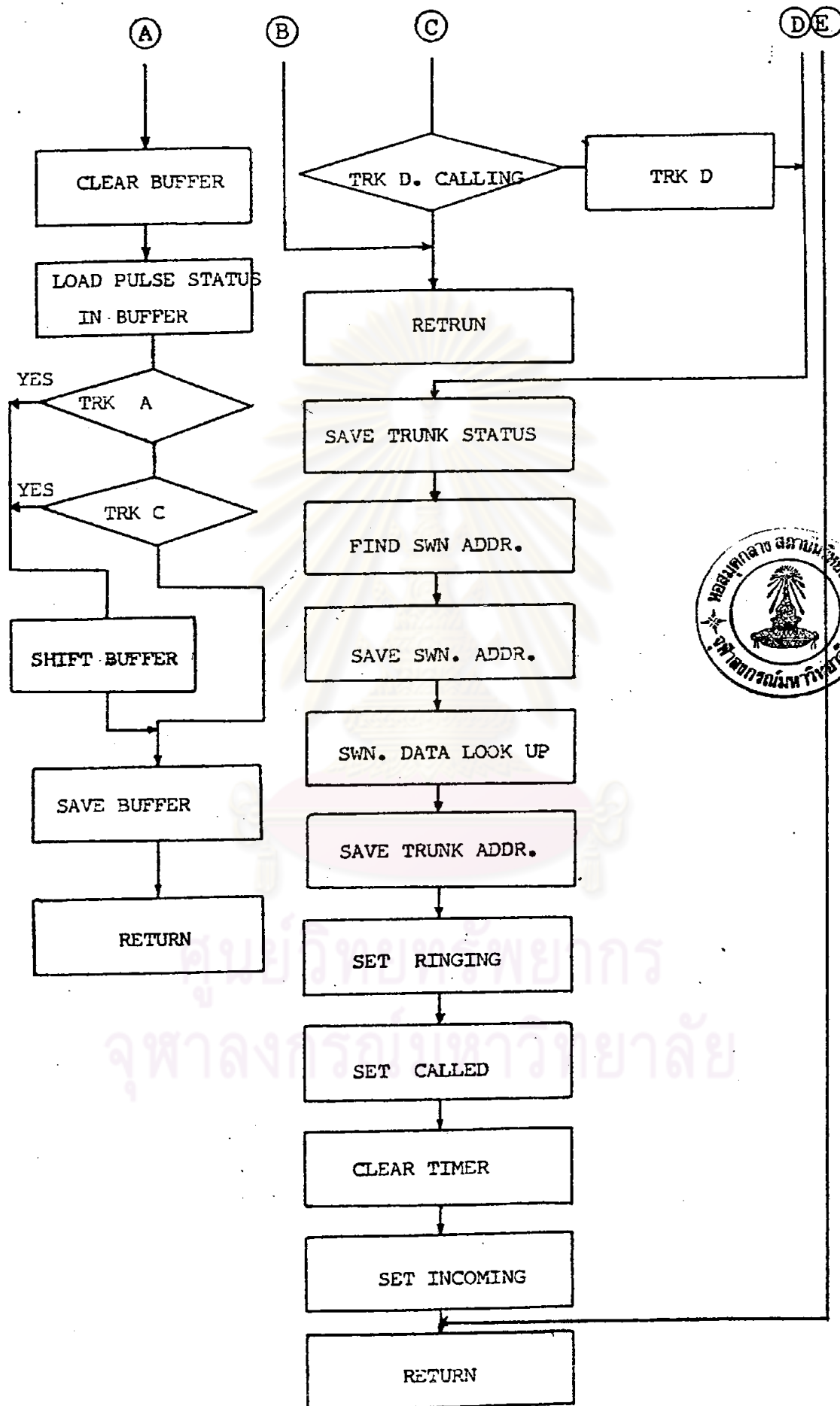
รูปที่ ๓.๒๐ โฟลวชาร์ตโปรแกรม OUT GOING JUNCTER



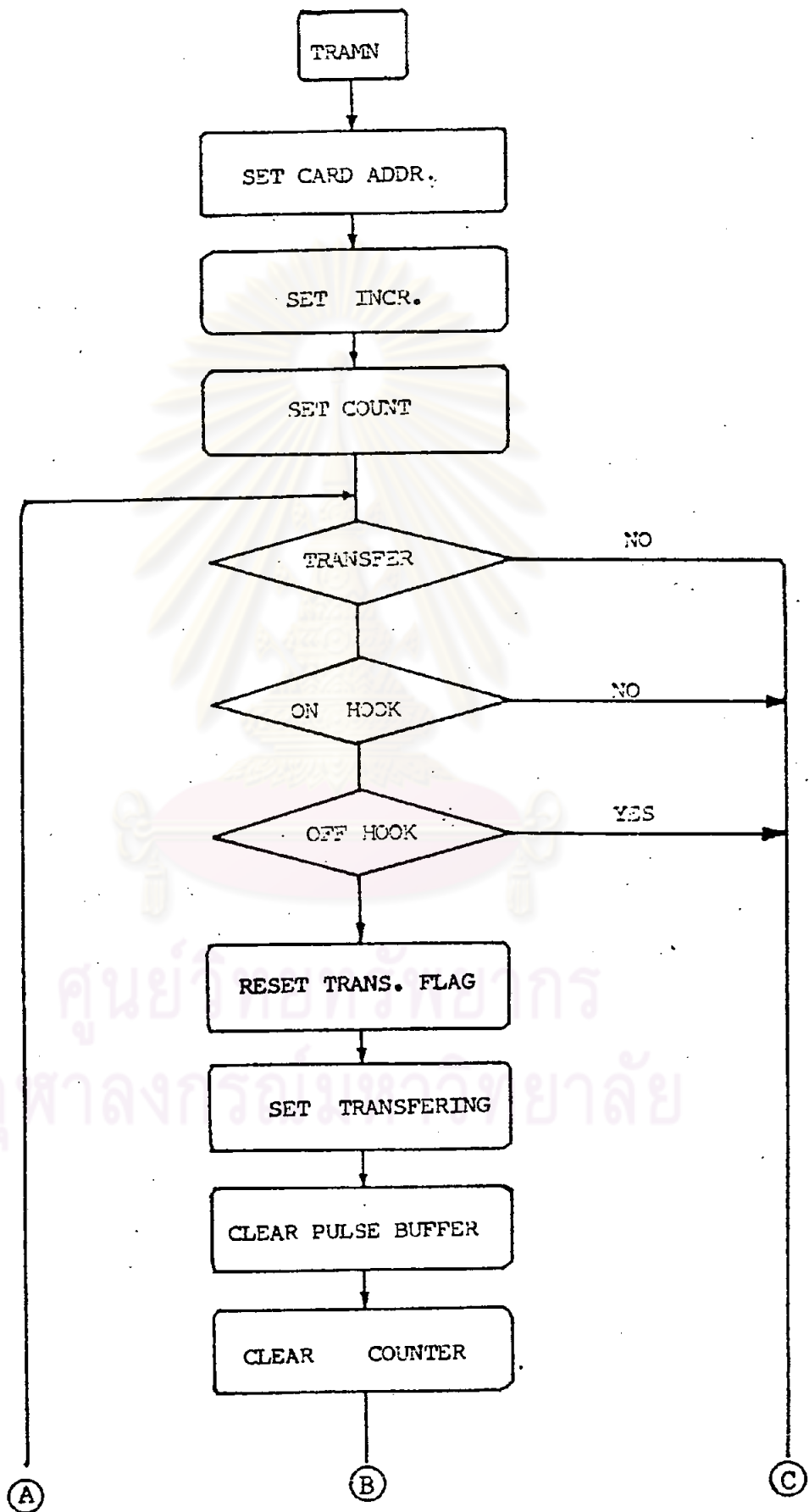


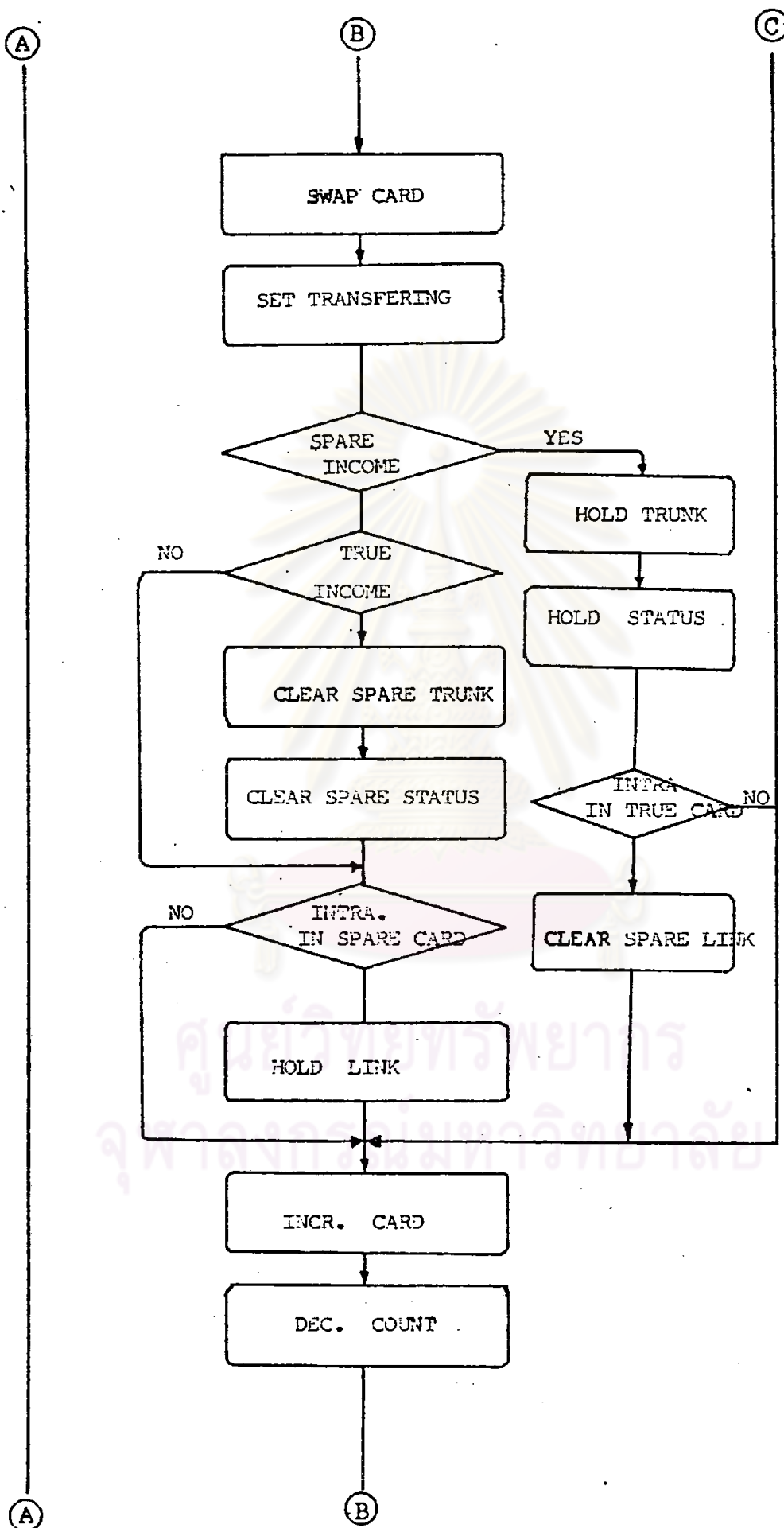
รูปที่ ๑.๒๑ โฟลวชาร์ตโปรแกรม INCOMING

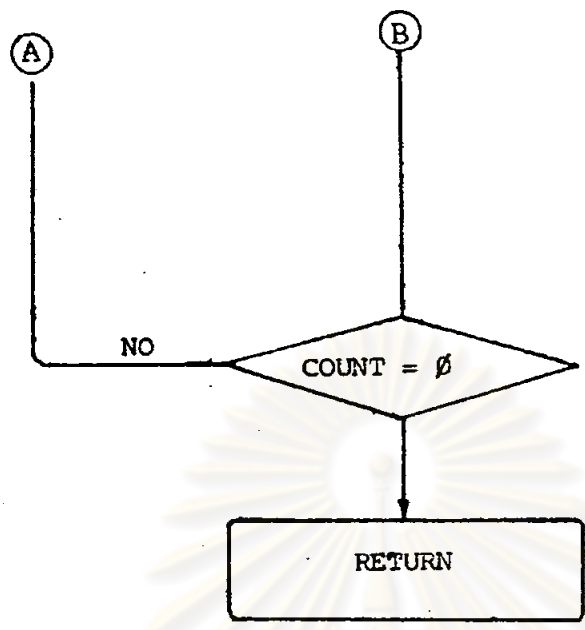




รูปที่ ๑.๒๒ โพลีชาร์ตการโอน

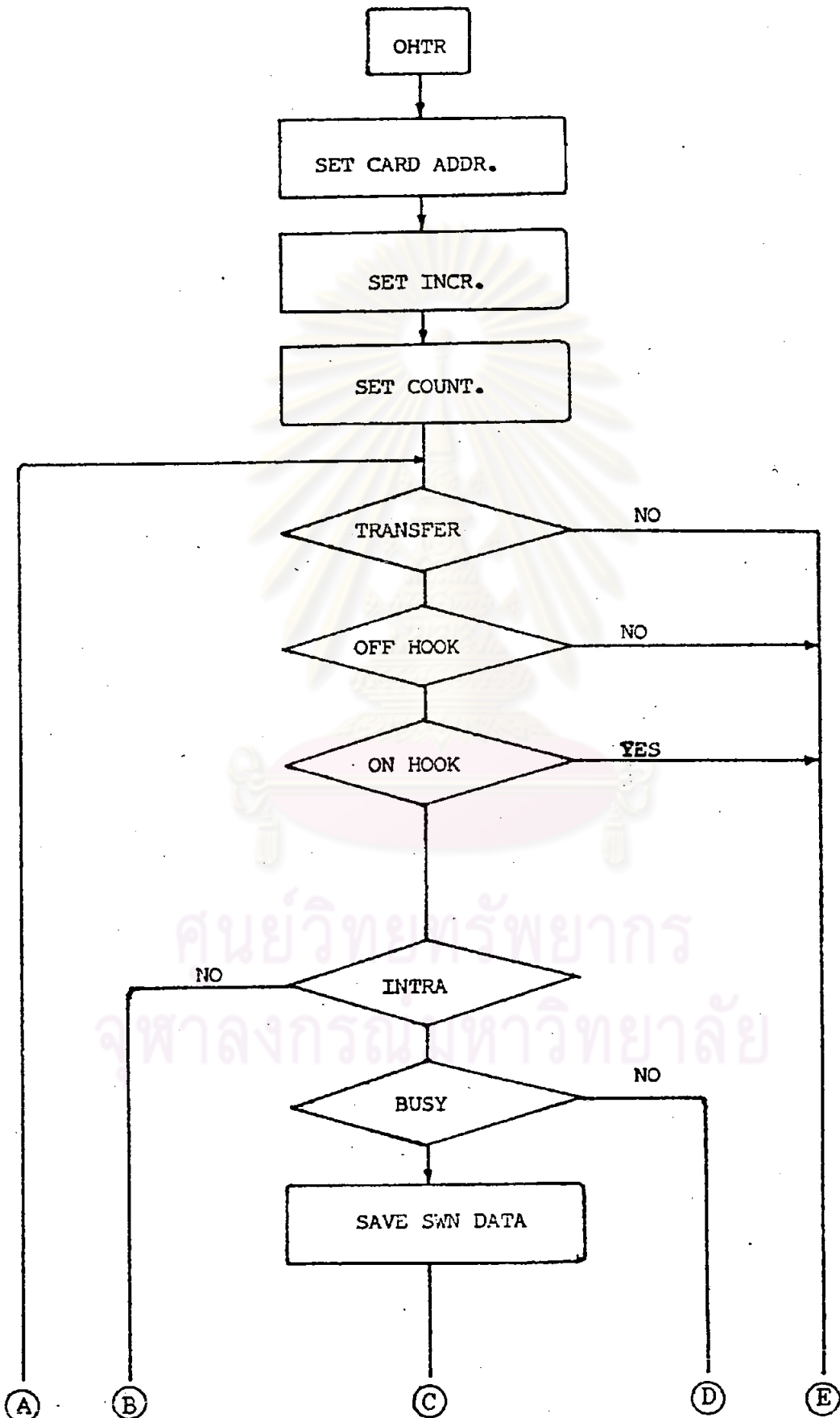


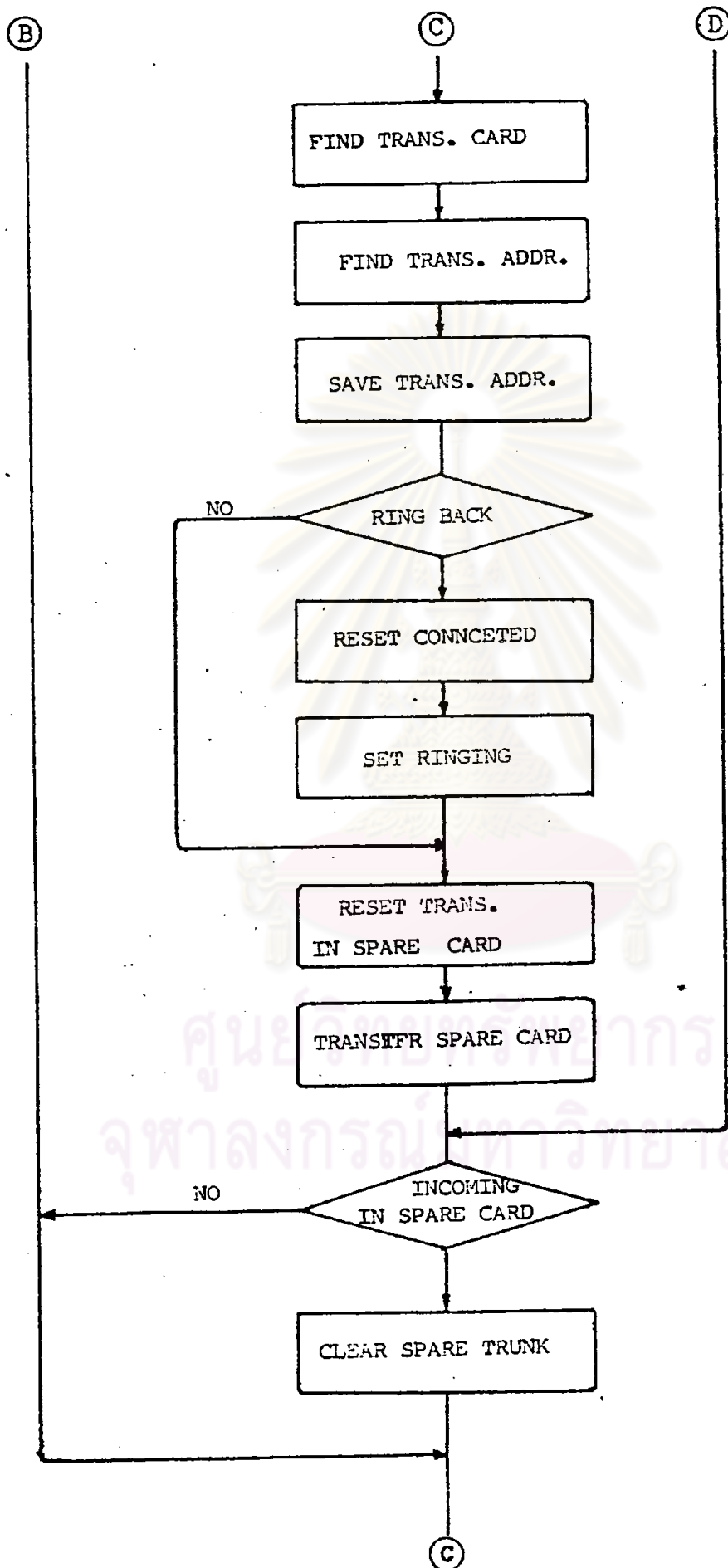


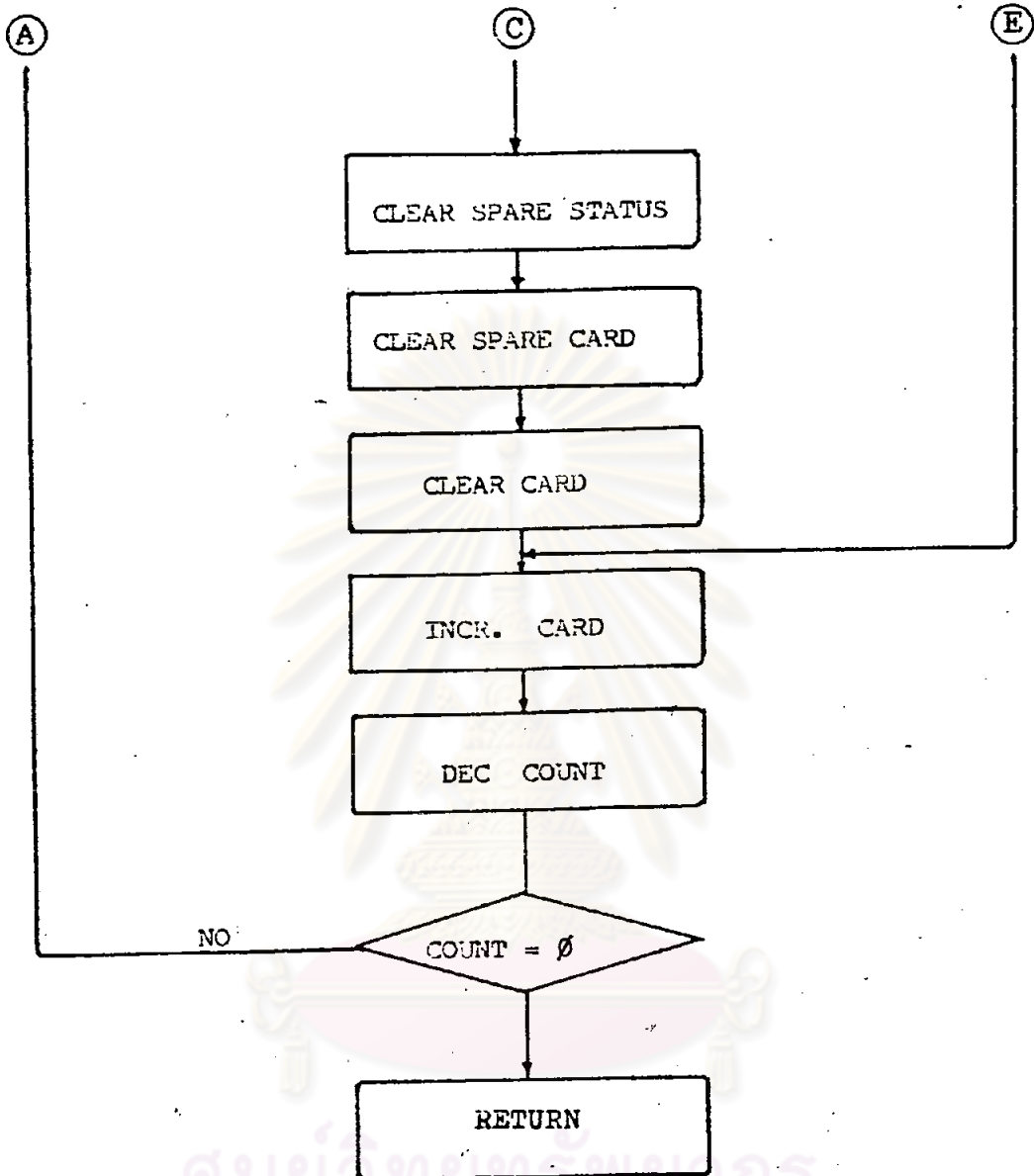


ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

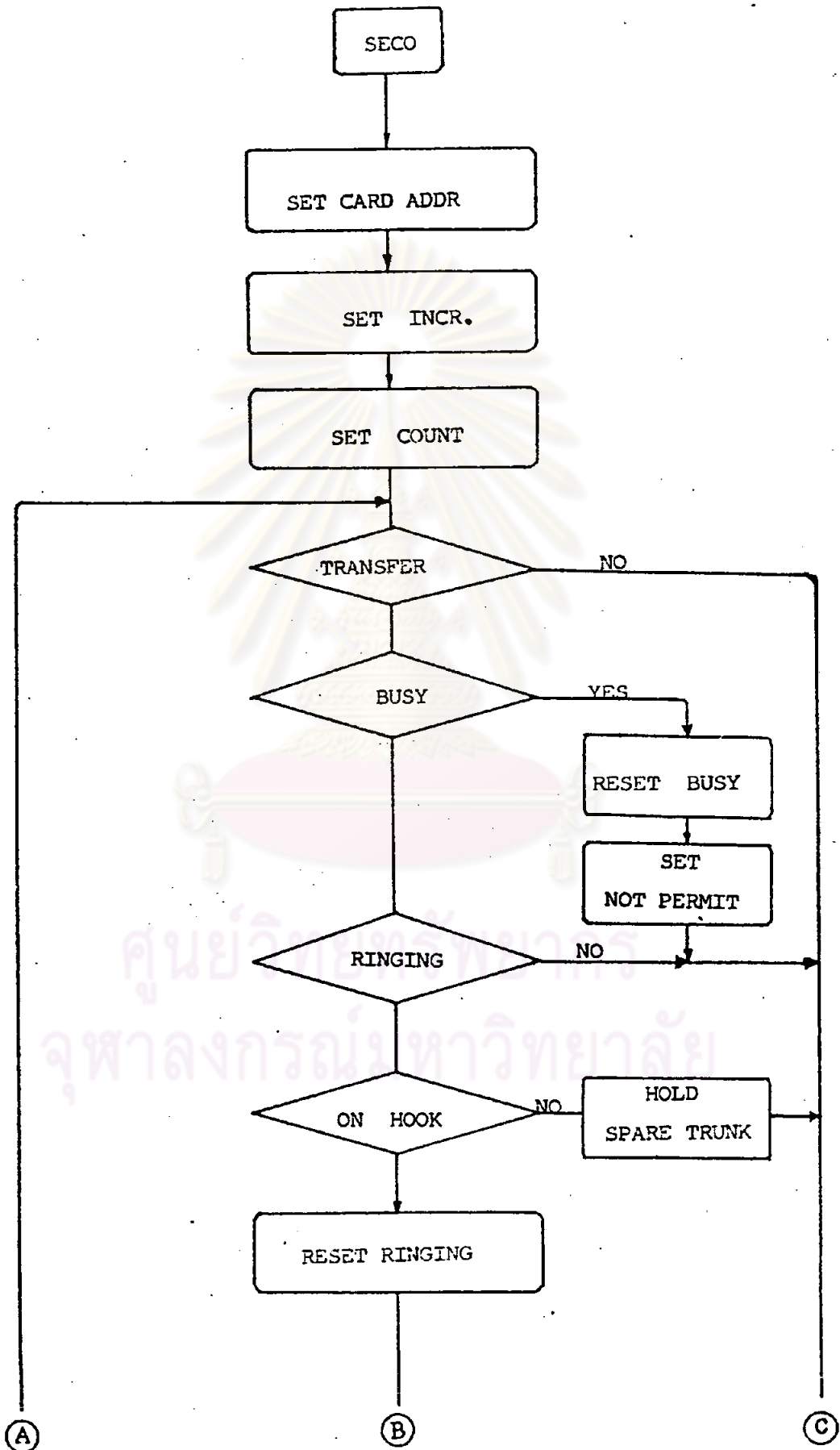
รูปที่ จ.23 โหลดซาร์ตโปรแกรม วางหุ้ดะโอน

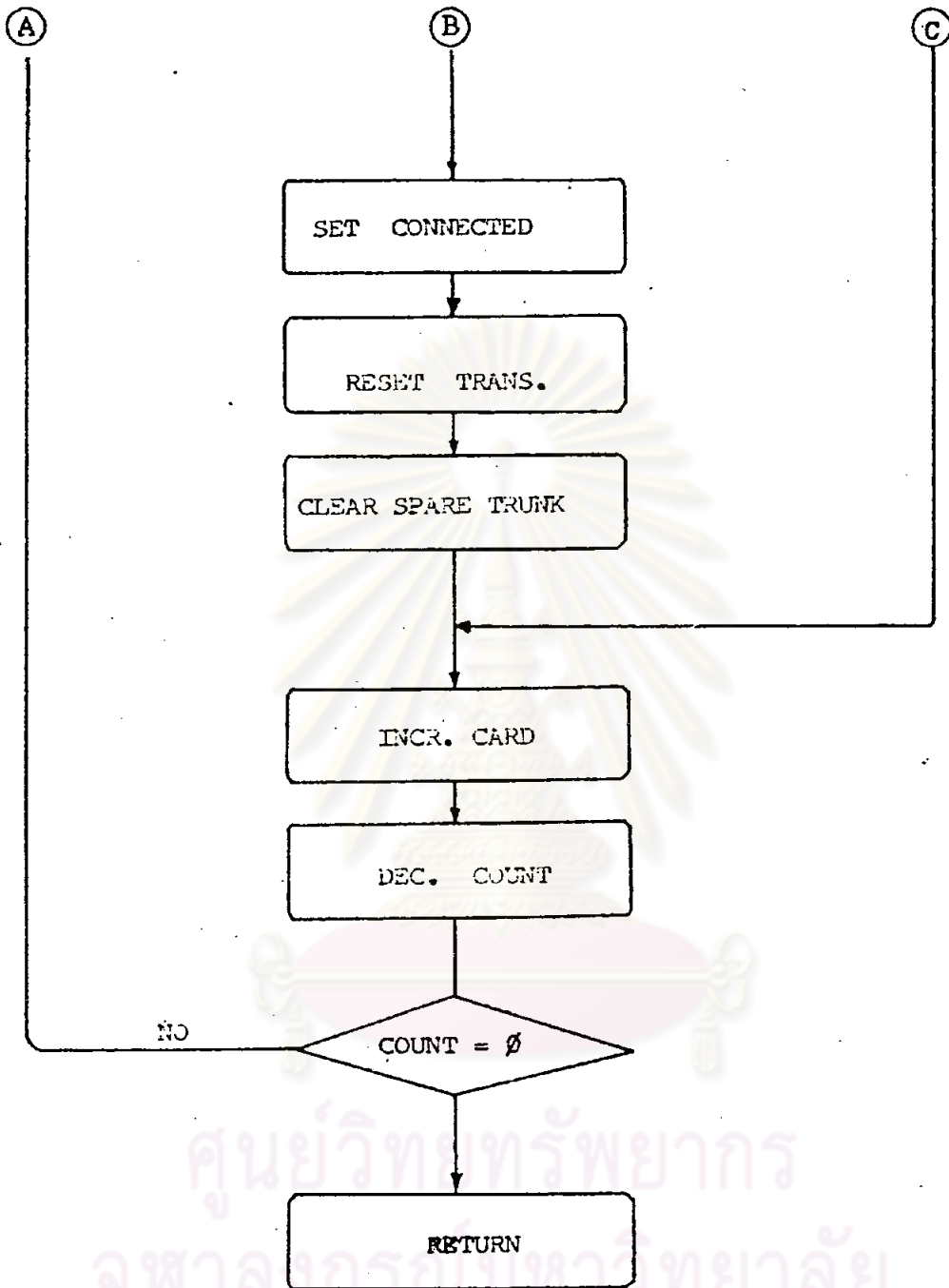






รูปที่ ๑.๒๔ โฟลชาร์ตโปรแกรม SET COMPLETE





ศูนย์วิทยพัชกร
จุฬาลงกรณ์มหาวิทยาลัย

ประวัติผู้เขียน

ร.อ. อนุรักษ์ เดือนศิริ เกิดวันที่ 3 กรกฎาคม 2498 ณ กรุงเทพมหานคร สำเร็จการศึกษาชั้นปริญญาตรี สาขาไฟฟ้าสื่อสารจาก วิทยาลัยเทคโนโลยีและอาชีวศึกษา เมื่อปี พ.ศ. 2520 สำเร็จการศึกษาชั้น ประกาศนียบัตร ชั้นสูง สาขาวิศวกรรมไฟฟ้า จาก จุฬาลงกรณ์มหาวิทยาลัย ปี พ.ศ. 2521 เคยรับราชการในตำแหน่ง อาจารย์ระดับ 4 วิทยาลัยช่างกลปทุมวัน แล้วจึงโอนเข้ารับราชการทหารในตำแหน่งประจำแผนกวิจัย กรมการทหารสื่อสาร เคยได้รับรางวัลชนะเลิศการประกวดอุปกรณ์ช่วยสอนระดับอุดมศึกษาจากคุรุสภาเมื่อปี พ.ศ. 2523 ปัจจุบันมีผลงานการวิจัย ทางด้านโทรศัพท์ และระบบชุมสายโทรศัพท์ ทางยุทธวิธี เพื่อใช้ในกิจการทหาร ของกองทัพบก



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย