

July 10, 1978

C O N F I D E N T I A L

TO: RICHARD CHANG  
FROM: DAVE CHANDLER  
SUBJECT: BACK-UP VIDEO SYSTEM

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It is clear that we should continue to strive to get our system completed for the January C.E.S. based on the G.I. STIC chip set. However, in light of the facts that the schedule for obtaining F.C.C. approval outlined by G.I. is quite tight for January C.E.S., cost reductions in the forms of 40K ROMS and a consolidated chip set will not be available for 1979 production, and the 40°C temperature specification on the STIC chip set promises to cause problems and expense, it seems wise to pursue a back-up system.

An interesting candidate for a back-up system appears feasible based on a combination of Signetics PVI chip set and MOS Technology's VIC chip. The VIC provides better background capability than we now have, with higher resolution and better alphanumeric. The PVI system provides more flexible foreground capability, primarily because of the multiplexing capability. All the chips exist now, functioning hardware can be put together right away. The lowest temperature spec on any of these chips is 55°C. There is the necessity to marry the two systems and while I have found no inherent obstacles to such a marriage, there could still be some problems.

I am proposing a three stage approach to pursuing this back-up system:

1. Proceed as quickly as possible to breadboard a system which would incorporate 1 VIC chip and 4 PVI chips.
2. Assuming the breadboard looks good, design and build PC boards to fit into our present housing, again based on 1 VIC chip and 4 PVI's. This system could be put through F.C.C. for January C.E.S. and used for limited early production, if desired.
3. Fund Signetics to lift the portions from PVI which generate moving objects, expand them to 16 lines high and put 8 moving objects in one new chip for us (call it MOVI). Off-the-top-of-the-head estimates by Signetics are that this could be done in about 6 months. That could permit us to use this chip for the quantity production and would appear to give us a chip set cost comparable to the STIC set.

Richard Chang  
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It would be good if we could be in a position to discuss the MOVI chip with Signetics management when they come here July 17.

To minimize the problems associated with creating another competitive system which we might not use, I would propose that the breadboard be put together at APH but with them having no contact with either Signetics or MOS Technology. All of the coordination would come through here and we would not let either company know the full nature of the systems we are putting together. They would also not know where it is being put together.

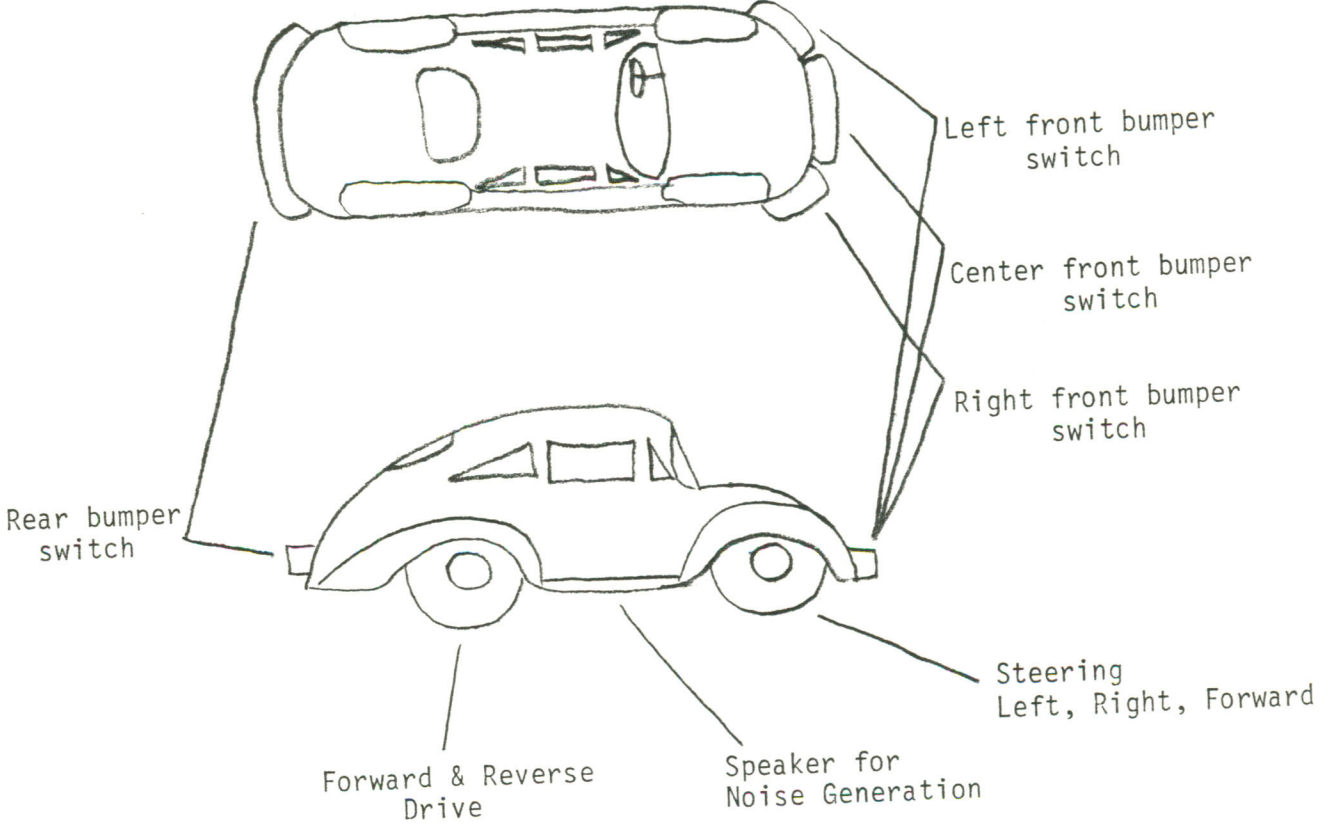
DPC:lb

cc: Denis Bosley  
Josh Denham  
Ed Krakauer  
Jeff Rochlis

11-29-78

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Proposal  
for a  
COMPUTER CONTROLLED CAR



B. Willis  
10/12/78

## I. MOTION

A motor is included to provide both forward and reverse drive.

### A. FORWARD DRIVE

Proportional speed control will be limited to a fixed acceleration curve in three steps, to simulate gear changes. Such acceleration will only be used while steering straight ahead.

Otherwise a slow deliberate speed will be used during left or right steering.

### B. REVERSE DRIVE

Reverse motion will be used to back away from obstacles encountered in front of the vehicle.

Speed in the reverse direction will be as in forward turns, whether turning or backing straight.

## II. STEERING

The three steering settings are:

FULL LEFT,  
FULL RIGHT, or  
CENTER (STRAIGHT AHEAD)

Left and right steering is used for maneuvering around encountered obstacles.

The amount of steering will depend entirely upon the duration of a left or right turn setting.

## III. BUMPER SWITCHES

Four bumper switches detect collisions with objects. They are located in the rear, in the center front, at the right front corner, and at the left front corner.

BUMPER SWITCHES (cont.)

A. REAR BUMPER SWITCH

This switch detects rear-end collisions and is used to initiate other actions such as forward motion.

B. CENTER FRONT BUMPER SWITCH

This switch can detect head-on collisions and together with the LEFT and RIGHT BUMPER SWITCHES can be used to determine corrective or evasive action. Only reverse drive will be used to correct a head-on collision.

C. LATERAL BUMPER SWITCHES

These switches can detect glancing collisions to the left or right of the vehicle. It will be assumed that forward or reverse motion can correct for a glancing collision.

IV. NOISE GENERATION

A. MOTOR ACCELERATION

In synchronization with the acceleration curve, a motor noise is generated.

B. CRASH

Upon any collision, a crash noise is generated.

C. BEEP-BEEP

While backing up, a "beep-beep" warning tone is generated.

V. OPERATION

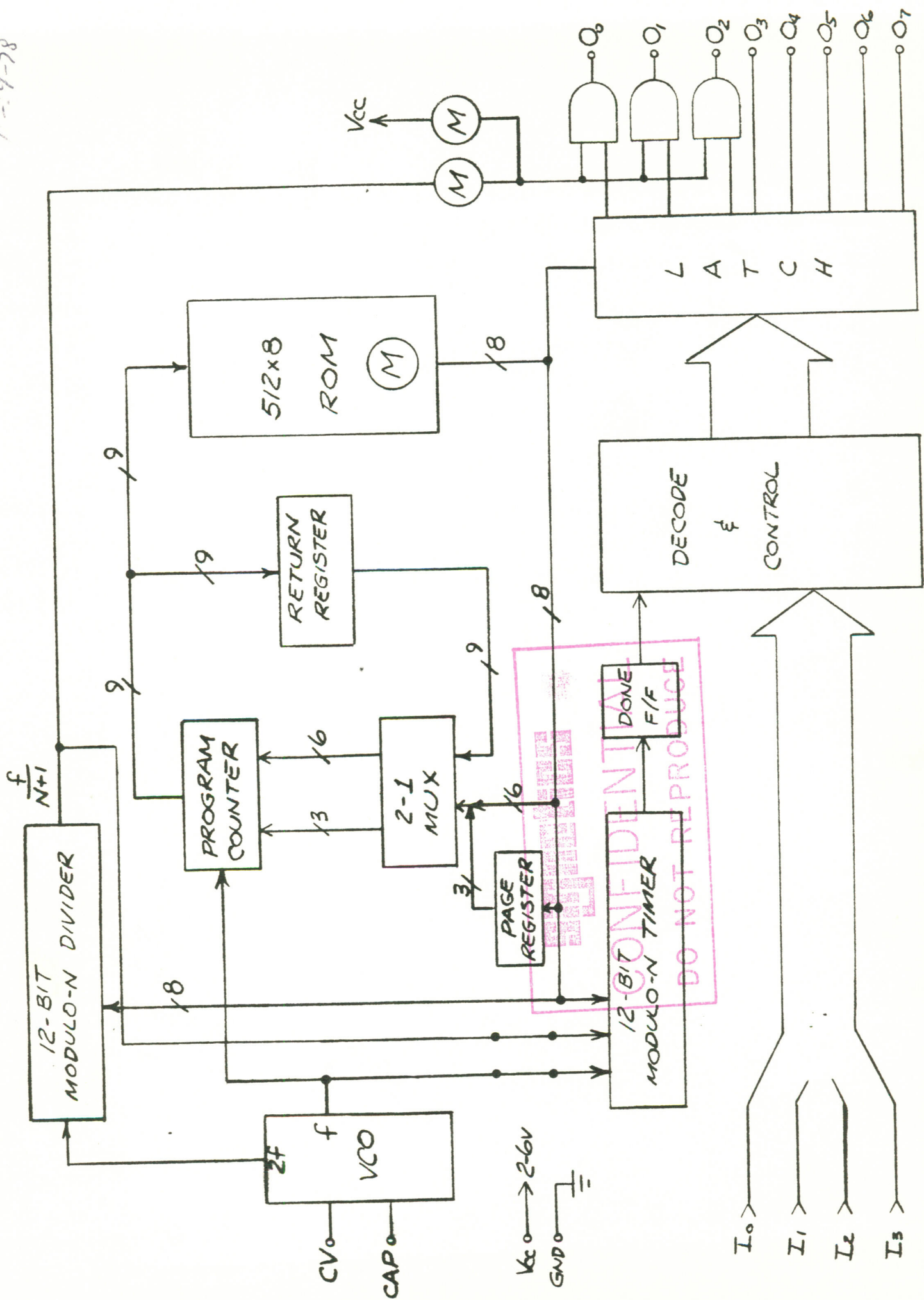
A. The vehicle is powered by batteries and is turned on with a simple switch.

B. The vehicle drives straight forward and begins the acceleration curve accompanied by the accelerating motor noise.

C. If a glancing collision occurs, the vehicle stops and a crash noise is heard. Then the vehicle proceeds forward slowly, but steers to avoid the obstacle. After going around the obstacle, operation continues with step B above.

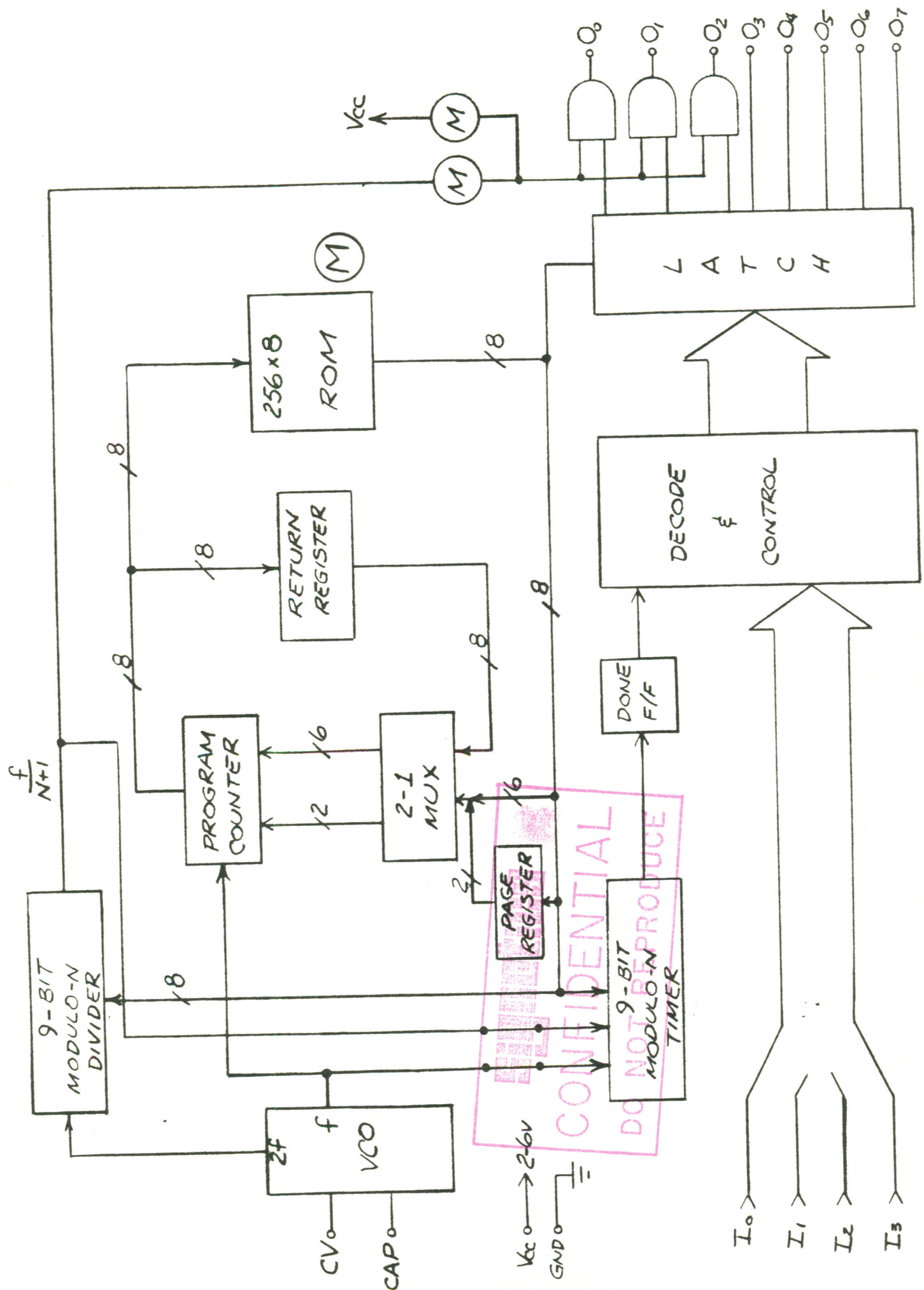
## V. OPERATION (cont.)

- D. If a head-on collision occurs, the vehicle stops and a crash noise is heard. If a right side collision is also sensed, then the steering turns to the right and the vehicle slowly backs up, with a "beep-beep" warning tone. After backing sufficiently, the vehicle goes around the obstacle on the left. If no right side collision is sensed, the vehicle backs and goes around the right side of the obstacle. After going around the obstacle, operation continues with step B above.
- E. If no collision has occurred before the "top-end" has been reached, the vehicle executes a "three-point" turn and heads off in a new direction with step B above.
- F. If anytime during the operation, a rear-end collision is detected, the vehicle stops, makes a crash noise, drives slowly straight forward, stops, and then continues the operation it was doing when the crash occurred.



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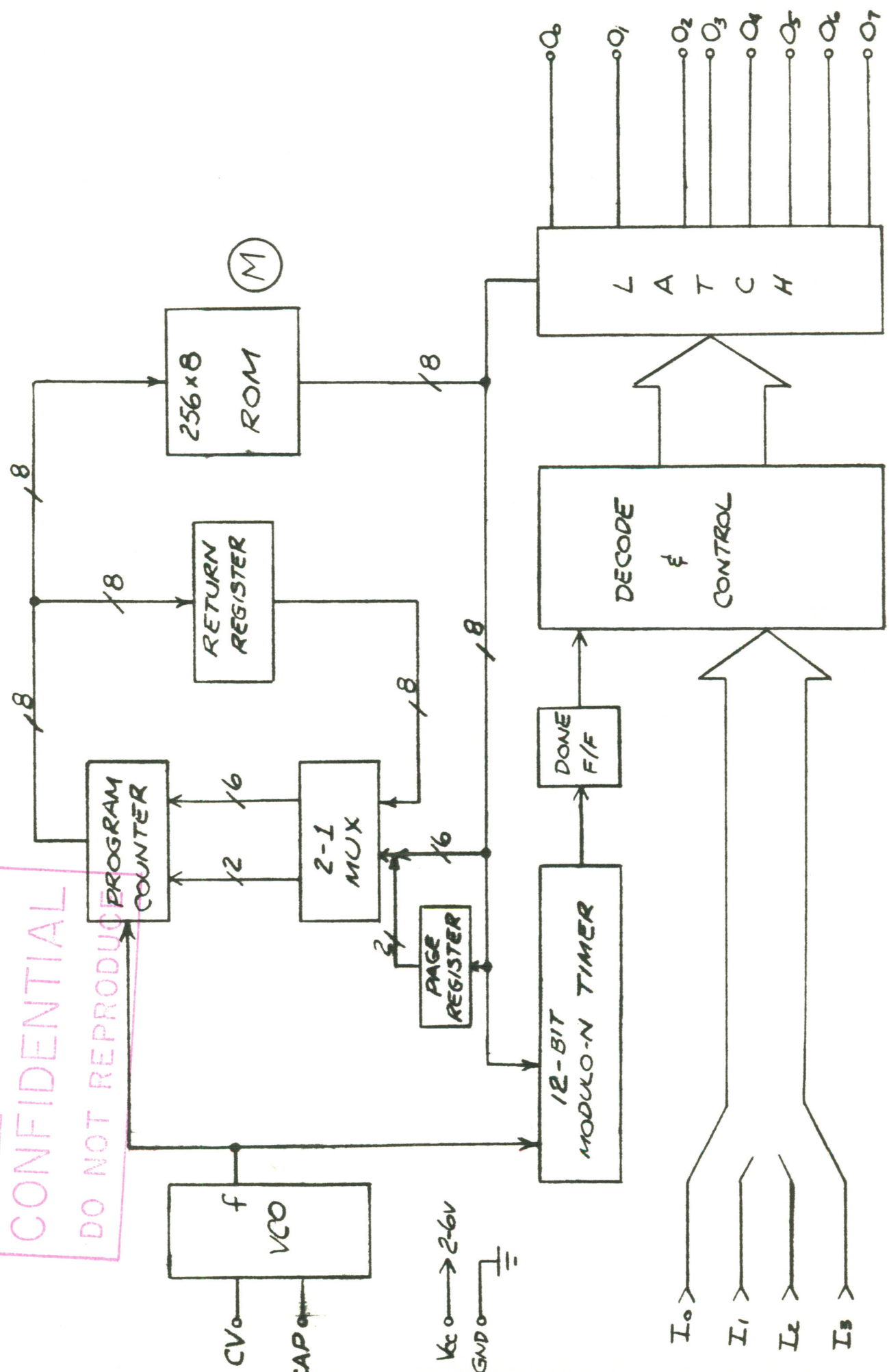
CyMC VERSION D





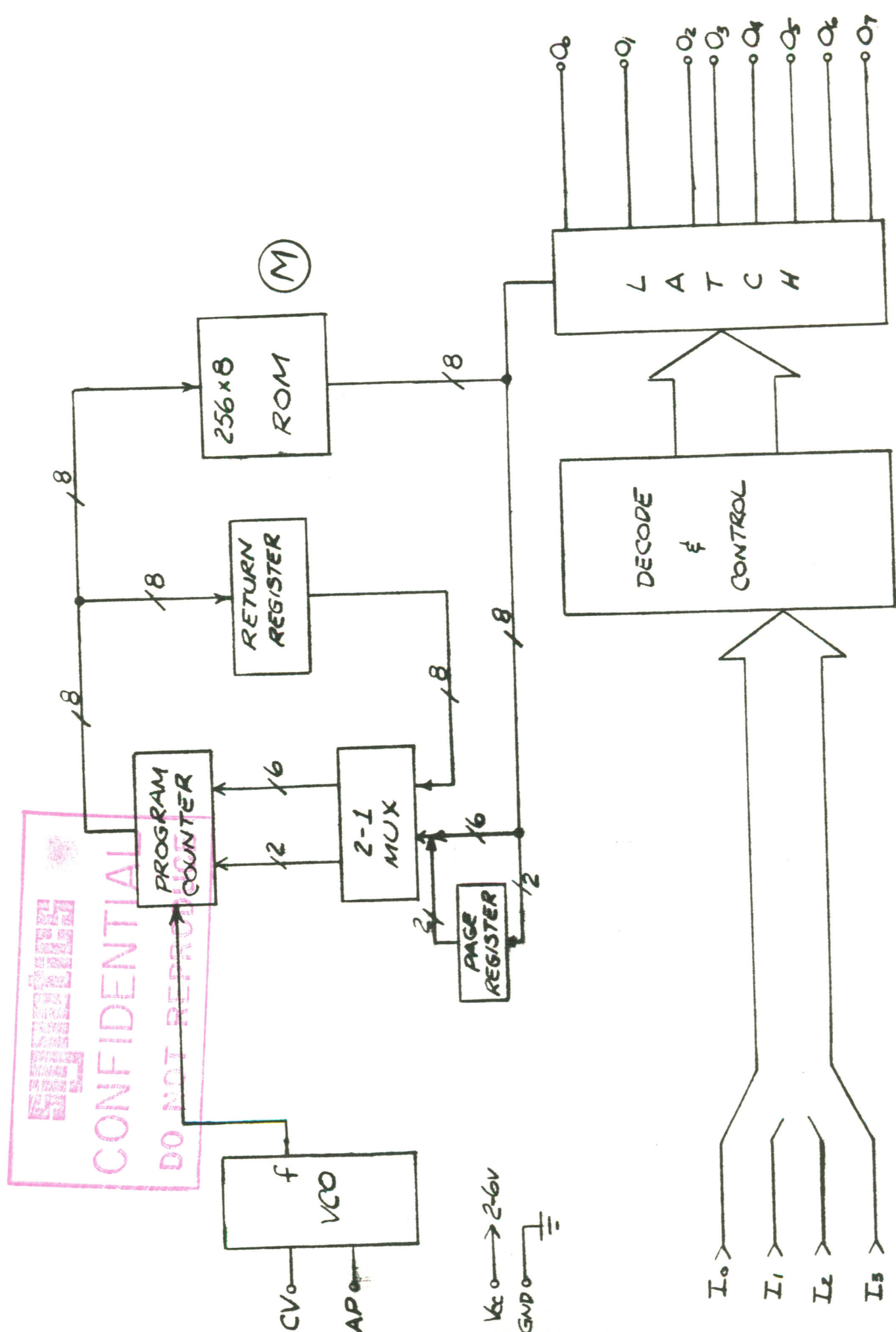
CMC VERSION 'C'

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V<sub>CC</sub> → 2-6V  
GND 0

CuC VERSION 'D'



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**signetics**  
CORPORATION  
PHONE 408 738-7700  
811 EAST ARQUES AVE.  
SUNNYVALE, CALIF

DRAWN *B WILLIS 11/27/78*  
DESIGNER  
CHECKED  
APPROVED *[Signature] 11/27/78*  
FACILITIES JOB NO

TITLE  
*INSTRUCTION SET  
CSC*

DWG NO. *XSC 2861-LI*  
SCALE SHT. OF ISSUE  
FINISH *B*

TOLERANCES  
UNLESS STATED OTHERWISE  
ANGULAR TOLERANCES ±30  
DECIMAL TOLERANCES  
.XX ±.01  
.XXX ±.005  
.XXXX ±.0005

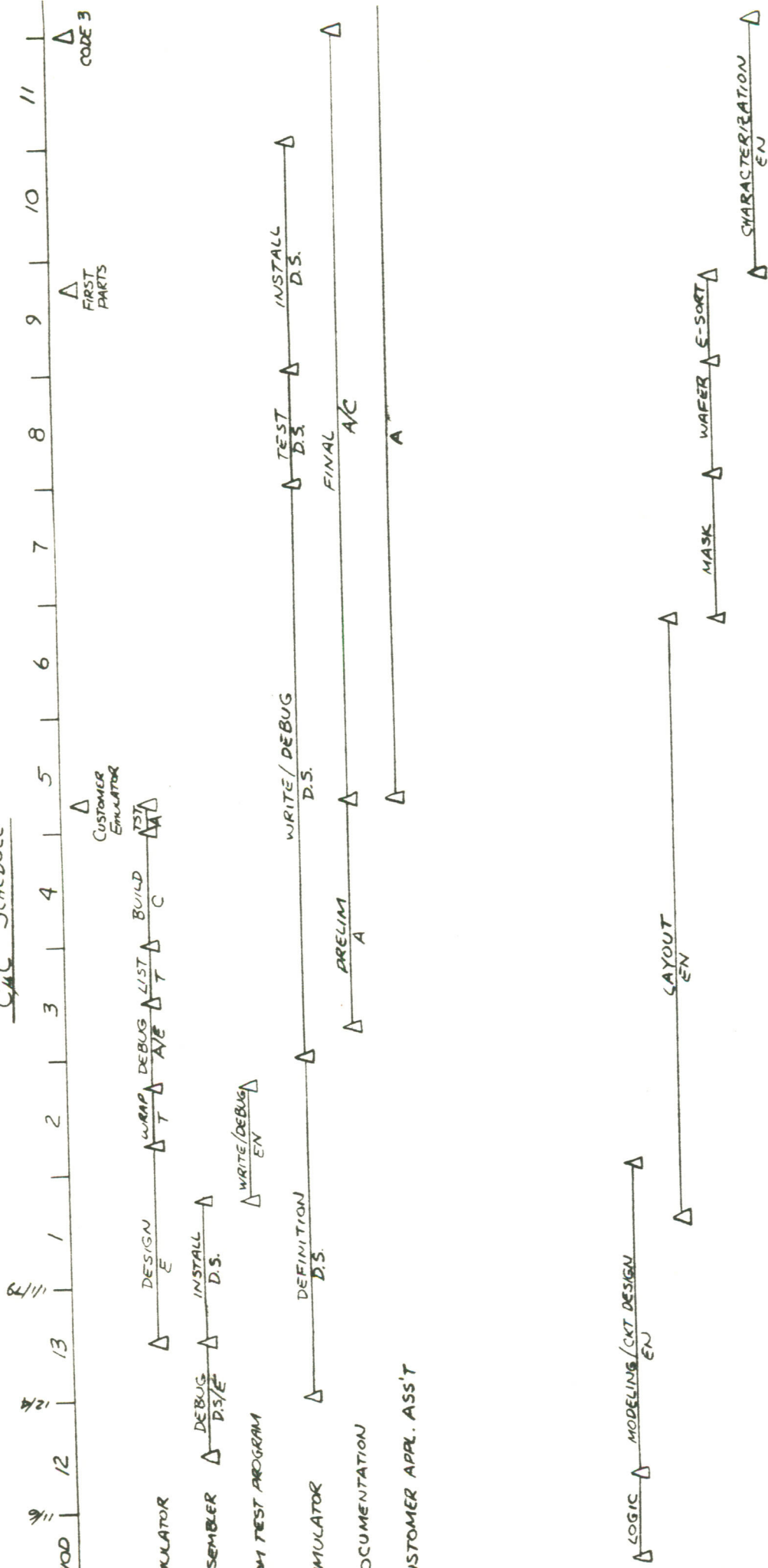
DASH NO	NEXT ASSY	ISSUE	DESCRIPTION	DATE	APPROVAL
		A B	ORIGINAL ISSUE INSERT FTMR STMR INST + MISC CORRECTIONS	<i>11/27/78</i>	<i>[Signature]</i>

MNEMONIC	NAME	FORMAT	DESCRIPTION
LDIV	LOAD DIVIDER	<i>1 0 0 E M</i>	DIVIDER ← $M \times 8^E$ (OTHER EXPONENTS OF 8) REMAIN UNCHANGED
LTMR	LOAD TIMER	<i>1 0 1 E M</i>	TIMER ← $M \times 8^E$ (OTHER EXPONENTS OF 8) REMAIN UNCHANGED
TMRT	TIMER TEST	<i>1 1 1 1 1 0 0 0</i>	IF TIMER IS DONE, THEN SKIP (PC ← PC + 2).
FTMR	FAST TIMER	<i>1 1 1 1 1 0 1 0</i>	TMCLK ← CLK
STMR	SLOW TIMER	<i>1 1 1 1 1 0 1 1</i>	TMCLK ← DIV
JMP	JUMP	<i>0 0 A</i>	PC <sub>5-0</sub> ← A
JSR	JUMP TO SUBROUTINE	<i>0 1 A</i>	RETURN REGISTER ← PC + 1 PC <sub>5-0</sub> ← A
LDPG	LOAD PAGE	<i>1 1 1 1 0 A</i>	PC <sub>8-6</sub> ← A (AFTER NEXT INSTRUCTION) (JMP & JSR BECOME GLOBAL IF PRECEDED BY LDPG.)
WRT	WRITE OUTPUT	<i>1 1 1 0 D N</i>	OUTPUT No. N ← D
INPT	INPUT TEST	<i>1 1 0 T S<sub>3</sub> S<sub>2</sub> S<sub>1</sub> S<sub>0</sub></i>	IF ALL INPUTS (I <sub>3</sub> , I <sub>2</sub> , I <sub>1</sub> , I <sub>0</sub> ) SELECTED (BY S <sub>3</sub> , S <sub>2</sub> , S <sub>1</sub> , S <sub>0</sub> ) ARE EQUAL TO T, THEN SKIP (PC ← PC + 2).
RTN	RETURN	<i>1 1 1 1 1 0 0 1</i>	PC ← RETURN REGISTER
NOP	NO OPERATION	<i>1 1 0 0 0 0 0 0</i>	PC ← PC + 1

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NOTE: UNLESS OTHERWISE INDICATED, PC ← PC + 1 WITH EACH INSTRUCTION.

CAC SCHEDULE



KEY:

- A - APPLICATIONS
- C - OUTSIDE CONTRACT
- D.S. - DEVELOPMENT SYS.
- E - BRIAN WILLIS
- EN - DESIGN ENG.
- T - TECHNICIAN

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FAB 11-10-78

# CμC PRICE INDEX

CμC VERSION	1980	1981
A	1.00	0.56
B	0.74	0.43
C	0.66	0.41
D	0.50	0.35

**SYMULIS**  
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