

THE

INTRONICS

EPROM

PROGRAMMER

INTRONICS, INC.

VERSION 4.6 1986

The Intronics Eprom Programmer for the Color Computer is simple to use and will program the following Eprom's from the eprom type menu:

- |                 |             |                   |            |
|-----------------|-------------|-------------------|------------|
| 1 - 2516 / 2716 | 2K X 8 ROM  | 2 - 2532          | 4K X 8 ROM |
| 3 - 2732        | 4K X 8 ROM  | 4 - 2564          | 8K X 8 ROM |
| 5 - 2764        | 8K X 8 ROM  | 6 - 68764 / 68766 | 8K X 8 ROM |
| 7 - 27128       | 16K X 8 ROM | 8 - 2732A         | 4K X 8 ROM |
| 9 - 27256 1/2   | 32K X 8 ROM | FIRST HALF        |            |
| A - 27256 2/2   | 32K X 8 ROM | SECOND HALF       |            |
| B - 27512 1/4   | 64K X 8 ROM | FIRST QUARTER     |            |
| C - 27512 2/4   | 64K X 8 ROM | SECOND QUARTER    |            |
| D - 27512 3/4   | 64K X 8 ROM | THIRD QUARTER     |            |
| E - 27512 4/4   | 64K X 8 ROM | FORTH QUARTER     |            |

With one memory location change you can also program:

- |                   |            |                     |            |
|-------------------|------------|---------------------|------------|
| 1 - 2508          | 1k X 8 ROM | 2 - 2578 (H or L)   | 1k X 8 ROM |
| 3 - 2758 (H or L) | 1k X 8 ROM | 4 - MK2764 (MOSTEK) | 8K X 8 ROM |

\*\*\*\*\* NOTE - NOTE - NOTE \*\*\*\*\*

THIS UNIT IS UNDER SOFTWARE CONTROL AT ALL TIMES !!!!!!!!!!!!!!!!!!!!!!!

DO NOT INSERT or REMOVE a Eprom until you have executed the program by typing " EXEC &HCOOO " for Extend Basic or " EXEC 49152 " for Color Basic and have a blinking cursor. DO NOT remove or insert the Eprom at any other time.

Do Not Press the Reset Button or Turn Off your computer with an Eprom in the programmer socket, as this is also bad for the health of the Eprom.

Doing any of the above will burn out most 12.5 VPP Eprom's. They will never be programmable again.

BREAK KEY - This key, will return you back to the main menu only when a data string is begining displayed or you are programming an Eprom. You can also stop and start the display by pressing any other key.

RESET BUTTON - DO NOT PRESS !!!!!!!!!!!!!!!!!!!!!!!

The functions contained in the program are:

1 - EPROM ERASED ? - This checks to see if the Eprom is Erased, has FF's (hex) in all locations. If there isn't, the address, what it expected to see and what it did see will be displayed on the screen.

xxxx EXPECTED :FF FOUND :xx

The display can be stopped and started any time by pressing any key expect the Break Key. The Break Key will end the function altogether and return you to the main menu.

2 - PROGRAM EPROM - This will program the Eprom with data from the buffer area. An intelligent algorithm method for programming the Eprom is used. The Eprom is first programmed with a .5 milsec. pluse, it then tries to verify the Eprom with the data in the buffer to see if it did program. If it didn't, the time pluse will be doubled and reprogrammed.

This will be done until the Eprom verifies or the time pluse is more than 32 milsec. At this time, the program pluse time will be doubled, programmed and verified one more time. If the Eprom does not verify this time it is assumed the Eprom is either bad or was not compeletly erased, a message "EPROM DID NOT PROGRAM" is displayed and you are returned back to the function menu. When it is on it's last pass, an " \* " will be displayed.

If the Eprom shows bad, use #3 to verify it yourself. Sometimes a bit will drop back to low (0) when programming it. This doesn't mean the Eprom is bad, it may not have been compeletly erased. Try erasing it and programming it again before you call it bad. You can press the Break Key to end this function and return to the main menu at any time.

3 - VERIFY EPROM - The contents of the Eprom is compared with the data in the buffer. If a location doesn't compare, the address, what it expected to see and what it did see will be displayed on the screen.

xxxx EXPECTED :xx FOUND :xx

The display can be stopped and started any time by pressing any key expect the Break Key. The Break Key will end the function altogether and return you to the main menu.

4 - MOVE EPROM TO MEMORY - This will move the data from the Eprom to the buffer area. You should do a verify after this step to be sure that there isn't a bad connection.

5 - SLIDE MEMORY - This will move memory from one location to another. You will be asked for an "BEGINING" address, this is the first memory location you want to move. You must enter all four (4) digits (hex) then press <C/R>. Next you will be asked for a "ENDING" address, this is the last memory location you want moved. You must enter all four (4) digits (hex) then press <C/R>. Now you will be asked for a "NEW" address, this is the begining of the new location you want to move it to. You must enter all four (4) digits (hex) then press <C/R>.

6 - EXAMINE / CHANGE MEMORY - This will allow you to look at and / or change memory locations. You will be asked for a BEGINNING address. You must enter all four (4) digits (hex) then press <C/R>. The memory address and value will be displayed. If you type a non-hex character the next memory address and value will be displayed without changing the old one. To return to the menu, press <C/R>. You can use the UP-ARROW key to backup to the last memory location. When you type in a legal hex number, the program stores it in that memory address and compares it to see if it is correct. If it isn't correct a question mark (?) will appear meaning a bad memory location or you tried to change a ROM location.

7 - FILL BUFFER WITH FF's - This will fill the buffer area, dependent on the Eprom type, with FF's (hex).

8 - RETURN TO BASIC - This will return you back to Basic with-out destoring a Basic program. If you did a "EXEC" from a Basic program, you will be return to where you left. This will let you write a Basic program to do I/O with the your disk drive or cassette tape. You must be careful not to over write your Basic program. You can Save or Load the buffer to tape or disk. To go back to the program, type "EXEC 49152" or "EXEC &HC000" <C/R>. The buffer will remain intact and will not be destroyed.

The Default Addresses for the buffer areas are:

- 2K X 8 = 2000 - 27FF (hex) 16K X 8 = 2000 - 5FFF (hex)
4K X 8 = 2000 - 2FFF (hex) 32K X 8 = 2000 - 5FFF (hex) Each Half
8K X 8 = 2000 - 3FFF (hex) 64K X 8 = 2000 - 5FFF (hex) Each Quarter

9 - CHANGE BUFFER ADDRESS - This will let you to change the buffer addresses so you can program a byte or more of the Eprom or from a different area. Care should be used with this function. When selected the Begining address of the buffer will be displayed and you will be asked for a new Begining address. If you press <C/R> the address will remain the same and you will be asked for a new Ending address. This is begining and ending address of the buffer area and can be anywhere you want. Now you will be asked for a Begining address again. This is the Begining address of the Eprom you are programming.

Example: To program EX. Basic into an 68766.

```
2000 BEGINING :8000 <C/R>
3FFF ENDING :9FFF <C/R>
0000 BEGINING : <C/R>
```

Example: To program ONE byte in a 2716 at 0456 Eprom address from 2456 buffer address, enter the same address for both.

```
2000 BEGINING :2456 <C/R>
3FFF ENDING :2456 <C/R>
0000 BEGINING :0456 <C/R>
```

When you change the buffer address, you affect the all of the functions. The addresses will return to their default values when Reset is pushed. When you are using a Basic program, you may need to change the buffer location so that you don't destroy your Basic program.

0 - CHANGE VPP - This will let you change the program voltage to any of the three voltages available (12.5V - 21V - 25V). Some of the new Eprom's coming on to the market are made to use a lower voltage to program them, but they are still pin - pin compatible with the old ones. This allows them to have a faster access time. Some EEPROM's use a 21V VPP, but program the same as an 2716. Each time you select this function, the VPP will change and the New value will be displayed.

A - CHANGE EPROM TYPE - This will return you back to the Eprom Type Menu when you want to change to a different type or program another part of a large Eprom.

To start, turn the color computer OFF. DO NOT insert the E.P. unit with the POWER ON. Insert the E.P. unit in the cartridge slot and turn on the Co-Co. This is time to load your data into the buffer if you are going to load it from tape. Now type " EXEC 49152 " for Color Basic or " EXEC &HCOOO " Extended Basic and <C/R>. The Eprom type menu will be displayed, select the type you want to program. The function menu will be displayed now. This is the time to insert or remove Eprom's from the ZIF (zero insertion force) socket.

Insert a Eprom in the ZIF socket, see figure #3, with pin 1 (the notched end) points toward you. If you are programming a 24-pin device, put Pin-1 two places back, there is a notch to show you where. Now type #1 to see if the Eprom is erased. If you return to the menu, the Eprom is erased and ready to be programmed. With your data in the buffer, type #2 to program the Eprom. You will see in upper right hand corner, a live bug indicator. This tells you that the Eprom is beeing programmed.

You will also notice '?'s begining displayed at the bottom of the screen. These indicate how many times the Eprom has been programmed. The first "?" indicates a .5 milsec. pluse, second a 1 milsec., third a 2 milsec., forth a 4 milsec., fifth a 8 milsec., sixth a 16 milsec., the seventh a 55 milsec.

There is one main note of caution:

NOT ALL EPROM'S WITH THE SAME NUMBER ARE THE SAME.
BE SURE OF THE TYPE YOU ARE PROGRAMMING.

The E.P. program starts at C000 (hex) or 49152 (decimal) and ends at C7FF (hex) or 51199 (decimal) for a total of 2K. The program is 100% position independent and will run anywhere in memory.

To program 2508 / 2578 L / 2758 L (1k X 8) select #1 (25/2716) and use #6 to change memory location 0042H from 28H to 24H.

To program 2578 H or 2758 H (1k X 8) select #1 (25/2716) and use #6 to change memory location 0040H from 1FH to 23H.

To program MOSTEK MK2764 use #3 (2732) and use #6 to change memory location 0042H from 30H to 40H.

\*( H=HEX )

BASIC IN ROM PACK BY GEORGE INDORF  
INTRONICS VERSION 2.3 COPYRIGHT (c) 1985

This program was written with the following assumptions:

1. The ROM pack cannot be used with the disk controller so it will not work with programs written for Disk Basic. It will work with BASIC 1.0 - 1.1 - 1.2 and EXTENDED BASIC 1.0 - 1.1.
2. The auto-start feature of the ROM pack will be used (Pins 7 & 8 tied together).
3. You may be selling a BASIC program and want protection from listing and copying. This is done by a list default. If you try to do a "LIST" the program will reset the computer. But as with all protection ideas there are ways to disable it.
4. That you will be using at least a 2K or larger Eprom.
5. Only one Basic program will reside in the ROM pack at a time with a starting address of C000 (hex) 49152 (decimal). You can mix a Basic and a machine language as long as the Basic program is first.

----- USING BIRP -----

1. Start by turning off the color computer and insert the Eprom programmer into the cartridge slot.
2. Load the Basic program from cassette or the keyboard that is to go into the rom pack.
3. When it is done loading type " EXEC 50992 " or " EXEC &HC730 " and your Basic program will be conditioned for a Eprom. At this time you CAN NOT " LIST " or " RUN " the program. It has been conditioned to run at C000 (hex). When BIRP is done the Eprom size will appear on the screen. If the program is too large for the rom pack the message will say so.
4. Now type "EXEC 49152" <enter> and program your Eprom. You can use any size or type of Eprom as long as it is as large or larger than the size that was displayed on the screen.
5. After the Eprom is programmed place it in the rom pack. With the Co-Co turned off insert the rom pack into the cartridge slot and turn it on. The program will automatically execute by itself.

A few final notes:

A. If you don't want to use the auto-start on the ROM pack disable the auto-start feature and type "POKE 25,192:POKE 26,42" <C/R>. Now you can "RUN" or "LIST" the program.

B. The ROM pack only allows you 15.75K or from C000 (hex) to FEFF (hex) or 16128 bytes (decimal) of memory that you can use. The BIRP program uses 42 bytes (decimal) its' self. So watch your memory size on large programs.

C. To list the program type "POKE 422,57" <C/R>. You will now be able to list a "LIST" protected program.

##### USING YOUR EPROM PROGRAMMER WITH DISK DRIVES #####

If you want to use your programmer with disk drives, you will need a Multi - Pack interface from Radio Shack (a 32K system is assumed but not needed). This software has only been tested with the Radio Shack interface but may work with others that use the same control codes.

You will can place your disk controller and Eprom Programmer in any Slot. Now turn your computer and Multi-Pak with the Multi - Pack set to the Slot number that contains your Eprom Programmer. Type " EXEC &HC000 " <c/r> and press #1 and #5 <c/r>. Enter C000 <c/r>, C7FF <c/r>, 7000 <c/r>. Press #8 <c/r>, you should now be back at Extend Basic. You have just moved the EP 4.6 to memory at location H7000.

Press and hold reset while you switch the Multi-Pak switch to the Slot number containing your disk controller. Release the reset button and type EXEC &HC000 <c/r>. Now you should be at Disk Basic. With a blank formatted diskette in Drive 0, type:

SAVEM "EP",&H7000,&H77FF,&H7000 <C/R>

Anytime you want to use your programmer, insert the Eprom Programmer in any slot and with the switch on the Multi-Pak set to the Disk Controller slot and turn them both on. The software will find which slot the programmer is in, type LOADM "EP" <C/R>, EXEC <C/R>. You do not have to save the program at &H7000, but this is just the best place if you have a 32K system so you will have room for your Basic program if you decide to do one.



### HOW THE SWITCHING POWER SUPPLY WORKS (I think ?)

This unit uses a switching power supply to raise the +5 volt supply to 25 and 21 volts. It is the most difficult part of the E.P. unit to understand how it works. The following explanation is provided for your use in trouble shooting if you should have problems later. When looking at the schematic you can see L1 is a coil of wire with a feedback winding. Q8 is turned on by R18 and a current will follow through L1. This induces a volt in the feedback winding and turns off Q8. When the current is removed from L1 a high voltage is created that is allowed to flow through D3 and charge C5.

This voltage (no load condition) can be up to 75 Volts. R19 - R22, Z1 - Z2, and Q9 is used as a voltage feed back to regulate it. When the voltage reaches VPP volts the zener breaks down and a voltage is placed across Q9 turning it on. With Q9 turned on, Q8 is turned off and C5 discharges. When the voltage drops below 25 or 21 volts, Q9 turns off and Q8 turns on. Q10 and Q11 changes VPP from 25 to 21 to 12.5 volts.

If you have any problems programming a Eprom try erasing the edge card connector. Then check VPP at D3 - Z2 junction, these are the two diodes that are next too each other, for 21 Volts. The most common problem is Q8 going bad or D3 burning up due to Bad Eprom's.

### HOW TO USE A 2764 - 2564 IN CO - CO

To use a 2764 eprom in the Basic Extend Basic or Disk Basic socket you have to make some pin changes. Refer to figure #2 on how to do it. Using a 28 pin socket and a 24 pin header, connect pins 1, 28, 27 and 26 together then connect pin 20 to pin 22, pin 23 to pin 18 (header) and pin 2 to pin 21 (header). The rest go pin for pin (3-1 4-2 5-3 ect.).

To use a 2564 eprom in the Basic, Ex. Basic or D. Basic socket you have connect pins 1 and 28 together and pins 2, 27 and 14 together after you have programmed it. Then put the back 24 pins in the socket and let the front 4 hang out.

### HOW TO READ DYNAMIC ROMS LIKE DISK BASIC

The ROM in the Disk controller is a Dynamic ROM. This means that the data is present for a certain amount of time after the address lines have become stable. After this time, the data disappears and will not reappear until the address lines are changed again. This was done to prevent copying of the ROM's by an EPROM programmer.

Simply remove your Extended Basic Rom and insert your Dynamic Rom in it. With your programmer in and turn the power on. Type "EXEC 49152" c/r and select the type of Eprom you want to program. Now select #9 and change the beginning buffer address to "8000", the ending address to "9FFF" but do not change the starting address. Now program your Eprom, turn the system off and replace your Extend Basic Rom.

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The Intronics Eprom Programmer has a 90 day LIMITED WARRANTY from the time of purchase.

INTRONICS, INC. SHALL HAVE NO LIABILITY OR RESPONSIBILITY TO THE CUSTOMER OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY LOSS OR DAMAGE CAUSED OR ALLEGED TO BE CAUSED DIRECTLY OR INDIRECTLY BY "EQUIPMENT" OR "SOFTWARE" SOLD OR FURNISHED BY INTRONICS, INC.

To get your eprom programmer repaired under the warranty send it postage-paid with proof of purchase to:

Intronics, Inc.  
 Box 13723  
 Edwardsville, Ks. 66113  
 (913) 422 - 2094

Source code is available for \$25.00 from the above address. It comes in a ASCII file under R-S Dos or Flex, along with a print out.

#####

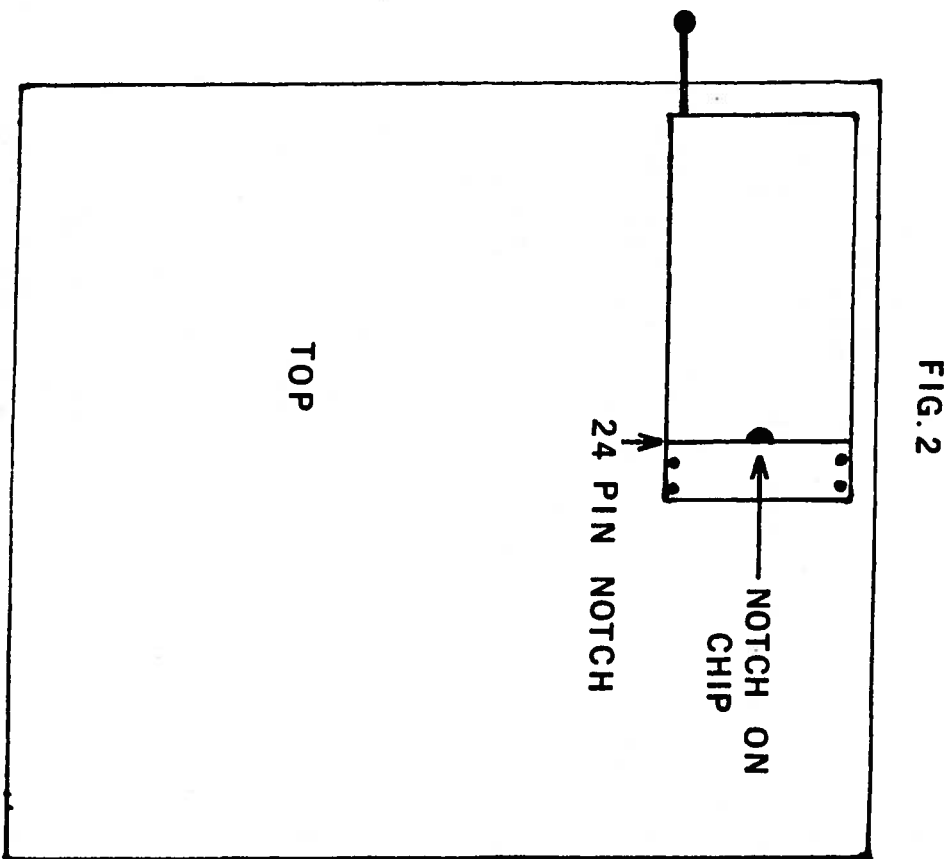
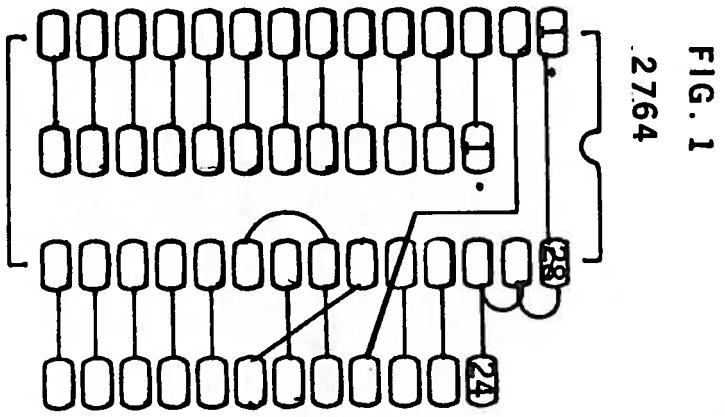
PARTS LIST

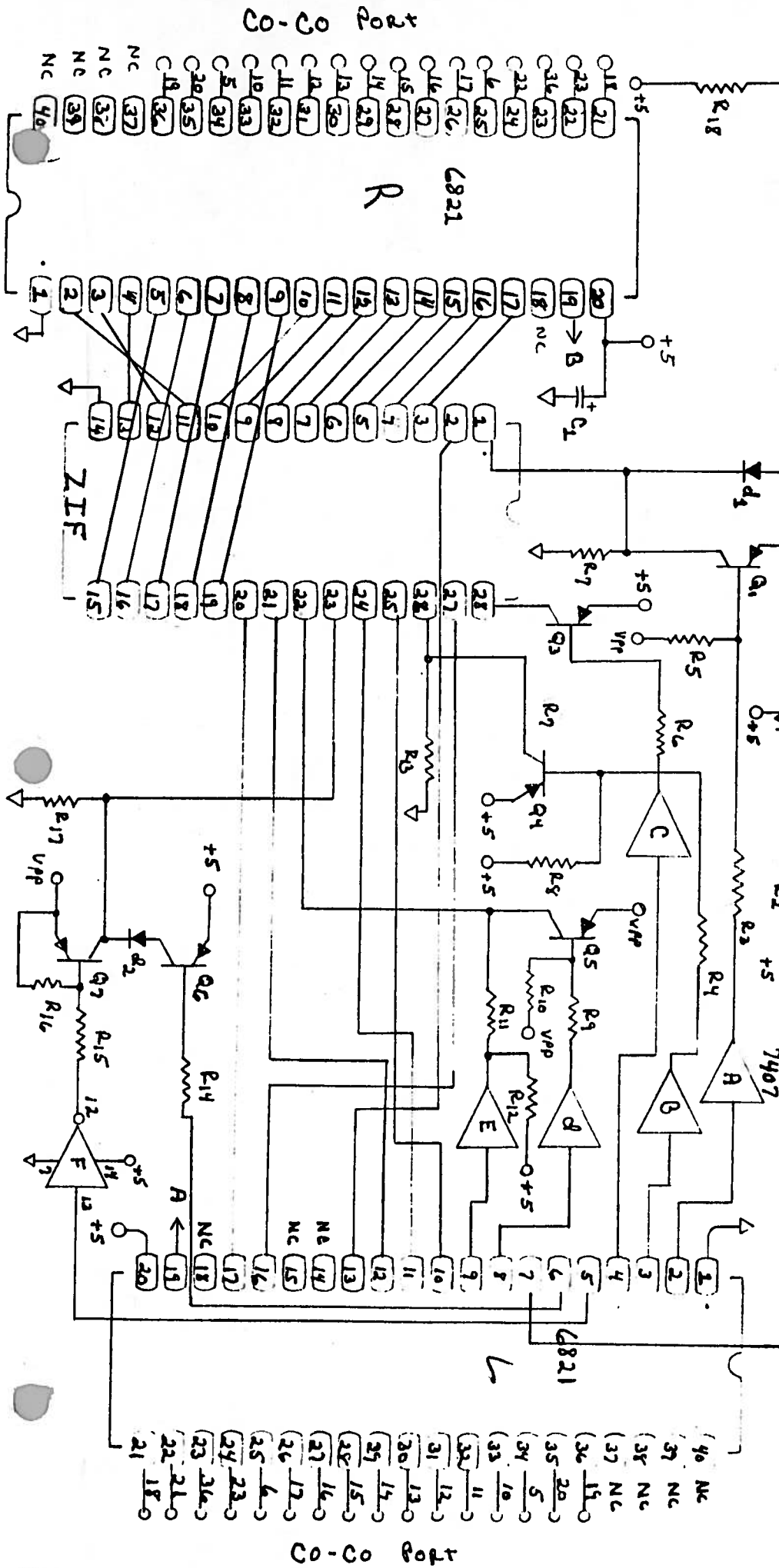
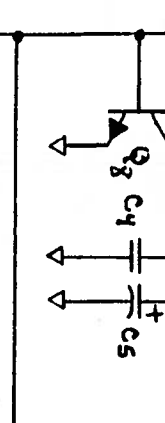
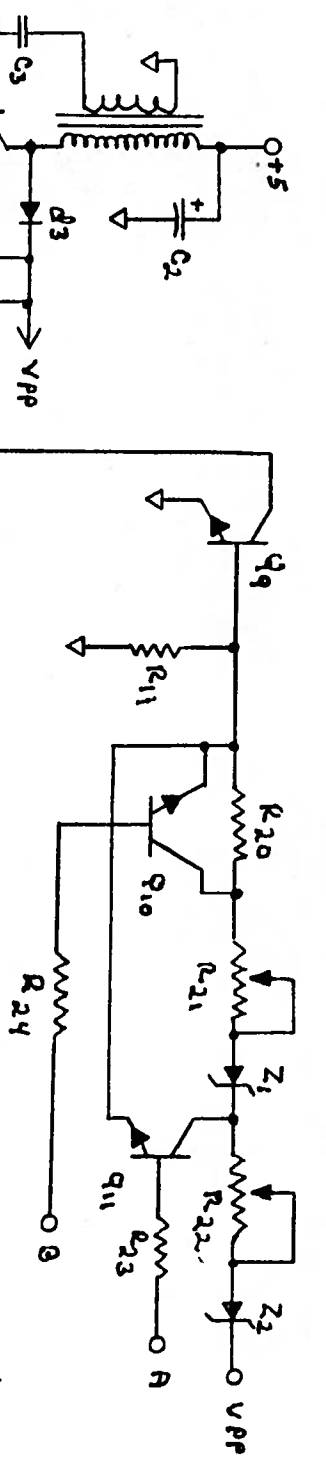
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R 1-13-14	= 2.2K	1/4 W.	C 1-2	= 47	UF 16V
R 3-7-8-9-11-12-13	= 22K	1/4 W.	C 3	= .001	UF
R 4-6-19	= 220 OHM	1/4 W.	C 4	= .1	UF 35V
R 5-10-16-17	= 47K	1/4 W.	C 5	= 47	UF 35V
R 18	= 560 OHM	1/4 W. *			
R 20	= 680 OHM	1/4 W.			
R 21-22	= 1K POT	1/4 W.	Q 1-2-3-4-5-6-7	= 2N3906	
R 23-24	= 1K	1/4 W. **	Q 8-9-10-11	= 2N4401	
Z 1	= 8.2 VOLT		D 1-2-3	= 1N4148	
Z 2	= 11.0 VOLT				

NOTE: DESIGN AND PART VALUES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

\* This value is dependent on Q8.  
 \*\* This value is dependent on Z1.





Co-Co Port

Co-Co Port

40	Nc	18	21
37	Nc	19	20
38	Nc	17	18
35	20	16	17
36	15	15	16
34	5	14	15
33	10	13	14
32	11	12	13
31	12	11	12
30	13	10	11
29	14	9	10
28	15	8	9
27	16	7	8
26	17	6	7
25	18	5	6
24	19	4	5
23	20	3	4
22	21	2	3
21	22	1	2