FLASH WRITER VIDEO BOARD

ASSEMBLY INSTRUCTIONS AND

USERS MANUAL

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FLASH WRITER VIDEO BOARD

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INTRODUCTION

THE FLASHWRITER VIDEO BOARD REPRESENTS THE SECOND GENERATION OF MEMORY MAPPED VIDEO DISPLAYS, INCORPORATING MANY IMPROVED FEATURES OVER EXISTING DESIGNS SUCH AS FLICKER FREE UPDATING OF THE SCREEN, SEPARATE SYNC OUTPUTS FOR VIDEO MONITORS REQUIRING IT, MORE CHARACTER ATTRIBUTES CONTROLLING 64 GRAPHIC BLOCK CHARACTERS, VERTICAL AND HORIZONTAL LINE ELEMENTS INDEPENDENT OF CHARACTER OR GRAPHIC ELEMENTS, AND REDUCED INTENSITY FIELDS. IN ADDITION, A KEYBOARD PORT IS PROVIDED ON THE BOARD, ELIMINATING THE NEED FOR A SEPARATE I/O BOARD IN MOST SYSTEMS. THIS PORT IS INDEPENDENTLY ADDRESSABLE, AND THE BOARD IS DESIGNED TO WORK WITH EITHER 8080 OR Z-80 CPU BOARDS.

IN ORDER TO MINIMIZE ANY CHANGES IN EXISTING SOFTWARE THE BOARD IS DESIGNED TO BE UPWARD COMPATIBLE WITH THE VDM-1 WITH THE EXCEPTION OF THE RARELY USED HARDWARE SCROLL FEATURE. A BLOCK OF MEMORY ON THE BOARD, TYPICALLY FROM D000-D7FF, CONTROLS THE CHARACTER AND GRAPHIC ELEMENTS GENERATED ON THE SCREEN. THE FIRST 1K BYTES OF THE MEMORY FROM D000-D3FF CONTAIN THE CHARACTER OR GRAPHIC ELEMENT CODE AND THE REVERSE VIDEO FLAG. THE ORGANIZATION IS AS 16 LINES OF 64 CHARACTERS WITH THE TOP LEFT HAND CHARACTER AT D000, PROGRESSING FROM LEFT TO RIGHT, TOP TO BOTTOM IN MEMORY. EXACTLY 1K HIGHER IN MEMORY IS ANOTHER BLOCK OF MEMORY CONTROLLING THE OTHER CHARACTER ATTRIBUTES, BUT ONLY FOUR BITS OF EACH MEMORY LOCATION IS UTILIZED. THE ON BOARD MEMORY THEREFORE APPEARS TO THE CPU AS A 2K BLOCK OF 8 BITS, WHILE TO THE VIDEO CIRCUITRY IT APPEARS AS A 1K BLOCK OF 12 BITS. IN ORDER TO RETAIN COMPATIBILITY WITH EXISTING SOFTWARE WHICH DOES NOT MAKE USE OF THE ENHANCED FEATURES, ALL THAT IS REQUIRED IS THAT THE UPPER PORTION OF MEMORY BE CLEARED OR SET TO 20H INITIALLY. THIS USUALLY REQUIRES CHANGING ONLY ONE BYTE IN THE VIDEO DRIVER SOFTWARE. ALTERNATIVELY, THE FOUR MEMORY CHIPS CONTROLLING THE CHARACTER ATTRIBUTES CAN BE REPLACED WITH JUMPER WIRES, COMPLETELY DISABLING THIS FEATURE. THE SOFTWARE SUPPLIED IN THE APPENDIX INCLUDES A SIMPLE VIDEO DRIVER WHICH PROVIDES TELETYPE SIMULATION, AND A MORE ELABORATE VERSION PROVIDING SIMULTANEOUS SCROLLING AND WRITING OF CHARACTER AND ATTRIBUTE FIELDS WITH CONTROL SEQUENCES COMPATIBLE WITH BASIC, AND CURSOR MOTION CONTROLS. CONSERVATIVE DESIGN PRINCIPLES HAVE BEEN USED THROUGHOUT TO RESULT IN A PRODUCT THAT IS EASY TO ASSEMBLE WITH FEW DISCRETE COMPONENTS, AND RELIABLE IN OPERATION.

THE PURPOSE OF THESE INSTRUCTIONS IS TO HELP YOU PRODUCE THE BEST RESULTS IN THE SHORTEST TIME WITH NO DAMAGE TO THE VARIOUS COMPONENTS.

IF THERE IS ANYTHING THAT YOU DO NOT UNDERSTAND, PLEASE DO NOT HESITATE TO CALL OR WRITE US!

AFTER COMPLETING THE ASSEMBLY, PLEASE FILL OUT AND RETURN THE WARRANTY CARD SO THAT WE CAN ADD YOU TO OUR MAILING LIST FOR FUTURE PRODUCTS.

IMPORTANT PRECAUTIONS

POWER MUST BE OFF WHEN:

INSERTING OR REMOVING BOARDS OR IC CHIPS
CONNECTING OR DISCONNECTING WIRES
SOLDERING

ONLY SOLDER WITH:

30 WATT MAXIMUM SOLDERING IRON
60/40 ROSIN CORE SOLDER

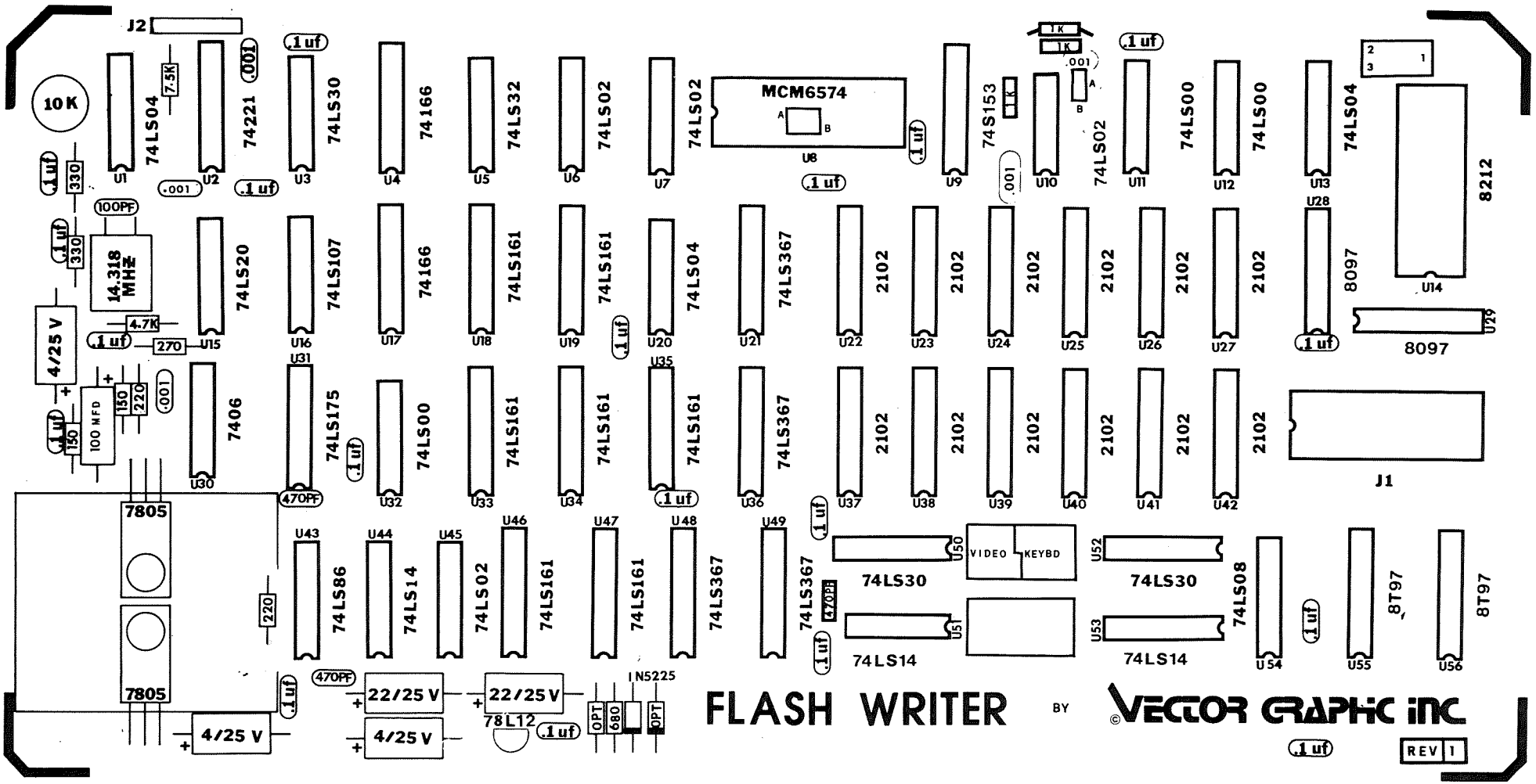
ALWAYS PROTECT MOS CHIPS FROM STATIC ELECTRICITY.

KIT CONTENTS FLASH WRITER

QTY.	DESCRIPTION
1	√PRINTED CIRCUIT BOARD
1	√6072 HEAT SINK
2	√7805/340T-5 REGULATOR
1	√78L12 REGULATOR
2	√8T97 (U55, U56)
2	√8097/74367 (U28, U29)
3	√74LS30 (U3, U50, U52)
4	√74LS02 (U6, U7, U10, U45)
3	√74LS00 (U11, U12, U32)
3	√74LS04 (U1, U13, U20)
3	√74LS14 (U51, U53, U44)
7	√74LS161 (U18,U19,U33-35,U46,U47)
1	√74LS175 (U31)
1	√74221 (U2)
2	√74166 (U4, U17)
1	√74S153 (U9)
12	√2102LHPC (U22-27, U37-42)
1	√74LS107 (U16)
1	√74LS32 (U5)
1	√74LS86 (U43)
1	√74LS08 (U54)
1	√7406 (U30)
1	√8212 (U14)

QTY.	DESCRIPTION
1	MCM6574 (U8)
1	IN5225B
4	74LS367 (U21, U36, U48, U49)
1	74LS20 (U15)
3	470 PF 50 VOLT AXIAL GLASS CAPACITORS
3	4.0 MFD 50V AXIAL ELECTROLYTIC CAPACITOR
1	100 MFD 16V AXIAL ELECTROLYTIC CAPACITOR
2	22 MFD 16V AXIAL ELECTROLYTIC CAPACITOR
5	.001 MFD 10V DISC CAPACITOR
19	0.1 MFD 50V RADIAL CAPACITOR
1	100 PF 10V DISC CAPACITOR
2	150 OHMS 1/4 WATT CARBON RESISTORS (STRIPES OF BROWN, GREEN, BROWN)
2	220 OHMS 1/4 WATT CARBON RESISTORS (STRIPES OF RED, RED, BROWN)
2	330 OHMS 1/4 WATT CARBON RESISTORS (STRIPES OF ORANGE, ORANGE, BROWN)
3	1K 1/4 WATT CARBON RESISTORS (STRIPES OF BROWN, BLACK, RED)
1	7.5K 1/4 WATT CARBON RESISTOR (STRIPES OF VIOLET, GREEN, RED)
1	4.7K WATT CARBON RESISTOR (STRIPES OF YELLOW, VIOLET, RED)
1	270 OHMS 1/4 WATT CARBON RESISTOR (STRIPES OF RED, VIOLET, BROWN)
1	680 OHMS 1/4 WATT CARBON RESISTOR (STRIPES OF BLUE, GRAY, BROWN)
1	10K POTENTIOMETER
1	14.318 MHZ CRYSTAL

QTY.	DESCRIPTION
3	√24 PIN SOCKETS
32	√16 PIN SOCKETS
22	√14 PIN SOCKETS
2	√EJECTORS, PINS
1	√MOLEX PLUG, 6 PIN
10" (APPROX)	√JUMPER WIRE, 30 GA.


J2
10K
74LS04
7.5K
74221
.001
.1 uf
74LS30
74166
74LS32
74LS02
74LS02
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74S153
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8097
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150
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7406
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FLASH WRITER
BY
VECTOR GRAPHIC INC
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ASSEMBLY INSTRUCTIONS

TOOLS AND MATERIALS REQUIRED FOR ASSEMBLY

THE FOLLOWING MINIMUM SET OF TOOLS AND MATERIALS IS REQUIRED FOR THE ASSEMBLY OF VECTOR GRAPHIC INC. KITS:

DESCRIPTION	COMMENT
VOLT-OHMMETER	INEXPENSIVE
SCREWDRIVER-STRAIGHT SLOT	FOR #5 AND #8 SCREWS
SCREWDRIVER-PHILLIPS HEAD*	FOR #8 SCREWS
CUTTERS-DIAGONAL	4", FLUSH CUTTING
PLIERS-NEEDLE NOSED	6"
PLIERS-REGULAR	MEDIUM
WIRE STRIPPER	FOR 8 AWG TO 20 AWG
SOLDERING IRON	30 WATTS MAXIMUM CHISEL TIP
SOLDER	.030 GA. 60/40 TIN-LEAD ROSIN CORE
SPONGE	FOR CLEANING SOLDERING IRON
PEN KNIFE	OR 'X-ACTO KNIFE
CLEANING SOLVENT	TRICHLORETHANE OR ISOPROPYL ALCOHOL. DO NOT USE ACETONE!
CARDBOARD	TO PROTECT TABLE TOP DURING SOLDERING
HEAT SINK GREASE	OR HIGH TEMPERATURE PLUMBERS GREASE
RULER*	TO MEASURE WIRE LENGTHS

* NOTE: REQUIRED FOR MAINFRAME CABINET ASSEMBLY ONLY.

SOLDERING TECHNIQUE

THE SOLDER

USE A #20 GAUGE (.030") ROSIN CORE SOLDER WITH A RATIO OF AT LEAST 60% TIN AND 40% LEAD. "KESTER" AND "ERSIN" ARE TWO DEPENDABLE BRANDS OF SOLDER. ACID CORE SOLDERS OR ACID FLUX MUST NOT BE USED AS THEY WILL CORRODE THE PRINTED CIRCUIT BOARD.

THE SOLDERING IRON

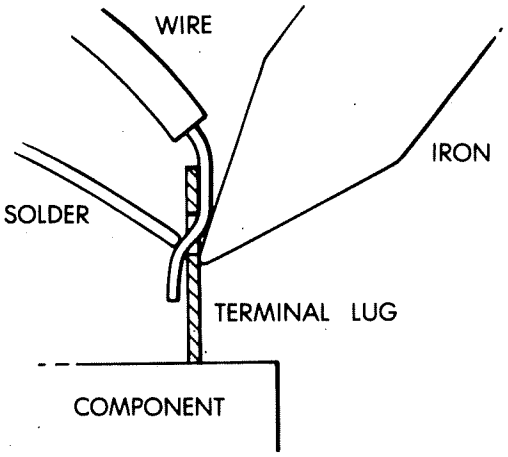
USE A SMALL, 30 WATT MAXIMUM IRON WITH A SMALL, CHISEL SHAPED TIP. TOO MUCH HEAT WILL DAMAGE BOTH COMPONENTS AND BOARDS. SOLDERING GUNS ARE TOO HOT AND SHOULD NOT BE USED.

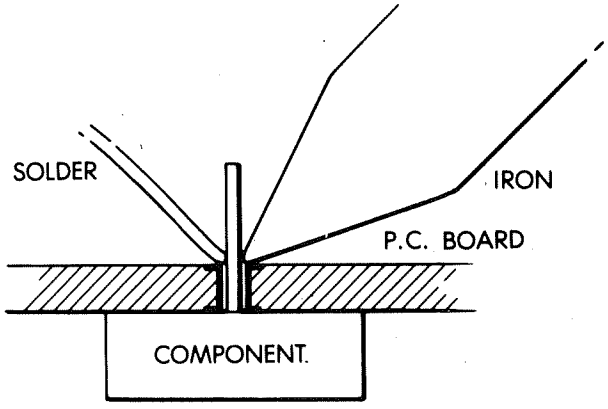
HEAT THE IRON, WIPE ITS TIP QUICKLY ON THE DAMP SPONGE, AND APPLY A TINY AMOUNT OF SOLDER TO THE TIP - JUST ENOUGH TO MAKE IT SILVER IN COLOR BUT NOT SO MUCH THAT IT WILL DRIP OFF. THIS CLEANING PROCEDURE SHOULD BE REPEATED WHENEVER THE TIP OF THE SOLDERING IRON BEGINS TO TAKE ON A BROWNISH COLOR.

THE PROCEDURE

THE ENTIRE SOLDERING OPERATION SHOULD TAKE LITTLE MORE THAN TWO SECONDS PER JOINT. THE SEQUENCE IS AS FOLLOWS:

TOUCH THE TIP OF THE SOLDERING IRON TO THE JOINT, AS SHOWN BELOW, SO THAT BOTH CONDUCTORS TO BE JOINED ARE SIMULTANEOUSLY HEATED SUFFICIENTLY TO MELT THE SOLDER.





TOUCH THE SOLDER TO THE JOINT, AS SHOWN ABOVE, JUST LONG ENOUGH TO MELT ENOUGH SOLDER TO FORM A FILLET ON THE JOINT. TOO MUCH SOLDER MAY SHORT CIRCUIT THE BOTTOM OF THE BOARD OR FLOW THROUGH THE HOLES AND WICK INTO THE SOCKETS. THE

MELTED SOLDER WILL APPEAR WET AND SHINY. IT WILL QUICKLY FLOW COMPLETELY AROUND THE WIRE AND OVER THE SURFACE TO WHICH THE WIRE IS ATTACHED.

REMOVE THE SOLDERING IRON AS SOON AS BOTH SURFACES HAVE BEEN COMPLETELY WETTED. REMEMBER, THE TOTAL TIME FROM APPLICATION TO REMOVAL OF THE SOLDERING IRON SHOULD BE ONLY TWO OR THREE SECONDS. REMOVAL OF THE SOLDERING IRON TOO SOON MAY RESULT IN A COLD SOLDER JOINT AND LEAVING THE SOLDERING IRON IN CONTACT TOO LONG MAY CAUSE HEAT DAMAGE TO EITHER THE COMPONENTS OR THE BOARD.

REMOVAL OF MULTI-PIN SOLDERED-IN PARTS

CAUTION

IF FOR ANY REASON IT BECOMES NECESSARY TO REMOVE A SOLDERED-IN PART HAVING MORE THAN JUST TWO LEADS, DO NOT TRY TO REMOVE THE PART INTACT. IT CAN BE DONE, BUT ONLY WITH THE RISK OF DAMAGING THE PRINTED CIRCUIT BOARD IN THE PROCESS.

HOLD THE PRINTED CIRCUIT BOARD IN A PADDED VISE TO AVOID DAMAGE.

REMOVAL OF SOLDERED-IN IC SOCKETS

CAREFULLY PRY UP THE PLASTIC BODY OF THE SOCKET USING A KNIFE OR SCREWDRIVER TO LEAVE THE PINS EXPOSED. GENTLY REMOVE THE PINS FROM THE TOP OF THE BOARD WITH NEEDLE NOSED PLIERS WHILE TOUCHING THE JOINT ON THE OTHER SIDE OF THE BOARD WITH THE TIP OF THE IRON. DO NOT USE FORCE. THE PIN WILL COME OUT QUITE EASILY ONCE THE SOLDER MELTS.

CLEAR THE HOLES OF ANY EXCESS SOLDER USING A SOLDER SUCKER OR WICK.

REMOVAL OF SOLDERED-IN INTEGRATED CIRCUIT CHIPS

CUT EACH PIN WITH A PAIR OF DIAGONAL CUTTERS AT A POINT BETWEEN THE CHIP AND THE PRINTED CIRCUIT BOARD WHICH IS AS CLOSE TO THE CHIP AS POSSIBLE SO THAT THERE IS ENOUGH OF THE PIN SHOWING ABOVE THE BOARD TO BE GRASPED BY NEEDLE NOSED PLIERS WHILE REMOVING AS DESCRIBED ABOVE.

PREPARATION FOR ASSEMBLY

WORKING AREA AND TOOLS

A WELL-LIGHTED, CLEAN TABLE OR WORK BENCH AND THE PROPER TOOLS AND MATERIALS ARE MOST IMPORTANT FOR PRODUCING TROUBLE FREE ASSEMBLIES. THE WORK SURFACE SHOULD BE CLEAN AND FREE OF ALL ITEMS EXCEPT FOR THE TOOLS AND KIT COMPONENTS BEING USED. A CLEAN PIECE OF CARDBOARD OR HAND TOWEL IS SUGGESTED TO PROTECT THE TABLE TOP WHEN SOLDERING.

CHECK KIT CONTENTS

VERIFY THE CONTENTS OF YOUR KIT AGAINST THE KIT CONTENTS LIST IN FRONT OF THIS MANUAL. CHECK EACH PART VISUALLY FOR DAMAGE IN SHIPPING. IF THERE ARE ANY MISSING OR DAMAGED ITEMS, PLEASE NOTIFY THE DEALER FROM WHOM YOU BOUGHT YOUR KIT IMMEDIATELY. THERE MAY BE SLIGHT VARIATIONS FROM THE PARTS SPECIFIED, BUT THE COMPONENTS SHOULD BE FUNCTIONALLY EQUIVALENT.

PARTS LAYOUT AND ASSEMBLY SEQUENCE

THE FRONT OF THE BOARD IS THE SIDE ON WHICH THE PARTS LAYOUT HAS BEEN SILK SCREENED. ALL PARTS WILL BE ON THE FRONT OF THE PRINTED CIRCUIT BOARD. THEIR LEADS OR PINS WILL PASS THROUGH THE BOARD AND BE SOLDERED ON THE REAR.

PLACE THE BOARD WITH ITS FRONT SIDE UP AND THE GOLD EDGE CONTACTS NEAREST YOU. IN THAT POSITION, WE WILL REFER TO THE UPPER PORTION OF THE BOARD AS BEING FURTHEST AWAY FROM YOU.

SHOULD YOU USE SOCKETS?

WE RECOMMEND THE USE OF SOCKETS FOR TWO REASONS. ONE IS THAT SOLDERED-IN CHIPS CANNOT BE RETURNED FOR REPLACEMENT. ANOTHER IS THAT, SHOULD YOU HAVE TO REPLACE A CHIP, IT IS POSSIBLE TO DO CONSIDERABLE DAMAGE TO THE P.C. BOARD, UNLESS YOU ARE EXPERIENCED AT IC REMOVAL AND HAVE THE PROPER TOOLS.

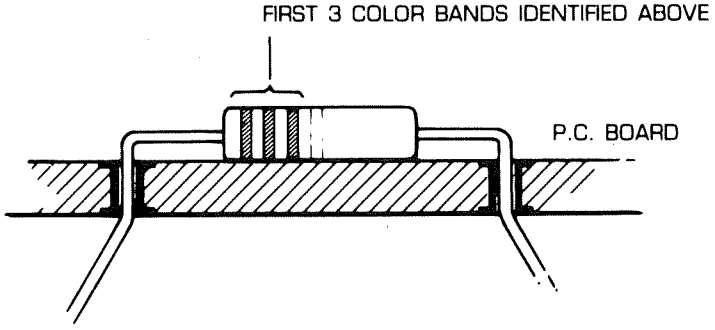
FLASH WRITER ASSEMBLY SEQUENCE

CHECKING THE PRINTED CIRCUIT BOARD

ALTHOUGH WE HAVE INSPECTED THE BOARD PRIOR TO SHIPMENT, A FURTHER ELECTRICAL CHECK FOR ETCH BRIDGES BETWEEN TRACES MAY BE PERFORMED WITH AN OHMMETER, USING THE LOW RESISTANCE RANGE.

RESISTORS

ORIENTATION IS OF NO CONCERN WITH RESISTORS, BUT BE SURE THAT THE STRIPED COLOR CODE WHICH IDENTIFIES THE RESISTANCE VALUE IS AS SHOWN ON THE COMPONENT DIAGRAM FOR THE PARTICULAR LOCATION.



INSERT THE LEADS INTO THE PROPER HOLES, HOLD THE RESISTOR BODY FIRMLY AGAINST THE BOARD, AND THEN SLIGHTLY SPREAD THE LEADS ON THE OPPOSITE SIDE OF THE BOARD TO HOLD IT IN PLACE WHILE SOLDERING.

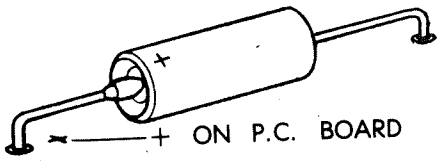
INSPECT FOR PROPER LOCATION AND FOR PROPER SOLDER JOINTS AND THEN CLIP OFF EXCESS LENGTH WITH DIAGONAL CUTTERS.

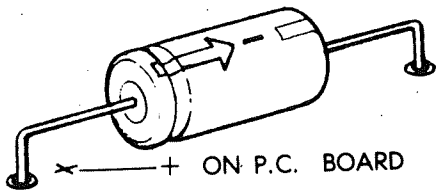
AXIAL GLASS CAPACITORS

AXIAL GLASS CAPACITORS HAVE NO SPECIAL POLARITY REQUIREMENTS. REFER TO THE COMPONENT DIAGRAM FOR PROPER LOCATION AND SOLDER IN PLACE AS DESCRIBED ABOVE FOR RESISTORS.

AXIAL ELECTROLYTIC CAPACITORS

AXIAL ELECTROLYTIC CAPACITORS HAVE SPECIAL POLARITY REQUIREMENTS, THE REVERSAL OF WHICH WILL CAUSE DAMAGE TO THE CAPACITOR. MOST SMALL, AXIAL ELECTROLYTICS WILL BE MARKED WITH A "+" AND/OR HAVE A GROOVE AT THE PLUS END. SOME HAVE AN ARROW POINTING TO THE OPPOSITE END WHICH IS "-". THE LEAD FROM THE "+" END IS TO BE INSERTED IN THE HOLE MARKED "+" ON THE PRINTED CIRCUIT BOARD. REFER TO THE COMPONENT DIAGRAM FOR PROPER LOCATION AND SOLDER AS DESCRIBED ABOVE FOR RESISTORS.





SOCKETS

CHECK THE PINS OF IC SOCKETS TO INSURE THAT NONE ARE MISSING AND THAT EACH IS IN LINE. IF THERE ARE ANY CONTACTS MISSING, THE SOCKET IS DEFECTIVE AND MUST BE REPLACED. IF ANY CONTACTS ARE OUT OF LINE, GENTLY STRAIGHTEN THEM WITH NEEDLE NOSED PLIERS.

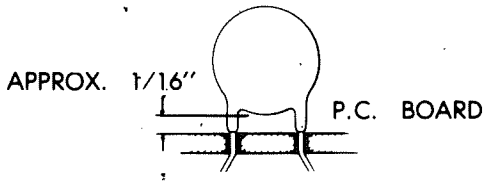
CAREFULLY INSERT EACH IC SOCKET IN ITS PROPER LOCATION MAKING SURE THAT ALL ITS PINS ENTER THEIR ASSIGNED HOLES SIMULTANEOUSLY TO AVOID BENDING. CHECK THE BACK OF THE BOARD TO INSURE THAT ALL THE PINS HAVE STARTED THROUGH. PRESS IN AND HOLD THE SOCKET FIRMLY AGAINST THE BOARD WHILE SOLDERING.

SOLDER THE DIAGONALLY OPPOSITE PINS OF THE SOCKET FIRST AND THEN HOLD THE BOARD UP TO THE LIGHT TO INSURE THAT EACH SOCKET IS FIRMLY SEATED. THEN SOLDER THE REMAINING PINS.

DO NOT INSERT IC CHIPS UNTIL AFTER ALL OTHER PARTS HAVE BEEN SOLDERED IN AND THE BOARD HAS BEEN CLEANED.

DISC CAPACITORS

DISC CAPACITORS DO NOT REQUIRE SPECIAL ORIENTATION. HOWEVER, THEY OFTEN HAVE THEIR COATING EXTENDING DOWN FROM THEIR BODY ALONG THEIR LEADS. IF TOO FAR ALONG THE LEAD, IT MAY BE CRACKED OFF BY SQUEEZING IT WITH PLIERS. IN ANY EVENT, BE SURE THAT THIS INSULATIVE COATING DOES NOT EXTEND INTO THE PRINTED CIRCUIT BOARD HOLE.



INSERT THE LEADS OF THE CAPACITORS THROUGH THE PROPER HOLES AS INDICATED ON THE PARTS LAYOUT. BEND THE LEADS SLIGHTLY OUTWARD TO HOLD THE CAPACITOR IN POSITION WHILE SOLDERING. THE CAPACITORS SHOULD BE SPACED UNIFORMLY ABOVE THE PRINTED CIRCUIT BOARD ABOUT 1/16" SO AS TO GIVE A NEAT APPEARANCE TO THE FINISHED BOARD. SOLDER IN PLACE WHILE HOLDING IN THIS POSITION. CLIP OFF EXCESS LEAD LENGTH WITH DIAGONAL CUTTER.

78L12 REGULATOR

REFER TO THE COMPONENT DIAGRAM FOR PROPER PLACEMENT. THE 78L12 REGULATOR SHOULD BE SO ORIENTED THAT THE FLAT EDGE OF THE REGULATOR POINTS TOWARD THE TOP OF THE BOARD. BEND THE LEADS TO FIT INTO THE PC HOLES AND SOLDER IN PLACE AS DESCRIBED ABOVE FOR DISC CAPACITORS.

! IMPORTANT !

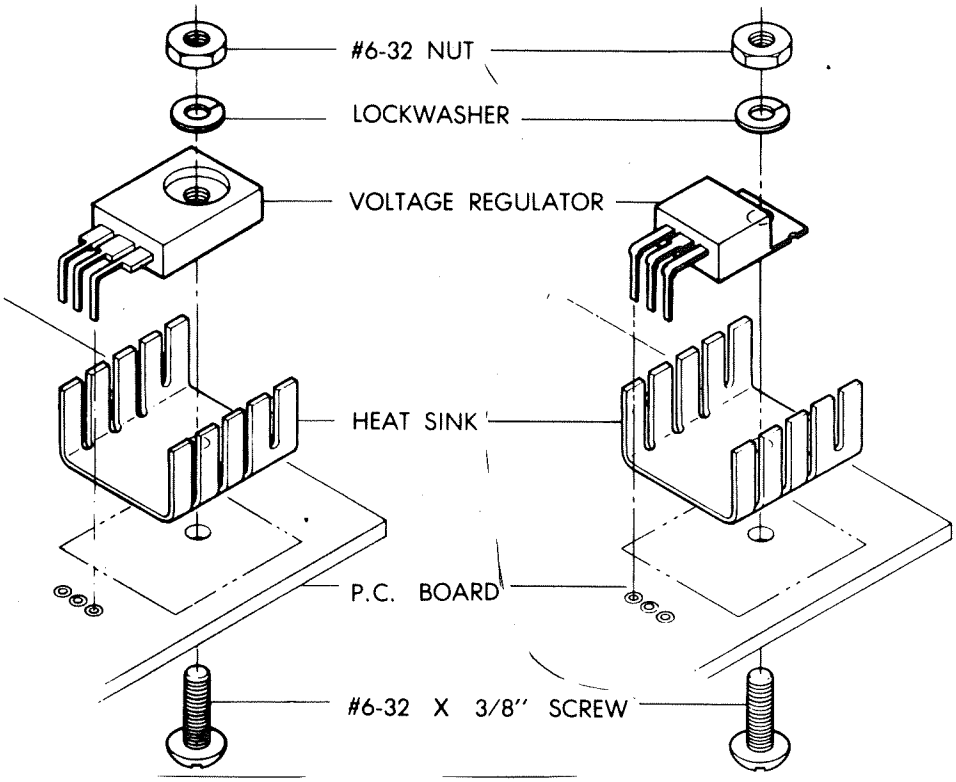
CLEAN THE BOARD WITH A FLUX REMOVING SOLVENT BEFORE CONTINUING ASSEMBLY.

7805 REGULATOR AND HEATSINK

ASSEMBLE THE 7805 REGULATOR ON THE FRONT OF THE BOARD IN THE LOCATION NOTED ON THE PARTS LAYOUT.

1. INSERT THE 6-32X3/8" METAL SCREW FROM THE BACK OF THE PRINTED CIRCUIT BOARD.
2. APPLY A THIN COAT OF HEAT SINK GREASE OR PLUMBERS GREASE TO BOTH SIDES OF THE HEAT SINK. THIS WILL GREATLY IMPROVE THE CONDUCTION OF HEAT BETWEEN COMPONENTS.
3. PLACE THE HEAT SINK ON THE TOP OF THE BOARD OVER THE PROTRUDING SCREW.
4. PLACE THE VOLTAGE REGULATOR OVER THE SCREW WHILE CAREFULLY INSERTING ITS LEADS INTO THEIR PROPER HOLES.
5. PLACE THE LOCKWASHER OVER THE END OF THE SCREW AND FINALLY THE METAL NUT.
6. CAREFULLY TIGHTEN THE SCREW FROM THE BACK WITH A SCREWDRIVER WHILE HOLDING BOTH THE HEAT SINK TO INSURE THE PROPER ALIGNMENT AND THE REGULATOR TO PREVENT

ANY STRAIN ON THE LEADS CAUSED BY TURNING PRESSURE.
7. SOLDER THE LEADS ON THE BACK OF THE BOARD. INSPECT FOR PROPER SOLDER JOINTS AND THEN CLIP OFF EXCESS LEAD LENGTH WITH DIAGONAL CUTTERS.



TESTING THE REGULATORS

APPLY POWER TO THE BOARD BY PLUGGING IT INTO YOUR COMPUTER OR BY CONNECTING IT TO A SUITABLE POWER SUPPLY AND MEASURE THE REGULATED OUTPUT OF EACH REGULATOR. IF LESS THAN +4.75 VOLTS IS MEASURED, CHECK FOR A SHORT CIRCUIT.

CAUTION! SHORTED REGULATORS SOMETIMES EXPLODE -- STAY CLEAR OF THE REGULATOR SIDE OF THE BOARD WHILE TESTING IT.

IF MORE THAN +5.30 VOLTS IS MEASURED, THE REGULATOR SHOULD BE REPLACED.

POTENTIOMETER

THE POTENTIOMETER SHOULD BE SO ORIENTED THAT THE FLAT EDGE OF THE WHITE DISK POINTS TOWARD THE LOWER EDGE OF THE PC BOARD. REFER TO THE COMPONENT DIAGRAM FOR PROPER LOCATION AND BEND THE LEADS TO FIT INTO THE PC HOLES. SOLDER AS DESCRIBED ABOVE FOR DISC CAPACITORS.

CRYSTAL

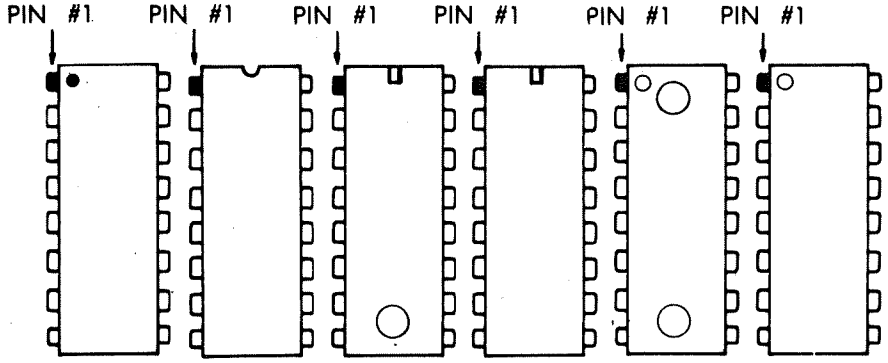
REFER TO THE COMPONENT DIAGRAM FOR PROPER PLACEMENT. INSERT THE LEADS THROUGH THE PC HOLES AND BEND THE BODY OF THE CRYSTAL FLAT TO THE BOARD. SPREAD THE LEADS SLIGHTLY TO HOLD IN PLACE WHILE SOLDERING. SOLDER IN PLACE AND CLIP THE EXCESS LEAD LENGTH WITH DIAGONAL CUTTERS.

THERE IS A PC HOLE ON EACH SIDE OF THE CRYSTAL FOR USE IN SOLDERING A RETAINING WIRE ACROSS THE CRYSTAL. WE RECOMMEND USING SUCH A STRAP TO PREVENT THE CRYSTAL FROM MOVING AND BREAKING THE LEADS.

ORIENTATION OF INTEGRATED CIRCUIT CHIPS

CARE MUST BE TAKEN TO INSURE THAT EACH INTEGRATED CIRCUIT CHIP IS SO ORIENTED, PRIOR TO INSERTION IN ITS SOCKET, THAT PIN #1 IS AT THE LOCATION SO DESIGNATED ON THE PRINTED CIRCUIT BOARD OR IN THE INDIVIDUAL ASSEMBLY INSTRUCTIONS FOR THE KIT.

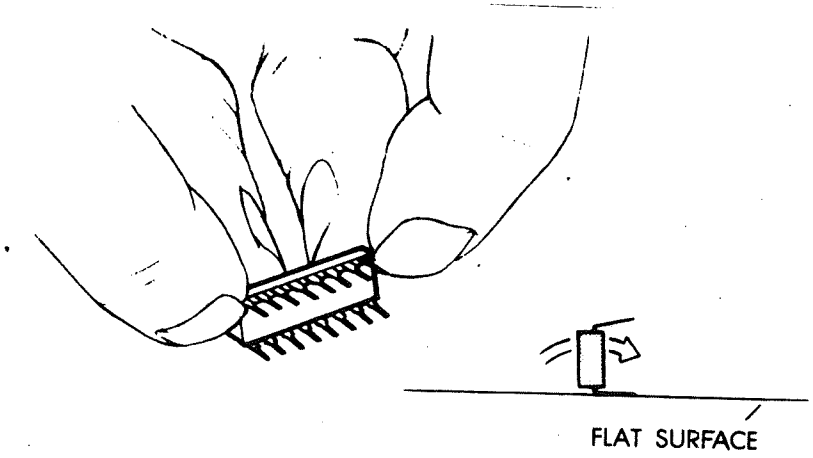
PIN #1 IS, UNFORTUNATELY, DESIGNATED IN A VARIETY OF WAYS DEPENDING UPON THE INTEGRATED CIRCUIT MANUFACTURER. SEVERAL METHODS ARE INDICATED IN THE DRAWING BELOW. WITH THE LEADS OF THE CHIP POINTING AWAY FROM THE VIEWER, PIN #1 IS IN THE POSITION INDICATED WITH RESPECT TO THE VARIOUS END NOTCHES OR TINY CIRCULAR MARKINGS OR DEPRESSIONS IN ONE CORNER.



INSERTION OF INTEGRATED CIRCUIT CHIPS

BE SURE ALL LEADS ARE STRAIGHT AND PARALLEL. IF NOT, GENTLY STRAIGHTEN AND ALIGN THE BENT PINS WITH NEEDLE NOSED PLIERS.

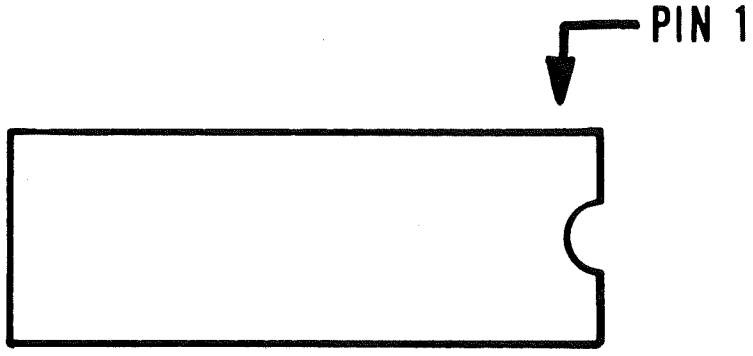
INTEGRATED CIRCUIT CHIPS USUALLY COME FROM THE MANUFACTURER WITH THEIR ROWS OF LEADS SPREAD WIDER THAN THE SOCKET. TO BEND THE PINS IN A UNIFORM MANNER, PLACE THE CHIP ON ITS SIDE ON A FLAT SURFACE SO THAT ONE ROW OF PINS IS FLAT AGAINST THE SURFACE AS SHOWN BELOW.



HOLDING EACH SIDE OF THE CHIP FIRMLY AGAINST THE FLAT SURFACE WITH BOTH HANDS, ROTATE IT A SHORT DISTANCE UNTIL THE PINS ARE BENT PERPENDICULAR TO THE BODY.

INSTALLING THE INTEGRATED CIRCUITS

REFERRING TO THE COMPONENT DIAGRAM, INSTALL THE IC'S IN THEIR PROPER SOCKETS. PIN #1 ORIENTATION IS INDICATED ON THE COMPONENT DIAGRAM AND THE SILKSCREEN BY A SEMI-CIRCULAR DEPRESSION AT ONE END OF THE CHIP.



BE SURE THAT PIN #1 ORIENTATION IS CORRECT AND THAT THE LEADS ARE NOT BENT. IT IS VERY EASY TO FOLD PINS UNDER WHILE INSTALLING THEM.

EJECTORS

EJECTORS HAVE BEEN PROVIDED FOR EASE IN REMOVING THE BOARD FROM YOUR COMPUTER.

INSTALL THE EJECTORS IN THE UPPER CORNERS OF THE BOARD, USING PLIERS TO INSERT THE SPLIT PINS.

MOLEX CONNECTOR

REFER TO THE USERS GUIDE SECTION OF THIS MANUAL FOR CONNECTION OF THE MOLEX CONNECTOR.

JUMPER WIRES

A SHORT PIECE OF 30 GA JUMPER WIRE HAS BEEN PROVIDED FOR CONNECTION OF SIGNALS ON THE CIRCUIT SIDE OF THE BOARD. (REFER TO E COMPONENT LAYOUT DIAGRAM).

1. ON THE CIRCUIT SIDE OF THE BOARD ADD A JUMPER WIRE BETWEEN THE PAD MARKED A LOCATED UNDER U8.

2 ON THE CIRCUIT SIDE OF THE BOARD ADD A JUMPER WIRE BETWEEN THE PAD MARKED B LOCATED UNDER U8 TO THE PAD MARKED B LOCATED BETWEEN U10 AND U11.

THEORY OF OPERATION

THIS IS A COMPLEX CIRCUIT COMPRISED OF MANY INTERACTING LOGIC CHAINS. IF THE PRECEEDING LINK IN THE CHAIN IS NOT FUNCTIONING PROPERLY, LITTLE CAN BE LEARNED BY LOOKING AT THE WAVEFORMS OF A PARTICULAR CIRCUIT. THE ORIGIN OF ALL TIMING SIGNALS IS A 14.318 MHZ OSCILLATOR CONSISTING OF A CRYSTAL AND SEVERAL SECTIONS OF U1. THIS FREQUENCY IS FOUR TIMES THE TELEVSION COLOR SUBCARRIER. U33 IS A DIVIDE BY 10 STAGE WHICH IS PRESET TO 3 AND COUNTS TO 12 TO GENERATE A SYMMETRICAL MOST SIGNIFICANT OUTPUT TO SIMPLIFY DECODING OF THE GRAPHIC SYMBOLS. THIS COUNTER, LIKE MOST OF THE OTHERS USED ON THE BOARD, IS A SYNCHRONOUS COUNTER WHICH MEANS THAT ALL OUTPUTS CHANGE SIMULTANEOUSLY IN TIME WITH THE CLOCK INPUT (PIN 1) AND ALL INPUTS HAVE AN EFFECT ONLY AT THE RISING EDGE OF THE CLOCK. THIS ELIMINATES THE PROBLEM OF DECODING GLITCHES PREVALENT WITH LESS COMPLEX RIPPLE COUNTERS. THE 10 CLOCK CYCLES COUNTED OUT REPRESENT ONE CHARACTER CELL, OR THE TIME DURING WHICH A SINGLE CHARACTER IS DISPLAYED ON THE SCREEN. U34 AND U35 ARE CASCADED TO PROVIDE A COUNT OF 91 WITH A PERIOD OF 63.5 USEC, THE CORRECT PERIOD FOR THE TV HORIZONTAL SWEEP. DURING THE LAST 64 COUNTS, U35 PIN 12 GOES HI, AND THIS IS THE PERIOD DURING WHICH THE CHARACTERS ARE DISPLAYED ON THE SCREEN. AT THE END OF THIS TIME PIN 15 GOES HI, INITIATING A VARIABLE DELAY IN U2 WHICH GENERATES A 5 USEC HORIZONTAL SYNC PULSE WHICH IS COMBINED BY U43 WITH THE VERTICAL SYNC PULSE AND THE VIDEO FROM U30 PIN 8 TO FORM COMPOSITE VIDEO.

THE HORIZONTAL SYNC PULSE FROM U2 PIN 4 IS USED AS THE CLOCK FOR THE VERTICAL SYNC COUNTERS BEGINNING WITH U46. IN ORDER TO SIMPLIFY THE DECODING OF THE GRAPHIC ELEMENTS WHICH DIVIDE THE 15 LINE CHARACTER CELL INTO THREE ELEMENTS VERTICALLY, U46 FIRST DIVIDES BY 5 AND U47 THEN DIVIDES BY THREE. CONCURRENT WITH THIS, A STRAIGHT BINARY COUNT MUST BE GENERATED FOR THE CHARACTER GENERATOR ROW INPUTS. THIS IS ACCOMPLISHED BY PRESETING U18 TO THE PROPER COUNT AT THE TOP OF EACH CHARACTER CELL. U19 AND A SECTION OF U16 COMBINE WITH U47 AND U46 TO FORM A COUNTER THAT OVERFLOWS AT A COUNT OF 262 GENERATING A 60 HZ VERTICAL SYNC PERIOD. THE COUNT SEQUENCE IS SUCH THAT THE CHARACTER DISPLAY OCCURS DURING THE FIRST 240 COUNTS, AND THE VERTICAL SYNC INTERVAL BEGINS IMMEDIATELY THEREAFTER. THE LOWER HALF OF U16 GENERATES A VERTICAL SYNC PULSE OF 5 LINES BEFORE BEING RESET BY U47 PIN 14. U16 PIN 3 IS COMBINED WITH THE HORIZONTAL SYNC IN U43.

SINCE THE DISPLAY IS 64 CHARACTERS BY 16 LINES AND BOTH THESE NUMBERS ARE BINARY POWERS, THEY CAN BE COMBINED TO GENERATE A BINARY ADDRESS FOR 1024 BYTES OF MEMORY. THE APPROPRIATE SIGNALS LABELLED C0-C9 ARE MULTIPLEXED BY U36, U21, U48, U49 WITH THE MICROPROCESSOR ADDRESS BUS TO SELECT ONE OF 1024 MEMORY LOCATIONS. TWELVE MEMORY CHIPS ARE USED ON THE BOARD COMPRISING A 1024X8 AND 1024X4 BLOCK AS FAR AS THE MIROCOMPUTER IS CONCERNED, BUT IT IS READ OUT AS 1024X12 WHEN ACCESSED BY THE SYNC CIRCUITRY. U55 AND U56 INTERFACE THE MEMORY TO THE BUS SO THAT IT CAN BE READ BY THE CPU. THE 12 OUTPUTS FROM MEMORY GENERATED WHILE THE SYNC CIRCUITRY SCANS IT SEQUENTIALLY ARE APPLIED TO U8, THE CHARACTER GENERATOR AND TO U9, THE MULTIPLEXER FOR THE GRAPHIC SYMBOLS. SINCE THE CHARACTER GENERATOR IS INHERENTLY A SLOW DEVICE, IT OUTPUTS THE 7 BITS NEEDED TO FORM THE DOTS IN ONE HORIZONTAL LINE OF A CHARACTER IN PARALLEL, AND THEY ARE CLOCKED INTO SHIFT REGISTERS U17 AND U4 FROM WHICH THEY ARE CLOCKED OUT AT THE 14.318 MHZ DOT CLOCK RATE. THE GRAPHIC SYMBOLS ARE DECODED BY U9 USING THE OUTPUTS OF U47 AND U33 TO SELECT THE APPROPIATE MEMORY BITS.

THESE SIGNALS ARE COMBINED IN U6 AND U7 WITH THE CHARACTER GENERATOR OUTPUTS. THE LEAST SIGNIFICANT BIT OF THE UPPER MEMORY BANK SELECTS EITHER GRAPHIC OR CHARACTER OUTPUTS BY ENABLING THE CHARACTER GENERATOR OR MULIPLEXER THROUGH U5 AND SECTIONS OF U32.

SEPARATE VIDEO AND SYNC SIGNALS ARE PROVIDED FOR USE WITH MONITORS THAT REQUIRE THEM, SUCH AS THE BALL BROTHERS MONITOR MODEL TV-12. FOR USE WITH STANDARD MONITORS REQUIRING RS170 COMPOSITE VIDEO, U30, A HIGH CURRENT OPEN COLLECTOR INVERTER COMBINES THE SYNC AND VIDEO SIGNALS WITH A RESISTER NETWORK. THIS NETWORK PRODUCES 0.5 VOLTS OF SYNC AND ABOUT 1 VOLT OF VIDEO WITH AN OUTPUT IMPEDANCE WHICH MATCHES 75 OHM CO-AXIAL CABLE. THE RISE AND FALL TIME OF THE OUTPUT SIGNALS IS LESS THAN 20 NANOSECONDS, REPRESENTING A BANDWIDTH OF ABOUT 17 MHZ. SOME HIGH FREQUENCY PREEMPHASIS TO IMPROVE OPERATION WITH LIMITED BANDWIDTH DISPLAYS HAS BEEN PROVIDED BY SHUNTING THE 150 OHM RESISTOR WITH A 1000PF CAPACITOR.

THE ADDRESS OF THE REFRESH MEMORY IS DECODED BY U50 WHICH PRODUCES A BOARD ENABLE SIGNAL. ADDITIONAL LOGIC IS PROVIDED BY U10 TO ESTABLISH PRIORITY BETWEEN THE CPU ACCESS TO MEMORY AND THE SYNC COUNTER SCANNING OF MEMORY IN ORDER TO PREVENT GLITCHES ON THE SCREEN. DURING THE HORIZONTAL BLANKING INTERVAL, WHICH REPRESENTS ABOUT 25% OF THE TOTAL 63.5 MICROSECOND HORIZONTAL SWEEP TIME, THE CPU HAS PRIORITY. SHORTLY BEFORE THE ACTIVE DISPLAY PORTION OF THE SWEEP, THE CPU IS INHIBITED FROM ACCESSING MEMORY AND IS PUT IN A WAIT STATE UNTIL THE BLANKING INTERVAL. THIS RESULTS IN SOME REDUCTION IN THE SPEED AT WHICH THE CPU CAN UPDATE THE SCREEN MEMORY. A TYPICAL SOFTWARE LOOP TO WRITE ONTO THE SCREEN NORMALLY TAKES 30-40 MICROSECONDS WITH A 2 MHZ CLOCK. THE CPU IS SYNCHRONIZED TO THE HORIZONTAL SWEEP BY THE WAIT CIRCUITRY ON THE BOARD AND MAKES A TRANSFER EVERY 63.5 USEC. WITH A 4 MHZ CLOCK, TWO TRANSFERS CAN BE MADE EVERY 63.5 USEC. THIS IS MUCH FASTER THAN WAITING FOR THE VERTICAL RETRACE INTERVAL WHICH REDUCES THE TRANSFER RATE BY AS MUCH AS 90%. THE MEMORY BLOCK USED BY THE BOARD CAN BE SET AT ANY 2K BOUNDARY BY SELECTING THE APPROPRIATE JUMPERS TO U50, AND THE RELATIVE POSITION OF THE CHARACTER CODE MEMORY AND ATTRIBUTE MEMORY SELECTED BY THE JUMPER TO A10 OR A10. SINCE THE ATTRIBUTE MEMORY IS ONLY 4 BITS WIDE, THE CPU WILL READ THE FOUR MOST SIGNIFICANT BITS AS HIGH FOR ALL MEMORY LOCATIONS.

THE KEYBOARD INPUT PORT CONSISTING OF U14, U28, U52 IS LOGICALLY DISTINCT FROM THE VIDEO PORTION OF THE CIRCUIT. U14, AN 8212 8 BIT LATCH INPUTS PARALLEL DATA FROM A KEYBOARD CONNECTED TO J1 WHEN CLOCKED BY THE STROBE INPUT PIN 11. A JUMPER IS PROVIDED TO SELECT THE NORMAL POSITIVE GOING STROBE OR A NEGATIVE STROBE FROM THE KEYBOARD. A SERVICE REQUEST FLIP-FLOP IN THE 8212 IS SET WHEN A STROBE IS RECEIVED WHICH CAUSES PIN 23 TO GO LOW. THE MICROPROCESSOR INPUTS DATA BY FIRST TESTING THE STATUS PORT (EVEN) AND LOOKING AT THE PROPER BIT TO SEE IF A KEYBOARD STROBE HAS BEEN RECEIVED. IF SO, IT THEN READS THE DATA FROM THE DATA (ODD) PORT. THREE STATUS BITS ARE ACTUALLY PROVIDED; DIO HAS A LOW TRUE RDA BIT AND DI6 HAS A HIGH TRUE RDA BIT. THESE BITS AND POLARITIES HAVE BEEN CHOSEN TO BE COMPATIBLE WITH MOST OF THE EXISTING SOFTWARE. AFTER THE CPU READS THE DATA PORT, THE STATUS BITS ARE RESTORED TO THE INACTIVES STATE. A THIRD STATUS BIT IS CONNECTED TO THE VERTICAL BLANKING SIGNAL, AND CAN BE USED BY SOFTWARE AS A REAL TIME CLOCK OR TO SYNCHRONIZE CHANGES ON THE SCREEN WITH THE VERTICAL RETRACE. THE ADDRESS OF THE KEYBOARD DATA AND STATUS PORTS IS SELECTED BY CONNECTING THE APPROPRIATE JUMPERS IN THE PATCH AREA NEXT TO U52.

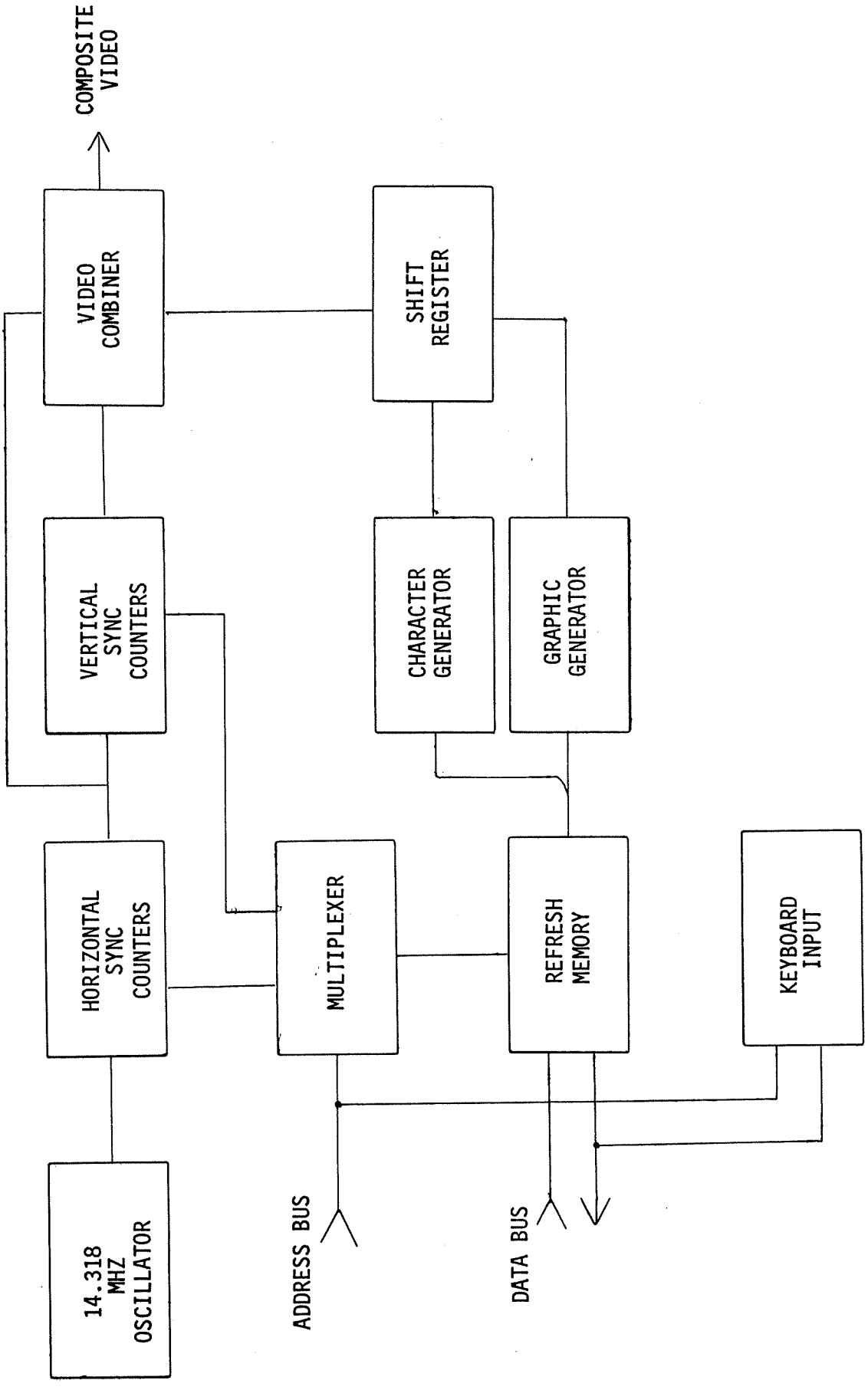


FIGURE 1 FLASHWRITER BLOCK DIAGRAM

USERS GUIDE

KEY BOARD PORT

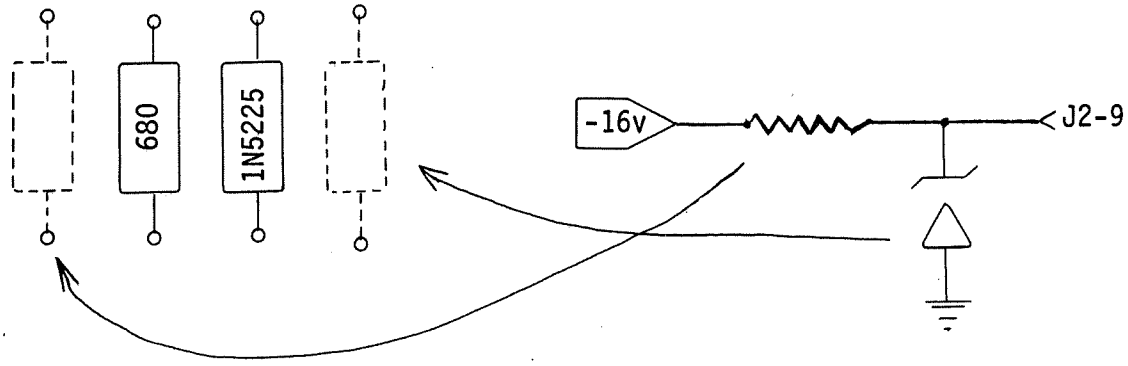
INV ☐ 2

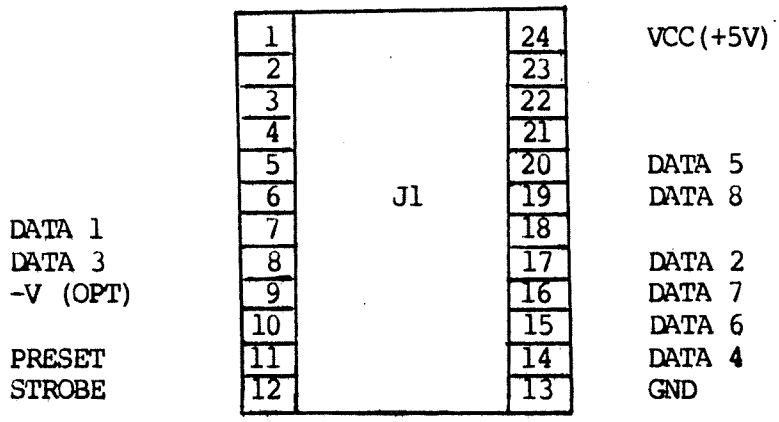
NOR ☐ 3 ☐ 1 TO LATCH

PAD 2 = INV = NEGATIVE (0V) KEYBOARD STROBE
PAD 3 = NOR = POSITIVE (+5V) KEYBOARD STROBE

IF YOUR KEYBOARD HAS A POSITIVE TRUE STROBE JUMPER PADS 3 TO 1; IF YOUR KEYBOARD HAS A NEGATIVE TRUE STROBE JUMPER PADS 2 TO 1.

MANY KEYBOARDS REQUIRE A NEGATIVE VOLTAGE IN ADDITION TO THE +5V, AND THERE ARE PADS LOCATED IN THE LOWER CENTER PORTION OF THE BOARD FOR AN OPTIONAL ZENER REGULATER SUPPLY.





(24 PIN DIP)

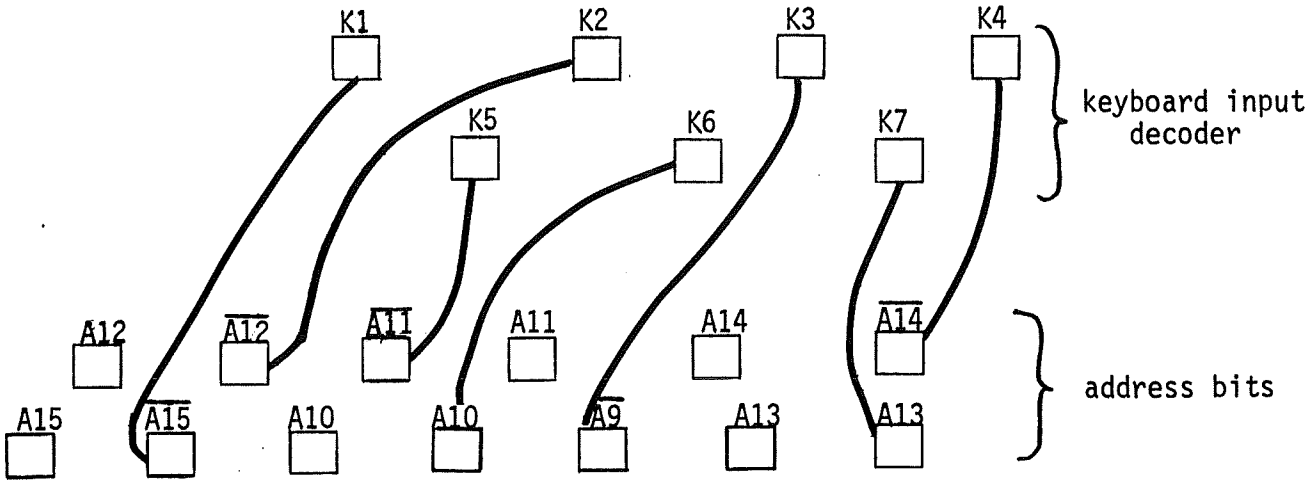
KEYBOARD I/O CONNECTOR

THE ZENER VOLTAGE WILL DEPEND ON THE KEYBOARD REQUIREMENTS IF IT IS NEEDED AT ALL, AND THE RESISTOR SHOULD BE SELECTED TO BIAS THE ZENER WITH AT LEAST 10 MA OF CURRENT IN ADDITION TO THE CURRENT REQUIRED BY THE KEYBOARD. FOR EXAMPLE, WITH A KEYBOARD REQUIRING 10 MA OF CURRENT AT 6V, THE ZENER COULD BE A IN752A (5.6V) AND THE RESISTOR COULD BE 10/.02=500 OHMS (470 NOMINAL). THE ZENER POWER DISSIPATION WOULD BE 60 MW AND THE RESISTOR DISSIPATION WOULD BE 200 MW (USE A 1/2 WATT TO ALLOW FOR HIGHER SUPPLY VOLTAGES).

MOST KEYBOARDS HAVE EXTRA KEYS THAT ARE NOT CONNECTED TO THE ENCODER LOGIC, BUT MAY BE USED INDEPENDENTLY. IT IS CONVENIENT TO CONNECT ONE OF THESE KEYS TO MOMENTARILY GROUND PIN 75 ON THE BUS (PRESET) VIA PIN 11 ON J2 TO PERMIT JUMPING TO THE MONITOR IN THE VECTOR 1 WITHOUT USING THE RESET SWITCH ON THE FRONT PANEL.

KEYBOARD PORT ADDRESSING

THE KEYBOARD PORT IS PREJUMPERED ON THE BOARD FOR PORTS 00H AND 01H. IF A DIFFERENT PORT ADDRESS IS REQUIRED IT MAY BE NECESSARY TO CUT ONE OR MORE CIRCUIT TRACES AND ADD APPROPRIATE JUMPERS.

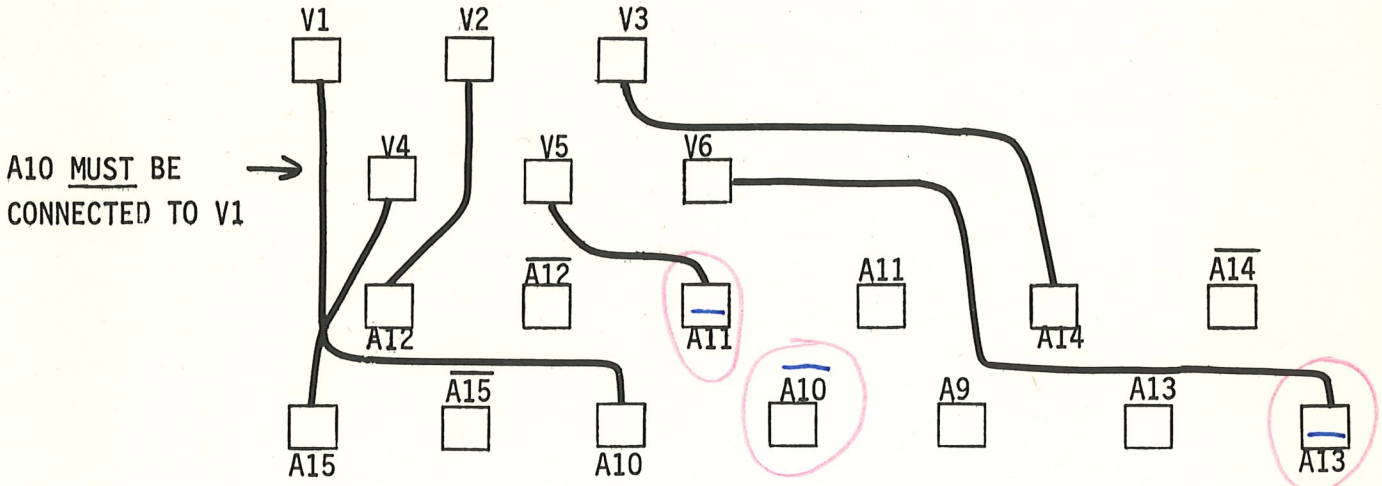


CIRCUIT TRACES AS MANUFACTURED

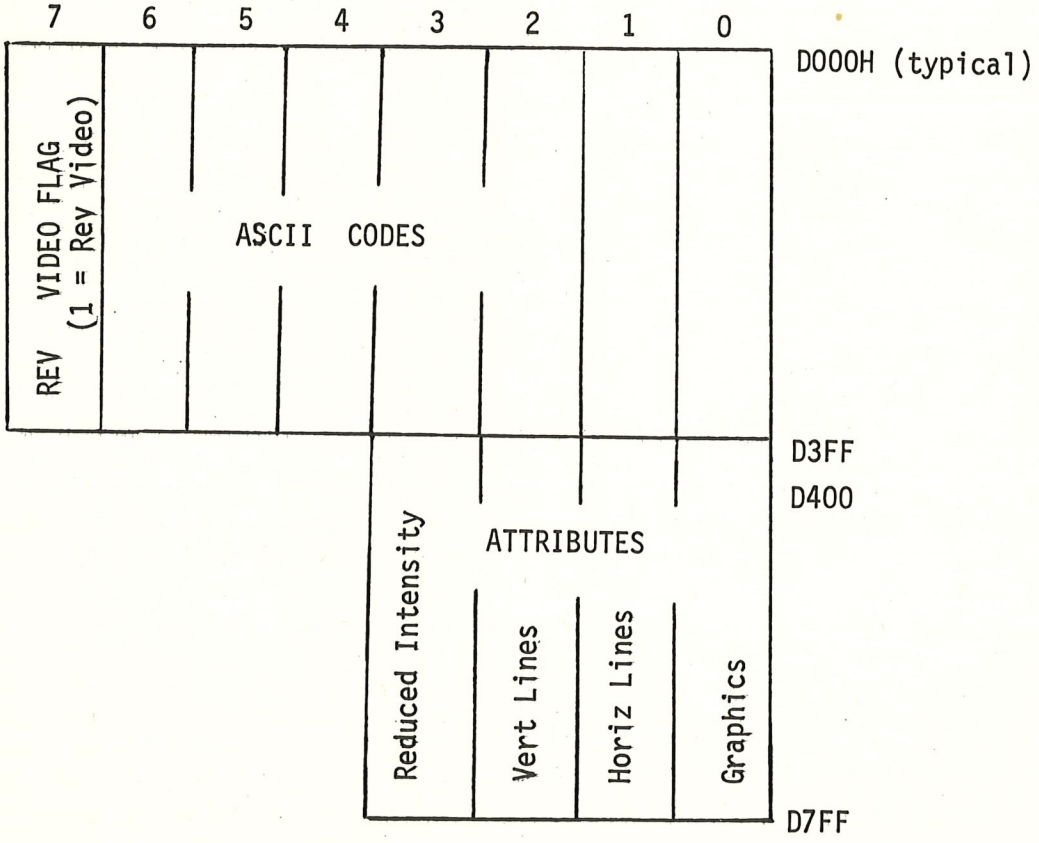
EXAMPLE: IF YOU NEEDED TO CHANGE THE KEYBOARD ADDRESS FROM 00H TO 10H THE TRACE FROM A12 TO K2 SHOULD BE CUT AND A JUMPER ADDRESSED FROM A12 TO K2.

VIDEO ADDRESSING

THE VIDEO DISPLAY PORTION OF THE FLASHWRITER ADDRESS IS ESTABLISHED BY JUMPER CONNECTIONS ON THE FRONT SIDE OF THE BOARD. IF YOUR BOARD WAS FACTORY ASSEMBLED AND TESTED, THE ADDRESS IS SET AT D000H. IF YOU PURCHASED THE FLASHWRITER IN KIT FORM, YOU MUST ADD THE JUMPERS.



JUMPERS FOR ADDRESS D000H



FLASH WRITER MEMORY MAP

GENERAL TROUBLE SHOOTING GUIDE

BECAUSE OF THE COMPLEXITY OF THE ENTIRE COMPUTER SYSTEM, BOTH HARDWARE AND SOFTWARE, IT IS ESSENTIAL TO ISOLATE ANY PROBLEM TO AN INDIVIDUAL BOARD OR PROGRAM. FORTUNATELY, ALL OF THE COMPUTER LOGIC IS ON EASILY REMOVABLE BOARDS. IT IS EXTREMELY VALUABLE TO HAVE ACCESS TO A TESTED COMPUTER SO THAT THE BOARDS CAN BE INDIVIDUALLY TESTED. ALTHOUGH THERE IS THE POSSIBILITY OF INTERACTION BETWEEN BOARDS DUE TO MARGINAL TIMING OR DEFECTIVE COMPONENTS, THIS IS NOT THE USUAL CASE, AND IT IS BEST TO ASSUME THAT IF A BOARD WORKS IN COMPUTER "A" IT WILL ALSO WORK IN COMPUTER "B".

THE MINIMUM SYSTEM CONSISTS OF THREE BOARDS: THE CPU BOARD, THE PROM/RAM BOARD, AND EITHER A VIDEO OR SERIAL I/O BOARD. MAKE SURE THAT THE MONITOR PROGRAM HAS BEEN PROPERLY PATCHED FOR THE PARTICULAR I/O CONFIGURATION OF YOUR SYSTEM. THERE IS TOTAL CONFUSION IN THE INDUSTRY CONCERNING PORT ASSIGNMENTS, LOGIC CONVENTIONS, AND STRAPPING OPTIONS. SEVERAL TYPES OF PROGRAMMABLE USARTS ARE USED WHICH REQUIRE INITIALIZATION.

IF YOU HAVE CAREFULLY FOLLOWED THE ASSEMBLY INSTRUCTIONS FOR EACH OF THE BOARDS AND THE REGULATORS CHECK OUT, INSTALL ALL CHIPS. LET'S ASSUME YOU ARE USING A VIDEO DISPLAY. AS SOON AS YOU TURN THE COMPUTER ON, YOU SHOULD SEE A DISPLAY OF RANDOM MEMORY GARBAGE ON THE TV SCREEN. THIS WILL BE INDEPENDENT OF ANY FUNCTIONING OF THE COMPUTER OTHER THAN THE CLOCK OSCILLATOR. IF YOU DO NOT GET A PROPER DISPLAY, THE VIDEO INTERFACE MUST BE DEBUGGED FIRST. FEEL THE CHIPS ON THE BOARD. ANY THAT ARE HOT TO THE TOUCH MAY BE IN BACKWARD (PROBABLY DESTROYED IF TTL) OR MAY HAVE THEIR OUTPUTS SHORTED. THERE IS MORE THAN A FACTOR OF TEN DIFFERENCE IN THE POWER DISSIPATION OF TTL CHIPS, BUT THEY SHOULD NOT BE UNCOMFORTABLY HOT TO THE TOUCH.

REMOVE THE BOARD AND INSPECT IT CAREFULLY. ABOUT HALF OF THE PROBLEMS CAN BE FOUND SIMPLY BY VISUAL INSPECTION. LOOK WITH A MAGNIFYING GLASS OR INSPECTION SCOPE AT EACH PIN ON THE BOTTOM FOR UNSOLDERED PINS, MISSING PINS THAT MAY BE BENT UNDER OR BROKEN OFF, SOLDER BRIDGES BETWEEN PINS OR TO ADJACENT TRACES, AND ETCH BRIDGES BETWEEN TRACES (VERY HARD TO SEE). A CAREFUL EXAMINATION WILL TAKE 15 MINUTES, BUT MAY SAVE YOU A LOT OF GRIEF, AND YOU MAY DISCOVER PROBLEMS LIKE UNSOLDERED PINS THAT MAY REVEAL THEMSELVES ONLY LATER AS INTERMITTENT PROBLEMS. EXAMINE THE TOP OF THE BOARD TO BE SURE THE PROPER CHIPS ARE INSTALLED IN THE RIGHT PLACES. SIGHT ALONG THE EDGE OF THE CHIPS TO FIND BENT UNDER PINS. CHIPS ARE SOMETIMES INSERTED WITH A WHOLE ROW OF PINS THAT MISS THE SOCKET HOLES.

IF THE VISUAL INSPECTION FAILS TO GET THE VIDEO DISPLAY WORKING, A COMPONENT MAY BE BAD (USUALLY AN IC). TRY EXCHANGING IDENTICAL COMPONENTS TO SEE IF THE SYMPTOMS CHANGE. AT THIS POINT IT IS WISE TO GO BACK AND CAREFULLY REREAD THE MANUAL TO BE SURE YOU UNDERSTAND THE WAY THE BOARD WORKS AND THAT YOU HAVE SELECTED THE PROPER JUMPER OPTIONS. AFTER THIS, YOU WILL PROBABLY WANT TO TAKE THE UNIT TO A DEALER IF YOU ARE NOT FAMILIAR WITH DIGITAL TROUBLE SHOOTING PROCEDURES, OR GO THROUGH THE CIRCUIT BLOCK BY BLOCK WITH A SCOPE OR LOGIC PROBE IF YOU ARE EXPERIENCED.

AFTER THE VIDEO DISPLAY OR SERIAL I/O IS WORKING, THE RESET SWITCH SHOULD CAUSE A "*" PROMPT TO BE WRITTEN. IF THIS DOES NOT WORK, FOLLOW THE SAME PROCEDURE ON THE CPU AND PROM/RAM BOARDS. THE CPU BOARD CONSISTS MOSTLY OF 8097 BUS DRIVERS

WHICH CAN BE EXCHANGED ONE BY ONE. THE VECTORED INTERRUPT AND REAL TIME CLOCK COMPONENTS, IC A1, ARE NOT NECESSARY IN THE BOARD AT THIS TIME AND SHOULD BE REMOVED. USING A SCOPE, EXAMINE THE OUTPUT PINS OF ALL CHIPS. LOW LOGIC LEVELS ARE NORMALLY LESS THAN 0.2 VOLTS AND HIGH GREATER THAN 3.0 VOLTS. A LEVEL OF 0.4 VOLTS MAY INDICATE SHORTS BETWEEN OUTPUTS WHERE ONE IS TRYING TO PULL HIGH AND THE OTHER LOW. A LEVEL OF 1.2 VOLTS INDICATES AN OPEN CIRCUITED INPUT. NMOS CHIPS HAVE SIMILAR LOGIC LEVELS, WHILE PMOS CHIPS CAN PULL TTL INPUTS TO -0.6V WHERE THE INPUT CLAMP DIODE LIMITS THE VOLTAGE. DO NOT BE SURPRISED AT HOW STRANGE SOME OF THE WAVEFORMS ON THE BUS LOOK, SUCH AS THE DI LINES. THERE ARE PERIODS OF TIME DURING WHICH THE BUS IS NOT BEING ACTIVELY DRIVEN, AND THE VOLTAGE MAY DRIFT DUE TO RECEIVER INPUT CURRENT. ABNORMAL OPERATION IS INDICATED PRINCIPALLY BY ABNORMAL LOGIC LEVELS MAINTAINED CONSTANT FOR AT LEAST ONE CLOCK PERIOD (500 MICROSECONDS).

ONCE YOUR BASIC SYSTEM IS WORKING, CHECK OUT OF MEMORY BOARDS AND OTHER INTERFACES IS RELATIVELY STRAIGHTFORWARD USING THE MEMORY TEST PROGRAM IN THE MONITOR, OR SIMPLE DIAGNOSTIC ROUTINES YOU CAN PROGRAM IN MEMORY ON THE PROM/RAM BOARD. AFTER YOUR SYSTEM IS UP AND RUNNING, IT SHOULD BE QUITE RELIABLE. SINCE MOST MICROCOMPUTER SYSTEMS ARE MEMORY INTENSIVE, THE MEMORY IS THE MOST LIKELY SOURCE OF COMPONENT FAILURE. A SYSTEM WITH 32K OF STATIC MEMORY MAY CONTAIN 75% OF ITS COMPONETS ON THE MEMORY BOARDS. IF A PROBLEM IS EXPERIENCED RUNNING A PROGRAM, FIRST SUSPECT THE MEMORY AND USE THE MONITOR TEST PROGRAM. WE HAVE YET TO EXPERIENCE A PROBLEM WITH OUR 8K MEMORY BOARDS THAT WAS NOT REVEALED BY THE TEST PROGRAM. IF YOU DO MUCH REARRANGING OF YOUR SYSTEM, IT IS A GOOD PRACTICE TO TEST MEMORY FOR A FEW SECONDS WHEN YOU FIRST TURN ON THE COMPUTER TO MAKE SURE THE BOARDS ARE ADDRESSED PROPERLY OR THAT THEY ARE IN THE COMPUTER. THIS MAY SAVE SOME HEAD SCRATCHING WHEN THE PROGRAM YOU HAVE JUST LOADED FAILS TO RESPOND TO YOUR EAGER KEYBOARD TOUCH. IF YOU SUSPECT TEMPERATURE SENSITIVE CHIPS, REMOVE THE COVER OF THE COMPUTER TO INTERRUPT AIR FLOW BETWEEN BOARDS. WE DO NOT RECOMMEND OBSTRUCTING THE AIR FLOW THROUGH THE COMPUTER BY PLACING A SHEET OF PAPER OVER THE LEFT SIDE. A FULL COMPUTER MAY DISSIPATE OVER 300 WATTS AND REACH UNACCEPTABLE TEMPERATURES IF NO AIRFLOW IS PERMITTED.

STATEMENT OF WARRANTY

ALL COMPONENTS SOLD BY VECTOR GRAPHIC INC. ARE WARRANTEED FOR NINETY (90) DAYS AGAINST DEFECTS IN WORKMANSHIP OR MATERIALS. DEFECTIVE PARTS WILL BE REPLACED AT NO CHARGE WHEN RETURNED POSTPAID TO VECTOR GRAPHIC WITHIN THE WARRANTY PERIOD.

ANY PRODUCT PURCHASED AS A KIT AND RETURNED POSTPAID WITHIN THE WARRANTY PERIOD, WHICH IN THE JUDGEMENT OF VECTOR GRAPHIC HAS BEEN ASSEMBLED WITH REASONABLE CARE AND NOT SUBJECTED TO MECHANICAL OR ELECTRICAL ABUSE, WILL BE REPAIRED AND RETURNED WITHOUT CHARGE. IF, IN THE JUDGEMENT OF VECTOR GRAPHIC THE KIT WAS NOT ASSEMBLED WITH REASONABLE CARE, THERE WILL BE A $35.00 REPAIR CHARGE PER BOARD.

ANY PRODUCT PURCHASED AS A FACTORY ASSEMBLED UNIT IS WARRANTEED FOR 90 DAYS AGAINST DEFECTS IN WORKMANSHIP OR MATERIALS. ALL FACTORY ASSEMBLED UNITS RETURNED POSTPAID TO VECTOR GRAPHIC WITHIN THE WARRANTY PERIOD WILL BE REPAIRED AND RETURNED WITHOUT CHARGE.

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C700                    0010 * SHORT FLASHWRITER VIDEO DRIVER *
C700                    0020 * R.S.HARP 1/22/78
C700                    0030 * FOR 1702A PROM/RAM BOARD *
C700                    0040 *
C700                    0050 PAGE   EQU   0D000H
C700                    0060 PSTAT  EQU   0D0H
C700                    0070 CURS   EQU   0CF00H
C700                    0080 IFL    EQU   CURS+2
C700                    0090 * POP PSW AND ENTER HERE **********
C700 F5                 0100 VIDEO  PUSH  PSW
C701 C5                 0110        PUSH  B
C702 D5                 0120        PUSH  D
C703 E5                 0130        PUSH  H
C704 47                 0140        MOV   B,A
C705 3A 02 CF           0150        LDA   IFL
C708 FE 20              0160        CPI   20H
C70A C2 5B C7           0170        JNZ   CLRSC
C70D                    0180 * DISPLAY A CHARACTER ON THE SCREEN *
C70D 2A 00 CF           0190 DISPL  LHLD  CURS
C710 36 20              0200        MVI   M,20H
C712 78                 0210        MOV   A,B
C713 B7                 0220        ORA   A
C714 CA 6A C7           0230        JZ    DELAY
C717 FE 04              0240        CPI   4               (D) CLEAR SCREEN
C719 CA 5B C7           0250        JZ    CLRSC
C71C FE 0A              0260        CPI   0AH             (J) LINE FEED
C71E CA 75 C7           0270        JZ    LNFD
C721 FE 5F              0300        CPI   5FH             UNDRLN BK SPCE
C723 CA 7C C7           0310        JZ    BKSPC
C726 FE 20              0312        CPI   20H             CONTROL CHAR
C728 DA 6A C7           0314        JC    DELAY
C72B E6 7F              0320        ANI   07FH
C72D 77                 0330        MOV   M,A
C72E 23                 0340        INX   H
C72F                    0350 * MAKE SURE CURSOR IS ON THE SCREEN *
C72F 7C                 0360 ONSCR  MOV   A,H
C730 FE D4              0370        CPI   PSTAT+4
C732 C2 51 C7           0380        JNZ   RETRN
C735 21 00 D0           0390        LXI   H,PAGE
C738 11 40 D0           0400        LXI   D,PAGE+64
C73B                    0410 * IF NOT,SCROLL UP ONE LINE *
C73B 1A                 0420 SCROL  LDAX  D
C73C 77                 0430        MOV   M,A
C73D 13                 0440        INX   D
C73E 23                 0450        INX   H
C73F 7A                 0460        MOV   A,D
C740 FE D4              0470        CPI   PSTAT+4
C742 C2 3B C7           0480        JNZ   SCROL
C745                    0490 * CLEAR THE LAST LINE *
C745 36 20              0500 CLRLN  MVI   M,020H
C747 23                 0510        INX   H
C748 7C                 0520        MOV   A,H
C749 FE D4              0530        CPI   PSTAT+4
C74B C2 45 C7           0540        JNZ   CLRLN
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C74E 21 C0 D3            0550         LXI   H,PAGE+960
C751                     0560 * RESTORE THE CURSOR AND RETURN *
C751 36 A0               0570 RETRN   MVI   M,0A0H
C753 22 00 CF            0580         SHLD  CURS
C756 E1                  0590         POP   H
C757 D1                  0600         POP   D
C758 C1                  0610         POP   B
C759 F1                  0620         POP   PSW
C75A C9                  0630         RET
C75B                     0640 * CLEAR THE SCREEN *
C75B 21 02 CF            0650 CLRSC   LXI   H,IFL
C75E 36 20               0660 WRSPC   MVI   M,20H          SPACE
C760 23                  0670         INX   H
C761 7C                  0680         MOV   A,H
C762 FE D8               0690         CPI   PSTAT+8
C764 C2 5E C7            0700         JNZ   WRSPC
C767 C3 4E C7            0710         JMP   RETRN-3
C76A                     0740 * FIXED DELAY ROUTINE *
C76A 16 10               0750 DELAY   MVI   D,10H
C76C 7A                  0760 DLOOP   MOV   A,D
C76D A7                  0770         ANA   A
C76E 1B                  0780         DCX   D
C76F C2 6C C7            0790         JNZ   DLOOP
C772 C3 51 C7            0800         JMP   RETRN
C775                     0810 * LINE FEED *
C775 11 40 00            0820 LNFD    LXI   D,64
C778 19                  0830         DAD   D
C779 C3 2F C7            0840         JMP   ONSCR
C77C                     0850 * BACK SPACE *
C77C 2B                  0860 BKSPC   DCX   H
C77D C3 51 C7            0870         JMP   RETRN
C780                     0880 * KEYBOARD ECHO ROUTINE
C780 CD DC C0            0890 ECHO    CALL  0C0DCH         CONTROL C
C783 C4 00 C7            0900         CNZ   VIDEO
C786 C3 80 C7            0910        JMP   ECHO           KEEP LOOPING
C789                     0920 *
```

SYMBOL TABLE

```
BKSPC C77C    CLRLN C745    CLRSC C75B    CURS  CF00    DELAY C76A
DISPL C70D    DLOOP C76C    ECHO  C780    IFL   CF02    LNFD  C775
ONSCR C72F    PAGE  D000    PSTAT 00D0    RETRN C751    SCROL C73B
VIDEO C700    WRSPC C75E
```

OPTION V VIDEO DRIVER FOR VDM-1 AND SIMILAR VIDEO INTERFACES

The Option V video driver is branched to at C700H with the character code to be output in the accumulator. All registers are saved and restored, and the stack is not reinitialized. Six memory locations on the PROM/RAM board at CFDBH are used to store the cursor position, an initialization code, a reverse video flag, the character under the cursor, and a delay parameter. An initial call tests "IFL" for the code "1", and initializes the hardware scroll (port C8), reverse video flag, "SPD" and clears the screen, initializing the cursor position.

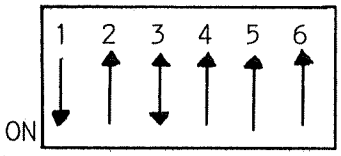
Control U, R, L and LF control the cursor position. To demonstrate these features, branch to the echo routine at C7F9 from the monitor with G C7F9. Although the monitor will echo any character, if it does not recognize it as a valid command, it prints CR, LF, '*'. Control N and O turn the reverse video off and on respectively, D clears the screen, H homes the cursor and shift O backspaces (not the same as Control L).

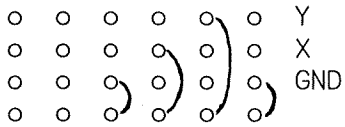
The video driver can be used by basic or other programs independently, by making minor changes to the output routine.

	FROM	TO
OUTPUT	IN 0	POP PSW
	ANI 80H	JMP C700H
	JNZ OUTPUT	(don't care)
	POP PSW	
	OUT 1	
	RET	

Note: Output = 04CD in 8K Basic V 3.1
= 06E1 in Extended V 3.2

No changes are needed to the VDM-1 board, but it must be jumpered for output port C8 and address D000H. The switch positions and address jumpers are diagrammed below.





Switch 3 is optional and controls the blinking cursor.

SPEED CONTROL

A controllable delay loop is used to vary the writing speed on the display, both with basic and with the monitor. Control S causes memory location "SPD" to be incremented from an initialized value to control the "delay" subroutine. This subroutine is branched to by either a NULL (00H) or carriage return (0DH). For use with the monitor, type Control S several times to slow down the display. For basic, type NULL X to change the delay. The value in "SPD" overflows after 7 Control S's to give zero delay. Control D initializes the value in "SPD" as well as clearing the screen.

If the cursor position in "CURS" gets bombed by a runaway program, the video driver may attempt to write in some random memory location not on the screen. This gives the operator the illusion that the CPU is in some hang up mode since "RESET" will not restore the Monitor prompt. If this happens, Control D will initialize the cursor position.

Any suggestions about improving the usefulness of this program would be appreciated.

```
C700                    0010 * VIDEO DRIVER FOR VDM-1 TYPE DISPLAYS
C700                    0020 * SELF INITIALIZING VERSION
C700                    0030 * R.S.HARP 11/4/77
C700                    0040 *
C700                    0050 *
C700                    0060 *
C700                    0070 PAGE   EQU   0D000H        SCREEN LOCATION
C700                    0080 PSTAT  EQU   0D0H
C700                    0090 CURS   EQU   0CFDBH
C700                    0095 IFL    EQU   CURS+2
C700                    0100 VFL    EQU   CURS+3
C700                    0110 UND    EQU   CURS+4
C700                    0120 SPD    EQU   CURS+5
C700                    0130 * POP PSW AND ENTER HERE
C700                    0140 *
C700 F5                 0150 VIDEO  PUSH  PSW
C701 C5                 0160        PUSH  B
C702 D5                 0170        PUSH  D
C703 E5                 0180        PUSH  H
C704 47                 0190        MOV   B,A
C705 3A DD CF           0200 INIT   LDA   IFL           GET FLAG
C708 FE 49              0210        CPI   'I'           INITIALIZED?
C70A CA 1F C7           0220        JZ    DISPL         DISPLAY CHARACTER
C70D AF                 0225 INI    XRA   A             ZERO ACC
C70E D3 C8              0227        OUT   0C8H          ZERO SCROLL
C710 21 DD CF           0230        LXI   H,IFL
C713 36 49              0240        MVI   M,'I'         SET IFL
C715 2C                 0250        INR   L
C716 36 00              0260        MVI   M,0           NORMAL VIDEO
C718 2C                 0270        INR   L
C719 2C                 0275        INR   L
C71A 36 20              0280        MVI   M,32
C71C C3 BE C7           0350        JMP   CLRSC
C71F                    0360 *
C71F                    0370 * VIDEO DRIVER CONTINUES HERE
C71F                    0380 *
C71F 2A DB CF           0390 DISPL  LHLD  CURS
C722 3A DF CF           0410        LDA   UND
C725 77                 0420        MOV   M,A
C726 78                 0430        MOV   A,B
C727 B7                 0440        ORA   A
C728 CA D4 C7           0450        JZ    DELY          DELAY TO SLOW SCROLL
C72B FE 13              0452        CPI   13H           CTRL S SPEED
C72D CA EE C7           0454        JZ    INDEL
C730 FE 15              0460        CPI   21            15H  CURSOR UP
C732 CA A4 C7           0470        JZ    UP
C735 FE 12              0480        CPI   18            12H  CURSOR RIGHT
C737 CA 6B C7           0490        JZ    FORWD
C73A FE 0C              0500        CPI   12            0CH  CURSOR LEFT
C73C CA EA C7           0510        JZ    CRSBK
C73F FE 0E              0520        CPI   14            0EH  TOGGLE VIDEO
C741 CA B6 C7           0530        JZ    GRON
C744 FE 0F              0540        CPI   15            0FH  REVERSE VIDEO
C746 CA B1 C7           0550        JZ    GROFF
```

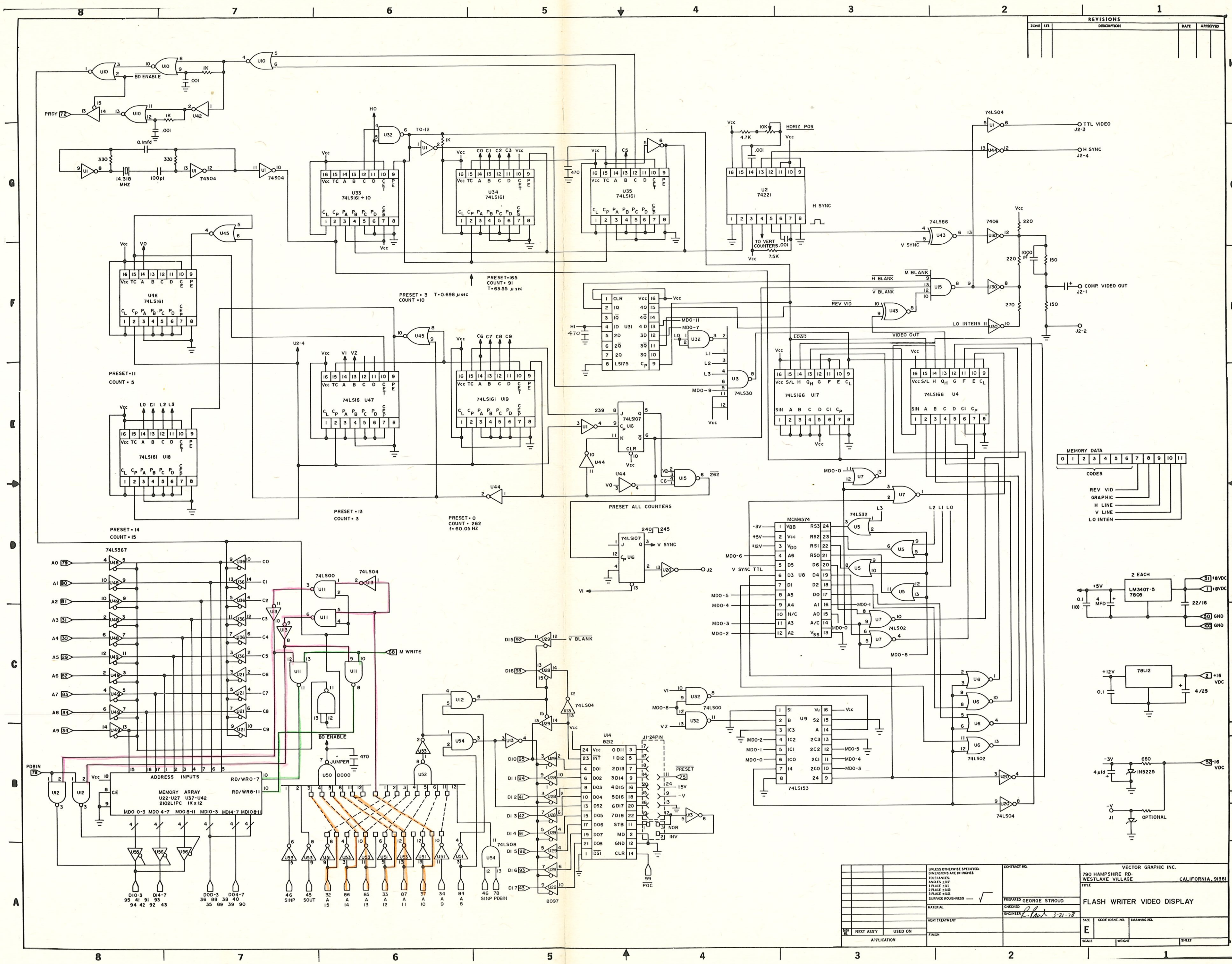
```
C749 FE 04          0560          CPI   04          04H  CLEAR SCREEN
C74B CA 0D C7       0570          JZ    INI
C74E FE 0A          0580          CPI   10          0AH  LINE FEED
C750 CA E1 C7       0590          JZ    LNFD
C753 FE 0D          0600          CPI   13          0DH CTRL M RETURN
C755 CA D0 C7       0610          JZ    CRTN
C758 FE 08          0620          CPI   08          08H  CURSOR HOME
C75A CA CA C7       0630          JZ    HMCRS
C75D FE 5F          0640          CPI   95          5FH  BACK SPACE
C75F CA E8 C7       0650          JZ    BKSPC
C762 E6 7F          0655          ANI   7FH         MASK MSB
C764 47             0660          MOV   B,A         SAVE A
C765 3A DE CF       0670          LDA   VFL         LOAD FLAG
C768 B0             0680          ORA   B           SET MSB
C769 47             0710          MOV   B,A
C76A 70             0730          MOV   M,B
C76B 23             0740 FORWD    INX   H
C76C 7C             0750 ONSCR    MOV   A,H
C76D FE D4          0760          CPI   PSTAT+4
C76F C2 8E C7       0770          JNZ   RETRN
C772 21 00 D0       0780          LXI   H,PAGE
C775 11 40 D0       0790          LXI   D,PAGE+64
C778 1A             0810 SCROL    LDAX  D
C779 77             0820          MOV   M,A
C77A 13             0830          INX   D
C77B 23             0840          INX   H
C77C 7A             0850          MOV   A,D
C77D FE D4          0860          CPI   PSTAT+4
C77F C2 78 C7       0870          JNZ   SCROL
C782 36 20          0890 CLRLN    MVI   M,20H       WRITE SPACE
C784 23             0900          INX   H
C785 7C             0910          MOV   A,H
C786 FE D4          0920          CPI   PSTAT+4
C788 C2 82 C7       0930          JNZ   CLRLN
C78B 21 C0 D3       0940          LXI   H,PAGE+960
C78E 7E             0950 RETRN    MOV   A,M
C78F 32 DF CF       0955          STA   UND
C792 F6 80          0960          ORI   80H         REVERSE VID CURSOR
C794 77             0970          MOV   M,A
C795 22 DB CF       0990          SHLD  CURS
C798 E1             1000          POP   H
C799 D1             1010          POP   D
C79A C1             1020          POP   B
C79B F1             1030          POP   PSW
C79C C9             1040          RET
C79D 3C             1050 DELAY    INR   A
C79E C2 9D C7       1060          JNZ   DELAY
C7A1 C3 8E C7       1070          JMP   RETRN
C7A4 11 C0 FF       1080 UP       LXI   D,-64
C7A7 19             1090          DAD   D
C7A8 7C             1100 FIX      MOV   A,H
C7A9 E6 03          1110          ANI   3
C7AB F6 D0          1120          ORI   PSTAT
C7AD 67             1130          MOV   H,A
C7AE C3 8E C7       1140          JMP   RETRN
C7B1 3E 80          1150 GROFF    MVI   A,80H
```

```
C7B3 C3 B8 C7            1160          JMP   SET
C7B6 3E 00               1170 GRON     MVI   A,0
C7B8 32 DE CF            1180 SET      STA   VFL
C7BB C3 8E C7            1190          JMP   RETRN
C7BE 21 00 D0            1240 CLRSC    LXI   H,PAGE
C7C1 36 20               1260 WRSPC    MVI   M,20H
C7C3 23                  1270          INX   H
C7C4 7C                  1280          MOV   A,H
C7C5 FE D4               1290          CPI   PSTAT+4
C7C7 C2 C1 C7            1300          JNZ   WRSPC
C7CA 21 00 D0            1310 HMCRS    LXI   H,PAGE
C7CD C3 8E C7            1320          JMP   RETRN
C7D0 7D                  1330 CRTN     MOV   A,L
C7D1 E6 C0               1340          ANI   0C0H
C7D3 6F                  1350          MOV   L,A
C7D4 3A E0 CF            1351 DELY     LDA   SPD          LOOK AT DELAY PARAM.
C7D7 57                  1352          MOV   D,A
C7D8 7A                  1353 DLOOP    MOV   A,D
C7D9 A7                  1354          ANA   A
C7DA 1B                  1355          DCX   D
C7DB C2 D8 C7            1356          JNZ   DLOOP
C7DE C3 8E C7            1360          JMP   RETRN
C7E1 11 40 00            1370 LNFD     LXI   D,64
C7E4 19                  1380          DAD   D
C7E5 C3 6C C7            1390          JMP   ONSCR
C7E8 36 20               1400 BKSPC    MVI   M,20H
C7EA 2B                  1410 CRSBK    DCX   H
C7EB C3 A8 C7            1420          JMP   FIX
C7EE 3A E0 CF            1430 INDEL    LDA   SPD          LOOK AT DELAY
C7F1 C6 20               1435          ADI   32           INCREMENT DELAY
C7F3 32 E0 CF            1440          STA   SPD          RESTORE DELAY
C7F6 C3 8E C7            1445          JMP   RETRN
C7F9 CD 8B C0            1500 ECHO     CALL  0C08BH
C7FC C3 F9 C7            1520          JMP   ECHO

SYMBOL TABLE

BKSPC C7E8   CLRLN C782   CLRSC C7BE   CRSBK C7EA   CRTN  C7D0   CURS  CFDB
DELAY C79D   DELY  C7D4   DISPL C71F   DLOOP C7D8   ECHO  C7F9   FIX   C7A8
FORWD C76B   GROFF C7B1   GRON  C7B6   HMCRS C7CA   IFL   CFDD   INDEL C7EE
INI   C70D   INIT  C705   LNFD  C7E1   ONSCR C76C   PAGE  D000   PSTAT 00D0
RETRN C78E   SCROL C778   SET   C7B8   SPD   CFE0   UND   CFDF   UP    C7A4
VFL   CFDE   VIDEO C700   WRSPC C7C1

$
```


REVISIONS
VECTOR GRAPHIC INC.
790 HAMPSHIRE RD.
WESTLAKE VILLAGE
CALIFORNIA, 91361
FLASH WRITER VIDEO DISPLAY
PREPARED GEORGE STROUD
3-21-78
MEMORY DATA
PRESET ALL COUNTERS
COMP. VIDEO OUT
TTL VIDEO
H SYNC
V SYNC
MEMORY ARRAY
ADDRESS INPUTS