MAIL FOR THE USER GROUP HAS BEEN ARRIVING AT A RAPID RATE. WE NOW HAVE 100 PARTICIPANTS AND 5 TO 10 NEW LETTERS ARRIVE EVERY DAY. IT HASN'T BEEN EASY KEEPING UP, SO THE MAJORITY OF THIS NEWSLETTER WILL BE A ROSTER WITH COMMENTS FROM THE PARTICIPANTS.

#1. BUGS IN CONSTRUCTION ARTICLE OR ON PC BOARDS.
SEE NEWSLETTER #1 AND NOTE THE FOLLOWING:
A) ON LED REGISTER BOARD, C2 GOES FROM B+ TO B+ AND SHOULD GO FROM B+ TO GND.
B) ON ADDRESS LATCH BOARD, THERE SHOULD BE A JUMPER FROM IC1 PIN 5 TO IC2 PIN 1.
C) ON MEMORY BOARDS, DO NOT PUT FRONT TO BACK JUMPERS IN HOLES SHOWN BELOW EVEN THO THE HOLES ARE DRILLED SINCE YOU WILL SHORT OUT THE MEMORY OUTPUT LINES.

#2. SOURCES FOR OBTAINING 8008.
A) BILL GODBOUT - TERRY RITTER WAS VERY PLEASED - SEE ROSTER.
B) RGS ELECTRONICS - $75, SEE ROSTER.
C) ELECTRONIC COMPONENT SALES - VERY QUESTIONABLE, IF THEY EXIST AT ALL. PRESENT INFO INDICATES OPERATOR OF COMPANY HAS 12 ALIASES AND HAS SWINDLED PEOPLE FOR OVER $400,000 BUT SOME MATERIAL IS BEING DELIVERED NOW AND A FEW PEOPLE HAVE REPORTED REFUNDS.
D) M&R ENTERPRISES, P.O. BOX 1011, SUNNYVALE, CA 94088 8008 CPU $60, CPU, ALL RESISTORS AND CAP FOR MARK-8 AND 15 7400'S, $75.
E) ROBERT W. COOK - SEE HIS LETTER IN LAST PART OF NEWSLETTER.
F) SEE MARTIN RESEARCH DATA IN BACK OF NEWSLETTER.
G) JAMES S. HEATON CO, INC. 3772 KATTELLA AVE., LOS ALAMITOS, CA 90720 DISTRIBUTOR FOR MICROSYSTEM INTERNATIONAL'S MF8008R 2ND SOURCE CHIP @ $95 BUT WRITE FOR SINGLE UNIT PRICE.
H) KA COMPONENT SALES - SEE FLYER IN BACK OF NEWSLETTER -- NOTE THAT NEW 8008 CPU PRICE IS $66.
H) ELECTRONIC DISCOUNT SALES, 138 N. 81ST ST., MESA, ARIZONA 8008 CPU FOR $59.45

#3 SOURCES OF OTHER COMPONENTS
A) SEE S. LIEBERMAN'S APPRAISAL OF HOBBY IC SUPPLIERS IN ROSTER.
B) SEE FLYER PROVIDED BY KA ELECTRONICS IN BACK OF NEWSLETTER.
C) FOR MOLEX CONNECTORS TRY FORCE ELECTRONICS, 343 HINDRY AVE., INGLEWOOD, CA 90301
D) SIGNETICS IC'S, HAMILTON ELECTRO SALES, 10912 W. WASHINGTON BLVD., CULVER CITY, CA 90230, 213-870-7171. WRITE THEM AND YOU WILL NEVER RECEIVE AN ANSWER - TELEPHONE AND YOUR IC'S WILL BE SENT OUT COD UPS THAT SAME DAY.

#4 KITS
IF ANYONE HASN'T BOUGHT PARTS YET, IT WOULD BE WORTH SERIOUSLY EVALUATING RGS ELECTRONIC'S KIT, INFO IN BACK OF NEWSLETTER OR THE SCELBI, SEE ROSTER AND INFO IN BACK. I'D VERY MUCH LIKE TO SEE THEIR MANUALS BUT AM UNWILLING TO SPEND THE MONEY. IF ANYBODY WOULD LOAN ME A COPY FOR A COUPLE OF DAYS I'D APPRECIATE IT.

#5 OUTSTANDING NEWS

A) A CALCULATOR INTERFACE ARTICLE IS SCHEDULED FOR RE IN SEVERAL MONTHS BY J. TITUS.

B) A CASSETTE TAPE UNIT FOR THE TV TYPEWRITER (TVT) IS SCHEDULED FOR THE JANUARY RE BY ROGER L. SMITH.

#6 CASSETTE TAPE INTERFACE

MAYBE MR. SMITH'S ARTICLE WILL SOLVE OUR PROBLEMS. I'LL KEEP COPYING ARTICLES UNTIL THEN. ROBERT COOK SENT IN THE REPRINT OF THE SIGNETICS FSK CIRCUIT AND THE ECONOMY MODEL TAPE SYSTEM CIRCUIT REPRINT.

#7 TTY INTERFACE

ROBERT COOK SENT IN THE CIRCUIT REPRINT INCLUDED. ALSO INCLUDED IS A REDRAWING OF THE ILLEGIBLE CIRCUIT PRINTED IN THE LAST ISSUE.

#8 STANDARDIZATION

WHAT A TOUGH ONE THIS IS! PLEASE SEND IN ANY AND ALL COMMENTS. IT IS ESSENTIAL THAT WE GET SOMETHING ESTABLISHED SOON FOR:

1) TTY INTERFACE INCLUDING PAPERTAPE FORMAT
2) TVT INTERFACE 3) CASSETTE TAPE INTERFACE
4) HIGH SPEED PAPER TAPE READER AND PUNCH INTERFACE
5) SCOPE GRAPHICS TERMINAL DRIVER 6) A/D AND D/A INTERFACES
7) SWITCH-RELAY INTERFACE 8) PROGRMMMABLE TIMER
9) ETC

SOME OF THIS WILL BE FORCED BY: 1) INTEL 2) RGS 008A
*3) SCELBI COMPUTERS 4) PRO LOG CORP., 852 AIRPORT ROAD, MONTERY, CA 93930
5) DIGITAL EQUIPMENT CORP., MAYNARD, MASS 01754
6) PLEASE REPORT OTHER MANUFACTURERS USING 8008 CHIPS.
7) LARGE USERS OF 8008 SYSTEMS SUCH AS: LAWRENCE RADIATION LABS, LIVERMORE, CA

THE PROBLEM IS TO OBTAIN AND SORT THRU ALL OF THIS, SEE HOW IT TIES IN TO THE MARK-8 AND ESTABLISH SOMETHING QUICK. IT SEEMS THAT THERE ARE TWO STANDARD CONFIGURATIONS WE MUST DEAL WITH: 1) MARK-8 BUILT EXACTLY AS SPECIFIED IN THE RE ARTICLE. 2) MARK-8 MODIFIED TO INCLUDE EXPANDED I/O CAPABILITY.

I'D LIKE TO PROPOSE THE CONFIGURATION SHOWN IN FIGURE 1 AS THE I/O MODIFIED STANDARD. THIS IS LIKE THE POPULAR CONFIGURATION IN USE BY THE HUNDREDS AT LAWRENCE RADIATION LABS. THEY HAVE STANDARD MODULES, CHASSIS, ETC. FOR THS CONFIGURATION AND AN ENORMOUS AMOUNT OF STANDARD SOFTWARE. EXAMPLE: A 256 WORD PROM THAT GIVES COMPLETE TTY CONTROL OF THE 8008 FEATURING: OCTAL LOADING OF H & L, 2) EXAMINE AND DEPOSIT FROM KEYBOARD INTO MEMORY 3) START APROGRAM IN MEMORY 4) LOAD A PROGRAM FROM PAPER TAPE (WHO NEEDS A FRONT PANEL?) I HAVE THS ONE AND AM TRYING TO GET FORMAL APPROVAL TO RELEASE IT.

ANOTHER CONFIGURATION TO LOOK AT WOULD BE INTEL'S INTELLEC 8. I AM LOOKING INTO WHAT THEY RECOMMEND AS A STANDARD. LET'S HAVE YOUR IDEAS QUICK SO WE CAN AGREE ON SOME STANDARDS BEFORE EVERYBODY GOES THEIR OWN WAY.

THAT SEEMS TO COVER EVERYTHING TO DATE. HOPE YOU WILL BE PATIENT WITH THE TYPING AND THE DUPLICATING. IT IS A VERY TIME CONSUMING JOB AND WE DON'T HAVE THE BEST EQUIPMENT TO WORK WITH. I HOPE YOU FIND THE INFORMATION VALUABLE AND AGAIN, PLEASE SEND IN ANYTHING THAT MIGHT BE OF USE TO OTHERS. I CAN'T PUT OUT A NEWSLETTER WITHOUT YOUR HELP. THE THE NEXT ISSUE WILL BE ABOUT A MONTH AWAY. I HAVE TO GET BOTH MY 8008 PROJECTS RUNNING PLUS BUILD A PDP-8 SCOPE DRIVER INTERFACE.

IF ANYBODY NEEDS A CROSS ASSEMBLER TO ASSEMBLE CODE ON A PDP-8 LET ME KNOW.

HAL SINGER
MARK-8 NEWSLETTER EDITOR
CABRILLO COMPUTER CENTER
4350 CONSTELLATION
LOMPOC, CA 93436

BILL ALLMON, 3121 SOUTH K, OXNARD, CA 93030

BILL AMES, 304 MOSHER JORDEN, ANN ARBOR, MICH. 48104 IS A COMPUTER ENGR. STUDENT AT THE UNIV. OF MICHIGAN. HE IS INTERESTED IN A CASSETTE RECORDER INTERFACE, AND WANTS TO MODIFY THE MARK-8 TO USE 16K SO HE CAN WRITE A HIGH LEVEL COMPILER (BASIC, FORTRAN, OR PL/1 SUBSET). HE WOULD LIKE TO KNOW IF ONE CAN SIMPLY INCREASE THE CLOCK FREQUENCY AND SUBSTITUTE A 8008-1. HE PLANS TO DEVELOP A MORSE CODE SENDING AND RECEIVING PROGRAM (HE'S WAOWBJ), A HIGH PRECISION FLOATING POINT PACKAGE WITH FUNCTIONS, AND EVENTUALLY THE COMPILER. HE WANTS A SOURCE OF VERY CHEAP 1101'S AND DOESN'T MIND FALLOUTS SINCE HE IS GOING TO CHECK THEM WITH THE MARK-8. IN HIS SECOND LETTER, BILL INDICATES THAT 4K IS SMALL FOR A GOOD BASIC (IT TAKES 4K OF 12 BITS IN A PDP-8 SO 6K IN THE MARK-8 IS MORE REALISTIC) BUT HE IS THINKING OF PUTTING THE OP-CODE ONTO A CASSETTE, AFTER EDITING, ORDERING, ETC., POSSIBLE WITH A COMPILE COMMAND. HE WANTS TO KNOW IF IT IS POSSIBLE TO CONNECT A /41 OP AMP SO A POSITIVE SIGNAL WOULD PRODUCE A 1 AND A NEGATIVE ONE A 0 FOR USE IN AN ALPHA-WAVE BIOFEEDBACK ANALYSIS MONITOR, AND WHERE CAN HE GET ROM'S PROGRAMMED.

RON ANGSTADT, RDE 3 BOX 281, KITZTOWN, PA 19530 PLANS TO USE HIS MARK-8 FOR HOME SECURITY, TV GAMES, AND INVENTORY ON FOOD SUPPLIES.

BILL ARNOLD, 216 1/2 AVE. B, FORT DODGE, IOWA 50501 TEAMS COMMUNICATION SERVICE, SAYS HE CAN FORSEE GREAT USE OF THE MARK-8 WITH HIS BUSINESS OF DESIGN AND MAINTENANCE OF COMMUNICATIONS SYSTEMS AND ANTENNAS.

CRAIG A. BAKER, 1310 PEORIA, APT. 1, AURORA, CO 80011

OTTO BARTH, ELBA TOOL CO., INC., 601 ESTES AVE., SCHAUMBURG, IL 60172 HASN'T STARTED A MARK-8 YET AND WANTS TO KNOW WHERE TO GET RELIABLE COMPONENTS. HE IS A NOVICE IN COMPUTERS AND WANTS SOME SUGGESTIONS AS TO HOW TO GET STARTED. HE WOULD LIKE TO USE THE COMPUTER FOR SCORING AND TIMING SKI RACES.

HARRY B. BATEMAN, 5638 SOUTH FOX CIRCLE #102, LITTLETON, CO 80120

ANGEL BRAVO, 10333 FELSON ST., BELLFLOWER, CA 90706 WANTS TO USE THE MARK-8 TO GAIN EXPERIENCE IN DEVELOPING SOFTWARE.

RICK BRENNAN, 601 S. KNIGHT, PARK RIDGE, IL 60068

JAMES CALLAS, SAN RAFAEL, CA 94903 HOPES TO USE THE SYSTEM FOR INFORMATION STORAGE AND RETRIEVAL AND IS PARTICULARLY INTERESTED IN MODEMS AND TAPE STORAGE.

DAVE CHAPMAN, 3420 S. PERKINS RD., MEMPHIS, TN 38118 IS A DRAFTSMAN AND IS KEENLY INTERESTED IN COMPUTER AIDED DESIGN. HE WANTS TO PUT TOGETTHER A VERY LOW COST CAD WITH CASSETTE STORAGE, DIGITAL PLOTTER, AND A GRAPHICS DIGITIZER, AND WOULD LIKE TO COMMUNICATE WITH ANYONE WITH SIMILAR INTERESTS.

C. TOM CHILDRESS, JR., 1006 APPLE DRIVE., BICOXI, MS, 39532 WILL USE THE MARK-8 AS A DATA HANDLING MACHINE WITH A KEYBOARD, TVT, CASETTE TAPE, TELEHONE INTERFACE, D/A AND A/D CONVERTERS. HE PLANS TO USE 1K OF 1101 MEMORY AND THEN INCREASE SIZE IN 4K INCREMENTS USING 2102'S. HE HAS ORDERED THE MARTIN RESEARCH BOOK AND AN 8008.

STEPHEN CIARCIA, UNIVERSAL OIL PRODUCTS, 41 HILLTOP DR., WEST HARTFORD, CN 06107 IS AN A/D SYSTEM DESIGNER AND IS RESEARCHING THE 8080 FOR HIS COMPANY AND IS COLLECTING IDEAS FOR HIS OWN 8008 SYSTEM.

JOSEPH A. CIMMINO II, 19304 RICHWOOD COURT, BROOKEVILLE, MD 20729

SCOTT COLEMAN, 8515 SPRUCE ST., S.W., TACOMA, WASH 98498 (TILLICUM ELECT)

ROBERT W. COOK, 25W178 39TH ST., NAPERVILLE, IL 60540 HAS THE AD IN RE FOR THE 8008. HE IS TRYING TO COLLECT ENOUGH ORDERS TO PLACE A QUANTITY ORDER.

EDWARD DEGRAFF, 6611 WENZ AVE., APT. O, HODGKINS, IL 60527 PLANS TO BUILD THE MARK-8 AND CONNECT IT AS AN EXPANSION TO HIS HP-35. HE IS A CHEMICAL ENGINEER AND HAS APPLICATIONS INVOLVING HEAT AND MASS BALANCES AND WANTS TO BUILD THE MARK-8 INTO A SUITCASE SO IT CAN BE USED ON SITE.

LARRY, DENISE, 3375 AZTEC RD., APT. 32C, DORAVILLE, GEORGIA 30340

STEPHEN L. DIAMOND, 311 CARL ST., SAN FRANCISCO, CA 94117

CHARLES DITE, 82 DAVID ST., SOUTH RIVER, NJ 08882 SAYS THAT HE IS NEW TO THE COMPUTER FIELD AND CAN USE ALL THE HELP HE CAN GET. (LET PEOPLE KNOW WHAT YOU NEED CHARLES, YOU'LL GET LOTS OF HELP.)

BURTON DORF, 315 OVINGTON AVE., BROOKLYN, NY 11209 WANTS TO INTERFACE A CALCULATOR CHIP AND A CASSETTE RECORDER.

CHARLES ECHARD, 7820 JACKSON ROAD, BEAUMONT, TX 77706 WILL USE THE MARK-8 AS A GENERAL PURPOSE COMPUTER AND FOR DATA ACQUISITION.

PAUL N. EVEN, 4637 ROSEHILL ST., PHILADELPHIA, PA 19120 HAS AN ANTIQUE REMINGTON TYPEWRITER, AN HP #561B 11 DIGIT PRINTER, AND A PAPER TAPE PUNCH HE WILL BE INTERFACING AND IS INTERESTED IN BUILDING A PAPER TAPE READER, OSCILLOSCOPE DISPLAY AND CASSETTE RECORDER. HE IS WILLING TO TRADE PROGRAMS ON PAPER TAPE. HE SUGGESTS USING 14 PIN DIP SOCKETS AND WIRE WRAP DIP SOCKETS PIGGYBACK FOR I/O CONNECTIONS (VERY CHEAP), AND USING THE INPUT MUX CIRCUIT IN FIG. 2A, AND USING OUTPUT LATCHES TO DRIVE THEIR OWN DISPLAYS AS IN FIGURE 2B.

M. PAUL FARR, 3723 JACKSTADT, SAN PEDRO, CA 90731 IS ETCHING HIS OWN BOARDS, AND PROVIDED THE 2ND SOURCE 8008 DISTRIBUTOR.

F. DALLAS FOGG, 1385 HIGH STIE DR., APT. 101, ST. PAUL, MN 55121 WANTS TO USE THE TVT, CASSETTE MAG TAPE, A 256 WORD PROM. HE WANTS INTERRUPT ADDRESS POINTERS AND A TAPE LOAD ROUTINE IN PROM, AND WANTS TO DEVELOP A KEYBOARD DEBUGGING ROUTINE, AND A MORSE CODE DECODER WITH ITS DISPLAY ON THE TVT.,

JIM FRY, 4249 N. LOCKWOOD, TOLEDO, OH 43612 (DIGI-TEL ELECTRONICS) IS WORKING ON A PROGRAM TO HANDLE INTERRUPTS WITHOUT LOSING THE REGISTER OR FLAG INFORMATION AND A HARDWARE REPLACEMENT FOR THE TVT CURSOR BOARD WHICH WILL ALLOW THE COMPUTER TO INDIVIDUALLY ADDRESS ANY CHARACTER OR LINE IN THE DISPLAY AND READ OR WRITE INTO THAT LOCATION.

FRANK GEHERTY, 826 WILLOWGLEN ROAD, SANTA BARBARA, CA 93105

KEITH GOERING, 720 S. ASHBY, CHANUTE, KS 66720 MENTIONED THE C2 ERROR ON THE LED BOARD.
DON GOLENSKIE, BOX A-375, CAMARILLO, CA WANTS TAPES FOR FORTRAN, BASIC, AND PL/1 AND WANTS TO USE THE MARK-8 FOR NUMBER CRUNCHING.

DR. GEORGE L. HALLER, 1500 GALLEON DR., NAPLES, FL 33940 USES A SCELBI COMPUTER AND HAS ORDERED A 33 RO TTY. HE SAYS ACTON TECHNICAL SERVICES, 919 CRYSTAL SPRINGS AVE., PENSACOLA, FL 32505 HAS A SUPPLY OF THESE AT REASONABLE PRICES. HE ALSO SENT IN THE SORTING PROGRAM IN FIGURE 3.

O. F. HAMM, 4751 LOUISIANA AVE., ST. LOUIS, MO 63111 MENTIONED THE CA LED BOARD ERROR AND POINTED OUT THE JUMPER OMISSION ON THE ADDRESS LATCH BOARD.

DAN HANCOCK, HANCOCKS' LABORATORY, PO BOX 312TALLAHASSEE, FL 32303 IS INTERESTED IN TEXT STREAMS, WORD PROCESSING, AND COMPUTER PRINTING OF ACADEMIC MATERIAL.

LLOYD G. HANSON, EE, CONSULTING ENGINEER, LAKELAND INSTRUMENT LABS, ROUTE 2, BOX 52-A, ANGOLA, IN 46703 WANTS TO GET TOGETHER WITH OTHER HAMS IN THE GROUP ON 15 OR 20 ONE DAY AND PASS AROUND INFORMATION (W9YCB). HE MENTIONS DODD DIGITAL DESIGN, 234 WAPLES PARK, FAIRFAX, VIRGINIA 22030 AS A DISTRIBUTOR OF TECHNICAL LITERATURE AND ASCII INTERFACE CARDS. THEIR CATALOG ON "SERIES 100" REQUIRES 50 CENTS IN STAMPS. SEE THE FOLLOWING: MOTOROLA DOCUMENT #AN-558, "CRT DISPLAY WITH DYNAMIC MOS RAM." ELECTRONIC DESIGN #19, EPT 14, 72. ELECTRONIC DESIGN #14, JULY 5, 74 PAGE 112, "IMPROVED DOT MATRIX GENERATOR". ELECTRONIC DESIGN, #1, JAN 4, 74, "7 X 9 CRT DISPLAY." PC BOARDS CAN BE OBTAINED FROM SEMTRONICS, RT 3, BOX 1, BELLAIRE, OH 43906. NOTE THE MARTIN RESEARCH INFO SUPPLIED BY LLOYD IN THE BACK OF THE NEWSLETTER.

RUDOLF HAUSDORF, 1961 REDONDO AVE., SALT LAKE CITY, UTAH 84108

IRVIN F. HAVENS, 9 HARVEY LANE, WESTBORO, MASS. 01581
DR. HOWARD, ELECTRICAL ENGR. DEPT., UNIV. OF CA, SANTA BARBARA, CA 93106. THEY ARE BUILDING 10 VERY ELABORATE 8008 BASED TRAINING SYSTEMS WITH OCTAL DIGIT INPUT AND OUTPUT, ALL REGISTER INFORMATION BROUGHT OUT DURING WAIT AND HALT, AND A VERY ELABORATE INTERRUPT STRUCTURE.

GREG HUNZINGER, 2332 OAKLAND ST., AURORA, CO 80010 WORKS FOR METRO STATE COLLEGE IN THEIR TV STUDIO AND IS BUILDING THE TVT TO INTERFACE WITH THEIR TV SYSTEM. HE WANTS TO ADD CASSETTE TAPE STORAGE SO HE CAN DO ALL KINDS OF WEIRD TITLING DURING TAPING OF A PROGRAM AND WOULD LIKE TO ATTEMPT SOME COMPUTER ART.

J. L. ISENHOWER, PO BOX 7352, LONG BEACH, CA 90807

PRIMUS E. JACKSON, JR., 947 18TH ST., SOUTH, ST. PETERSBURG, FL 33712

BYRON KIRKWOOD, PRESIDENT, KA ELECTRONIC SALES, 1220 MAJESTY, DALLAS, TX 75247 IS PROVIDING A SOURCE FOR SOME OF THE PARTS FOR THE MARK-8. HE MENTIONS THAT SOME OF THE PARTS ARE MORE EXPENSIVE THAN THE SURPLUS HOUSES, BUT ARE ALL NEW FIRST FIRST LINE DISTRIBUTOR PARTS. THEY DISTRIBUTE THE MF8008R MICROSYSTEMS INTERNATIONAL 8008 CHIP FOR $66. SEE THE COPY OF THE FLYER IN BACK OF NEWSLETTER.

JIM KASSEBAUM, RT 3 BOX 517, NEWBERG OR 97132 (TEKTRONIX) WAS THE FIRST ONE TO MENTION THE THRU BOARD JUMPER PROBLEM ON THE MEMORY BOARDS.

EDWARD KELLY, JR., PUBLIC ACCOUNTANT, 300 BARNSTABLE ROAD, HYANNIS, MA 02601

ROBERT W. KELLY, 5805 MT. TERMINAL DR., WACO, TX 76710 HAS ALSO ORDERED THE MARTIN RESEARCH BOOK AND 8008. HE PLANS TO USE THE MARK-8 FOR CALCULATION OF ENGINEERING PROBLEMS AND GENERAL RECORDS. HE AS OBTAINED TWO TT-7/FG TTY'S (BAUDOT) AND WANTS INFORMATION ON INTERFACING THEM.

PAUL LENTZ, 7072 HANOVER PKWY., APT. D-1, GREENBELT, MD 20770

S. LIEBERMAN, [illegible] AVE., LA, CA 90035 IS GOING TO DO A CALCULATOR AND CASSETTE TAPE INTERFACE. HE INCLUDED THE FOLLOWING ADDRESS FOR OBTAINING SWITCHES: UID ELECTRONICS, 4165 PEMBROKE RD., HOLLYWOOD, FL. 33021. HE IS ALSO INTERESTED IN 8080 SYSTEMS. HE BOUGHT THE MARTIN BOOK AND 8008 AND RECEIVED A CHIP WITH 2.5 MICROSEC CYCLE TIME VS INTEL'S 4.0 MICROSEC. HE IS IMPATIENTLY AWAITING HIS PC BOARDS AND RECOMMENDS LANCASTER'S TTL COOKBOOK (SAM). HE OFFERS THE FOLLOWING COMMENTS ON SUPPLIERS: BABYLON ELECTRONICS, VERY GOOD; POLYPAKS, VERY GOOD; DIGIKEY, VERY GOOD; INTERNATIONAL ELECTRONICS UNLIMITED, GOOD, 5% BAD UNITS, RETURN FOR REPLACEMENT. HE IS LOOKING FOR OTHER'S INTERESTED IN INTERFACING WITH AN HP-35.

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MIKE LINDSEY, 2625 FAIRGREEN DRIVE, PITTSBURGH, PA 15241 IS AN EE STUDENT AT UNIV. OF PITTSBURGH AND IS DOING SOFTWARE DEVELOPMENT FOR THE MARK-8 BY USING A PDP-10 SIMULATION PROGRAM. HE WOULD LIKE TO SEE CASSETTE TAPE, CORE MEMORY, A FORTRAN IV, AND A TRUE X-Y VIDEO DISPLAY.

DANIEL C. LINGROTH, 35 OFFICER'S COURT, LEXINGTON PARK, MD 20653

LOOMIS LABORATORIES, ROUTE1, BOX 121, PRAIRIE POINT, MISS. 39353

J. MCCORD, 330 VEREDA LEYENDA, GOLETA, CA 93017

K. A. MCGINNIS, PO BOX 1287, SAN MATEO, CA 94401 WANTS TO KNOW IF ANYONE IS INTERESTED IN 8080'S. HE IS BUILDING A SMALLER VERSION OF THE MARK-8 AND WANTS TO INTERFACE A CASSETTE RECORDER. HE MENTIONED KA ELECTRONIC SALES AND ELECTRONIC COMPONENTS SALES AS POSSIBLE SUPPLIERS.

WILLIAM R. MAINS, 139 - 17TH ST., PASO ROBLES, CA 93446 IS WAITING TILL THE RIGHT TIME TO BUILD UP AN EDUCATIONAL SYSTEM FOR THEIR HIGH SCHOOL USING EITHER AN 8008 OR 8080 MICRO-PROCESSOR.

M&R ENTERPRISES, PO BOX 1011, SUNNYVALE, CA 94088 HAS A 2513, 2518, & 6 EACH OF 2524 KIT AVAILABLE FOR $42.50 & 8008 CPU'S FOR $75 AND IS ATTEMPTING TO PUT TOGETHER A COMPLETE KIT OF PARTS FOR THE TVT.

DAN MARTIN, BOX 653, MALTA, MONTANA 59538 IS A STUDENT IN HIGH SCHOOL AND IS BUILDING THE TVT AND MARK-8. HE HAS A CIRCUIT FOR 8 INPUTS AND 24 OUTPUTS THAT HE WILL SOON SEND IN.

A. F. MASHBURN JR., 2591 SHALLOWFORD ROAD N.E., APT. 18, ATLANTA, GA 30345

JOHN K. MICHALIK, 36 LATHROP ST., BUFFALO, NY 14212 IS BUILDING A 1K MARK-8 WITH THE TVT AND WANTS INFORMATION ON BUILDING A CASSETTE RECORDER.

W. S. MILLER, 2813 WAGNER DR., BURLINGTON, NC 27215 WANTS A MARK-8 WITH A TYPEWRITER AND CASSETTE TAPE INTERFACE

R. W. MOELL, 5505 DAYWOOD CT., RALEIGH, NC 27609

DR. JOHN R. NICHOLS, CAPITOL CAMPUS 10, W154, PENNSYLVANIA STATE UNIVERSITY, MIDDLETOWN, PA 17057

TOM PAROUETTE, 116 SANFORD AVENUE, CLINTON, NY 13323 IS ORDERING PARTS AS HE CAN AFFORD THEM AND WANTS TO USE A CARD READER AND PUNCH, IMPACT PRINTER, CRT CONSOLE, EXPANDED MAIN MEMORY, AND TAPE AND DISK DRIVES.

CABELL A. PEARSE, 3523 TILDEN STREET, N.W., WASHINGTON D.C. 20008 INTENDS TO USE HIS MARK-8 AS AN INSTRUMENT CONTROL UNIT AND IS INTERESTED IN ANY UTILITY SOFTWARE ROUTINES AVAILABLE.

LAURENCE L. PLATE, 2320 SKYLINE WAY, SANTA BARBARA, CA 93109 LISTS AS ONE OF HIS PROJECTS THE WRITING OF A BASIC. HE IS NOW SORT OF RETIRED AND WAS THICK IN COMPUTERS IN MILITARY RESEARCH AND DEVELOPMENT. FOR REMOVING IC'S HE SUGGESTS USING KWIK-WICK (SIZE #2), A FINE IRON, AND A PRESSURE CLIP. HE WOULD RATHER USE IC SOCKETS. HE IS WILLING TO ANSWER QUESTIONS ON SOFTWARE PROBLEMS.

LARRY PLESKAC, 938 PAULA ST., ESCONDIDO, CA 92027 WOULD LIKE TO SEE A PAPER TAPE PUNCH AND READER, CASSETTE TAPE, A CALCULATOR INTERFACE, AND A GRAPHIC DISPLAY MODE FOR THE TVT. HE IS ADDING OCTAL READOUT DISPLAY, CPU STATE LAMPS, PROCESSOR CYCLE LAMPS, AND FLAG LAMPS TO HIS MARK-8

TED J. POULOS, 18 CUSHING ROAD, BROOKLINE, MASS. 02146 WILL USE HIS MARK-8 TO GAIN PRACTICAL EXPERIENCE IN PROGRAMMING IN ASSEMBLY LANGUAGE. HE HAS BUILT THE TVT AND WANTS TO ADD A CASSETTE RECORDER.

RADIO-ELECTRONICS, SUITE 1105, 200 PARK AVENUE SOUTH, NEW YORK, NY 10003

JOHN G. RAICHE, 10406 - 55TH AVE. SOUTH, SEATTLE WASHINGTON, 98178

DALE REID, 1127 DRAKE ST., MADISON, WISCONSIN 53715

RGS ELECTRONICS, 3650 CHARLES ST., SUITE K, SANTA CLARA, CA 95050 HAS ANNOUNCED THEIR 008A KIT. THEY ARE WORKING ON THE FOLLOWING ADDITIONS: KEYBOARD, ($50), CASSETTE RECORDER ADAPTER, TV ADAPTER. PRICE OF THE 008A IS $300 CASH. SEE ENCLOSED SHEET FOR DETAILS. THEY WOULD BE GLAD TO DEMONSTRATE IF YOU WOULD LIKE TO DROP IN. THEY ARE AGAIN STOCKING THE 8008 BUT AT $75. REGARDING RELIABLE SUPPLIERS, RAY STEVENS, THE OWNER, RECOMMENDS HIS OWN COMPANY OF COURSE, & BILL GODBOUT. HE KNOWS OF AT LEAST ONE PERSON THAT GOT BURNED BADLY BY ELECTRONIC COMPONENT SALES. THEY ALSO INCLUDE A 1 YEAR MEMBERSHIP IN THEIR PROGRAM EXCHANGE GROUP WITH THE KIT OR MANUAL ($25) PURCHASE.

R. RILEY, BOX 4310, FLINT, MI 48504

TERRY F. RITTER, VICE PRESIDENT, DIRECTIONAL ANTENNA CO., 2524B GLEN SPRINGS WAY, AUSTIN, TX 78741 FINISHED DEBUGGING HIS MARK-8 ON 9 SEPT. HE SUGGESTS USING OUTPUT PORT #5 AS INPUT TO A 74193 PROGRAMMABLE DELAY TIMER. (MORE DETAILS PLEASE). HE IS GOING TO CONNECT A TTY, COMPUTER KEYBOARD, AND CASSETTE TAPE I/O. HE PURCHASED HIS 8008 FROM BILL GODBOUT AND RECEIVED IT IN A WEEK, AIRMAIL, AND WITH A SOCKET. SUSPECTING IT TO BE DEFECTIVE, HE REQUESTED A REPLACEMENT AND IT ARRIVED IN FIVE DAYS, AGAIN BY AIRMAIL. HE COULDN'T BE HAPPIER WITH THEM AS A SUPPLIER. AN ORDER WITH SCELBI HAS BEEN IN FOR A MONTH AND A HALF WITH NO NOTICEABLE RESULTS. HE NOTES THAT IT IS POSSIBLE TO BUILD A BETTER INPUT BOARD BUT HAS NOT FURNISHED A SCHEMATIC AS YET. HE SUGGESTS USING SOFTWARE FOR ASCII TO BAUDOT CONVERSION. HIS LINE OF ATTACK IS: 1) KEYBOARD INTO COMPUTER (DONE) 2) KEYBOARD LOADING AND TTY DUMP SOFTWARE. 3) 1K ROM FOR BASIC SOFTWARE 4) CASSETTE TAPE DUMP 5) 12K CORE MEMORY SYSTEM. HE SPENT ABOUT 20 HOURS FULLY DEBUGGING HIS UNIT AND CAN SUGGEST LINES OF ATTACK IF ANYONE ELSE SHOULD HAVE PROBLEMS.

F. B. ROBERTSON, 1406 CREEK HOLLOW DRIVE, SEABROOK, TX 77586

NOLEN F. ROBERSON, 12511 JACKSON AVE., GRANDVIEW, NO 64030 IS A STUDENT AT PARK COLLEGE AND IS USING THIS PROJECT FOR HIS SENIOR LAB AND RESEARCH PROJECT. HE WANTS TO INTERFACE WITH A CALCULATOR CHIP.

WARREN G. ROME, 6221 AMHURST ST., METAIRE, LOUISIANA 70003 WILL INTERFACE THE TVT AND A CALCULATOR TO HIS MARK-8 AND USE IT FOR PERSONAL AND JOB RELATED PROBLEM SOLVING AND INFORMATION CONSOLIDATION.

SCELBI COMPUTER CONSULTING, INC., 1322 REAR - BOSTON POST ROAD, MILFORD, CN 06460 ORDER THEIR BASIC LITERATURE PACKAGE. THEY OFFER KITS STARTING WITH BARE BOARDS AND GOING ALL THE WAY TO AN ASSEMBLED 4K COMPUTER. THEY ALSO FEATURE SOFTWARE AND A CRT AND CASSETTE RECORDER INTERFACE. A COPY OF THEIR INFO SHEET FOR THE CASSETTE RECORDER IS INCLUDED. THEIR MANUAL PRICE IS NOW $10. THEIR EXPERIENCE WITH HOBBYIST OUTLET 1101'S WAS A FAILURE RATE OF 15 TO 40%. ABOUT 80% OF THE FAILURES WERE FOUND IN INCOMING INSPECTION AFTER TEMPERATURE CYCLING. THE REMAINDER FAILED LATER, USUALLY WITHIN SEVERAL WEEKS BUT SOME AFTER SEVERAL MONTHS. THEY SUGGEST THAT IF YOU ARE GOING TO USE CHEAP MEMORY COMPONENTS THAT YOU HAD BETTER BE READY FOR LOTS OF FRUSTRATIONS. THEY CAN SUPPLY A LIMITED NUMBER OF INTEL 1101'S IN GROUPS OF 8 CHIPS FOR $45. THEY ALSO CAUTION THAT IF YOU ARE USING CHEAP IC'S FROM HOBBY SUPPLIERS, CHECK THEM BEFORE YOU SOLDER THEM INTO THE BOARD. TO REMOVE IC'S FROM A BOARD, THEY SUGGEST SACRIFICING THE IC BY CLIPPING THE LEADS ON THE TOP OF THE BOARD AND THEN SUCKING OUT THE SOLDER AND REMAINING LEADS FROM THE HOLES.

GRANT RUNYON, 1146 NIRVANA ROAD, SANTA BARBARA, CA 93101 IS BUILDING A TVT FOR USE IN THE HIGH SCHOOL FOR OFF-LINE PREPARATION OF PROGRAMS TO BE INPUT TO THEIR DATA GENERAL TIME-SHARE BASIC SYSTEM.

WILLIAM E. SEVERANCE, JR., CENTER LOVELL, MN 04016 IS CURRENTLY BUILDING THE TVT AND EXPECTS TO START THE MARK-8 IN DECEMBER. HIS PRESENT PLANS INCLUDE EXPERIMENTING, SOFTWARE DEVELOPMENT, (HE SPECIALIZED IN PDP-10 ASSEMBLY LANGUAGE PROGRAMMING IN COLLEGE), AND DESIGN OF ADD-ONS SUCH AS A CALCULATOR INTERFACE, FSK MODEM FOR AUDIO CASSETTE STORAGE, AND A PROM PROGRAMMER. HE MENTIONS THAT IT IS VERY IMPORTANT THAT WE JOIN TOGETHER IN STANDARDIZATION OF I/O AND SOFTWARE FORMAT FOR FULL INTERCHANGE OF INFORMATION.

WM J. SCHENKER MD, 1515 NEWELL AVENUE, WALNUT CREEK, CA 94596

RONALD E. SEIBEL, 10 B ADAMS ST., AVON PARK, FL 33825

DON SINGER, ROUTE 1, BOX 12318, GASTON, OR 97119

ROGER L. SMITH, SMITH ENTERPRISES, 4502 E. NANCY LANE, PHOENIX, AZ 85040 ANNOUNCED THAT HE HAS AN ADD-ON CIRCUIT BOARD TO BE ADDED TO THE TV TYPEWRITER TO ENABLE ONE TO TRANSMIT AND RECEIVE DATA AS WELL AS RECORD IT ON A CASSETTE TAPE RECORDER. THE RECORDING FEATURE WOULD BE HANDY IN CONJUNCTION WITH A MARK-8 AS A BULK STORAGE MEDIUM. IT IS SCHEDULED FOR THE DECEMBER RE.

LEE L. C. SORENSEN, 10226 VICTORIA AVE., WHITTIER, CA 90604 FOUND THE SCELBI-8H USER MANUAL VERY VALUABLE ($10 FROM SCELBI). HE ALSO MENTIONS THE FIRST OF A TWO PART BOOK ARTICLE IN ANALYTICAL CHEMISTRY, VOL 46, #11, PAGE 917A SEPT. 74.

WAYNE SPLAWN, 1680 SE 2ND PLACE, GRESHAM, OR 97030

PETER SPOERRI, BOX 1527, HUNTER COLLEGE, 695 PARK AVENUE, NY, NY 10021 IS PRESENTLY INVOLVED IN BUILDING A MARK-8 FOR USE IN A CHEMICAL INSTRUMENTATION CLASS. HE IS GOING TO INTERFACE A SILICONIX LD110-11 A/D CONVERTER. HE SPOTTED A CASSETTE RECORDER TO TTY INTERFACE IN A RECENT ISSUE OF ELECTRONICS

MARK STUMP, 927 LAFAYETTE AVE., CINCINNATI, OHIO 45220

MICHAEL STEVENS, 10200 DESOTO AVE., CHATSWORTH, CA 91311

D. W. STICKLEY, BOX 370, MARS, PA 16046

BOB STOLLER, DIGITAL EQUIPMENT CORPORATION, PDP-11 SMALL SYSTEMS, MAYNARD, MASS. 01754

E. KENNETH TAYLOR, COMMUNICATIONS CONSULTANT, W6WT , 8528 WEST HARGIS ST., LOS ANGELES, CA 90034 IS STILL HAVING TROUBLE FINDING TVI PARTS AND IS STARING TO ACQUIRE MARK-8 PARTS.

JONATHAN A. TITUS, TITUS LABS, P.O. BOX 242, BLACKSBURG, VA 24060 HAS A CALCULATOR INTERFACE SCHEDULED FOR RE IN THE NEXT COUPLE OF MONTHS AND IS WILLING TO CONTRIBUTE SOME ITEMS SUCH AS A REMOTE INTERRUPT MODULE, EXPANSION OF MEMORY USING 2102 RAMS AND AN ASYNCHRONOUS TTY INTERFACE. HE IS PARTICULARLY HAPPY SO MANY PEOPLE HAVE ACTUALLY UNDERTAKEN CONSTRUCTION OF THE MARK-8. HE HAS A VERY INTERESTING MICRO-PROCESSOR ARTICLE IN EDN, AUG 20, 74, "HOW TO DESIGN A MICRO-PROCESSOR BASED CONTROLLER SYSTEM."

JAMES UPCHURCH, BOX 1987, SEBRING, FL 33870 WANTS A GOOD SOURCE OF MOLEX CONNECTORS.

CPT. MACK C. WARD JR., 3215 BARKSDALE RD., FAYETTEVILLE, NC 28301 HAS COMPLETED SOME RESEARCH ON BCD ALGORITHMS THAT HE WILL PROVIDE TO THE GROUP. HE INTENDS TO USE THE MARK-8 FOR TINKERING FOR THE MOST PART. HE IS NOW DEVELOPING A SOFWARE ROUTINE FOR HANDLING HIS END OF THE MONTH BILLS AND IS WORKING ON A LEAST SQUARES REGRESSION ANALYSIS PROGRAM.

KIRK WARREN, 5025 THACHER ROAD, OJAI, CA 93023

P. S. WEISS, 1020 WASHINGTON BLVD., OAK PARK, IL 60302

DARRELL D. WOOD, 1404 S. 57TH ST., MILWAUKEE, WISC. 53214 IS PLANNING ON SENDING US SOME DIAGRAMS AND PLANS FROM OTHER BOOKS THAT DEAL WITH X-Y PLOTTERS AND STRIP RECORDERS. HE IS WORKING ON A CHEAP X-Y PLOTTER.

MAX L. WYMORE, EDWARDS, SPANGLER, WYMORE & KLASS, ATTORNEYS AND COUNSELORS, 1200 UNITED BANK CENTER, 1700 BROADWAY, DENVER, CO 80202

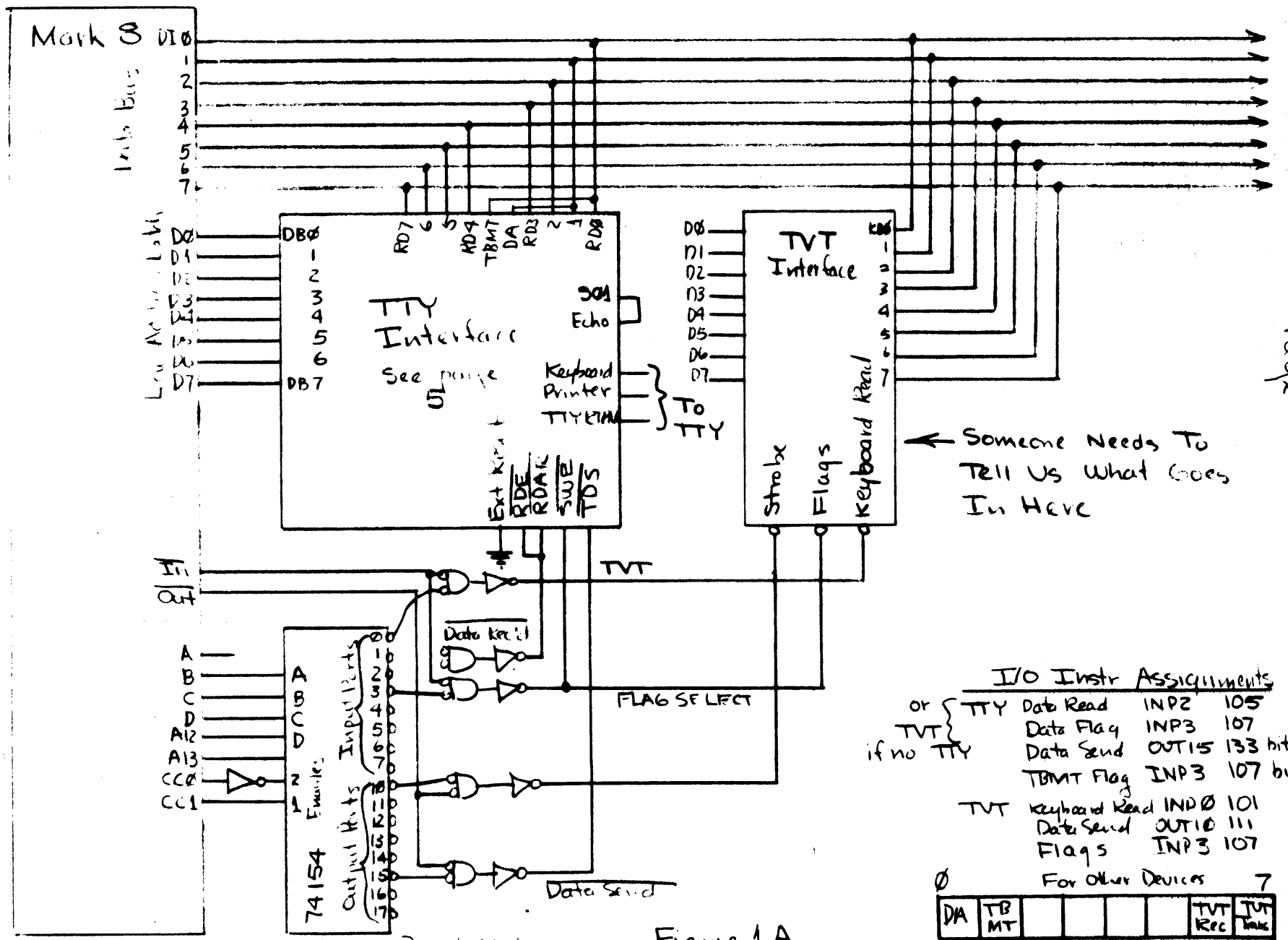


Figure 1A
(Note: Present Mark-8 Output Ports Remain Tri State Expanded I/O Configuration As Is)

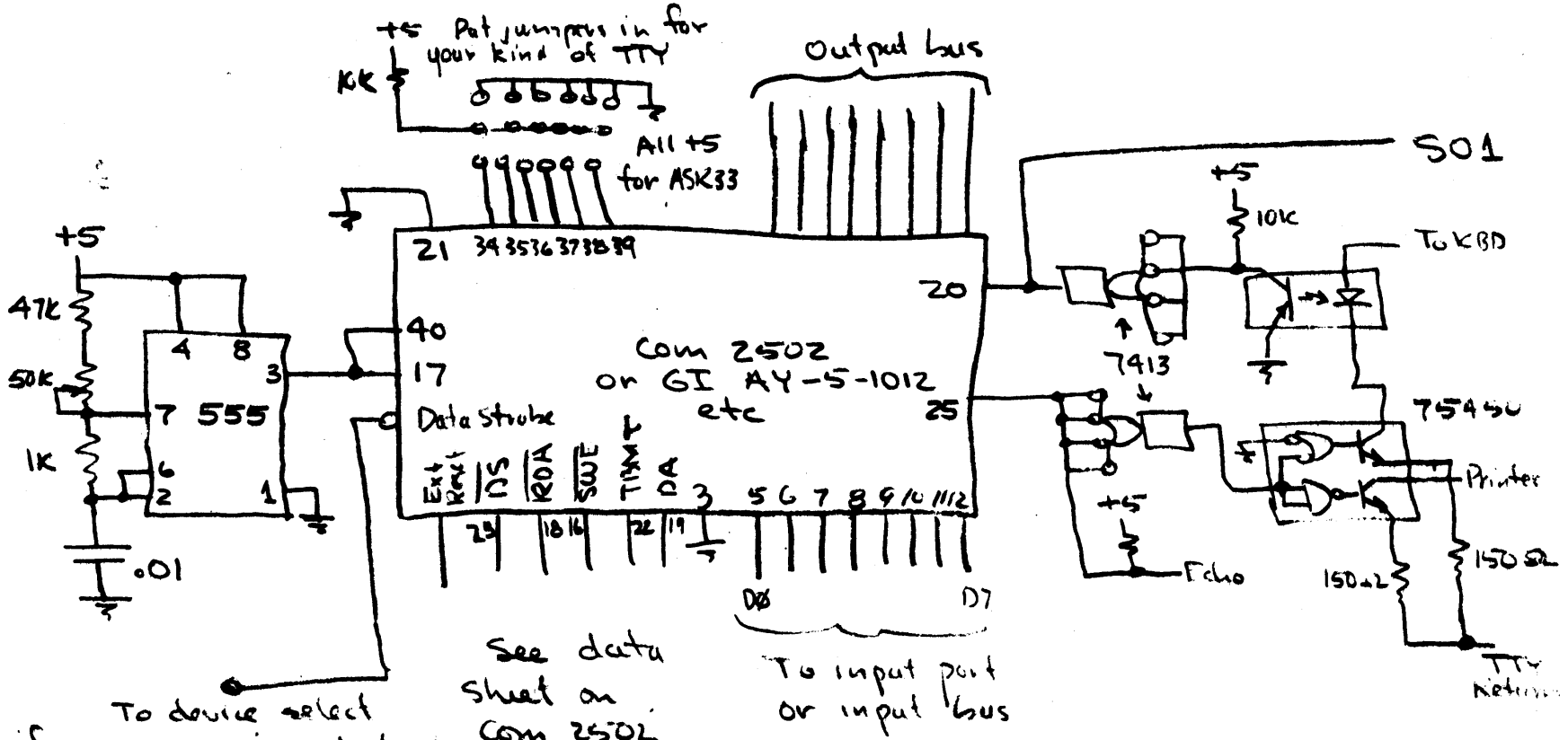
I/O Instr Assignments

or TTY	TTY	Data Read	INP2	105
		Data Flag	INP3	107
TVT if no TTY		Data Send	OUT15	133 bit Ø
		TBMT Flag	INP3	107 bit 1
	TVT	Keyboard Read	INPØ	101
		Data Send	OUT1Ø	111
		Flags	INP3	107

Ø For Other Devices 7

DA	TB MT					TVT Rec	TVT Trans

Flag Assignments



Order COM 2502 from

Energy Electronic Products Corp
6060 Manchester Ave
LA, CA 90045 for $13.20

Or Celetron Electronics
1618 James St
Syracuse, NY 13203 for $9.95
(he will supply a detailed TTY schematic)

Figure 1B TTY Interface
(See also Fig 1A)

Figure 2A Paul Even's Input Multiplexer Circuit

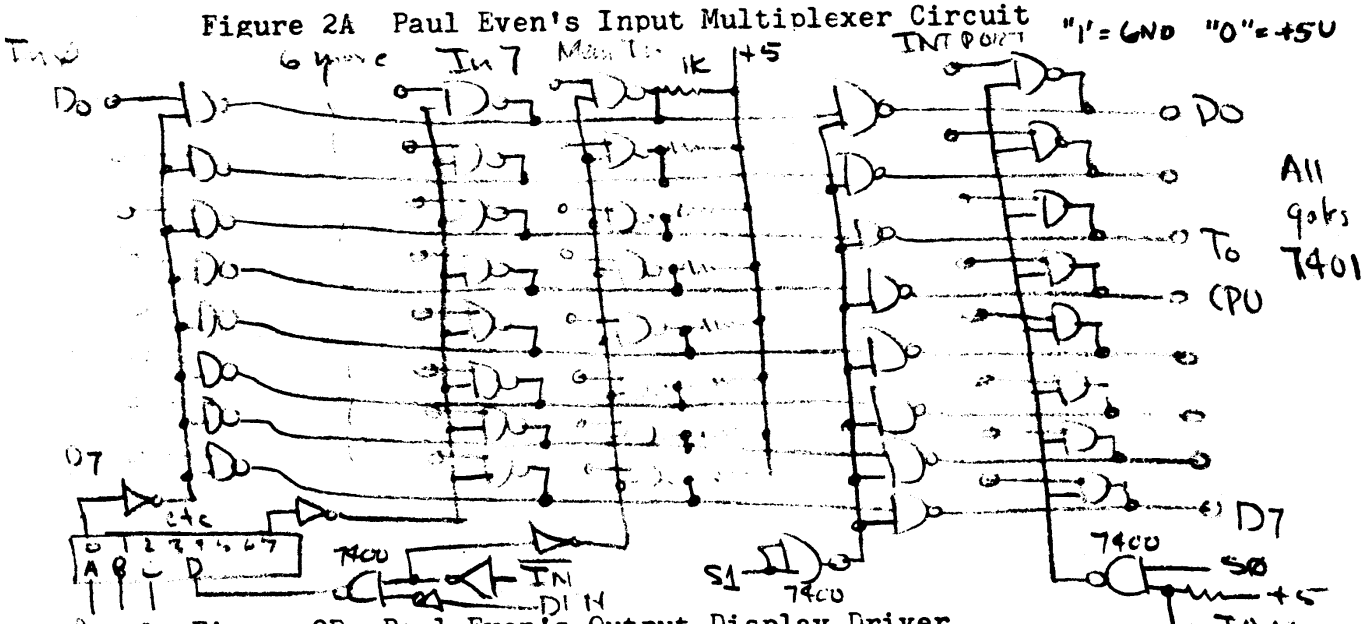


Figure 2B Paul Even's Output Display Driver

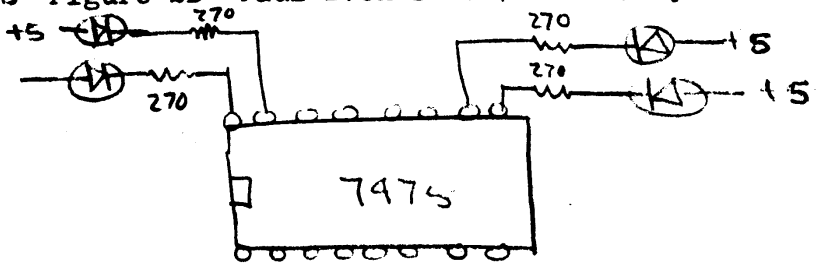


Figure 3 Dr. George Haller's Sorting Program

```
000 000   056     LHI
    001   001
    002   066     LLI
    003   000
    004   026     LCI
    005   XXX     One less than number of numbers
    006   307     LAM
    007   240     NDA sets C Flag
    010   060     INL
    011   277     CPM
    012   140     JTC
    013   030
    014   000
    015   021     DCC
    016   110     JFZ
    017   006
    020   000
    021   377     hlt
    030   317     LBM
    031   061     DCL
    032   307     LAM
    033   371     LBM
    034   060     INL
    035   370     LMA
    036   104     JMP
    037   000
    040   000
```

DELIVERY--Microcomputer Design is scheduled for publication on October 15, 1974. Prepublication orders will be shipped postpaid on that date, by United Parcel Service (by mail in non-UPS areas). Orders received after October 15 will normally be shipped within five days of receipt.

8008 OFFER--As advertised, one 8008 microprocessor is included with the book at a special promotional price, which is competitive with the price usually paid for the 8008 alone. The MF8008R supplied is manufactured by Microsystems International, Ottawa, Canada, and is identical to the Intel part. *(See second-source announcement in the* Electronic Design *survey of microprocessors, September 1, 1974, page 64.)* Each chip is tested and guaranteed. An 8008 manual will be shipped to purchasers with the book.

EARLY 8008 SHIPMENT--A person who orders *Microcomputer Design* before the publication date, October 15, 1974, and who wishes to receive the 8008 in advance, can make arrangements for early shipment of the microprocessor. Advance payment for the book, at $100.00, will be required.

CONTENTS OF THE BOOK--See the *CHAPTER OUTLINE*. The book is an original work, going far beyond the materials available from the microprocessor manufacturers. Release of the book, or sections thereof, before the publication date is not possible. *Microcomputer Design* is a copyright publication protected under the laws of the United States.

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		2	*3-9*	*10-24*	*25-99*	*100 UP*
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Martin Research Ltd. is not authorized to sell the 8008 microprocessor alone. The price for the book-plus-8008 combination is the same for quantity orders as for single orders. In computing quantity rates on books, credit is given to copies of the book previously bought by the same purchaser. Prices subject to change without notice. Non-exempt Illinois purchasers, please add 5% state sales tax. Terms: for recognized corporate purchasers, net 30 days. Martin Research reserves the right to request prepayment, or to delay shipment pending clearing of checks.

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Martin Research will be introducing a microcomputer module suitable for instruction, breadboarding, and prototyping in the fourth quarter of 1974. Contact us for details.

THANK YOU for your interest in *MICROCOMPUTER DESIGN*.

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microcomputer design

1.	INTRODUCTION	*What a microcomputer is and how it is used. Why microprocessor applications are growing. Cost of microprocessors as compared to random logic designs. Focus of this book: practical microcomputer design, with examples and schematics.*
2.	THE 8008 CPU	*General description. Speed and processing power of instruction set. Block diagrams. Timing.*
3.	THE 8080 CPU	*Description. Speed, added capabilities of instruction set. Comparison with 8008 for cost-effectiveness.*
4.	OTHER CPUs	*General descriptions of other currently available microprocessors.*
5.	8008 MAIN TIMING LOGIC	*Block diagram of full microcomputer. CPU clock design.* State decoding techniques.* Cutting manufacturer's prototype CPU chip count 20-50%.**
6.	BUS STRUCTURES	*Bidirectional bus drivers: advantages for systems design.**
7.	MICROCOMPUTER INPUT/ OUTPUT TECHNIQUES	*Input multiplexer design.* Bus-structured input design.* I/O strobe lines.* Peripheral strobe decoding techniques.**
8.	INPUT DESIGN APPROACHES	*Three-state devices.* Inputs from FIFOs; using FIFOs to absorb data bursts; interfacing to microprocessor.* UARTS.* Conditional input concepts.* Expanding number of input ports.**
9.	OUTPUT DESIGN APPROACHES	*Pulse outputs.* Gates and decoders.* One-shot outputs.* Conditional pulse outputs.* Standard conditional and addressable latch outputs.* Driving LED lamps from latches.* Flip-flop output design.* Multiple flip-flop outputs.* Alternate-action flip-flops.* Use of flip-flop for last-executed-port steering memory.**
10.	COMBINED INPUT/ OUTPUT TECHNIQUES	*When an input is an output. Table lookups.* Byte-swapping techniques.**
11.	ADDING INSTRUCTIONS TO 8008	*Simple hardware to provide one-byte 8008 instructions: output any register with one byte.* One-byte WAIT instruction.* SIN, COS, SQUARE ROOT instructions.**
12.	EXPANDING 8008 CAPABILITIES	*Push-pop, or LIFO, registers: implications for handling interrupts.* A one-byte, one-chip LIFO.* Low-cost 32-byte LIFO register.* Saving flags with software; examples. Single-chip design for flag saving.* Simple six-bit flag-saving technique.* Four-bit version.**
13.	RANDOM ACCESS MEMORY	*Design and cost criteria. Static RAMs.* Dynamic RAM.**
14.	READ-ONLY MEMORY (ROM)	*Comparison of types; suitability in different applications. Field-programmable ROMs for system characterization.* ROM programmers.**
15.	DIRECT MEMORY ACCESS	*Floating memory address lines.* Keeping track of external addresses. Avoiding interference with normal program flow.*

(continued, over)

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* *SCHEMATIC DIAGRAMS INCLUDED.*

16.	HANDLING INTERRUPTS	*"Zero-level" system.* Single-level system.* Three-level system with software priority encoder.* Full eight-level priority interrupt.**
17.	SAVING STATUS DURING INTERRUPTS	*Software approach using 8008, and its limits; examples. 8080 software. Hardware approach using 8008; costs.* Saving needed registers, flags with one chip.* Other designs.**
18.	INTERVAL TIMERS	*Timers to be read into CPU.* Timers to cause interrupts.**
19.	DIGITAL DISPLAYS	*Low-power seven-segment displays.* Scanning displays with decoders and multiplexers.**
20.	PERIPHERAL INTERFACE DESIGN	*Interfacing the peripheral to the microcomputer: where to draw the line. Systems approach to tapes, discs, keyboards, paper tape, modems.*
21.	KEYBOARDS	*Scanning keyboard encoders.* 2-of-13 encoders.* Interfacing to FIFO buffers and to microprocessor.**
22.	ANALOG INPUTS AND OUTPUTS	*Analog sample/hold.* Track/hold.* Analog multiplexer.* A/D converter.* Successive approximation registers.* D/A converters.* Analog output range switching to increase resolution.* Use of sample/hold, multiplexers for low-cost analog outputs.* Software implementation.*
23.	SOFTWARE TRICKS	*General purpose programs. Push-pop stack routine for 8008. Table lookup. Jump table. Indexed loops.*
24.	TESTING	*Designing microcomputers for easy testing. Externally sync'd scope.* Programs useful in repair work.* Using interrupts for testing.* Inexpensive three-chip 16-channel display for development and testing.* Octal or hex display to read instructions on the fly at normal system speed.**
25.	A 15-IC 8008 MICROCOMPUTER	*How it works.* Interrupt handling: saving status, losing use of only one register.*
26.	A 19-IC 8008 MICROCOMPUTER	*With interrupts, 2K bytes ROM, 256 bytes RAM. Input and output interfaces and full keyboard interface.*

APPENDICES

A.	GLOSSARY OF SYMBOLS	*Logic symbols used in this book.*
B.	MOS ICs	*Capacitative loading and speeds for MOS ICs used in this book.*

* *SCHEMATIC DIAGRAMS INCLUDED.*

THIS IS AN INTERFACE THAT ALLOWS THE USER TO UTILIZE A LOW COST AUDIO TAPE CASSETTE RECORDER AS A PERIPHERAL DEVICE FOR STORING PROGRAMS OR DATA FOR THE SCELBI-8H MINI-COMPUTER. THE DATA OR PROGRAMS CAN THEN BE RELOADED BACK INTO THE MEMORY OF A SCELBI-8H WHENEVER DESIRED. THE SYSTEM IS ABOUT FIVE TIMES FASTER THAN A TYPICAL TELETYPE PAPER TAPE SYSTEM. IT THUS GREATLY INCREASES THE EFFICIENCY WITH WHICH PROGRAMS CAN BE LOADED INTO THE COMPUTER, OR SAVED FOR FUTURE USE. THE LOW COST OF THE UNIT MAKES IT AN EXTREMELY ATTRACTIVE ADDITION TO ANY SCELBI-8H MINI-COMPUTER SYSTEM.

TECHNICAL INFORMATION

THE SCELBI AUDIO MAGNETIC TAPE INTERFACE UTILIZES AN ASYNCHRONOUS RECORDING TECHNIQUE THAT GREATLY SIMPLIFIES THE RECORDING AND PLAYBACK PROCESS WHILE SIGNIFICANTLY INCREASING THE RELIABILITY OF THE SYSTEM.

IN THE RECORDING MODE THE INTERFACE ACCEPTS 4 BITS (HALF OF A SCELBI-8H WORD) IN PARALLEL FROM AN OUTPUT PORT AS DATA BITS FOR TRANSMISSION TO THE TAPE RECORDER. TWO ADDITIONAL BITS ON THE SAME OUTPUT PORT (OF THE REMAINING 4 AVAILABLE) ARE USED TO CONTROL OPERATION OF THE INTERFACE/TAPE RECORDER. ONE OF THESE TWO BITS IS USED TO ACTUATE A SMALL RELAY ON THE INTERFACE CARD. THE CONTACTS OF THE RELAY MAY BE USED TO AUTOMATICALLY START OR STOP THE TAPE RECORDER. THE SECOND BIT INFORMS THE INTERFACE WHEN IT IS TO GO TO THE WRITE MODE.

WHEN THE INTERFACE RECEIVES THE 4 DATA BITS TO BE WRITTEN ON THE TAPE RECORDER, THE INTERFACE ADDS A "START" BIT TO THE DATA AND THUS TRANSMITS A GROUP OF 5 BITS OF INFORMATION (START BIT PLUS 4 DATA BITS) TO THE TAPE RECORDER USING A TWO TONE FSK TECHNIQUE AT A NOMINAL RATE OF 650 BAUD. THE FSK TONES ARE NOMINALLY 1300 HZ FOR A "0" AND 2600 HZ FOR A "1" CONDITION. DURING THE TIME THAT THE DATA IS BEING SERIALLY TRANSMITTED TO THE TAPE UNIT, A CONTROL SIGNAL GOING TO AN INPUT PORT OF THE SCELBI-8H COMPUTER IS USED TO INFORM THE COMPUTER THAT THE INTERFACE IS "BUSY." WHEN THE DATA HAS BEEN TRANSMITTED THE BUSY FLAG IS CLEARED AND THE INTERFACE IS READY TO ACCEPT THE NEXT 4 BITS FROM THE COMPUTER.

THE INTERFACE ALSO CONTAINS A DELAY CIRCUIT THAT ENABLES THE TAPE RECORDER UNIT TO REACH NORMAL OPERATING SPEED BEFORE THE FIRST GROUP OF BITS IN A BLOCK OF DATA ARE TRANSMITTED.

IN THE RECEIVE MODE THE INTERFACE ACCEPTS DATA IN ASYNCHRONOUS SERIAL FASHION. DATA COMING FROM THE TAPE RECORDER IS FED TO A FSK DISCRIMINATOR. THE OUTPUT OF THE DISCRIMINATOR IS FILTERED, SHAPED, AND LEVEL SHIFTED TO PROVIDE A "TTL" SIGNAL TO ONE LINE OF AN INPUT PORT ON A SCELBI-8H. THIS LINE IS NORMALLY ON THE SAME INPUT PORT AS THAT USED TO RECEIVE THE "BUSY" FLAG. IN THE RECEIVE MODE A TYPICAL TAPE READ PROGRAM CHECKS THE INPUT DATA LINE UNTIL IT DETECTS A START BIT. AFTER THE START BIT HAS BEEN DETECTED APPROPPIATE DELAYS ARE USED TO ALLOW PROPER SAMPLING OF THE NEXT 4 DATA BITS. THE 4 DATA BITS ARE ORGANIZED INTO HALF A SCELBI-8H WORD AND THE PROCESS REPEATED UNTIL A BLOCK OR FILE OF DATA HAS BEEN RECEIVED AND PLACED IN MEMORY. STANDARD SCELBI PROGRAMS USE A "CHECK-SUM" TECHNIQUE TO VERIFY THE RECEPTION OF CORRECT DATA. THE USE OF THE VERY SHORT LENGTH BIT GROUPS IN AN ASYNCHRONOUS FASHION COMPENSATES FOR SIGNIFICANT VARIATIONS IN TAPE SPEED WHICH IS OFTEN A PROBLEM WITH LOW COST TAPE RECORDERS AND MAKES

THE SCELBI AUDIO MAGNETIC TAPE SYSTEM A REMARKABLY RELIABLE AND YET LOW COST METHOD FOR STORING AND RETRIEVING PROGRAMS OR DATA.

THE INTERFACE CIRCUITRY IS CONTAINED ON TWO PRINTED CIRCUIT CARDS MEASURING 4 1/2 BY 6 1/2 INCHES THAT PLUG INTO 22 PIN P.C. SOCKETS. THE UNIT IS PACKAGED IN AN ALUMINUM MINI-BOX WITH TWO 11 PIN MALE I/O CONNECTORS AND APPROPRIATE CONNECTORS FOR POWER. POWER REQUIREMENTS ARE APPROXIMATELY 250 MA. AT +5 VOLTS. THE POWER SHOULD BE DERIVED FROM THE SAME SOURCE AS THAT USED BY THE SCELBI-8H MINI-COMPUTER.

THE INTERFACE REQUIRES ONE SPECIAL "SYNC" SIGNAL FROM THE SCELBI-8H MINI-COMPUTER. THIS SIGNAL IS NORMALLY ROUTED FROM THE COMPUTER THROUGH A SPARE PIN ON THE INPUT PORT I/O CONNECTOR THAT IS USED WITH THE INTERFACE.

TYPES OF RECORDERS TO USE WITH THE INTERFACE

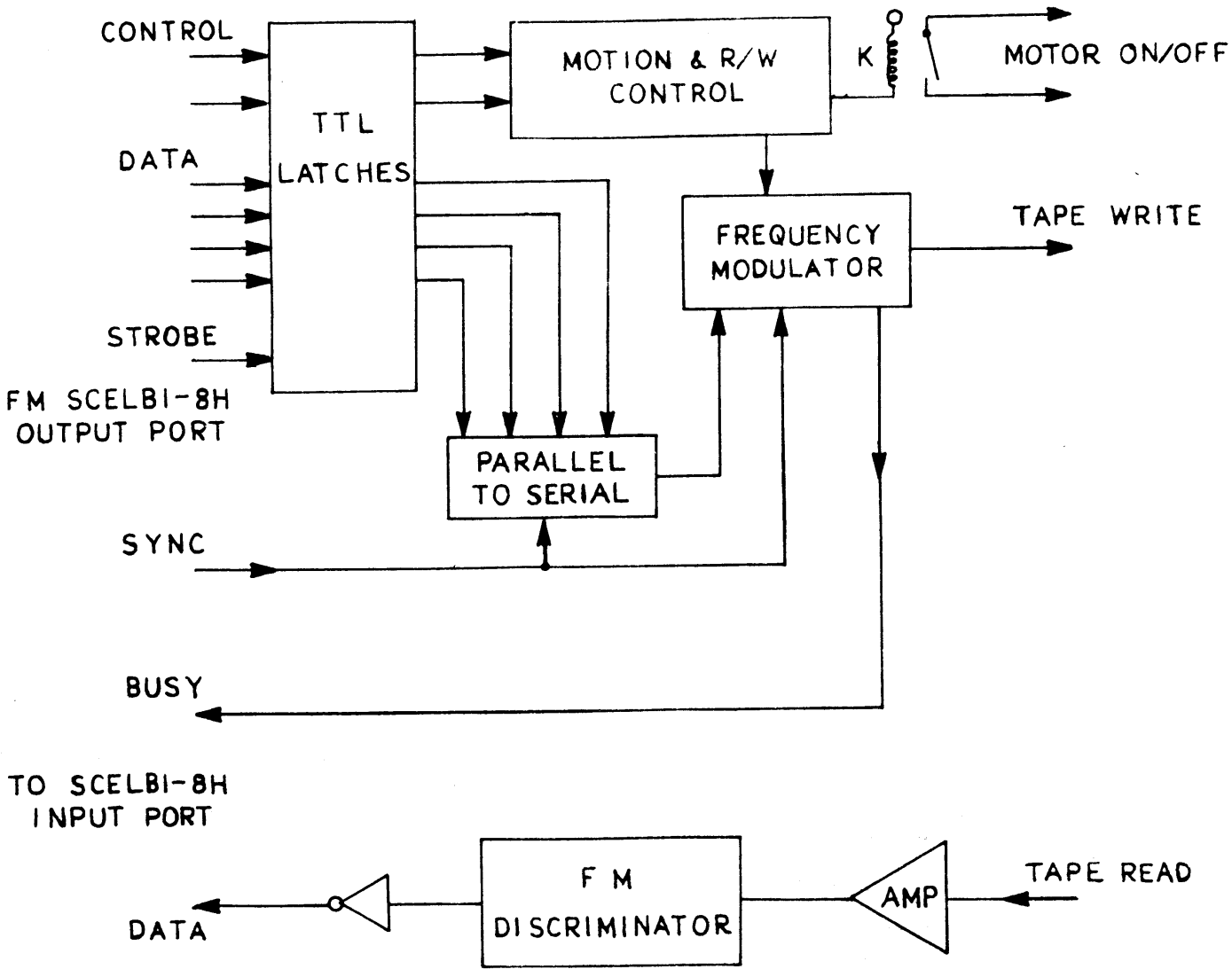
THE SCELBI AUDIO MAGNETIC TAPE INTERFACE HAS BEEN DESIGNED TO OPERATE WITH LOW TO MEDIUM COST CASSETTE TAPE RECORDERS THAT HAVE THE FOLLOWING MINIMUM SPECIFICATIONS: CAPSTAN SPEED CONTROL WITH MAXIMUM VARIATION OF PLUS OR MINUS 5%, FREQUENCY RESPONSE PLUS OR MINUS 3 DB OVER THE RANGE OF 300 TO 6000 HERTZ, AN AUXILLIARY INPUT FOR RECORDING AND AN EARPHONE JACK FOR PLAYBACK. AS AN OPTION, RECORDERS THAT ALLOW A BUTTON ON A MICROPHONE TO BE USED TO START AND STOP TAPE MOTION, AND THAT HAVE A SUBMINIATURE JACK PROVIDED FOR THIS FUNCTION, CAN BE USED WITH THE RELAY PROVIDED ON THE SCELBI INTERFACE TO PLACE THIS FUNCTION UNDER CONTROL OF THE COMPUTER. IN ADDITION, RECORDERS WITH A MANUAL "RECORD VOLUME" CONTROL ARE PREFERRED OVER THOSE WITH AUTOMATIC RECORD GAIN CONTROL AND RECORDERS WITH CONTINUOUSLY ADJUSTABLE TONE CONTROL(S) ARE PREFERRED OVER THOSE THAT HAVE NO TONE CONTROL, OR THAT HAVE SWITCH SELECTED TONE RANGES. THESE TONE AND GAIN CONTROLS CAN OFTEN BE USED TO "PEAK" A RECORDING UNIT SO THAT THE BIT ERROR RATE IS AT A MINIMUM.

IN ADDITION, A GOOD QUALITY CASSETTE TAPE SHOULD BE USED WHENEVER THE RECORDER IS USED FOR STORING DATA OR PROGRAMS.

IT SHOULD BE NOTED THAT THE SCELBI-8H AUDIO MAGNETIC TAPE INTERFACE DOES NOT REQUIRE ANY MODIFICATIONS TO THE TAPE RECORDING UNIT - WHEN THE RECORDER IS NOT BEING USED WITH THE SCELBI-8H MINI-COMPUTER IT CAN BE USED AS A GENERAL PURPOSE TAPE UNIT.

SINCE THE QUALITY OF THE CASSETTE TAPE AS WELL AS THAT OF THE TAPE RECORDER WILL HAVE AN OVER-ALL EFFECT ON THE RELIABILITY OF THE TAPE SYSTEM, IT IS VIRTUALLY IMPOSSIBLE TO SPECIFY A BIT ERROR RATE FOR SUCH A SYSTEM. HOWEVER, EXTENSIVE TESTING AND USAGE OF A VARIETY OF TAPE RECORDERS COMMONLY AVAILABLE IN THE $50.00 TO $75.00 RANGE HAS SHOWN THE SYSTEM TO BE REMARKABLY RELIABLE FOR THE COST AND QUITE ADEQUATE FOR THE PURPOSES FOR WHICH IT WAS DESIGNED. BIT ERROR RATES ARE TYPICALLY IN THE RANGE OF 1 IN 100,000 TO 1 IN 1,000,000. THE USE OF "CHECK-SUM" TECHNIQUES ALLOWS THE OPERATOR TO VERIFY THE CORRECT READING OF BLOCKS OF DATA. THE ADDITION OF SOFTWARE ERROR CORRECTING TECHNIQUES CAN FURTHER INCREASE THE OVER-ALL RELIABILITY OF THE SYSTEM IN SPECIAL APPLICATIONS.

A BLOCK DIAGRAM OF THE SCELBI AUDIO MAGNETIC TAPE INTERFACE IS INCLUDED FOR REFERENCE.



BLOCK DIAGRAM

SCELBI AUDIO TAPE INTERFACE

Home tape recorder stores binary data

With just two simple circuits—one a voltage differentiator, the other a Schmitt trigger—you can use an ordinary tape recorder to record or play back binary data.

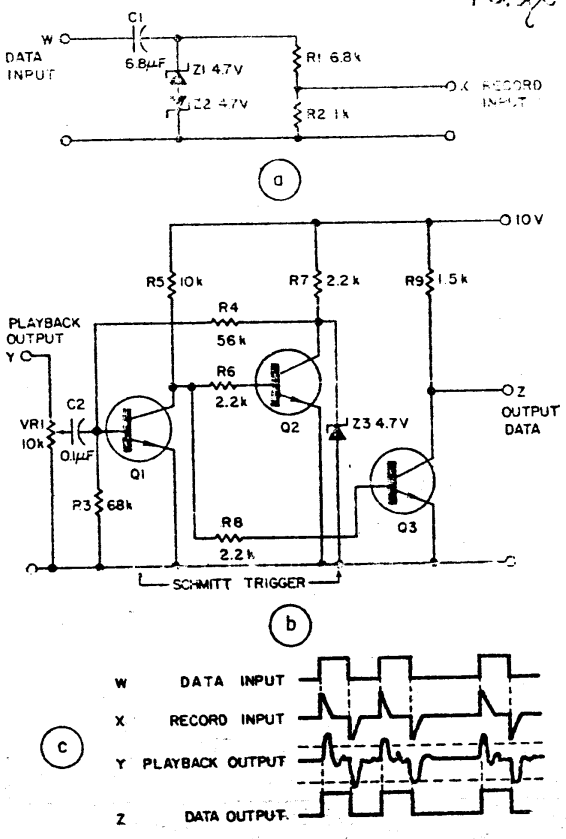
In the diagram the differentiator removes the low frequency and dc components of the binary data to be recorded and transforms the data to a series of positive and negative pulses. The values of R1, R2 and C1 were chosen to match the input impedance of the recorder and to minimize data-source loading. The time constant of the differentiator, (R1 + R2)C1, is about one-fourth of the bit time.

Zener diodes Z1 and Z2 force the amplitude of the recorded information to be essentially constant.

The Schmitt trigger, containing Q1 and Q2, differentiates between data pulses and any ringing in the waveform. Potentiometer VR1 is adjusted for the particular tape recorder to detect only the peaks and valleys in the playback waveform corresponding to bit edges. Transistor Q3 and associated components serve as a buffer between the Schmitt trigger and the output. The opposite polarity signal may be obtained at the output simply by connecting R8 to the collector of Q2 instead of Q1.

L. E. Davies, Terminal Systems Dept., International Computers Ltd., Kidsgrove, Stoke-on-Trent, ST7 1TL, England.

VOTE FOR 312



A voltage differentiator and Schmitt trigger are the main components needed to convert a home tape recorder into a binary data machine. The voltage differentiator circuit (a) converts the data to a form suitable for recording; the second circuit (b) reconverts the recorder output to its original form. Waveforms are shown in c.

25W178-39th Street
Naperville, Illinois 60540

Dear Inquirer:

I placed an ad in Radio Electronics offering an Intel 8008 for $80 because I have an opportunity to obtain 8008's at a quantity price if I can obtain a few more people who are interested. If you are interested in placing an order for one through me, you may do so in one of the following ways. First you may send me $80 and as soon as I have the chips I will send yours to you postpaid and insured. Second you may send me an order and request that it be sent to you COD, in which case the price will be $88 in addition to which you will have to pay the COD fee when it arrives, which I understand is about $1. I would much perfer to have cash orders and would also be willing to discuss a further discount on quantity orders.

I can provide no warranty in addition to that provided by Intel, however that should be sufficient and I will assist you if necessary to obtain satisfaction. I also can not assure delivery of the 8008's in the event that there are insufficient orders, however since only a few more are necessary it seems as if there will be no problems. We hope to place an order by October and I will keep you notified of any developments if you place an order. I hope we can be of mutual benefit to each other.

Sincerely,

Robert Wolcott

Robert W. Cook

Interfacing a teletypewriter with an IC microprocessor

by Steven K. Roberts
Cybertronic Systems, Louisville, Ky.

The lengthy software service routine generally required to interface a teletypewriter and an IC microprocessor, such as the Intel 8008, can be eliminated by the circuit shown here. A shift register and some control logic are all that it takes, bringing total component cost to only about $6.50.

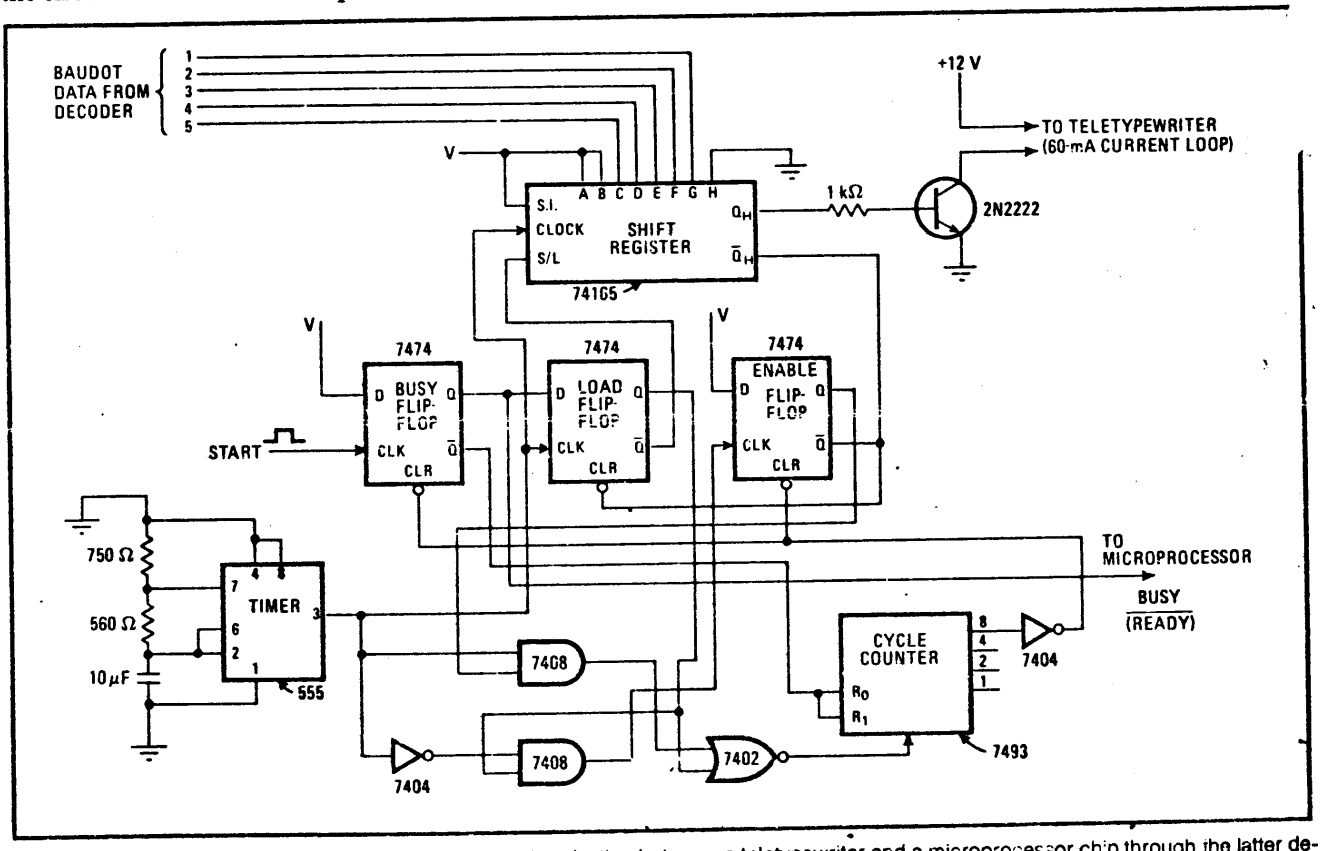
In the 8008 system, synchronization with the central-processing unit is accomplished through this microprocessor's READY line, making modification of the teletypewriter itself unnecessary. The hardware configuration given in the figure is designed for a 10-character-per-second Model 28 Teletype, which uses the five-level Baudot code. If the intended application will not easily accommodate data storage in the Baudot code, conversion may be accomplished with a read-only memory, such as National's MM5221TM. (A Model 33 Teletype presents no decoding problem.)

During the time that the input parallel data is valid, the circuit receives the START pulse, which sets the BUSY flip-flop and takes the READY line low. The BUSY flip-flop also removes the reset from the cycle counter and enables the LOAD flip-flop, which is set on the next clock pulse. This action loads the data at the input to the shift register and increments the cycle counter once.

On the succeeding clock pulse, the ENABLE flip-flop is set, and the data in the register begins to shift to the right. For each shift pulse, the cycle counter is incremented by one until it reaches a binary count of 8. Then, the BUSY and ENABLE flip-flops are both reset, and the READY signal is restored to the microprocessor so that the central-processing unit can resume operation.

In the data character presented to the shift register, bit H, which is constantly held low, corresponds to the teletypewriter START pulse. Similarly, the register's A and B bits are tied high, corresponding to the teletypewriter STOP pulse. Since the STOP signal must be applied to the teletypewriter for approximately 1.5 times longer than the other pulses, the BUSY flip-flop is reset on the falling edge of the clock, during the time that bit A is present at the register's Q_H output. The serial output of the register switches the 60-milliampere teletypewriter current loop through the transistor.

The clock signal for the circuit is derived from the IC timer that is free-running at approximately 75 hertz. For teletypewriters that operate at 6 characters per second, the clock frequency should be about 45.5 Hz. ⊏



Software bypass. Digital interface circuit provides synchronization between a teletypewriter and a microprocessor chip through the latter device's READY line. Normally, a long software routine is needed to make the interface. The input data is in the parallel Baudot code, and the output is for a 10-character-per-second teletypewriter. A free-running IC timer is used to produce the clock signal.

Page 20

RGS ELECTRONICS
008A MICROCOMPUTER KIT
Preliminary Data

The RGS Electronics 008A Microcomputer Kit includes everything necessary to build the computer EXCEPT the cabinet, screws, nuts and assorted hardware, and the line cord and fuses. At this time, the kit is built on a 60-socket wire-wrap board measuring 8½" x 7½" x 1 1/8"; in the future, it will be built on p.c. boards. The manual for the wire-wrapped kits includes information on where to obtain wire-wrap tools and wire.

The kit includes the 8008 CPU chip, and either 2102's or 2602's for the memory, which is 1024 x 8 bits and is expandable. The kit also includes all the other TTL ICs necessary to the operation of the kit, and all the power supply parts except the fuse. The power supply is capable of +5 volts at 5 amps maximum, and -9 volts at 60 milliamps. The front panel LEDs and switches are also provided.

The front panel on a working 008A can be used to load memory and to debug programs. The manual contains, in addition to all the construction information, a short course on programming the 8008, and directions for interfacing to most peripheral devices. The 008A kit has an I/O bus, instead of the arrangement of I/O ports more usual with the 8008. This bus will handle up to 256 peripheral devices; the I/O instructions have been changed to reflect this change in structure.

The manual includes membership for one year in a software exchange program: we send you any new programs we develop, and you the users send us any programs you develop; we will act as a clearinghouse, making all the programs available to everyone. This service is available with purchase of the manual alone, as well as with the computer kit.

PRICES

008A Microcomputer Kit $375.00
(We offer a 20% discount on orders over $250.00, so the actual price for cash is $300.00.)

008A Microcomputer Manual $25.00
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P.21

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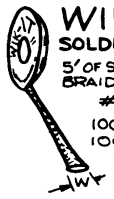

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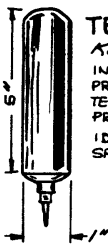

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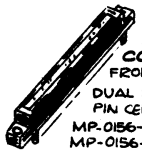

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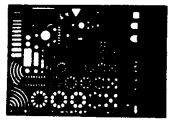

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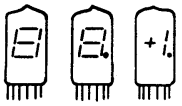

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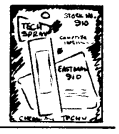

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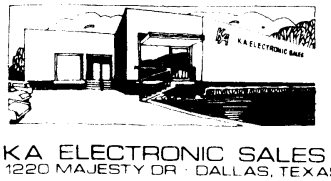

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