

SCELBI COMPUTER CONSULTING, INC.

ASSEMBLY INSTRUCTIONS - SCELBI CARD #: 1100-

CPU CARD

DESCRIPTION

THE SCELBI 1100- CPU CARD IS THE PRIMARY CARD IN A SCELBI-8H MINI-COMPUTER. THIS CARD CONTAINS A MICRO-PROCESSOR "CPU-ON-A-CHIP," A NETWORK OF CONTROL AND TIMING LOGIC, AND A MASTER CLOCK SYSTEM. ALL COMPUTER OPERATIONS EMANATE FROM AND TERMINATE AT THIS CARD. THIS CARD PROVIDES SIGNALS THAT CONTROL AND SYNCHRONIZE THE OVERALL OPERATIONS OF ALL OTHER CARDS IN A SCELBI-8H SYSTEM.

NOTE

IF THE CUSTOMER HAS PURCHASED THE OPTION, THE SCELBI 1100- CPU CARD IS SHIPPED WITH A NUMBER OF COMPONENTS ALREADY INSTALLED. THESE COMPONENTS MAY INCLUDE THE SPECIAL SOCKET PINS USED TO HOLD THE TYPE 8008 "CPU-ON-A-CHIP" INTEGRATED CIRCUIT, AND/OR A NETWORK OF COMPONENTS THAT FORM THE MASTER CLOCK SYSTEM. THE MASTER CLOCK SYSTEM FORMS A CRITICAL PORTION OF A SCELBI-8H MINI-COMPUTER AND THE MASTER CLOCK MUST BE CAREFULLY ADJUSTED IN ORDER TO INSURE PROPER COMPUTER OPERATION. THEREFORE, WHEN A 1100- CPU CARD IS SUPPLIED WITH THE MASTER CLOCK SYSTEM INSTALLED AND ADJUSTED BY SCELBI EXPERTS, THE FOUR RESISTIVE "TRIM-POTS" USED TO MAKE THE MASTER CLOCK SYSTEM ADJUSTMENTS ARE SEALED WITH AN ADHESIVE TO PREVENT THEIR BEING ACCIDENTLY ALTERED ONCE THEY HAVE BEEN SET. CUSTOMERS ARE CAUTIONED NOT TO TAMPER WITH THE "TRIM-POT" SETTINGS.

KIT ASSEMBLY

YOU SHOULD HAVE THE ASSEMBLY DRAWING (1100A) BEFORE YOUR WORK AREA FOR READY REFERENCE. THIS DRAWING SHOWS THE EXACT LOCATION OF EACH PART ON THE BOARD.

AS YOU PERFORM EACH STEP MAKE A CHECK IN THE BOX PROVIDED TO THE RIGHT OF EACH INSTRUCTION AS A MEANS OF REMEMBERING WHERE YOU ARE IN THE ASSEMBLY PROCESS.

WORK SLOWLY AND CAREFULLY. MAKE SURE THE CORRECT COMPONENT IS INSERTED IN THE PROPER LOCATION AND THAT IT IS ORIENTED IN THE RIGHT MANNER. THIS IS ESPECIALLY IMPORTANT WITH INTEGRATED CIRCUITS, DIODES, AND OTHER POLARITY SENSITIVE COMPONENTS. COMPONENTS INCORRECTLY INSTALLED CAN BE CATASTROPHICALLY DAMAGED WHEN POWER IS APPLIED. IT IS BETTER TO TAKE A FEW EXTRA MINUTES DURING THE ASSEMBLY PROCESS TO INSURE YOU ARE PROCEEDING CORRECTLY THAN TO HURRY AND HAVE TO TRY AND FIND AN ERROR AT A LATER TIME - POSSIBLY AFTER IRREVERSIBLE DAMAGE HAS OCCURED! A CAREFUL ASSEMBLER WILL BE ABLE TO COMPLETE THIS BOARD IN ABOUT TWO HOURS.

NOTES ON SOLDERING

USE A GOOD GRADE ROSIN-CORE SOLDER OF A TYPE INTENDED FOR USE WITH ELECTRONIC CIRCUITS. A SMALL 30 - 50 WATT SOLDERING IRON WITH A NARROW TIP SHOULD BE USED. DO NOT APPLY HEAT ANY LONGER THAN NECESSARY TO ALLOW THE SOLDER TO THOROUGHLY FLOW AROUND THE COMPONENT LEAD AND INTO THE HOLE SURROUNDING THE LEAD. THE 1100- P.C. BOARD HAS "PLATED-THROUGH" HOLES WHICH MEANS THAT THE CIRCUIT FOIL EXTENDS DOWN THROUGH EACH HOLE WHERE AN ELECTRICAL CONNECTION IS MADE TO ENSURE THAT ALL CONTACTS ARE GOOD. FOR SUCH "PLATED-THROUGH" HOLES, THE PROPER AMOUNT OF SOLDER HAS BEEN APPLIED WHEN THE SOLDER HAS JUST STARTED TO "CLIMB UP" THE COMPONENT LEAD ON THE OTHER SIDE OF THE BOARD FROM WHICH THE SOLDER IS APPLIED. NORMALLY SOLDERING SHOULD BE DONE FROM THE SIDE OPPOSITE TO THAT ON WHICH THE COMPONENTS MOUNT. AFTER EACH JOINT HAS BEEN SOLDERED CHECK TO ENSURE THAT THERE ARE NOT ANY SOLDER SHORTS TO ADJACENT CIRCUITRY.

INSTALLATION OF INTEGRATED CIRCUITS

NOTICE: WHEN INSTALLING INTEGRATED CIRCUITS MAKE SURE THAT EACH I.C. IS PROPERLY POSITIONED. PIN #1 ON AN I.C. NORMALLY HAS A SMALL DOT (OR DEPRESSION) NEXT TO IT ON THE BODY OF THE CHIP. THE LOCATION OF THIS DOT WHEN THE I.C. IS INSTALLED SHOULD BE THE SAME AS THAT SHOWN ON THE ASSEMBLY DRAWING. IF A MARKER CAN NOT BE FOUND ON AN I.C. THEN MAKE SURE THAT THE END OF THE INTEGRATED CIRCUIT WITH A DEPRESSION OR COLORED-IN AREA IS POSITIONED THAT SAME AS INDICATED ON THE ASSEMBLY DRAWING. ALL INTEGRATED CIRCUITS ON THE SCLEBI 1100- CARD MOUNT ON THE CARD SO THAT THEY ARE ORIENTED IN THE SAME DIRECTION. WHEN INSTALLING AN I.C. MAKE SURE THAT ALL OF THE PINS ON THE PACKAGE GO THROUGH THE PROPER HOLES IN THE P.C. BOARD (IT MAY BE OCCASSIONALLY NECESSARY TO STRAIGHTEN A PIN ON AN I.C.) AND THAT THE BODY OF THE I.C. IS FLUSH TO THE BOARD SURFACE. ONCE THE INTEGRATED CIRCUIT HAS BEEN INSTALLED SEVERAL OF THE PINS PROTRUDING THROUGH THE BOARD SHOULD BE BENT AGAINST THE FOIL ON THE BACK SIDE OF THE CARD SO THAT THE COMPONENT WILL BE HELD IN POSITION PRIOR TO THE TIME IT IS SOLDERED. WHEN IT IS TIME TO SOLDER THE COMPONENTS TURN THE CARD OVER SO THAT THE COMPONENTS ARE FACING DOWN AND CAREFULLY SOLDER EACH I.C. PIN TO ITS FOIL PAD.

- () INSTALL FOUR TYPE 7400 INTEGRATED CIRCUITS IN THE LOCATIONS LABELED ON THE ASSEMBLY DRAWING AS: Z6, Z13, Z21 AND Z25. WHEN ALL FOUR HAVE BEEN INSTALLED TURN THE CARD OVER AND SOLDER THE PINS ON EACH I.C. TO THEIR FOIL PAD.
- () INSTALL A TYPE 7402 I.C. AT THE LOCATION SPECIFIED FOR Z14 ON THE ASSEMBLY DRAWING. SOLDER THE PINS OF THE INTEGRATED CIRCUIT TO THE CARD.
- () INSTALL AND SOLDER TWO TYPE ⁷⁴⁰³~~7402~~ INTEGRATED CIRCUITS AT THE LOCATIONS SHOWN FOR Z2 AND Z3.
- () INSTALL AND SOLDER FOUR TYPE 7404 INTEGRATED CIRCUITS AT LOCATIONS Z5, Z12, Z15 AND Z24.
- () INSTALL AND SOLDER TWO TYPE 74L04 (LOW POWER) INTEGRATED CIRCUITS AT LOCATIONS Z1 AND Z10.
- () INSTALL AND SOLDER TWO TYPE 7410 INTEGRATED CIRCUITS AT LOCATIONS

Z7 AND Z20.

- () INSTALL AND SOLDER A TYPE 7420 I.C. AT LOCATION Z19.
- () INSTALL AND SOLDER A TYPE 7442 I.C. AT LOCATION Z4.
- () INSTALL AND SOLDER THREE TYPE 7474 INTEGRATED CIRCUITS AT LOCATIONS Z18, Z22 AND Z26.
- () INSTALL AND SOLDER A TYPE 7476 I.C. AT LOCATION Z23.
- () INSTALL AND SOLDER FIVE TYPE 74121 INTEGRATED CIRCUITS AT LOCATIONS Z8, Z9, Z16, Z17 AND Z21A.

SPECIAL NOTE ABOUT LOCATING POSITIONS OF DISCRETE COMPONENTS
ON THE PRINTED CIRCUIT CARD

SCELBI PRINTED CIRCUIT CARDS HAVE NUMEROUS HOLES IN THE BOARD MATERIAL THAT ARE LINED WITH A CONDUCTIVE MATERIAL AND THAT ARE SIMPLY USED TO CONNECT CIRCUIT FOIL PATHS FROM ONE SIDE OF THE CARD TO THE OTHER SIDE. THESE HOLES ARE OFTEN TERMED "FEED-THROUGH" HOLES. IN ADDITION TO THE "FEED-THROUGH" HOLES THERE ARE ALSO HOLES PROVIDED FOR THE LEADS OF DISCRETE COMPONENTS TO PASS THROUGH AND THUS ALLOW ATTACHMENT OF SUCH COMPONENTS TO THE CARD AND ASSOCIATED CIRCUITRY. (THESE HOLES ALSO SOMETIMES SIMULTANEOUSLY SERVE AS "FEED-THROUGH" HOLES.) THE DISTINCTION BETWEEN HOLES THAT SIMPLY SERVE AS "FEED-THROUGH" HOLES AND THOSE THAT ARE FOR COMPONENT LEADS CAN BE MADE BY OBSERVING THE SIZE OF THE FOIL PAD THAT SURROUNDS A HOLE. HOLES FOR THE LEADS OF DISCRETE COMPONENTS ALWAYS HAVE LARGER FOIL PADS AROUND THEM THAN THE PLAIN "FEED-THROUGH" HOLES. THIS IS IMPORTANT TO REMEMBER WHEN INSTALLING DISCRETE COMPONENTS AS SOMETIMES A PLAIN "FEED-THROUGH" HOLE MAY BE CLOSE TO A HOLE THAT THE LEAD OF A DISCRETE COMPONENT IS SUPPOSED TO GO THROUGH. AN ADDITIONAL AID TO DISCERNING THE PROPER HOLE(S) FOR 1/4 WATT RESISTOR LEADS IS TO REMEMBER THAT THE HOLES FOR 1/4 WATT RESISTOR LEADS ARE ALWAYS SPACED 1/2 INCH APART.

INSTALLATION OF RESISTORS

NOTICE: TO PREPARE RESISTORS FOR MOUNTING ON THE P.C. CARD USE A PAIR OF NEEDLE POINT PLIERS TO BEND EACH LEAD PERPENDICULAR TO THE BODY OF THE RESISTOR AT A POINT 1/8 OF AN INCH AWAY FROM WHERE THE LEAD JOINS THE RESISTOR BODY. THE BENDING OF THE TWO LEADS SHOULD BE IN THE SAME DIRECTION SO THAT THE PREPARED RESISTOR HAS THE SHAPE OF A "U" WITH THE BODY OF THE RESISTOR FORMING THE BASE OF THE "U" AND THE TIPS OF THE "U" (FORMED BY THE LEADS) BEING 1/2 AN INCH APART. WHEN THIS HAS BEEN DONE THE RESISTOR'S LEADS WILL BE SPECED TO INSERT READILY IN THE HOLES ON THE P.C. CARD FOR RESISTORS. WHEN INSTALLING A RESISTOR, THE TWO LEADS ARE INSERTED IN THE APPROPRIATE HOLES AND THE LEADS PULLED FROM THE BACK OF THE BOARD UNTIL THE RESISTOR BODY IS PULLED UP NEXT TO THE P.C. BOARD. THE LEADS ARE THEN BENT OVER ON THE BACK SIDE OF THE CARD AND THE EXCESS LEAD MATERIAL CUT OFF LEAVING ABOUT 1/16 OF AN INCH OF THE LEAD AGAINST THE FOIL PAD. AFTER THE EXCESS LEAD HAS BEEN TRIMMED OFF THEN THE REMAINING 1/16 INCH OF LEAD IS SOLDERED TO ITS FOIL CONNECTION PAD.

IT IS ALSO IMPORTANT TO INSURE THAT THE PROPER RESISTOR VALUE IS INSTALLED AT EACH LOCATION. RESISTOR VALUES ARE "COLOR-CODED" BY THREE COLOR BANDS ON THE BODY OF THE RESISTOR AND THE SEQUENCE OF THE COLORS (STARTING FROM THE BAND NEAREST ONE END OF THE RESISTOR AND READING TOWARDS THE MIDDLE) ARE GIVEN FOR EACH VALUE OF RESISTOR USED ON A CARD.

ONLY THE FIRST THREE COLOR BANDS ARE USED TO DENOTE THE ACTUAL VALUE - ANY EXTRA BANDS ON A RESISTOR CAN BE IGNORED BY THE ASSEMBLER AS THEY ARE USED TO DESIGNATE PARAMETERS OTHER THAN THE ACTUAL RESISTOR VALUE.

- () INSTALL SIX 1 K OHM (BRN-BLK-RED) 1/4 WATT RESISTORS AT THE LOCATIONS SHOWN ON THE ASSEMBLY DRAWING FOR: R1, R3, R18, R23, R32, R33, R36 AND R37.
- () INSTALL NINE 3.3 K OHM (OR-OR-RED) 1/4 WATT RESISTORS AT THE LOCATIONS SHOWN FOR: R6, R8, R10, R11, R12, R14, R15, R16 AND R17.
- () INSTALL EIGHTEEN 10 K OHM (BRN-BLK-OR) 1/4 WATT RESISTORS AT THE LOCATIONS SHOWN FOR: R1A, R2, R4, R5, R7, R9, R13, R19, R20, R21, R22, R24, R26, R28, R30, R35, R38 AND R39.
- () INSTALL A 33 K OHM (OR-OR-OR) 1/4 WATT RESISTOR AT THE LOCATION SHOWN FOR R34.
- () INSTALL FOUR 5 K OHM TRIMPOTS AT THE LOCATIONS SHOWN FOR R25, R27, R29 AND R31.

INSTALLATION OF DIODES

NOTICE: DIODES ARE PREPARED FOR MOUNTING ON THE P.C. CARD IN A MANNER SIMILAR TO THAT USED FOR RESISTORS. THE BASE OF THE "U" IS THE BODY OF THE DIODE AND THE DISTANCE BETWEEN THE TIPS OF THE "U" MADE BY THE BENT LEADS SHOULD BE 1/2 INCH. DIODES HAVE A COLORED BAND OR A SERIES OF BANDS AT ONE END OF THEIR BODY. THIS BAND MARKS THE CATHODE (NEGATIVE) END OF THE DIODE. THE CATHODE END OF A DIODE IS DENOTED BY A BAND SHOWN ON THE END OF A DIODE REPRESENTED BY A PICTORIAL OF SUCH A COMPONENT ON THE ASSEMBLY DRAWING. IT IS ALSO REPRESENTED BY THE "BAR" END OF THE "TRIANGLE AND BAR" SYMBOL THAT IS SOMETIMES IMPRINTED ON THE P.C. CARD AT A LOCATION WHERE A DIODE IS TO BE INSTALLED. WHEN INSTALLING DIODES IT IS ESSENTIAL THAT THE COMPONENTS ARE INSTALLED WITH THEIR CATHODES IN THE POSITION INDICATED BY THE ASSEMBLY DRAWING. DIODES ARE POLARITY SENSITIVE DEVICES AND CIRCUITS UTILIZING THEM WILL NOT OPERATE PROPERLY IF THEY ARE INSTALLED INCORRECTLY. DIODES ARE MOUNTED FLUSH TO THE SURFACE OF THE P.C. BOARD (UNLESS OTHERWISE INDICATED) AND THE EXCESS LEAD LENGTH TRIMMED OFF LEAVING 1/16 INCH TO BE SOLDERED TO THE FOIL PAD ON THE P.C. CARD AS IS DONE WITH RESISTORS.

- () INSTALL NINE COMPUTER DIODES AT THE LOCATIONS SHOWN FOR: CR1, CR2, CR3, CR4, CR5, CR6, CR7, CR8 AND CR9.

TRANSISTOR INSTALLATION

- () INSTALL A TYPE 2N2907 TRANSISTOR AT THE LOCATION SHOWN ON THE ASSEMBLY DRAWING FOR Q1. THE BODY OF THE TRANSISTOR SHOULD BE SPACED ABOUT 1/8 INCH AWAY FROM THE P.C. BOARD. AS AN AID IN MAINTAINING THIS DISTANCE AS THE TRANSISTOR IS INSTALLED, PLACE A PAPER MATCH STICK UNDER THE TRANSISTOR WHEN THE TRANSISTOR LEADS ARE FIRST INSERTED IN THEIR HOLES. PUSH THE TRANSISTOR LEADS THROUGH THE BOARD UNTIL THE BODY IS TOUCHING THE MATCH STICK. TURN THE CARD OVER, BEND THE LEADS AGAINST THEIR RESPECTIVE FOIL PADS, TRIM THE EXCESS LEAD MATERIAL OFF LEAVING 1/16 INCH OF LEAD TO BE SOLDERED TO THE FOIL PAD. SOLDER THE LEADS OF THE TRANSISTOR, THEN REMOVE THE MATCHSTICK THAT WAS USED AS A SPACER. WHEN INSTALLING THE TRANSISTOR BE SURE THAT THE LITTLE TAB ON THE BODY OF THE TRANSISTOR (DENOTING THE EMITTER JUNCTION LEAD) IS ORIENTED IN THE DIRECTION SHOWN ON THE ASSEMBLY DRAWING.

INSTALLATION OF CAPACITORS

- () INSTALL THREE 10 MFD ELECTROLYTIC CAPACITORS IN THE POSITIONS LABELED ON THE ASSEMBLY DRAWING AS: C1, C9 & C14. BE CERTAIN THAT THE POSITIVE (+) END OF THE CAPACITOR IS ORIENTED IN THE SAME DIRECTION AS THAT SHOWN ON THE DRAWING (AND INDICATED ON THE P.C. CARD). AS EACH CAPACITOR IS INSTALLED BEND THE LEADS DOWN ONTO THEIR FOIL PADS ON THE BACK SIDE OF THE BOARD AND TRIM OFF THE EXCESS LEAD LEAVING ABOUT 1/16TH OF AN INCH TO BE SOLDERED TO THE FOIL. THEN SOLDER EACH CAPACITOR LEAD TO ITS FOIL CONNECTION POINT.
- () INSTALL SEVEN .1 UFD DISK CAPACITORS IN THE POSITIONS LABELED ON THE ASSEMBLY DRAWING AS: C2, C3, C4, C5, C6, C8 AND C17. TRIM THE LEADS AND SOLDER THE CAPACITORS IN PLACE.
- () INSTALL AND SOLDER IN PLACE A .02 UFD DISK CAPACITOR AT THE LOCATION IDENTIFIED ON THE ASSEMBLY DRAWING FOR C7.
- () INSTALL AND SOLDER IN FOUR 330 PF DISK CAPACITORS AT THE LOCATIONS FOR C10, C11, C12 AND C13.

INSTALLATION OF FUSE CLIPS

- () INSTALL THE FOUR P.C. MOUNTING FUSE CLIPS IN THE POSITIONS SHOWN TO HOLD F1 AND F2. INSERT THE TWO TABS ON THE BASE OF EACH CLIP INTO THE HOLES PROVIDED FOR EACH CLIP, BEND THE TABS SLIGHTLY AGAINST THE FOIL ON THE OTHER SIDE OF THE BOARD TO HOLD THEM IN PLACE AND THEN SOLDER EACH TAB TO THE FOIL. ENSURE THAT THE CLIPS LINE UP SO THAT A FUSE WILL SEAT PROPERLY WHEN INSTALLED.

INITIAL INSPECTION AND TESTING

- () AT THIS TIME CAREFULLY INSPECT BOTH SIDES OF THE BOARD TO ASCERTAIN THAT THERE ARE NOT ANY SOLDER SHORTS BETWEEN P.C. FOIL LANDS. BE ESPECIALLY OBSERVANT ON THE COMPONENT SIDE OF THE CARD AROUND THE I.C. PINS. REMOVE ANY SOLDER SHORTS THAT MIGHT BE FOUND.
- () INSTALL A 0.75 AMP 8AG FUSE IN THE FUSE CLIPS FOR F1.
- () TEMPORARILY "JUMPER" THE FUSE CLIPS FOR F2 WITH A CLIP LEAD OR A LENGTH OF SOLDER.
- () USE AN OHM METER TO MAKE THE FOLLOWING MEASUREMENTS:

METER BETWEEN PINS A1 AND A3 OF THE CARD CONNECTOR - AND THEN REVERSE THE METER LEADS TO OBTAIN A SECOND READING. THE READING IN BOTH DIRECTIONS SHOULD BE GREATER THAN FIVE (5) OHMS. (ONE READING WILL BE TYPICALLY 3 TO 6 TIMES HIGHER THAN THE OTHER). IF THE READING(S) ARE LESS THAN 5 OHMS LOOK FOR SOLDER SHORT(S) BETWEEN THE +5 VOLT SUPPLY LINES AND THE COMMON RETURN LINES ON THE CARD.

NOW REPEAT THE ABOVE READINGS BETWEEN PINS A3 AND A5 OF THE CARD CONNECTOR. THIS TIME THE READING IN ONE DIRECTION SHOULD BE VERY HIGH (GREATER THAN 50 K OHMS) AND THE READING WITH THE METER LEADS REVERSED SHOULD BE GREATER THAN FIVE (5) OHMS. IF THIS IS NOT THE CASE THEN LOOK FOR SOLDER SHORT(S) BETWEEN THE -9 VOLT SUPPLY LINES AND THE COMMON RETURN LINES ON THE CARD.

FINALLY, TAKE SIMILAR READINGS BETWEEN PINS A1 AND A5 OF THE CARD CONNECTOR. THE READING IN ONE DIRECTION SHOULD BE MORE THAN 50 K OHMS, AND IN THE OTHER DIRECTION MORE THAN FIVE (5) OHMS. IF NOT, LOOK FOR SOLDER SHORT(S) BETWEEN THE +5 VOLT AND -9 VOLT SUPPLY LINES ON THE P.C. CARD.

- () REMOVE THE "JUMPER" FROM THE FUSE CLIPS FOR F2 AND INSTALL THE 1/8 AMP 8AG FUSE. THIS CONCLUDES THE INITIAL INSPECTION AND TEST PROCEDURE.

ADJUSTING THE MASTER CLOCK

IF YOU PURCHASED A CPU CARD THAT DID NOT HAVE THE MASTER CLOCK CIRCUITRY INSTALLED AND ADJUSTED YOU SHOULD REFER TO THE APPENDIX ON THE NEXT PAGE AND PERFORM THE CLOCK CIRCUIT ADJUSTMENTS BEFORE GOING FURTHER. IF YOU PURCHASED A CPU CARD WITH THE CLOCK CIRCUITRY ALREADY INSTALLED AND ADJUSTED YOU MAY PROCEED DIRECTLY TO THE NEXT STEP.

INSTALLATION OF THE 8008 INTEGRATED CIRCUIT

- () BEFORE INSTALLING THE 8008 INTEGRATED CIRCUIT TAKE A SHORT PIECE OF WIRE AND INSTALL A "JUMPER" BETWEEN THE FOIL PADS ON THE CARD MARKED "E1" AND "E2" (NEXT TO I.C. Z14.) MAKE SURE THE JUMPER DOES NOT SHORT TO ANY OF THE FOIL LANDS THAT IT CROSSES OVER.

() THE 8008 "CPU-ON-A-CHIP" REQUIRES AN 18 PIN SOCKET. SUCH A SOCKET CAN BE MADE FROM "MOLEX" (RTM) PINS. THE POSITION OF THIS SOCKET IS DESIGNATED AS Z11 ON THE ASSEMBLY DRAWING. THE 8008 INTEGRATED CIRCUIT WILL HAVE A SMALL DOT OR ARROW NEXT TO ONE OF THE PINS AT ONE END OF THE DEVICE. THIS DESIGNATES PIN #1 ON THE CHIP. WHEN THE CHIP IS PLACED IN ITS SOCKET THIS PIN SHOULD BE ORIENTED IN THE SAME MANNER AS PIN #1 IS ON ALL THE OTHER INTEGRATED CIRCUITS ON THE CARD. WHEN INSTALLING THE INTEGRATED CIRCUIT IN ITS SOCKET USE EXTREME CARE TO ENSURE THAT EACH PIN FITS INTO ITS OWN INDIVIDUAL "CLIP" ON THE "MOLEX" SOCKET. DO NOT FORCE THE DEVICE INTO ITS SOCKET. USE CARE TO PREVENT ANY PINS FROM BEING BENT AND SUBSEQUENTLY BROKEN. WHEN THE CIRCUIT IS FULLY SEATED IN THE SOCKET CHECK TO ASCERTAIN THAT NONE OF THE "MOLEX" PINS ARE SHORTING TO AN ADJACENT PIN.

- () WHEN YOU HAVE FINISHED INSTALLING THE 8008 INTEGRATED CIRCUIT - CONGRADULATE YOURSELF - YOU HAVE FINISHED THE ASSEMBLY OF YOUR SCELBI #1100 CPU CARD.

FINAL TESTING

FINAL TESTING OF THE CARD MUST BE DONE WHEN THE CARD IS INSTALLED IN A SCELBI-8H MINI-COMPUTER SYSTEM. FINAL TESTING IS DESCRIBED IN DETAIL IN THE ASSEMBLY AND TESTING INSTRUCTIONS FOR THE SCELBI-8H MINI-COMPUTER CARD SET WHICH IS PROVIDED TO CUSTOMERS WHO PURCHASE SCELBI-8H MINI-COMPUTER CARD SETS. CUSTOMERS WHO HAVE PURCHASED TYPE 1100 BOARDS FOR OTHER TYPES OF SYSTEMS MAY DEVISE THEIR OWN FINAL CHECK-OUT PROCEDURES, OR MAY RETURN THE ASSEMBLED BOARD TO SCELBI COMPUTER CONSULTING, INC. FOR FINAL TESTING AT A MODEST FEE.

ADJUSTING THE MASTER CLOCK CIRCUITRY ON THE SCELBI #1100- CPU CARD

THE MASTER CLOCK CIRCUITRY FOR THE SCELBI-8H MINI-COMPUTER IS ON THE SCELBI #1100- CPU CARD. THIS CIRCUITRY MUST BE ADJUSTED CORRECTLY OR THE UNIT WILL NOT FUNCTION PROPERLY. TO ADJUST THE MASTER CLOCK CIRCUITRY YOU WILL NEED THE FOLLOWING INSTRUMENTS.

1. A FREQUENCY COUNTER.
2. A GOOD OSCILLOSCOPE, EITHER A DUAL TRACE, OR A SINGLE TRACE UNIT THAT CAN BE "EXTERNALLY" TRIGGERED.

ADJUSTMENT SETUP

CONNECT A +5 VOLT SUPPLY BETWEEN PINS A1 (+) AND A3 (COMMON) OF THE CPU CARD. (THE CARD MAY BE PLACED ON YOUR WORK BENCH - IT DOES NOT HAVE TO BE INSTALLED IN A CHASSIS OR SYSTEM.) THE +5 VOLT SUPPLY SHOULD BE CONTROLLED BY A SWITCH SO THAT POWER CAN BE APPLIED AND REMOVED AT WILL.

CONNECT THE "A" TRACE OF A DUAL TRACE SCOPE AND SET THE SCOPE TO TRIGGER ON SWEEP "A," OR, IF A SINGLE TRACE SCOPE IS BEING USED ATTACH THE "EXTERNAL" TRIGGER LEAD TO PIN 6 OF I.C. Z8. (THIS SIGNAL CAN ALSO BE READILY ACCESSED AT THE LEFT LEAD OF RESISTOR R2.) THIS SIGNAL WILL BE DESIGNATED "CLOCK PHASE 1" FOR THIS DISCUSSION.

CONNECT A FREQUENCY COUNTER TO PIN 6 OF Z17 (OR PICK UP THE SIGNAL ON THE RIGHT LEAD OF RESISTOR R1.) THIS SIGNAL IS DESIGNATED "CLOCK PHASE 2." IF YOU ARE USING A DUAL TRACE SCOPE YOU MAY ALSO CONNECT TRACE "B" TO THIS POINT. OTHERWISE, USE THIS POINT TO EXAMINE "CLOCK PHASE 2" WHEN NECESSARY DURING THE ADJUSTMENT PROCEDURE.

NATURALLY, BOTH THE OSCILLOSCOPE AND THE FREQUENCY COUNTER SHOULD HAVE THEIR COMMON TERMINALS CONNECTED TO THE COMMON POINT ON THE CPU CARD (AT PIN A3.)

ADJUSTMENT PROCEDURE

THE MASTER CLOCK CIRCUIT HAS A "SELF STARTING" NETWORK CONSISTING OF RESISTOR R24 AND CAPACITOR C9. IN ORDER FOR THE CIRCUIT TO START TWO CONDITIONS MUST BE MET. FIRST, THE POWER SUPPLY VOLTAGE MUST COME ON RAPIDLY WHEN POWER IS APPLIED TO THE CARD, AND SECOND, THE CLOCK CIRCUIT MUST BE ADJUSTED WITHIN ITS OSCILLATING RANGE.

THE FIRST STEP IN THE ADJUSTMENT PROCEDURE IS TO APPLY POWER TO THE CARD AND OBSERVE THAT A SIGNAL APPEARS AT "CLOCK PHASE 1." IF A SIGNAL DOES NOT APPEAR, TURN THE POWER OFF, ADJUST TRIMPOTS R25 AND R27 SEVERAL TURNS AND THE RE-APPLY POWER. CONTINUE THIS PROCEDURE UNTIL A SIGNAL APPEARS AT "CLOCK PHASE 1" WHEN POWER IS APPLIED.

N O T I C E

CUSTOMER'S WHO PROVIDE THEIR OWN POWER SUPPLIES SHOULD BE CAUTIONED THAT SOME POWER SUPPLIES, WHEN TURNED ON BY A SWITCH IN THE A.C. LINE, WILL NOT BUILD UP TO THE PROPER D.C. LEVEL AT A FAST ENOUGH RATE TO ACTIVATE THE CLOCK CIRCUIT. IN SUCH CASES, A SWITCH SHOULD BE INSTALLED IN THE D.C. SUPPLY LINE TO THE COMPUTER. AFTER THE POWER SUPPLY HAS BEEN INITIALLY TURNED ON BY THE A.C. LINE SWITCH, AND HAS HAD TIME TO BUILD UP THE PROPER VOLTAGE LEVELS, THE D.C. SWITCH CAN BE USED TO CONNECT THE SUPPLY VOLTAGES TO THE COMPUTER.

ONCE A STEADY SIGNAL HAS APPEARED AT "CLOCK PHASE 1, LOOK FOR A SIGNAL AT "CLOCK PHASE 2." IF NECESSARY, ADJUST TRIMPOTS R29 AND R31 UNTIL A SIGNAL APPEARS.

WHEN A SIGNAL IS PRESENT AT BOTH "CLOCK PHASE 1" AND "CLOCK PHASE 2" ONE MAY PROCEED TO MAKE THE FINE ADJUSTMENTS TO THE CLOCK CIRCUITRY.

TO MAKE THE FINE ADJUSTMENTS GO BACK AND CAREFULLY ADJUST TRIMPOTS R25 AND R27 UNTIL "CLOCK PHASE 1" IS HIGH FOR APPROXIMATELY 850 NANO-SECONDS AND LOW FOR 1150 NANO-SECONDS. ONCE THE SIGNAL IS CLOSE TO THIS RANGE OBSERVE THE FREQUENCY COUNTER AND CAREFULLY TWEAK THE TRIMPOTS FOR A FREQUENCY READING OF 500 KILOHERTZ WHILE MAINTAINING THE INDICATED HIGH/LOW RATIOS AS CLOSELY AS POSSIBLE. SET THE FREQUENCY AS CLOSE TO 500 KILOHERTZ AS PRACTICAL - AT LEAST WITHIN PLUS OR MINUS 5 KHZ., PREFERABLY WITHIN SEVERAL KILOHERTZ.

NEXT, WITH THE SCOPE BEING TRIGGERED BY "CLOCK PHASE 1," OBSERVE "CLOCK PHASE 2." USE TRIMPOTS R29 AND R31 TO OBTAIN THE FOLLOWING CONDITIONS. "CLOCK PHASE 2" SHOULD GO HIGH ABOUT 200 NANO-SECONDS AFTER THE FALL OF "CLOCK PHASE 1," AND SHOULD REMAIN HIGH FOR APPROXIMATELY 550 NANO-SECONDS. WHEN THIS CONDITION IS MET, AND "CLOCK PHASE 1" HAS BEEN PROPERLY ADJUSTED, THE DISTANCE BETWEEN THE FALL OF "CLOCK PHASE 2" AND THE RISE OF "CLOCK PHASE 1" WILL BE ABOUT 400 NANO-SECONDS.

NOTE! IF AT ANY TIME DURING THE ADJUSTMENT PROCEDURE THE CLOCK SIGNAL(S) DISAPPEAR IT WILL BE NECESSARY TO RE-APPLY POWER TO RESTART THE CLOCK.

WHEN "CLOCK PHASE 1" AND "CLOCK PHASE 2" HAVE BEEN ADJUSTED FOR THE WAVEFORMS AS DESCRIBED, YOU SHOULD ALLOW THE CIRCUIT TO OPERATE FOR APPROXIMATELY 30 MINUTES AND THEN RECHECK THE FREQUENCY. YOU MAY MAKE MINOR ADJUSTMENTS TO BRING THE FREQUENCY TO 500 KHZ. AFTER THE CIRCUIT HAS BEEN OPERATING FOR THIS PERIOD. THIS COMPLETES THE MASTER CLOCK CIRCUITRY ADJUSTMENT PROCEDURE.

A SUMMARY OF THE ADJUSTMENT LIMITS AND A PICTORIAL OF THE WAVEFORMS AND TIMING RELATIONSHIPS IS SHOWN ON THE NEXT PAGE.

CLOCK CIRCUITRY ADJUSTMENT

SUMMARY

CLOCK PERIOD (Phase 1 or 2): 2,000 Nano-seconds \pm 100 Nano-seconds
Minimum pulse width of CLOCK PHASE 1: 700 Nano-seconds
Minimum pulse width of CLOCK PHASE 2: 550 Nano-seconds
Minimum delay from fall of PHASE 1 to rise of PHASE 2: 200 Nano-seconds
Minimum delay from fall of PHASE 2 to rise of PHASE 1: 400 Nano-seconds
Minimum delay from fall of PHASE 1 to fall of PHASE 2: 900 Nano-seconds
Maximum delay from fall of PHASE 1 to fall of PHASE 2: 1,100 Nano-sec.

REPRESENTATIVE WAVEFORMS

