This manual for the Sol Terminal Computer is made up of those sections and appendices preceded with a check (X) mark.

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SECTION I

INTRODUCTION and

GENERAL INFORMATION

Sol-PC SINGLE BOARD TERMINAL COMPUTER TM



1.1 INTRODUCTION

This manual supplies the information needed to assemble, test and use the Sol-PC Single Board Terminal Computer. We suggest that you first scan the entire manual before starting assembly. Then make sure you have all the parts and components listed in the "Parts List" (Table 3-1) in Section III. When assembling the module, follow the instructions in the order given.

Should you encounter any problem during assembly, call on us for help if necessary. If your completed module does not work properly, recheck your assembly step by step. Most problems stem from poor soldering, backward installed components, and/or installing the wrong component. Once you are satisfied that the module is correctly assembled, feel free to ask for our help.

1.2 GENERAL INFORMATION

1.2.1 Sol-PC Description

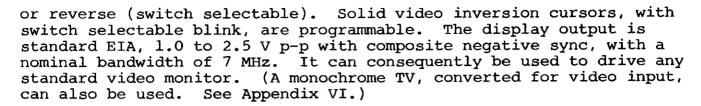
The Sol-PC is a single board microcomputer/terminal built around an 8080 microprocessor. Support circuitry permits full implementation of every 8080 function.

It features both parallel and serial communications interfaces, a keyboard interface, an audio cassette interface, a video display generator, 1024 8-bit words of system RAM (random access memory), 1024 8-bit words of display RAM, and a plug-in personality module with up to 2048 bytes of ROM (read only memory) stored program, and bus compatibility with all Processor Technology hardware and firmware products. Power requirements for the Sol-PC are +5 V dc $\pm 5\%$ at 2.5 A, +12 V dc $\pm 5\%$ at 150 mA and -12 V dc $\pm 5\%$ at 200 mA.

Parallel interfacing is eight bits each for input and output plus control handshaking signals, and the output bus is tristated TTL for bidirectional interfaces. The serial interface circuit includes both asynchronous RS-232 and 20 mA current loop provisions, 75 to 9600 baud (switch selectable).

Seven-level ASCII encoded, TTL keyboard interfacing requires a 2 to 10 usec strobe pulse after data is stable. The dual rate, 300 or 1200 bps (bits per`second), audio cassette interface is program controlled and self clocking with phase-lock loop. It includes automatic level control in both the record and playback modes. Recording is CUTS/Byte standard compatible, asynchronously Manchester coded at 1200/2400 Hz or 600/1200 Hz.

The video display circuitry generates sixteen 64 character lines from data stored in an on-card 1024 8-bit word display RAM. Alphanumeric and control characters (the full 128 upper and lower case plus control ASCII character set) are displayed black on white



Included on the card are 1024 words of static, low power system RAM capable of full speed operation and a plug-in personality module which contains the software control program. Three personality modules are available for Sol:

CONSOLTM--allows simple terminal operations plus direct control of the basic computer functions for entering or examining data in any memory location, or executing a program stored at a known location in memory.

SOLEDTM--allows advanced terminal operations with CONSOL plus screen, file and cassette tape editing/transmission operations.

SOLOSTM--allows full stand-alone terminal-computer operation.

1.2.2 Receiving Inspection

When your kit arrives, examine the shipping container for signs of possible damage to the contents during transit. Then inspect the contents for damage. (We suggest you save the shipping materials for use in returning the kit to Processor Technology should it become necessary to do so.) If your Sol-PC kit is damaged, please write us at once describing the condition so that we can take appropriate action.

1.2.3 Warranty Information

In brief, parts which fail because of defects in materials or workmanship are replaced at no charge for 3 months for kits, and one year for assembled products, following the date of purchase. Also, products assembled by the buyer are warranted for a period of 3 months after the date of purchase; factory assembled units carry a one year warranty. Refer to Appendix I for the complete "Statement of Warranty".

1.2.4 Replacement Parts

Order replacement parts by component nomenclature (DM8131 IC or 1N2222 diode, for example) and/or a complete description (680 ohm, $\frac{1}{4}$ watt, 5% carbon resistor, for example).

1.2.5 Factory Service

In addition to in-warranty service, Processor Technology also provides factory repair service on out-of-warranty Processor Technology products. Before returning the unit to us, first obtain our authorization to do so by writing us a letter describing the problem. After you receive our authorization to return the unit, proceed as follows:

- 1. Write a description of the problem.
- 2. Pack the unit with the description in a container suitable to the method of shipment.
- 3. Ship <u>prepaid</u> to Processor Technology Corporation, 6200 Hollis Street, Emeryville, CA 94608.

Your unit will be repaired as soon as possible after receipt and return shipped to you prepaid. (Factory service charges will not exceed \$20.00 without prior notification and your approval.)

SECTION II

Sol POWER SUPPLY

Sol TERMINAL COMPUTER TM

2.1 INTRODUCTION

The Sol power supply consists of a regulator board plus additional chassis-mounted components. This section covers assembly and test of the complete power supply.

2.2 PARTS AND COMPONENTS

2.2.1 Sol Regulator (Sol-REG)

Check all parts and components against the appropriate "Parts List", Tables 2-1, 2-2 and 2-3. If you have difficulty in identifying any parts by sight, refer to Figure 3-1 on Page III-5 in Section III of this manual.

2.2.2 Power Supply Subchassis and Components

In addition to the Sol-REG, you will need the following parts and components supplied with the Sol Cabinet-Chassis Kit. Check these parts against the appropriate "Parts List(s)", Tables 6-1 and 6-2, in Section VI and separate them from the other cabinet-chassis parts.

Fan Closure Plate

Power Supply Subchassis (L-shaped)

- 4 each 4-40 x 3/16 Machine Screw
- 4 each 4-40 x 5/16 Machine Screw
- 4 each 4-40 Hex Nut
- 10 each #4 Lockwasher
- 14 each 6-32 x ½ Machine Screw
- 14 each 6-32 Hex Nut
- 16 each #6 Lockwasher
 - 3 each 8-32 x ½ Machine Screw
 - 3 each 8-32 Hex Nut
 - 3 each #8 Lockwasher
- ll each #6 x 1/4 Sheet Metal Screw
- 1 each #6 x 5/16 Sheet Metal Screw
- 2 each #4 Solder Lug
- 2 each 4" Spacer, 4-40 Tapped

Table 2-1. Sol Regulator Parts List.

INT	EGRATE	D CIRCU	ITS		DIODES and RECTIFIERS
1 1458 CPI (U2) 1 7812 (U1) 1 7912 (U3) TRANSISTORS 2 2N2222 (Q2 & 3) 1 T1P41 (Q1)				ape N o	1 MDA101A (FWB2) 1 MDA970-1 (FWB1) 1 IR106B2 or MCR106-2 (SCR1) 2 lN4001 (D3 & 4) 1 lN4148 (D2) 1 lN5231B (D1)
	ISTORS 0.	l ohm,	3 watt, 5 watt,	5%	CAPACITORS 2 .1 ufd, disc 3 15 ufd, tantalum dipped
1			¼ watt,		2 2500 ufd, tubular electrolytic
2	1		watt, watt,		1 *18,000 ufd, electrolytic
4	10	K ohm,	¼ watt,	5%	a spen deduce 3/15 spenting 50
1	56		¼ watt,		A sect 4-4erx 3/16 Machine Su
1			¼ watt,		Office and Oh-A does a
1	4020	ohm,	¼ watt,	5%	vedewwd.o. Aw dole 01
CAB	LE ASS	EMBLIES			The second of th

- 1 *Single wire, 3" (Fuse Holder to Power Switch)
- 1 *Single wire, 31/4" (Power Switch to Commoning Block)
- 1 Two wire, 10" (C8 to Regulator Board)

^{*}Chassis-mounted component

Table 2-1. Sol Regulator Parts List (Continued).

MISCELLANEOUS 1 Sol REG Circuit Board 1 Heat Sink, 690-220-P 1 Heat Sink, 203-AP 1 Heat Sink, aluminum 2 Coax Connector, female* (Video Output) 1 Coax Connector, male (Video Output Cable) 1 Coax Connector Adapter Sleeve (Video Output Cable) 1 *AC Receptacle, female 1 *Fuse Holder 1 *SPST Power Switch, pushbutton (S5) 1 AC Power Cord 2 *Commoning Blocks 1 *Clamp for C8, $1\frac{1}{2}$ " 4 Tie Wraps Mica Insulators 1 4-40 x 7/16 screw 1 4-40 x 5/8 screw 4-40 Hex Nut 1 6-32 x ½ screw, metal 2 6-32 x ½ screw, Nylon 3 6-32 Hex Nut 5 #4 Lockwasher, internal tooth l Length Solder

^{*}Chassis-mounted component

Table 2-2. Sol-10 Power Supply Parts List.

The Sol-10 Power Supply Kit includes all Sol-REG parts listed in Table 2-1 plus the following components:

1 *Power Transformer, Tl

1 *Fuse, 3 amp Slo-Blo (F1)

Table 2-3. Sol-20 Power Supply Parts List.

The Sol-20 Power Supply Kit includes all Sol-REG parts listed in Table 2-1 plus the following components:					
RESISTORS 1 *39 ohm, 2 watt, 5%	CAPACITORS 1 *54,000 ufd, electrolytic				
RECTIFIERS 1 *MDA980-1 (FWB3)	TRANSFORMERS 1 *Power Transformer, T2				
MISCELLANEOUS	TO A WORLD A STATE OF THE				
1 *Fan	1 5-wire Cable Assembly				
1 *Fan Guard	1 *Clamp for C9, 2½"				
1 *Fuse, 3 amp Slo-Blo	2 *#10 solder lug, internal tooth				

^{*}Chassis-mounted component

^{*}Chassis-mounted component

2.3 ASSEMBLY TIPS

2.3.1 Electrical

For the most part the assembly tips given in Paragraph 3.2 of Section III (Page III-1) apply to assembling the Sol regulator board and power supply.

In addition, scan Section II completely before you start to assemble the power supply.

2.3.2 Mechanical

- 1. If you do not have the proper screwdrivers (see Paragraph 2.5), we recommend that you buy them rather than using a knife point, a blade screwdriver on a Phillips screw, and other makeshift means. Proper screwdrivers minimize the chances of stripping threads, disfiguring screw heads and marring decorative surfaces.
- 2. To assure a correct fit and tight assembly, be sure you use the screws specified in the instructions.
- 3. Lockwashers are widely used in the power supply assembly so that screws will not loosen when subjected to stress or vibration. When a lockwasher is specified, do not omit it and make sure you install it correctly.
- 4. Some instructions call for prethreading holes. This is done to make assembly easier by giving you maximum working space for installing relatively hard-to-drive sheet metal screws. If you bypass prethreading instructions you will only make subsequent cabinet-chassis assembly more difficult.

To prethread a hole, insert specified screw in the hole and position it as straight as possible. While holding the screw in this position, drive it into the metal with the proper screwdriver. If started straight the screw will continue to go straight into the metal so that the head and sheet metal surfaces are in full contact.

5. The diameter of the shank (threaded portion) of a screw increases in relation to its number. For example, a 6-32 screw is larger in diameter than a 4-40 screw. Also, a #8 lockwasher is larger than a #4 lockwasher.

2.4 ASSEMBLY PRECAUTIONS

The precautions concerning soldering and the installation and removal of integrated circuits given in Paragraph 3.3 of Section III (Page III-6) also apply to assembling the Sol regulator board.

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SECTION II

2.5 REQUIRED TOOLS, EQUIPMENT AND MATERIALS

The following tools, equipment and materials are recommended for assembling the Sol regulator board:

- 1. Needle nose pliers
- 2. Diagonal cutters
- 3. Sharp knife
- 4. Screwdriver, thin 4" blade
- 5. Screwdriver, #2 Phillips
- 6. Controlled heat soldering iron, 25 watt
- 7. 60-40 rosin-core solder (supplied)
- 8. Volt-ohm meter

2.6 ORIENTATION

2.6.1 Sol-REG PC Board

Location C5 (2500 ufd capacitor) will be located in the lower right-hand corner of the circuit board when locations SCRl, Ql and FWBl are positioned along the top of the board. In this position the component (front) side of the board is facing up and the horizontal legends will read from left to right; the other legends will read from bottom to top. Subsequent position references related to the Sol-REG board assume this orientation.

2.6.2 Fan Closure Plate

The large circular cutout will be located in the upper right quadrant of the plate when the heavy gauge doubler plate is facing up. In this position the rectangular cutouts are on the left, the front side of the plate is facing down, the back side is facing up, and the small circular cutout is at the bottom.

2.7 ASSEMBLY-TEST

NOTE

Instructions that apply only to the Sol-20 are preceded by an asterisk. Skip these instructions if you are assembling a Sol-10.

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2.7.1 Fan Closure Plate Assembly

Refer to Drawing No's. 105001 and 105014 in Section X. (Figure 2-1 shows a completed fan closure plate assembly.)



Figure 2-1. Sol-20 fan closure plate assembly. (Top of plate in foreground.)

*(Step 1. Mount cooling fan and guard to fan closure plate.

Insert four 6-32 x ½" binder or pan head screws from back side of fan closure plate. (Use the holes positioned in each quandrant of the large circular cutout.) Slip fan guard over screws on front side of plate. Position fan so that air flow will be from front to back side of plate and with its leads next to the rectangular cutouts in the place. Place #6 lockwasher on each screw and secure with 6-32 hex nut.

WARNING

FAILURE TO INSTALL FAN GUARD MAY RESULT IN DAMAGE TO THE Sol AND/OR PERSONAL INJURY.

(<u>Step 2</u>. Install power on-off switch in <u>upper</u> rectangular cutout in fan closure plate.

(Step 2 continued on Page II-8.)

Bend four retainer tabs on switch <u>in</u> and position switch with terminals facing front side of fan closure plate. Push switch unit from back side of plate through mounting hole and bend retainer tabs outward to hold switch in place.

(step 3. Install commoning blocks on front side of fan closure plate, one on each side of on-off switch.

Position each block with terminal #1 at top and terminal #5 at bottom and attach each block to front side of fan closure plate with two $6-32 \times \frac{1}{2}$ binder or pan head screws. Insert screws from back side of plate, place block over screws, on front side of plate, put #6 lockwasher on each screw and secure with 6-32 hex nut.

(Step 4. Install fuse holder in mounting hole located between the two rectangular cutouts in the fan closure plate.

Insert fuse holder from back side of plate, position large tab at top (next to on-off switch) and secure holder to plate with the large lockwasher and nut supplied with holder.

(<u>Step 5</u>. Install AC Power cord receptacle on fan closure plate.

Position receptacle on front side of fan closure plate over the rectangular cutout below fuse holder. Orient receptacle with green lead at the bottom and align the receptacle and closure plate mounting holes. Insert two 6-32 x ½ binder or pan head screws from back side of plate through each mounting hole, put #6 lockwasher on each screw and secure with 6-32 hex nut.

() <u>Step 6</u>. Install female coaxial connector on fan closure plate.

Insert connector from front side of plate so that the threaded end projects through to the back side. Then insert four 4-40 x 5/16 binder or pan head screws from back side of plate through the four connector and plate mounting holes. Place #4 lockwasher on each screw except the upper one which is closest to the AC receptacle. Secure with 4-40 hex nuts. (Leave upper nut closest to receptacle loose.)

(Step 7. Prepare coaxial cable.

Cut a 13" piece of coaxial cable from that supplied with the Sol-PC kit. Strip away one inch of the outer insulation at both ends to expose shield. Unbraid shield at one end and twist it into a single lead. Do the same thing at the other end. Tin shield lead at each end and solder a #4 lockwasher lug to each lead. Then remove ½" of the inner conductor insulation at both ends. (See Figure 2-2.)

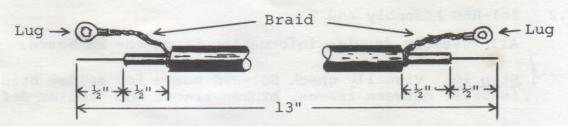


Figure 2-2. Coaxial cable preparation.

(<u>Step 8</u>. Connect coaxial cable to coaxial connector installed in Step 6.

Solder inner conductor on one end to the pin of the connector. Remove hex nut on upper connector mounting screw closest to AC receptacle, place lockwasher lug (coaxial shield) on screw and reinstall hex nut.

() Step 9. Connect fan closure plate wiring.

Install the 3½" power switch-to-commoning block cable supplied with your Sol-REG kit. Connect the female spade lug end to the upper terminal of the on-off switch and the commoning block lug end to the #l terminal of the commoning block closest to the fan.

() Install the 3" fuse holder-to-power switch cable supplied with your Sol-REG kit. (This cable has female spade lugs at both ends.) Connect one end to the bottom terminal of the on-off switch and the other to the longer male spade lug on the fuse holder.

() Connect the AC receptacle wire closest to the fan to the other fuse holder lug.

NOTE

The green AC receptacle wire will be connected later.

- Connect other AC receptacle wire to terminal #4 on the commoning block furthest away from the fan.
- *() Connect upper wire of fan cord to terminal #3 of the commoning block closest to fan.
- *(Connect lower wire of fan cord to terminal #5 of commoning block furthest from fan.
 - (Put fan closure assembly to one side.

Sol POWER SUPPLY SECTION II

2.7.2 Sol-REG Assembly and Test

All assembly drawing information is on the PC board.

(Step 10. Visually check Sol-REG board for solder bridges (shorts) between traces, broken traces and similar defects.

If visual inspection reveals any defects, return the board to Processor Technology for replacement. If the board is not defective, proceed to next paragraph.

(Step 11. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
() R1 () R2 () R3 () R4	330 10 K 10 K	none orange-orange-brown brown-black-orange " " "
(V R5	1 K	brown-black-red
(R6	68 10 K	blue-gray-black brown-black-orange
() R8	10 K	brown-black-red
() R9	56 K	green-blue-orange
() R10	10 K	brown-black-orange
(V) Rll	1690	brown-blue-white-brown
() R12	4020	yellow-black-red-brown

Step 12. Install U2 (1458CPI) in its location between C2 and C3. U2 is positioned with pin 1 in the lower left-hand corner and soldered into place. See "Loading DIP Devices" in Appendix IV.

(*) Step 13. Install diodes Dl (lN5231B), D2 (lN4148), D3 and D4 (lN4001). Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim. BE SURE to position Dl with its cathode (dark band) to the left, D2 and D3 with their cathode at the bottom, and D4 with its cathode at the top.

Step 14. Install the following capacitors in the indicated locations. Take care to observe the proper value, type and orientation, if applicable, for each installation. Bend leads outward on solder (back) side of board, solder and trim.

(See NOTE on Page II-11.)

NOTE

Disc capacitor leads are usually coated with wax during the manufacturing process. After inserting leads through mounting holes, remove capacitor and clear the holes of any wax. Reinsert and install.

LOCATION	VALUE (ufd)	TYPE	ORIENTATION
(N, Cl	15	Tantalum	"+" lead bottom right
(V) C2	and to. I have	Disc	None
() C3	Serven .1 about	Disc	None
() C6	15	Tantalum	"+" lead right
() C7	15	Tantalum	"+" lead left

- Step 15. Install 2500 ufd capacitors in locations C4 and C5. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim. Be sure to install C4 with its "+" lead to the right and C5 with its "+" lead to the left.
- () Step 16. Install Q2 and Q3 (2N2222) in their locations. The emitter lead (closest to tab on can) of Q2 is oriented toward the left and the base lead toward the bottom. The emitter lead of Q3 is oriented toward the bottom and the base lead toward the right.
- (Step 17. Install small black "star-shaped" cooling fin (heat sink) on Q2 by slipping it down onto the can. Be sure heat sink does not touch any other component on the board.
- (Step 18. Install bridge rectifier FWB2 (MDA101A) in its location at the bottom of the board. Position FWB2 with its "+" lead at the top and its "-" lead at the bottom, insert leads, solder and trim.
- (Step 19. Install large heat sink, Ul and U3 in their locations on the bottom left corner of the circuit board.
 - () Position large black heat sink, (flat side to board) over the square foil area in the lower left corner of the PC board. Orient sink so that the two triangular cutouts in the sink are over the two triangles of mounting holes in the board.
 - (1) Position Ul (7812) on heat sink and observe how leads must be bent to fit mounting holes. Note that the center lead must be bent down approximately 0.2 inches

(Step 19 continued on Page II-12.)

- Position Ql (TlP41), with component nomenclature up, on heat sink so hole in Ql package is aligned with the holes in sink and PC board. Observe how the leads of Ql must be bent down to fit the pads for Ql and bend them accordingly. Place rectangular mica insulator between heat sink and Ql, insert leads (emitter lead to right) and fasten Ql, insulator and heat sink to board with a 6-32 x ½ Nylon screw, lockwasher and nut. Insert screw from back (solder) side of board and drive nut finger tight.
- Position FWBl (MDA970-1), with "+" lead to the right, on heat sink, determine how leads must be bent as you did for Ql, and bend leads. Insert leads ("+" lead to right) and fasten FWBl and heat sink to PC board with a 4-40 x 5/8 screw, lockwasher and nut. Insert screw from back (solder) side of board and drive nut finger tight.
- Position SCR1 (IR106B2 or MCR106-2) on heat sink with component nomenclature up and prepare it for installation as you did Q1 and FWB1. Place circular mica insulator between heat sink and SCR1, insert leads and fasten SCR1, insulator and sink to PC board with a 4-40 x 7/16 screw, lockwasher and nut. Insert screw from back (solder) side of board and drive nut finger tight.
- (Check alignment of heat sink, SCR1, Ql and FWB2 and tighten the three mounting screws. Solder all leads and trim if required.

NOTE

The heat sink may have to be repositioned when you mount the Sol-REG on the power supply subchassis. This will require that you loosen the mounting screws for SCRl, Ql and FWB2 and retighten them after repositioning the heat sink.

- (V) Step 21. Connect two wire cable assembly (C8 to Regulator Board cable) to regulator. Tin ends without lugs and solder green (+) lead to pad X2 and white (-) lead to pad X3.
- Step 22. Test Sol-REG for short circuits. Check for continuity between FWB1 (MDA970-1) mounting screw and the following points: (The resistance should be greater than 20 ohms in all cases.)

X2
T2
Q1, Base
Q1, Collector
T1
Q1, right-hand lead
Q1, Emitter
Q1, left-hand lead
R1, left-hand lead
D3, top lead
D4, top lead
*D3, bottom lead
*D4, bottom lead

*Resistance will be initially low due to C4 and C5, but it should increase to greater than 20 ohms after a few seconds.

SECTION II

- (Step 23. Set Sol-REG to one side.
- 2.7.3 Power Supply Subchassis Assembly and Test
 - (Step 24. Mount transformer (Tl for Sol-10, T2 for Sol-20) on power supply subchassis (L-shaped chassis).

Position transformer as shown on Drawing No. 105001 and attach it to the subchassis with three 8-32 x ½ binder or pan head screws, #8 lockwashers and 8-32 hex nuts. Insert screws from bottom and outer side of chassis as shown. Place lockwasher on each screw and secure loosely with hex nuts. Slide transformer as close as possible to the edge of the chassis and tighten nuts.

NOTE

Only one of the holes in the side wall is used. Use the one that lines up with the transformer mounting tab.

- () <u>Step 25</u>. Prepare transformer leads.
 - (1) Twist the two black wires together except for the last two inches at the commoning block lug end.
 - (Twist the two green wires together for their full length.
 - (Twist the two yellow wires together for their full length.
 - *(,) Twist the two blue wires together for their full length.
- () Step 26. Connect Sol-PC power cable (4-wire cable which connects to J10 on Sol-PC) to Sol-REG. Tin ends of cable and solder green lead to pad X9, white lead to pad X1, red lead to pad X7 and white-yellow lead to pad X8.
- *() Step 27. Connect Sol-20 DC power cable (5 wire) to Sol-REG. Tin ends of cable and solder white lead to pad X4 (above R8), red-white lead to pad X5 (between C5 and FWB2) and yellow-white lead to pad X6 (left of C5).
 - () Step 28. Connect transformer leads to Sol-REG.
 - Solder green leads to pads Tl and T2, white-yellow lead to pad T3 and yellow leads to pads T4 and T5 on Sol-REG circuit board.
- () <u>Step 29</u>. Prethread the three Sol-REG heat sink mounting holes in the power supply subchassis shown in Drawing No. 105001 with #6 x 5/16 sheet metal screws. Remove screws.

II-14

- Step 30. Place #4 lockwashers on two 4-40 x 3/16 binder or pan head screws. Insert these screws from the bottom side of the power supply subchassis through the two mounting holes located near the middle of the bottom of the power supply subchassis, one on each side. Place another #4 lockwasher on the screws and drive each screw tightly into a 4-40 x ½ tapped spacer.
- (*) <u>Step 31</u>. Position Sol-REG PC board with top edge over the previously installed spacers. Place #4 lockwashers on two 4-40 x 3/16 binder or pan head screws and drive screws through Sol-REG board into spacers.
- (Step 32. Attach heat sink on Sol-REG to power supply subchassis as shown in Drawing No. 105001. At this point use only the two side screws which you used in Step 29 to prethread the holes. (The middle screw will be installed later.) Place a #6 lockwasher on each screw before driving it through the sink into the subchassis. Figure 2-4 shows an assembled Sol-10 power supply subchassis.

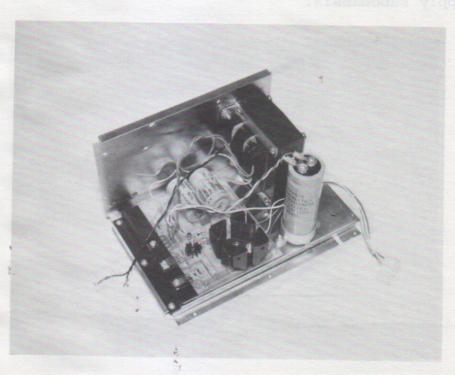


Figure 2-4. Sol-10 power supply subchassis assembly. (Rear of subchassis at left.)

*(Step 33. Install bridge rectifier FWB3 on power supply subchassis.

(Step 33 continued on Page II-16.)

Position FWB3 (MDA980-1) on power supply subchassis as shown on Drawing No. 105001. BE SURE NEGATIVE (-) TERMINAL OF FWB3 is next to transformer. Insert a 6-32 x $\frac{1}{2}$ binder or pan head screw from bottom of subchassis, place #6 lockwasher on screw and secure with 6-32 hex nut.

- *() Step 34. Connect blue transformer wires to unmarked terminals of FWB3.
- *() Step 35. Install large (2½") mounting ring for C9 (54,000 ufd capacitor) on side wall of power supply subchassis as shown on Drawing No. 105001.

Position ring over the three mounting holes in the side wall of subchassis so the clamping screw faces the bottom of subchassis and so it will be accessible from the Sol-REG end of the subchassis. Insert three 6-32 x ½ binder or pan head screws from outer side of side wall through the mounting holes. Place #6 lockwasher on each screw and secure with 6-32 hex nut. Figure 2-5 shows an assembled Sol-20 power supply subchassis.

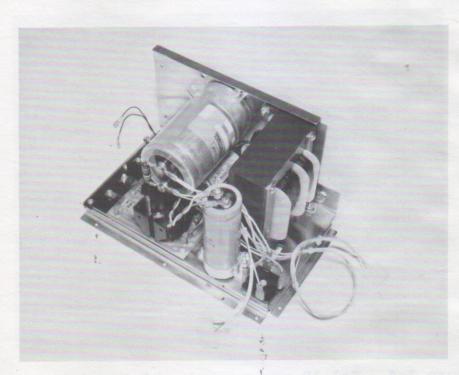


Figure 2-5. Sol-20 power supply subchassis assembly. (Rear of subchassis at left.)

($\sqrt{\frac{\text{Step 36}}{\text{ufd capacitor}}}$) Install small ($1\frac{1}{2}$ ") mounting ring for C8 (18,000 ufd capacitor) as shown on Drawing No. 105001.

(Step 36 continued on Page II-17.)

Position ring over the two mounting holes located hoween FWB3 and the Sol-REG so that the clamping screw is positioned between the transformer and FWB3. Insert two 6-32 x ½ binder or pan head screws from bottom side of chassis through the mounting holes. Place #6 lockwasher on each screw and secure with 6-32 hex nut. (Refer to Figure 2-4.)

- Step 37. Mount C8 in its mounting ring, tighten clamping screw and route Sol-PC power cable between C8 and the transformer. (See Figure 2-4.)
- Step 38. Connect white wire of C8 cable to negative (-) terminal of C8 and green wire to positive (+) terminal of C8. (This cable was soldered to the Sol-REG when you assembled it.) Remove terminal screws, place #10 lockwasher on each screw, place cable lugs on screws and drive screws tightly into appropriate terminals.
- *() <u>Step 39</u>. Mount C9 in its mounting ring and tighten clamping screw. (See Figure 2-5.)
- *(Step 40. Prepare R13 (39 ohm 2 watt) for installation on C9.

Solder a #10 lug to each lead of R13. Bend leads of R13 to fit the terminals of C9. (R13 should fit on C9 as shown in Figure 2-5.)

Step 41. Connect Sol-20 DC power cable (5 wire) and R13 to C9. Route cable between C8 and transformer.

Remove terminal screws from C9. Place lockwasher, terminal screw, blue lead of Sol-20 DC cable and one R13 lead on one terminal screw and drive it into the positive (+) terminal on C9. Attach lockwasher, white cable lead and other R13 lead to negative (-) terminal on C9 in the same manner. Tighten both capacitor terminals tightly.

LOOSE CONNECTIONS ON C9 CAN LEAD TO ARCING AND SUBSEQUENT POWER SUPPLY DAMAGE

*() Step 42. Connect blue pigtail of Sol-20 DC cable to positive (+) terminal of FWB3. (This pigtail has a spade lug at its free end and is connected to the lug you just attached to the positive terminal of C9.) Connect white pigtail of Sol-20 DC cable to negative (-) terminal of FWB3. (This pigtail has a spade lug at its free end and is connected to the lug you just attached to the negative terminal of C9.)

Sol POWER SUPPLY

SECTION II

- (<u>Step 43</u>. Connect green lead from AC receptacle (mounted on fan closure plate) to power supply subchassis assembly as shown in Drawing No. 105001. (Use the #6 x ½ sheet metal screw with which you prethreaded the middle Sol-REG heat sink mounting hole in Step 29.) Place lug on screw and drive screw into the middle Sol-REG heat sink mounting hole.
- (v) Step 44. Route black transformer leads along side wall of power supply subchassis out toward the Sol-REG heat sink. (See Figure 2-4.) Attach one lead to pin 2 of the commoning block (mounted on fan closure plate) nearest the fan. Attach other lead to pin 3 of the other commoning block.
- (1) Step 45. Using a #6 x 1/4 sheet metal screw, attach fan closure plate to power supply subchassis as shown in Drawing No. 105001.
- (Step 46. Push on-off switch in and out to determine the OFF position (switch mechanically out). With switch in OFF position, connect AC power cord to AC receptacle. Then plug power cord into 110 V ac outlet.
- (Step 47. Test power supply for proper operation.
 - (Make sure on-off switch is in OFF position.
 - (Install fuse in fuse holder.

CAUTION

NEVER INSTALL OR REMOVE FUSE WITH POWER ON.

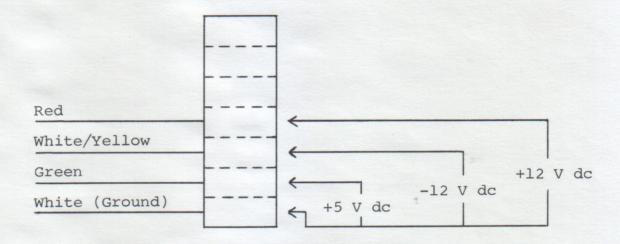
- () Check connector on Sol-PC power cable (4 wire) to insure it is wired as shown in Figure 2-6.
 - *() Check connector on Sol-20 power cable (5 wire) to insure it is wired as shown in Figure 2-7.
 - (Turn on-off switch ON:
 - Measure the voltages at the Sol-PC connector at the points indicated in Figure 2-6. The voltages must be as given in Figure 2-6.

NOTE .

Do not take voltage measurements at any other points in the power supply, even though they may be more accessible. It is important that the indicated voltages be available at the connector.

- *(Measure the voltages at the Sol-20 connector at the points indicated in Figure 2-7. The voltages must be within the ranges given in Figure 2-7. (See preceding NOTE.)
- () If the power supply fails any of the preceding tests, locate and correct the cause before proceeding.

If the power supply is operating correctly, turn on-off switch OFF, disconnect power cord, set power supply to one side and go on to Section III.



NOTE: All three voltages have a $\pm 5\%$ tolerance.

Figure 2-6. Sol-PC power connector and voltage measurements.

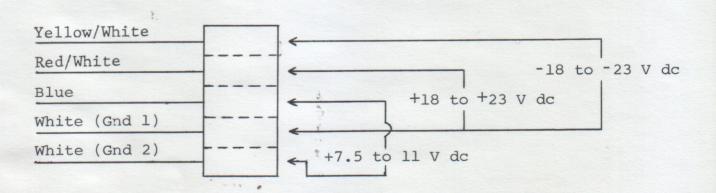


Figure 2-7. Sol-20 power connector and voltage measurements.

SECTION III

ASSEMBLY

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TEST

Sol-PC SINGLE BOARD TERMINAL COMPUTER TM



To simplify reading reciptor values after installation, in the read from left. The radiators so that the order codes or imprints read from left. To right and top to betten as arthroprists (beards oriented as defined

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Both the circuit reference and value or nomenclature (1.5K and 74HOO, for example) for each component ate included on the assembly drawings near the location

3.1 PARTS AND COMPONENTS

Check all parts and components against the "Parts List" on Pages III-2 through III-4 (Table 3-1). If you have difficulty in identifying any parts by sight, refer to Figure 3-1 on Page III-5.

3.2 ASSEMBLY TIPS

- 1. Scan Sections III and IV in their entirety before you start to assemble your Sol-PC kit.
- 2. In assembling your Sol-PC, you will be following an integrated assembly-test procedure. Such a procedure is designed to progressively insure that individual circuits and sections in the Sol-PC are operating correctly. IT IS IMPORTANT THAT YOU FOLLOW THE STEP-BY-STEP INSTRUCTIONS IN THE ORDER GIVEN.
- 3. Assembly steps and component installations are preceded by a set of parentheses. Check off each installation and step as you complete them. This will minimize the chances of omitting a step or component.
- 4. When installing components, make use of the assembly aids that are incorporated on the circuit boards and the assembly drawings. (These aids are designed to assist you in correctly installing the components.)
 - a. The circuit reference (R3, Cl0 and U20, for example) for each component is silk screened on the PC boards near the location of its installation.
 - b. Both the circuit reference and value or nomenclature (1.5K and 74H00, for example) for each component are included on the assembly drawings near the location of its installation.
- 5. To simplify reading resistor values after installation, install resistors so that the color codes or imprints read from left to right and top to bottom as appropriate (boards oriented as defined in Paragraph 3.5 on Page III-7).
- 6. Unless specified otherwise, install components, especially disc capacitors, as close as possible to the boards.
- 7. Should you encounter any problem during assembly, call on us for help if needed.

Table 3-1. Sol-PC Parts List.

			Chicago and
INT	EGRATED CIRCUITS		
1	AM0026 or DM0026 (Ul04)	1	74s04 (U92)
1	4N26 (U39)	2	7406 (U57,87)
1	8T94 (U58)	2	74LS10 (U47,61)
5	8T97 (U67,68,77,80,81)	3	74LS20 (U23,59,83)
2	1458CP or 1558CP (U56,108)	1	74LS86 (U74)
1	1489A (U38)	8	74LS109 (U43,52,63,64,70,
2	TMS6011NC (U51,69)		72,73,75)
1	MCM6574 or MCM6575 (U25)	761	
1	4001 (U102)	3	
2	4013 (U100,113)	3	74LS157 (U12,30,32)
1	4019 (Ull1)	4	74LS163 or 25LS163 (U28,31,33,40)
1	4023 (U98)	1	OCCUPANT TO CHILD AND C
1	4024 (U86)	2	
1	4027 (UlO1)	10	。
3	4029 (Ul,11,84)		(U2, 13, 26, 27, 42, 76, 90, 93,
1	4030 (U99)		97,106)
2	4046 (U85,110)	4	
2	4049 (U88,109)	7	74LS367 (U29,37,50,71,89, 94,107)
1	4520 (Ull2)	1	8080, 8080A or 9080A (UlO5)
1	74H00 (U91)	1	8836 or 8T380 (U46)
3	74LS00 (U44,48,55)	16	A CONTRACTOR OF THE CONTRACT O
2	74LS02 or 9LS02 (U53,60)		(U3 - 10, U14 - 21)
4	74LS04 (U24,45,49,54)	1	93L16 (U62)
'R A'	NSTSTORS	DIO	DES
	2NŽ222 (Q4 & Q5)	9	A THE PARTY OF THE
	2N2907 or 2N3460 (Q1 & Q2)	11	lN523lB Zener Diode (Dll)
	2N4360 (Q3)	14	lN4001 (D2,12,13,14)
CRY	STAL	REL	AYS
	14.318 MHz in HC-18/U Case (XTAL)		DIP Reed, Sigma 191-TE1A15S (Kl & K2)

Table 3-1. Sol-PC Parts List (Continued).

				2331	LEGIS			BIG	
RESISTORS						CAP	ACITORS		*
2	47	ohm,	1/4	watt,	5%	1	10	pfd,	disc
1	75	ohm,	1/4	watt,	5%	1	330	pfd,	disc
1	100	ohm,	1/4	watt,	5%	3	680	pfd,	monolythic or disc
3	100	ohm,	1/2	watt,	5%				ceramic (labeled 681 and usually
1	200	ohm,	1/4	watt,	5%				blue)
13	330	ohm,	1/4	watt,	5%	6	.001	ufd,	disc
1	330	ohm,	1/2	watt,	5%	2	.001	ufd,	Mylar tubular
3	470	ohm,	1/4	watt,	5%	2	.01	ufd,	Mylar tubular
2	470	ohm,	1/2	watt,	5%	37	.047	ufd,	disc
9	680	ohm,	1/4	watt,	5%	12	.1	ufd,	disc
64	1.5K	ohm,	1/4	watt,	5%	1	.1	ufd,	Mylar tubular
1	3.3K	ohm,	1/4	watt,	5%	1	.68	ufd,	monolythic ceramic
6	5.6K	ohm,	1/4	watt,	5%	1	1	ufd,	tantalum dipped
32	10 K	ohm,	1/4	watt,	5%				(usually orange or red)
1	15 K	ohm,	1/4	watt,	5%	5	15	ufd.	tantalum dipped
2	39 K	ohm,	1/4	watt,	5%	11		4247	(usually orange or
1	47 K	ohm,	1/4	watt,	5%				red)
3	50 K	ohm,	Po	otenti	ometer	1	100	ufd,	aluminum electrolytic
4	100 K	ohm,	1/4	watt,	5%				
2	150 K	ohm,	1/4	watt,	5%				
2	1 M	ohm,	74	watt,	5%				
1	2.2M	ohm,	1/4	watt,	5%			177	
2	3.3M	ohm,	1/4	watt,	5%	3 L			

CONNECTORS

- 1 25-pin Female, AMP206584-2 (J1)
- 1 25-pin Male, AMP206604-1 (J2)
- 2 20-pin Header, 3M3492-2002 (J3 & J4)
- 1 30-pin Right Angle Edge Connector, VIKING 3KH15/1JKC15 (J5)
- 2 Miniature Phone Jack (J6 & J7)
- 2 Subminiature Phone Jack (J8 & J9)
- 1 7-pin Male Locking Molex Connector (J10)
- 1 100-pin Edge Connector, TI H322150-0306A (J11)
- 1 Molex-type DC Power Cable, mates with J10 (prefabricated)

Table 3-1. Sol-PC Parts List (Continued).

MISCELLANEOUS

- 1 Sol-PCB Circuit Board
- length of #24 bare wire
- 2 8-pin DIP Socket
- 29 14-pin DIP Socket
- 74 16-pin DIP Socket
 - 1 24-pin DIP Socket
 - 3 40-pin DIP Socket
- 16 Augat Pins on Carrier
 - 2 DIP Switch, 6 position (S1 & S4)
 - 2 DIP Switch, 8 position (S2 & S3)
 - 1 4-foot Length 72-ohm Coaxial Cable
 - 1 Tie Wrap for Coaxial Cable
 - 2 Mounting Bracket, Sol-1040
- 2 Card Guide, SAE1250F
- 10 #4 Lockwasher, internal tooth
 - 2 #4 Insulating Washer
 - 4 4-40 x ½ Binder Head Screw
 - 6 4-40 x 7/16 Binder Head Screw
 - 2 4-40 x 5/8 Binder Head Screw
- 10 4-40 Hex Nut
- 1 Length Solder
- l Manual
- 1 Personality Module Kit (See Section IV for contents.)

Sol-PC SINGLE BOARD TERMINAL COMPUTER TM

SECTION III

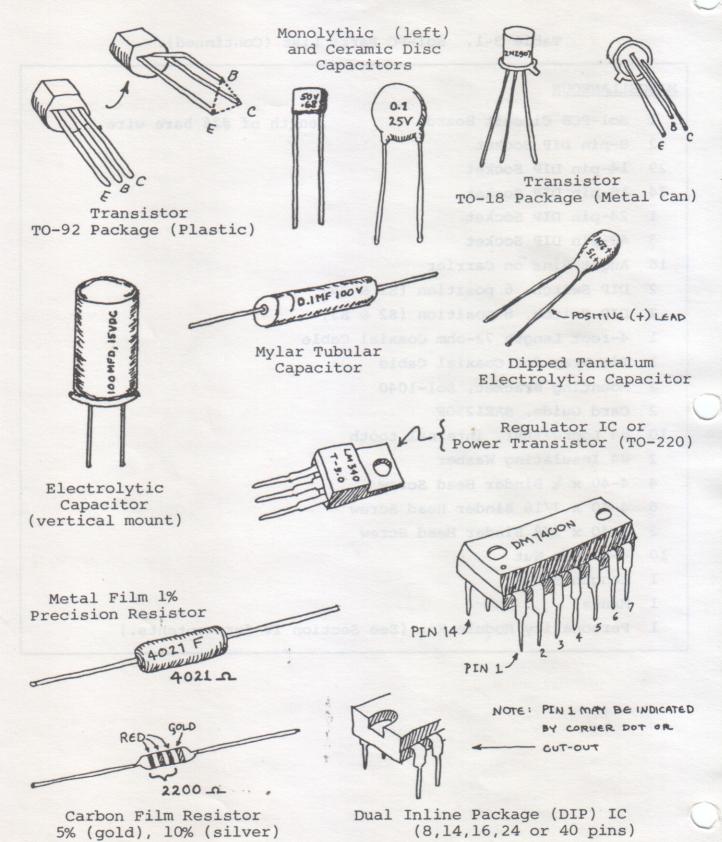


Figure 3-1. Identification of components.

3.3 ASSEMBLY PRECAUTIONS

3.3.1 Handling MOS Integrated Circuits

Many of the IC's used in the Sol-PC are MOS devices. They can be damaged by static electricity discharge. Always handle MOS IC's so that no discharge will flow through the IC. Also, avoid unnecessary handling and wear cotton--rather than synthetic--clothing when you do handle these IC's.

3.3.2 Soldering ** IMPORTANT **

- 1. Use a fine tip, low-wattage iron, 25 watts maximum.
- 2. DO NOT use excessive amounts of solder. DO solder neatly and as quickly as possible.
- 3. Use only 60-40 rosin-core solder. NEVER use acid-core solder or externally applied fluxes.
- 4. To prevent solder bridges, position iron tip so that it does not touch adjacent pins and/or traces simultaneously.
- 5. DO NOT press tip of iron on pad or trace. To do so can cause the pad or trace to "lift" off the board and permanently damage the board.
- 6. The Sol-PC uses circuit boards with plated-through holes. Solder flow through to the component (front) side of the board can produce solder bridges. Check for such bridges after you install each component.
- 7. The Sol-PC circuit boards have integral solder masks (a lacquer coating) that shield selected areas on the boards. This mask minimizes the chances of creating solder bridges during assembly. DO, however, check <u>all</u> solder joints for possible bridges.
- 8. Additional pointers on soldering are provided in Appendix IV of this manual.
- 3.3.3 Power Connection (J10)

NEVER connect the DC power cable to the Sol-PC when power supply is energized. To do so can damage the Sol-PC.

3.3.4 Installing and Removing Integrated Circuits

NEVER install or remove integrated circuits when power is applied to the Sol-PC. To do so can damage the IC.

3.3.5 Installing and Removing Personality Module

NEVER install or remove the plug-in personality module when power is applied to the Sol-PC. To do so can damage the module.

Rev A

3.3.6 Use of Clip Leads

TAKE CARE when using a clip lead to establish a ground connection when testing the Sol-PCB circuit board. Make sure that the clip makes contact only with the ground bus on the perimeter of the board.

3.4 REQUIRED TOOLS, EQUIPMENT AND MATERIALS

The following tools, equipment and materials are recommended for assembling and testing the Sol-PC:

- 1. Needle nose pliers
- 2. Diagonal cutters
- 3. Screwdriver
- 4. Sharp knife
- 5. Controlled heat soldering iron, 25 watt
- 6. 60-40 rosin-core solder (supplied)
- 7. Small amount of #24 solid wire
- 8. Volt-ohm meter
 - 9. Video monitor or monochrome TV converted for video input.
- 10. IC test clip (optional)
- 11. Oscilloscope (optional)

3.5 ORIENTATION (Sol-PCB)

Location J5 (personality plug-in module connector) will be located in the upper right-hand area of the circuit board when location J10 (power connector) is positioned at the bottom of the board. In this position the component (front) side of the board is facing up and all IC legends (Ul through UlO, U22 through U24, etc.) will read from left to right. Subsequent position references related to the Sol-PCB assume this orientation.

3.6 Sol-PC ASSEMBLY-TEST PROCEDURE

The Sol-PC is assembled and tested in sections and/or circuits. You will first test the Sol-PCB circuit board for shorts (solder bridges) between the power buses and ground. After assembling

the personality module (see Section IV), the clock and display control circuits are assembled. The bus, CPU, decoder and memory circuits are then assembled, followed by the parallel and serial input/output (I/O) and audio cassette I/O sections.

CAUTION

THE Sol-PC USES MANY MOS INTEGRATED CIRCUITS. THEY CAN BE DAMAGED BY STATIC ELECTRICITY DISCHARGE. HANDLE THESE IC'S SO THAT NO DISCHARGE FLOWS THROUGH THE IC. AVOID UNNECESSARY HANDLING AND WEAR COTTON, RATHER THAN SYNTHETIC, CLOTHING WHEN YOU DO HANDLE MOS IC'S. (STATIC CHARGE PROBLEMS ARE MUCH WORSE IN LOW HUMIDITY CONDITIONS.)

3.6.1 Circuit Board Check

- (Visually check Sol-PCB board for solder bridges (shorts) between traces, broken traces and similar defects.
- () Check board to insure that the +5-volt bus, +12-volt bus and -12-volt bus are not shorted to each other or to ground. Using an ohmmeter, make the following measurements (refer to Sol-PC assembly drawing in Section IX).
 - () +5-volt Bus Test. Measure between positive and negative mounting pads for C58. There should be no continuity.
 - (*) +12-volt Bus Test. Measure between positive and negative mounting pads for C59. There should be no continuity.
 - -12-volt Bus Test. Measure between positive and negative mounting pads for C60. There should be no continuity.
 - (√) 5/12/(-12) Volt Bus Test. Measure between positive mounting pads for C58 and C59, between positive pad for C58 and negative pad for C60, and between positive pad for C59 and negative pad for C60. You should measure no continuity in any of these measurements.

If visual inspection reveals any defects, or you measure continuity in any of the preceding tests, return the board to Processor Technology for replacement. If the board is not defective, proceed to next paragraph.

3.6.2 Personality Module Assembly

Since the personality module is required for testing the Sol-PC in the later stages of its assembly, we suggest that you assemble the personality module first. In so doing, your Sol-PC assembly will proceed uninterrupted. Assembly instructions for the personality module are provided in Section IV of this manual.

If you wish to wait to assemble the personality module until it is needed, go on to Paragraph 3.6.3.

3.6.3 Sol-PCB Assembly and Test

Refer to Sol-PC assembly drawing in Section IX.

(V) Step 1. Install DIP sockets. Install each socket in the indicated location with its end notch oriented as shown on the circuit board and assembly drawing. Take care not to create solder bridges between the pins and/or traces. (Refer to footnotes at end of this step before installing UlO5.)

INSTALLATION TIP

Insert socket pins into mounting pads of appropriate location. On solder (back) side of board, bend pins at opposite corners of socket (e.g., pins 1 and 9 on a 16-pin socket) outward until they are at a 45° angle to the board surface. This secures the socket until it is soldered. Repeat this procedure with each socket until all are secured to the board. Then solder the unbent pins on all sockets. Now straighten the bent pins to their original position and solder.

LOCATION			TYPE	SOCKET
() Ul through			16	pin
() U22 through	24			pin
(J U25	.)		24	pin
(V) U26 through	37.		16	pin
(~) U38			14	pin
() U39			Nor	ne
(U40 through		4	16	pin
() U44 through	49	THILL	14	pin
(~) U50		Ý	16	pin
(W, U51		1	40	pin
(~) U52			16	pin
(U53 through	55		14	pin
(V) U56			8	pin
(U57 through	61		14	pin

(Continued on Page III-10.)

LOCATION	TYPE SOCKET
(V) U62 through 68	16 pin
(4) U69	40 pin
(1) U70 through 73	16 pin
(N) U74	14 pin
(V) U75 through 81	16 pin
() U82#	None#
(H) U83	14 pin
(N) U84,85	16 pin
(*) U86,87	14 pin
(W U88 through 90	16 pin
(N) U91,92	14 pin
(4) U93 through 97	16 pin
() U98 through 100	14 pin
(J) U101	16 pin
(U102	14 pin
() U103#	None #
	None + TAL UP
(1 Ul05*	40 pin 2 2 1 1
(1), U106, 107	16 pin
() Ul08	
	8 pin Sine Ingel
(Julo9 through 112	16 pin 14 pin
(W U113	14 pin

#Spare locations, not used.
*Note that Ul05 notch is positioned at the top.

() <u>Step 2</u>. Install the following capacitors in the indicated locations. Take care to observe the proper value, type and orientation, if applicable, for each installation. Bend leads outward on solder (back) side of board, solder and trim.

NOTE

Disc capacitor leads are usually coated with wax during the manufacturing process. After inserting leads through mounting holes, remove capacitor and clear the holes of any wax. Reinsert and install.

LOCATION	VALUE (ufd)	TYPE	ORIENTATION
(/ cl	.047	Disc	None
C2 C3	.047	two for the	special "a good (v)
C4 C5	.047	ado or "esso este bass "aos es la	locations. To
() C6 () C7	.047	n bas "rebice	DESCRIPTION OF THE PROPERTY OF
() C8	.047	II ega" no beur	orinos U geris)

LOCATION	VALUE (ufd)	TYPE	ORIENTATION
(1) clo	.047	Disc	None
() Cll	.047	п	Cou (n)
(C13	.047	chronich 73"	OVU (U)
(C14	.047	п	570 (sn)
() C15	15	Tantalum	"+" lead bottom
(V C16	.047	Disc	None

(<u>Step 3</u>. Check for +5-volt bus to ground shorts. Using an ohmmeter, measure between positive and negative mounting pads for C58. There should be no continuity. If there is, find and correct the problem before proceeding to Step 4.

(\sqrt{1}) Step 4. Install the following capacitors in the indicated locations. Take care to observe the proper value, type and orientation, if applicable, for each installation. Bend leads outward on solder (back) side of board, solder and trim. (refer to NOTE in Step 2.)

LOCATION	VALUE (ufd)	TYPE	ORIENTATION
(W C19	.047	Disc Disc	None
() C20	.047	п	(IIU Du)
() C21	.047	п	1
(C24	.047	see locations, r	idea ii
() C25	.047	ton 3010 Jent es	folia II
(C26	.047	II .	II .
(N C33	.047	coller ser lists	ent work" gods (-)
(V C38	.047	Take care "to of	e acalii soci
(C40	15 1050 101	Tantalum	"+" lead bottom
() C41	.047	Disc	None
(V) C42	.047	II .	" may a
(V C45	.047	II .	п
(1) C56	.047	I DESCRIPTION OF THE PROPERTY	II .
(V/C58	Debasso 15 Issue etc	Tantalum	"+" lead top
(V) C59	15	Tantalum	"+" lead top
(C60	dou 15 abbel pe	Tantalum	"+" lead top
() C65	.047	Disc	None

() Step 5. Check for +5-volt bus to ground shorts. Using an ohmmeter, measure between the positive and negative leads of C58. You should measure at least 100 ohms. Less than 100 ohms indicates a short. If required, find and correct the problem before proceeding to Step 6.

(v) Step 6. Install the following capacitors in the indicated locations. Take care to observe the proper value and type for each installation. Bend leads outward on solder (back) side of board, solder and trim. (Refer to NOTE in Step 2.)

(Step 6 continued on Page III-12.)

LOCATION	VALUE (ufd)	TYPE	ORIENTATION
(N) C9 (L) C12	.047	Disc	None
() C17	.047	610 080	II 145 (1)
() C18	.047	538 100.	185
() C22 () C23	.047	53U 88.	" 285 VI
(M C27	.047	53.0	II 1850 (V)
() C28	.047	II TO ALL FLAG	II
() C46	.047	CREET TO LEGAL 1160	mant " . It gode (L)

(1) Step 7. Check for +5-volt bus to ground shorts. Using an ohmmeter, measure between the positive and negative leads of C58. You should measure some resistance. Zero resistance indicates a short. If required, find and correct the problem before proceeding to Step 8.

Step 8. Install diodes D8 (1N4148 or 1N914), D11 (1N5231B) and D12 (1N4001) in their locations (in the area below U90 through U92). Position D8 with its dark band (cathode) to the right, D11 with its band at the bottom, and D12 with its band at the top.

NOTE

The leads of Dl2 and its mounting holes are a snug fit. Take care when installing this diode.

Step 9. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
() R104	10 K	brown-black-orange
(R105 (R106	1.5K	brown-green-red
() R130 () R131	100, ½ watt	brown-black-brown
(R132 (R133	100, ½ watt	" " " " orange-brown
() R134 () R135 & 136	330 10 K	brown-black-orange
() R137 & 138	47.	yellow-violet-black

(v) Step 10. Install the following capacitors in the indicated locations. Take care to observe the proper value and type for each installation. Bend leads outward on solder (back) side of board, solder and trim. (Refer to NOTE in Step 2.)

LOCATION	VALUE	TYPE
() C39 () C43 () C44 () C61 () C62 () C63 () C64	.1 ufd 680 pfd 680 pfd .001 ufd .68 ufd .1 ufd 10 pfd	Disc Monolythic or Disc Monolythic or Disc Disc Monolythic Disc Disc

(1) Step 11. Install 14.318 MHz crystal in its location just above C61. Insert leads and pull down until the case is 1/16" above the front surface of the board. Solder quickly and trim.

(1) Step 12. Install male locking Molex connector in location J10. Position connector so the pins are closer to the bottom edge of the board than they are to the crystal (XTAL), insert shorter pins in mounting holes and solder.

Step 13. In the jumper area labeled CLK on the <u>assembly</u> drawing (between U90 and U91), install Augat pins in mounting holes A,B,C,D and E. (Refer to "Installing Augat Pins" in Appendix IV.) Using #24 bare wire, install a jumper between the A and B pins and another jumper between the D and E pins.

(*) <u>Step 14</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation. DO NOT SUBSTITUTE FOR ANY OF THESE IC's.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

ic No.	TYPE
() U77	8T97
U90	74LS175 or 25LS175
U91	74H00
U92	74S04
U104*	AM0026 or DM0026*

*Solder this IC in its location. See "Loading DIP Devices" in Appendix IV.

(<u>Step 15</u>. Connect power to power connector J10. Power and interconnection requirements are as follows:

(Step 15 continued on Page III-14.)

CAUTION 1

NEVER CONNECT POWER CABLE TO J10 WITH POWER SUPPLY ENERGIZED.

CAUTION 2

MAKE SURE POWER CABLE CONNECTOR MATES EXACTLY WITH J10; THAT IS, PIN 1 TO PIN 1, PIN 2 TO PIN 2, ETC. ANY OTHER MATING RELATIONSHIP WILL "BLOW" THE IC's.

	J10 PIN NO.	POWER
000000	1 2 and 6	Ground +5 V dc <u>+</u> 5%, 2 A max
1 2 3 4 5 6 7	3 and 5	$-12 \text{ V dc } \pm 5\%$, 300 mA max $+12 \text{ V dc } \pm 5\%$, 100 mA max
(J10, Top View)	7	Ground

NOTE

Though not labeled on the connector, J10 pins are designated 1 through 7, reading from left to right.

(Step 16. Check clock circuits. If you have an oscilloscope, use part A of this step. If you do not, use part B.

A. Oscilloscope Check

() Using an oscilloscope, check for the waveforms given in Figure 3-2 on Page III-15 at the indicated observation points and in the order given. The waveforms shown in Figure 3-2 approximate actual waveforms. If any waveforms are incorrect, determine and correct the cause before proceeding with assembly.

NOTE

Irregularities up to 1 volt are acceptable on positive portions of waveforms. Negative portions, however, should be relatively flat.

B. Volt-ohm Meter Check

() Using the test probe shown in Figure 3-3 on Page III-16, set meter to DC volts and make the following measurements:

(Volt-ohm Meter Check continued on Page III-16.)

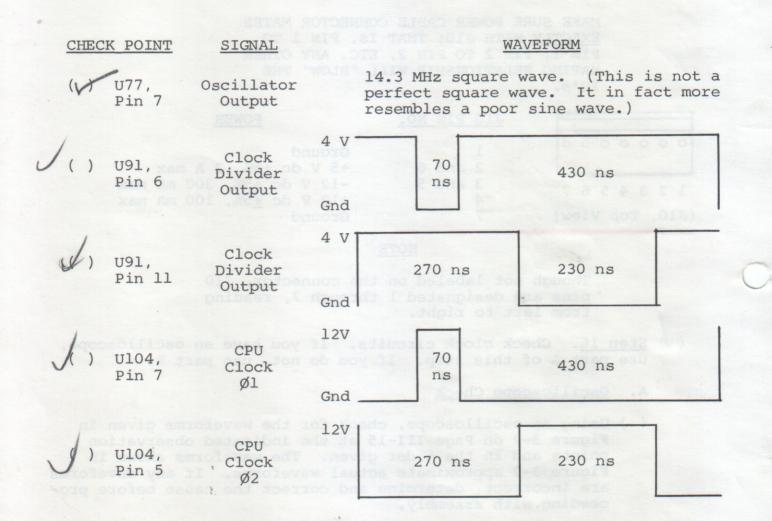


Figure 3-2. Clock circuit waveforms.

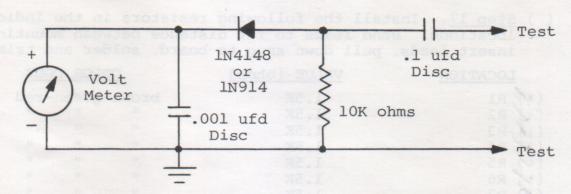


Figure 3-3. Test probe for Steps 16B and 25B.

NOTE 1

The probe shown in Figure 3-3 can be made using parts supplied with your Sol-PC kit. Since these parts will be used later in the Sol-PC assembly, DO NOT shorten the leads or otherwise alter the components. Assemble the probe using tack soldering technique.

NOTE 2

Make sure you have a good ground connection between the meter, probe and Sol-PCB.

At pin 7 of U77 you should measure approximately 1.5 V dc. (A significantly lower reading indicates a faulty oscillator circuit.)

At pin 6 of U91 you should measure approximately 0.25 V dc. (A significantly lower reading indicates a faulty clock divider. U90.)

At pin 11 of U91 you should measure approximately 1.25 V dc. (A significantly lower reading indicates a faulty clock divider, U90.)

At pin 5 of Ul04 you should measure approximately 4 V dc. (A significantly lower reading indicates a problem with Ul04.)

At pin 7 of Ul04 you should measure approximately 8 V dc. (A significantly lower reading indicates a problem with U 104.)

If any voltages are incorrect, determine and correct the cause before proceeding with assembly.

() If all voltages are correct, turn power supply off and disconnect power cable.

() <u>Step 17</u>. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
(V) Rl	1.5K	brown-green-red
() R2	1.5K	11 11 11
(N) R3	1.5K	н н н
(1) R4	1.5K	н н н
(N R5	1.5K	н н н
(V) R6	1.5K	п п п
() R7	1.5K	н н н
() R8	1.5K	P OF STREET
() R9	1.5K	н н н
() R10	1.5K	п п п
(R11	1.5K	11 11 11
() R16	ed mo E-1.5K old ml Avo	do allow all II
() R17	1.5K logue atte	TO THE OWNER OF THE PARTY OF TH
(R19	1.5K	arm squirms m
() R30	1.5K	THE RESERVE OF THE PARTY OF THE
() R80*	330, ½ watt	orange-orange-brown
() R81	75	violet-green-black
() R82	augustania 200 miliania ana ana	red-black-brown
() R83	1.5K	brown-green-red
() R84	3.3M	orange-orange-green
() R85	1.5K	brown-green-red
() R86	1.5K	
() R87	bue edo 330 tedem edd need	orange-orange-brown
() R88	680	blue-gray-brown
() R89	1.5K	brown-green-red
() R90	1.5K	" " " "
() R96	1.5K	and the second s
() R97	1.5K	n n
() R98	10 K	brown-black-orange
() R99	1.5K	brown-green-red
() R100	10 K	brown-black-orange
() R101	1.5K	brown-green-red
() R102	3.3M	orange-orange-green
() R103	1:5K	brown-green-red
() R120	100 K	brown-black-yellow
() R121	10 K	brown-black-orange
() R122	10 K	11 11 11
() R123	39 K	orange-white-orange
() R124	1.5K	brown-green-red
() R125	1.5K	" " "
() R126	39 K	orange-white-orange
() R127	10 K 3	orange-black-orange
() R128	3.3K Drown	orange-orange-red
() R129	10 V	orange-black-orange
() VR1 & VR	15	Potentiometer

*The leads of R80 and its mounting holes form a snug fit. Take care when installing this resistor. (Step 18. Install the following capacitors in the indicated locations. Take care to observe the proper value and type for each installation. Bend leads outward on solder (back) side of board, solder and trim. (Refer to NOTE in Step 2.)

CAUTION

REFER TO FOOTNOTE AT END OF THIS STEP BEFORE INSTALLING C31.

	LOCATION	VALUE	the two lang	TYPE
	(V _C31*	100		Aluminum Elegtuslutia
1	() C32	100	ufd ufd	Aluminum Electrolytic Disc
1	() C34	680	pfd	Monolythic or Disc
	() C35	.1	ufd	Mylar Tubular
1	() C36		ufd	Disc
	(W C37	1274		Disc
	(C52	.001	ufd	Mylar Tubular
	() C53	.01		Mylar Tubular
	(C54	.001		Disc
	() C55	.001		Disc
	(C57	.1	ufd	Disc

*Install C31 with "+" lead at the top.

- (V Step 19. Install Q2 (2N2907 or 2N3460) in its location below and to the right of U88. The emitter lead (closest to tab on can) is oriented toward the left of the board and the base is oriented toward the bottom. Push straight down on transistor until it is stopped by the leads. Solder and trim.
- (Step 20. Install diodes D9 and D10 (1N4148 or 1N914) in their locations below U88. Position D9 with its dark band (cathode) to the left and D10 with its band to the right.
- (<u>Step 21</u>. Install coaxial cable, composite video output. (See Figure 3-4 for details on how to prepare cable.)
 - (Strip away about 14" of the outer insulation to expose shield. Unbraid shield, gather and twist into a single lead. Then strip away the inner conductor insulation, leaving about 4" at the shield end.

CAUTION

WHEN PREPARING AND INSTALLING SHIELD, BE SURE BITS OF BRAID DO NOT FALL ONTO BOARD. SUCH DEBRIS CAN CREATE HARD-TO-FIND SHORT CIRCUITS.

(Insert inner conductor in mounting hole Pl (left side of board), solder and trim.

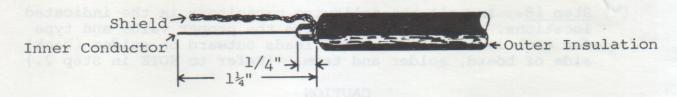


Figure 3-4. Coaxial cable preparation.

Insert twisted shield in mounting hole P2, solder and trim. Using the two large holes to the right of VR1 and VR2, tie cable to board with tie wrap (see CAUTION below).

CAUTION

AFTER INSTALLATION, FINE BITS OF THE BRAID FROM THE SHIELD MAY WORK LOOSE AND FALL ONTO THE BOARD AND CREATE HARD-TO-FIND SHORT CIRCUITS. TO PREVENT THIS, COAT ALL EXPOSED BRAID WITH AN ADHESIVE AFTER SOLDERING AND TIEING. USE AN ADHESIVE SUCH AS SILICONE, CONTACT CEMENT OR FINGERNAIL POLISH. DO NOT USE WATER BASE ADHESIVES.

- (Step 22. Install 6-position DIP switch in location Sl on left end of board. Position Switch No. l at the bottom.
- Step 23. Install 20-pin header in location J4 (video expansion connector) between U28 and U29. Position header so pin 1 is in the lower right corner. (An arrow on the connector points to pin 1.)
- (<u>Step 24</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

1	IC NO.	TYPE
	() U28 () U31 () U33 () U40 () U43	74LS163 or 25LS163 74LS163 or 25LS163 74LS163 or 25LS163 74LS163 or 25LS163 74LS109
	() U47 () U49	74LS10 74LS04

(Step 24 continued on Page III-20.)

IC NO.	TYPE
() U59 () U60 () U62 () U74 () U75	74LS20 74LS02 or 9LS02 93L16 74LS86 74LS109
(J) U87	7406
() U88*	4049*
(V U102*	4001*

*MOS device. Refer to CAUTION on Page III-8.

(Step 25. Apply power to Sol-PC and check display section timing chain operation. If you have an oscilloscope, use part A of this step. If you do not, use part B.

A. Oscilloscope Check

Using an oscilloscope, check for the waveforms given in Figure 3-5 at the indicated observation points and in the order given. The waveforms shown in Figure 3-5 approximate actual waveforms. If any waveforms are incorrect, determine and correct the cause before proceeding with assembly.

NOTE

Irregularities up to 1 volt are acceptable on positive portions of waveforms. Negative portions, however, should be relatively flat.

B. Volt-ohm Meter Check

() Using the test probe made in Step 16B, measure the voltage at pin 12 of U28. You should measure approximately 1 V dc. If you get a significantly lower reading, find and correct the cause before you proceed with assembly.

(Turn off power supply and disconnect power connector.

() Step 26. Check synchronization circuits.

(Set all Sl switches to OFF.

(Connect Sol-PC video output cable to video monitor.

SEE CAUTION ON PAGE III-22 BEFORE CONNECTING MONITOR.

(Step 26 continued on Page III-22.)

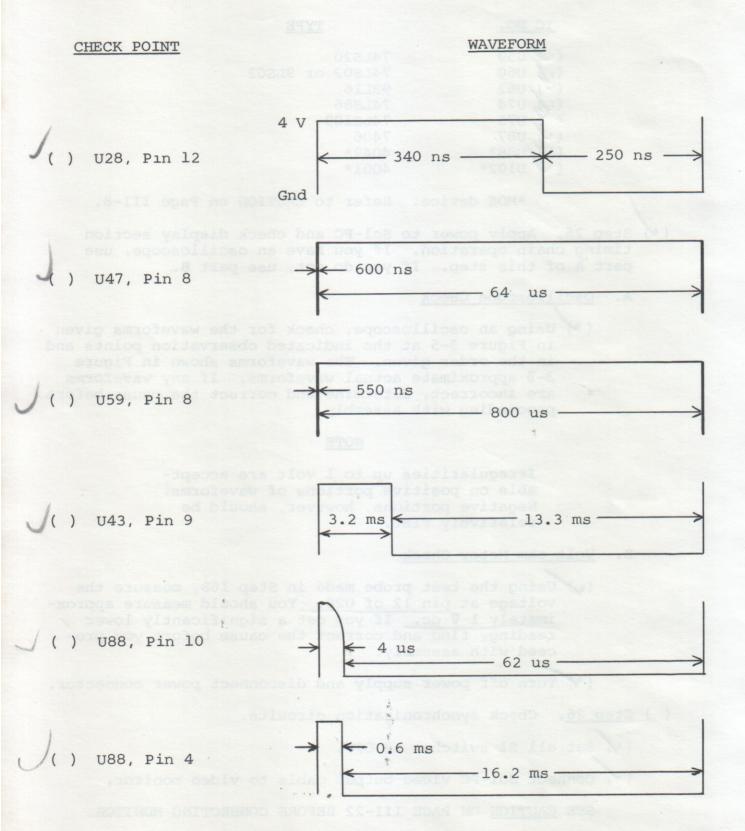


Figure 3-5. Display section timing waveforms.

1	IC NO.	TYPE
-	() U59	74LS20
1	() U60	74LS02 or 9LS02
J	(W U62	93L16
	() U74	74LS86
	() U75	74LS109
	() U87	7406
	() U88*	4049*
	() U102*	4001*

*MOS device. Refer to CAUTION on Page III-8.

() <u>Step 25</u>. Apply power to Sol-PC and check display section timing chain operation. If you have an oscilloscope, use part A of this step. If you do not, use part B.

A. Oscilloscope Check

() Using an oscilloscope, check for the waveforms given in Figure 3-5 at the indicated observation points and in the order given. The waveforms shown in Figure 3-5 approximate actual waveforms. If any waveforms are incorrect, determine and correct the cause before proceeding with assembly.

NOTE

Irregularities up to 1 volt are acceptable on positive portions of waveforms. Negative portions, however, should be relatively flat.

B. Volt-ohm Meter Check

- () Using the test probe made in Step 16B, measure the voltage at pin 12 of U28. You should measure approximately 1 V dc. If you get a significantly lower reading, find and correct the cause before you proceed with assembly.
- () Turn off power supply and disconnect power connector.
- () Step 26. Check synchronization circuits.
 - () Set all Sl switches to OFF.
 - () Connect Sol-PC video output cable to video monitor.

SEE CAUTION ON PAGE III-22 BEFORE CONNECTING MONITOR.

(Step 26 continued on Page III-22.)

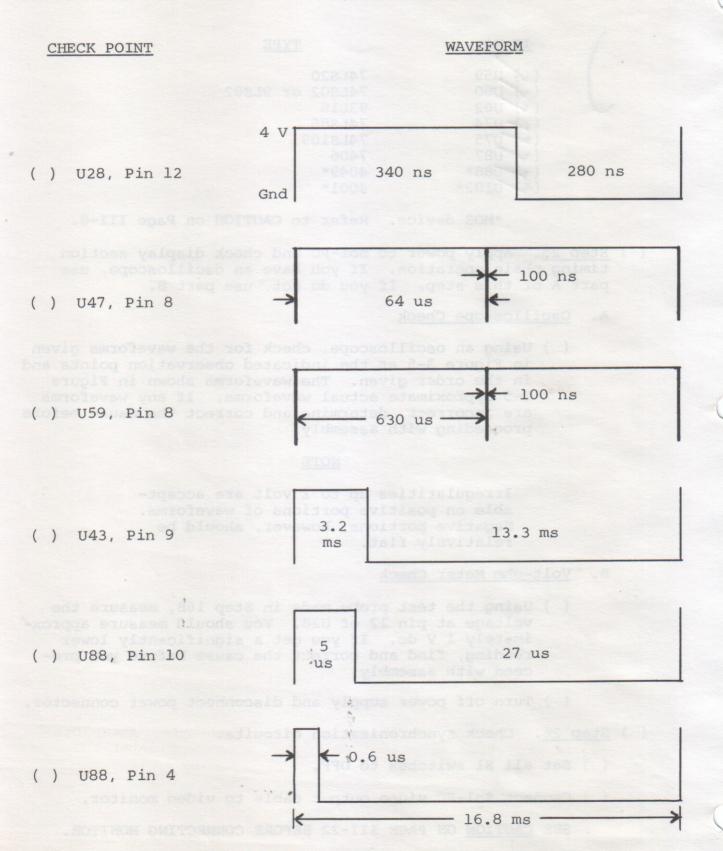


Figure 3-5. Display section timing waveforms.

III-21

CAUTION

DO NOT CONNECT THE SOI-PC VIDEO OUTPUT TO A MONITOR OR TV RECEIVER THAT IS NOT EQUIPPED WITH AN ISOLATION TRANSFORMER. (SEE PAGE AVI-7 IN APPENDIX VI.)

() Set VR2 (VERT) and VR1 (HORIZ) on the Sol-PC to their midrange settings. Turn monitor on and apply power to the Sol-PC.

(The display raster will be pulled in. Using the monitor Vertical Hold, you should be able to obtain a slow roll (black horizontal bar moves slowly down the screen) and a stationary raster. Using the monitor Horizontal Hold, you should be able to adjust for an out of sync raster (numerous black lines cutting across the raster) and a stable raster. If you cannot obtain these conditions, locate and correct the cause before proceeding.

NOTE

For a stable presentation, a few monitors (especially modified TV sets) may require a higher sync amplitude than that supplied by the Sol-PC. In such cases, increase sync amplitude by reducing the value of R80. DO NOT DECREASE R80 BELOW 225 OHMS.

- () If the synchronization circuits are operating correctly, turn monitor and power supply off, disconnect the power cable and go on to Step 27.
- (<u>Step 27</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

(Step 27 continued on Page III-23.)

IC NO.	TYPE
() U1*	4029*
() U2	74LS175 or 25LS175
() U11*	4029*
() U12	74LS157
() U13	74LS175 or 25LS175
() U25*	MCM6574 or MCM6575*
() U26	74LS175 or 25LS175
() U27	74LS175 or 25LS175
() U29	74LS367
() U30	74LS157
() U32	74LS157 or 25LS157
() U41	74166
() U42	74LS175 or 25LS175
() U44	74LS00
() U61	74LS10
() U89	74LS367

*MOS device. Refer to CAUTION on Page III-8.

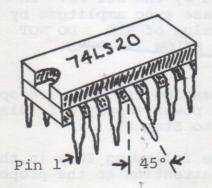
(Step 28. Check display circuits.

() Set Sl switches as follows:

No. 1 through 5: OFF

No. 6: ON

Remove U42 and bend pin 6 out 45° to its normal position. (See Figure 3-6.) Re-install U42 with pin 6 out of the socket.



Bend desired pin out 45° to vertical.

Figure 3-6. Bending selected pins on U42, 59 and 75 (U59 shown).

() Remove U59 and bend pin 4 in same manner as U42. Reinstall U59 with pin 4 out of the socket.

(Step 28 continued on Page III-24.)

- (Remove U75 and bend pin 5 in same manner as U42. Reinstall U75 with pin 5 out of the socket.
- () Using #24 wire, install the following TEMPORARY jumpers in the sockets for Ul4 through U21. Double check jumpers after installing for correctness. (See Figure 3-7.)

IC SOCKET	JUMPER		
() U14 () U15 () U16	Pin 12 to 6 Pin 12 to 5		
() U17	Pin 12 to 4 Pin 12 to 8		
() U18 () U19	Pin 12 to 2 Pin 12 to 7		
(U20 (U21	Pin 12 to 1 Pin 12 to 16		

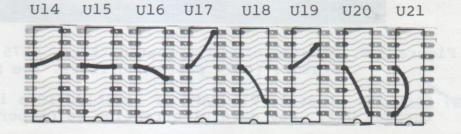


Figure 3-7. Ul4 through U21 socket jumpers.

- (Turn monitor on and apply power to Sol-PC.
- () Momentarily ground pin 1 of U2 and pin 5 of U75. The display shown in Figure 3-8 should appear on the monitor screen.
- () If the display circuits do not pass this test, determine and correct the cause before proceeding with assembly.
- () If the display circuits are operating correctly:
 - (Turn monitor and power supply off and disconnect the power cable.
 - (Remove jumpers from U14 through U21 sockets.
 - Bend pin 6 on U42, pin 4 on U49 and pin 5 on U75 back to their normal position and re-install these three IC's in their appropriate sockets.

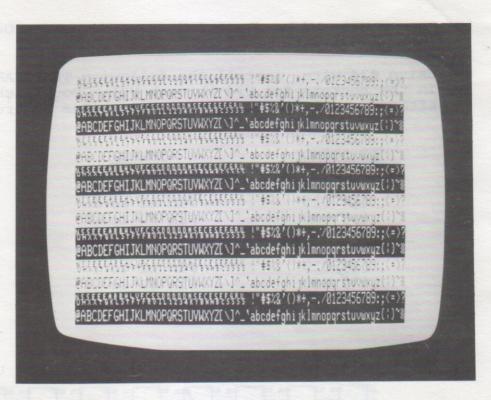


Figure 3-8. Display circuits test pattern, 6575 character generator. (6574 pattern differs. See Section VIII.)

(v) Step 29. Install 91L02APC or 2102L1PC IC's in locations U14 through U21. Pay careful attention to proper orientation.

CAUTION

IC's U14 THROUGH U21 ARE MOS DEVICES. RE-FER TO CAUTION ON PAGE III-8 BEFORE YOU INSTALL THESE IC's.

NOTE NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

() <u>Step 30</u>. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
/ Plateon I	to spile for All most sta	bear green red
(V) RIZ	1.5K	brown-green-red
() R12 () R18	10 K	brown-black-orange

(Step 30 continued on Page III-26.)

LOCATION	VALUE (ohms)	COLOR CODE	
(W R20	1.5K	brown-green-red	
() R31	1.5K	" " "	
(Y R32	1.5K	п п п	
(X R33	1.5K	ses on the on all on the	
(*) R34	1.5K	of salahayan Hari H	
(R35	1.5K	п п	
(R36	1.5K	OH OH H	
() R41	1.5K	п п п	
(R50	1.5K	и и	
() R51	1.5K	H H	
() R52	1.5K	и и	
() R53	1.5K	от п	
() R54	1.5K	и и	
() R55	1.5K	Еруп и п	
() R56	1.5K	ппппппппппппппппппппппппппппппппппппппп	
(R57	1.5K	Tour II II	
() R58	330	orange-orange-brown	n
() R91	1.5K	brown-green-red	
(R107	10 K	brown-black-orange	
(R108	10 K	101011 1 1 1	
(R109	10 K	11 11 11	
() R110	10 K	Tawog mylagam, at a mile in	
(× R111	10 K	H CAST WEST OF BOTH	
(× R112	10 K	н н н	
(V R113	10 K	n neason n	
() R114	10 K	п п п	
() R115	1.5K	brown-green-red	

- (Step 31. Install diode D7 (1N4148 or 1N914) in its location between U46 and U47. Position D7 with its dark band (cathode) at the bottom.
- () <u>Step 32</u>. Install 20-pin header in location J3 (keyboard interconnect) between U64 and U65. Position header so pin 1 is in the upper left corner. (An arrow on the connector points to bin 1.)
- () <u>Step 33</u>. In the jumper area labeled PHTM on the <u>assembly drawing</u> (below U64), install Augat pins in mounting holes F and G. (Refer to "Installing Augat Pins" in Appendix IV.)
 Using #24 bare wire, install a jumper between pins F and G.
- () Step 34. In the jumper area labeled RST on the assembly drawing (between U76 and U77), install Augat pins in mounting holes N and P. (Refer to "Installing Augat Pins" in Appendix IV.) Using #24 bare wire, install a jumper between pins N and P.

() <u>Step 35</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO.	TYPE
() U45 () U46	74LS04 8T380 or 8836
() U48	74LS00
() U50	74LS367
() U54	74LS04
() U63	74LS109
() U64	74LS109
() U67	8T97
() U68	8T97
() U76	74LS175
() U94	74LS367
() U107	74LS367

() <u>Step 36</u>. Apply power to Sol-PC and make the following voltage measurements:

MEASI	UREMENT POINT	VOLTAGE *
Pin 20	of Ul05 Socket of Ul05 Socket of Ul05 Socket	-5 V dc +5 V dc +12 V dc
	of U51 Socket of U51 Socket	+5 V dc -12 V dc

*All voltages referenced to ground.

- () If any voltages are incorrect, locate and correct the cause before going on to Step 37.
- () If voltages are correct, turn power supply off, disconnect power cable and go on to Step 37.
- (<u>Step 37</u>. Install the following IC's in the indicated locations. Pay <u>careful</u> attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

(Step 37 continued on Page III-28.)

di no Tits hel

IC NO.

TYPE

() U51* () U105*#

TMS6011NC* 8080,8080A or 9080A*#

*MOS device. Refer to CAUTION on Page III-8.

#Note that pin 1 of this IC is in the upper left corner.

(Step 38. Perform Functional Test No. 1 of CPU circuits.

(Set Sl switches as follows:

No. 1 through 5: OFF

No. 6: ON

(Turn monitor on and apply power to Sol-PC.

(1) Momentarily ground pin 1 of U2. You should see a full display (64 characters x 16 lines) on the monitor.

() Momentarily ground pin 2 of U75. The display should blank while pin 2 of U75 is grounded. When you remove the ground, the display shown in Figure 3-9 on Page III-29 should appear.

NOTE

The pattern shown in Figure 3-9 (delete characters) results from all bits of the DIO Bus being high. If you do not see the delete characters, one or more bits of the DIO bus are low. Consult the MCM6575 or MCM6574 pattern, as appropriate, in Section VIII of this manual to determine which bits are low.

- () If the test fails, determine and correct the cause before proceeding with assembly.
- () If the Sol-PC passes this test, turn monitor and power supply off, disconnect power cable and proceed to Step 39.
- (Step 39. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

(Step 39 continued on Page III-29.)

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO	0.		TYPE
(4)	U80 U81		8T97# 8T97#
	#DO	NOT	substitute.

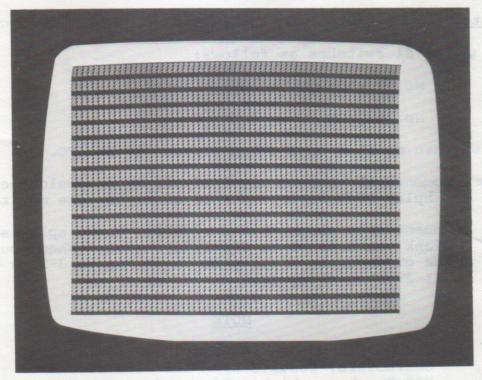


Figure 3-9. CPU Functional Test No. 1 display, 6574 character generator. (6574 pattern differs. See Section VIII.)

() Step 40. Perform Functional Test No. 2 of CPU circuits.

(\script Check that Sl switches are set as specified in Step 38.

(Turn monitor on and apply power to Sol-PC.

(Momentarily ground pin 1 of U2 and pin 2 of U75. The display shown in Figure 3-10 on Page III-31 should appear on the monitor.

If the test fails, determine and correct the cause before proceeding with assembly.

If the Sol-PC passes this test, turn monitor and power supply off, disconnect power cable and proceed to Step 41.

(<u>Step 41</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO.	TYPE
(W, U65	74LS253
(W U66	74LS253
(J U78	74LS253
(~) U79	74LS253
(~) U93	74LS175
(J Ul06	74LS175

(Step 42. Turn monitor on, apply power to Sol-PC and perform the test described in Step 40, except ground pin 5 of U75 instead of pin 2. You should get the same results.

(V) If the test fails, determine and correct the cause before proceeding with assembly.

(V) If the Sol-PC passes this test, turn monitor and power supply off, disconnect power cable and proceed to Step 43.

Step 43. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION '	VALUE (ohms)	COLOR CODE		
(× R13	1.5K	brown-	-green	-red
() R14	1.5K	350	"	11
() R15	1.5K	11		11
(N R60	1.5K	п	11	П

Step 44. Using two 4-40 x 5/8 binder head screws, two #4 insulating washers, two lockwashers and hex nuts, install 30-pin right angle edge connector in location J5. Insert screws from back (solder) side of board and place an insulating washer on each screw on front (component) side of board. Position connector with socket side facing right, place over screws and seat pins in mounting holes. Then place lockwasher on each screw, start nuts and tighten. Solder pins to board.

Step 45. Using four 4-40 x ½ binder head screws, lockwashers and hex nuts, install two brackets (Sol-1040) for personality module in area to right of J5. Position brackets over the mounting holes as shown in Figure 3-11. Insert screws from front (component) side of board, place lockwasher on each screw on back (solder) side of board, start nuts and tighten.

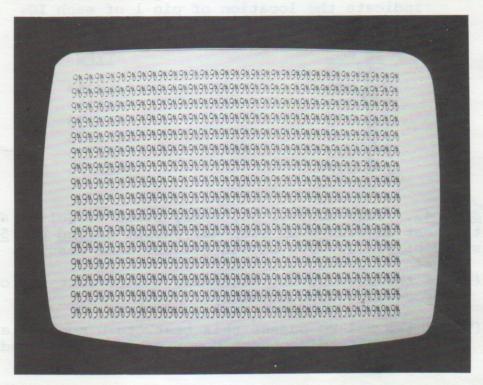


Figure 3-10. CPU Functional Test No. 2 display, 6575 character generator. (6574 pattern differs. See Section VIII.)

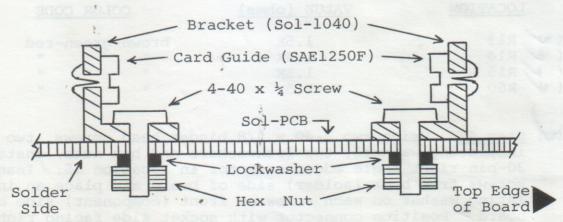


Figure 3-11. Personality module bracket/guide installation (Viewed from right end of Sol-PCB).

- Step 46. Attach plastic card guide (SAE1250F) to each of the brackets installed in Step 45. (See Figure 3-11.) Insert posts on guides into bracket holes and push in until they snap into place.
- (Step 47. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO.	TYPE
IC NO. () U3* () U4* () U5* () U6* () U7* () U8* () U9* () U10* () U22 () U23 () U24 () U34 () U35	91L02APC or 2102L1PC* 74LS136 74LS136 74LS138 74LS138
() U36 () U53 () U70 () U71 () U83	74LS138 74LS02 or 9LS02 74LS109 74LS367 74LS20

*MOS device. Refer to CAUTION on Page III-8.

() <u>Step 48</u>. Test memory and decoder circuits.

(Y Set Sl switches as specified in Step 38.

(Turn monitor on and apply power to Sol-PC.

(Ground pin 1 of U2. You should see the same display as shown in Figure 3-10 on Page III-31. In this case, however, there should be a vertical "flickering" movement with an apparent flicker rate of approximately three times per second.

() Turn Switch No. 1 of Sl to ON. The flicker should stop.

(Step 48 continued on Page III-33.)

- () If the test fails, determine and correct the cause before proceeding with assembly.
- (VIf the Sol-PC passes this test, turn monitor and power supply off, disconnect power cable, set Switch No. 1 of Sl to OFF and go on to Step 49.
- (V<u>Step 49</u>. Assemble personality module if you have not yet done so. (See Section IV.) If you have, go to Step 9 in Section IV and complete the personality module assembly.
- () <u>Step 50</u>. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
() R21 () R22 () R23 () R24 () R25 () R26 () R27 () R28 () R29 () R37 () R38	470 470, ½ watt 470, ½ watt 1.5K 10 K 10 K 470 10 K 10 K 10 K 10 K	yellow-violet-brown " " " brown-green-red brown-black-orange " " " yellow-violet-brown brown-black-orange " " brown-green-red " "
() R39 () R40 () R42 () R43 () R44 () R45 () R46 () R47 () R48 () R49 () R59	5.6K 1.5K 1.5K 1.5K 1.5K 330 5.6K 10 K 10 K	green-blue-red brown-green-red " " " " " " orange-orange-brown green-blue-red brown-black-orange " " " brown-green-red " " "
(R61 (R62 (R63 (R64 (R65 (R66 (R67 (R68 (R69 (R70 (R71	1.5K 5.6K 5.6K 330 330 330 330 330 330 330 330 330	green-blue-red """" orange-orange-brown """" """" """" """" """" """" """ ""

(Step 50 continued on Page III-34.)

LOCATION	VALUE (ohms)		COLOR	CODE	
(X R72	680	blue	-grav	-brown	
(A R73	680	п	"	NO. W. TELE	
() R74	680	11	П	11	
(X R75	680	ils"es	II C	(wister)	
(X R76	680	To Head	II II	II .	
(X R77	680	bod #30.	II .	III CONT	
(R78	680	H	II	II .	
(* R79	680	II	11	II .	
(X R92	5.6K	gree	n-blu	e-red	
(R93	1.5K	brow	n-gre	en-red	
(R94	10 K	brow	n-bla	ck-orange	
(X R95	15 K	brow	brown-green-orange		
(X R116	1.5K	brow	n-gre	en-red	

(VStep 51. Install the following capacitors in the indicated locations. Take care to observe the proper value and type for each installation. Bend leads outward on solder (back) side of board, solder and trim. (Refer to NOTE in Step 2.)

LOCATION	VALUE	TYPE	
(C29 (C30	.l ufd	Disc	
(C30	330 pfd	Disc	

(Step 52. Install diodes D1 (1N4148 or 1N914), D2 (1N4001) and D3 through D6 (1N4148 or 1N914) in their locations in the area of U39. Position all diodes with their dark band (cathode) to the right.

(Step 53. Install the following DIP switches in the indicated locations. Take care to observe proper orientation.

LOCATION	TYPE	ORIENTATION
() S2	8-position	Switch No. 1 at top
() S3	8-position	Switch No. 1 at top
() S4	6-position	Switch No. 1 at top

(V Step 54. Install Q1 (2N2907 or 2N3460) in its location between U55 and U56. The emitter lead (closest to tab on can) is oriented toward the bottom and the base lead toward the right. Push straight down on transistor until it is stopped by the leads. Solder and trim.

(Step 55. Using two 4-40 x 7/16 binder head screws, hex nuts and lockwashers, install 25-pin female connector in location Jl (serial I/O interface). Position connector with socket side facing right and insert pins into their holes in the circuit board. Insert screws from back (solder) side of board, place lockwasher on each screw, start nuts and tighten. Then solder connector pins to board.

- Step 56. Using two 4-40 x 7/16 binder head screws, hex nuts and lockwashers, install 25-pin male connector in location J2 (parallel I/O interface). Install J2 in the same manner as you did J1.
- (Step 57. Install Augat pins in mounting holes K, L and M. (Refer to "Installing Augat Pins" in Appendix IV.) These holes are located between U85 and U86. No jumper will be installed.
- (Step 58. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

	IC NO.	TYPE
DER IN Stop	(*) U37 (*) U38* (*) U39# (*) U52 (*) U55 (*) U56 (*) U57 (*) U58 (*) U72 (*) U73 (*) U84* (*) U85* (*) U86* (*) U95	74LS367 1489A* 4N26# 74LS109 74LS00 1458CP or 1558CP 7406 8T94 74LS109 74LS109 4029* 4046* 4024* 74173
-	() U96 () U97	74173 74LS175

*MOS device. Refer to CAUTION on Page III-8.

#Solder this IC in its location. See "Loading DIP Devices" in Appendix IV.

Step 59. Check input/output (I/O) circuits.

NOTE

The parallel I/O interface should be tested with the device you will be using. Refer to "I/O Interfacing" in Section VII.

(Step 59 continued on Page III-36.)

To check the serial I/O circuits, proceed as follows:

(Set S3 switches as follows:

No. 1: ON

No. 2 through 8: OFF

(Set <u>all</u> S4 switches to OFF.

- (Connect Sol-PC video output cable to monitor, turn monitor on and apply power to Sol-PC.
- () Set Sol-PC to local by depressing LOCAL key on keyboard to turn keyboard indicator light on.
- () Data entered from the keyboard should appear on the monitor.
- () If the Sol-PC fails this test, locate and correct the cause before proceeding.
- () If the Sol-PC passes this test, turn monitor and power supply off, disconnect power cable and video output cable and go on to Step 60.

(<u>Step 60</u>. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
(R117 (R118 (R119	10 K 10 K 10 K	brown-black-orange
(R139 (R140)	1.0M	brown-black-green brown-black-orange
(W R141	150 K	brown-green-yellow
() R142 () R143	10 K 1 M	brown-black-orange brown-black-green
(R144 (R145	47 K 10 K	yellow-violet-orange brown-black-orange
() / R146	10 K	п п п
() R147 () R148	2.2M 100 K	red-red-green brown-black-yellow
(* R149 (* R150	100	brown-black-brown yellow-violet-brown
(R151	5.6K	green-blue-red
(R152 (R153	150 K 100 K	brown-green-yellow brown-black-yellow
(R154	100 K	TO THE TOTAL PROPERTY OF
(VR3	50 K	Potentiometer

Sol-PC SINGLE BOARD TERMINAL COMPUTER TM

SECTION III

(v) <u>Step 61</u>. Install the following capacitors in the indicated locations. Take care to observe the proper value and type for each installation. Bend leads outward on solder (back) side of board, solder and trim. (Refer to NOTE in Step 2.)

CAUTION

REFER TO FOOTNOTE AT END OF THIS STEP BEFORE INSTALLING C67.

	LOCATION	VALUE (ufd)	TYPE
676	C47 C48 C49 C50 C51	.001 .047 .001 .01	Disc " Mylar Tubular Disc "
	C67* C68 C69 C70 C71 C72 C73	.1 .1 .1 .001 .001 .047	Tantalum Disc " " Mylar Tubular Disc

*Install C67 with "+" lead at top right.

(<u>Step 62</u>. Install <u>miniature</u> phone jacks in locations J6 and J7 located to the right of UlOl. Position J6 and J7 with jack facing right, insert pins in mounting holes and solder.

Step 63. Install <u>subminiature</u> phone jacks in locations J8 and J9 in lower right corner of board. Install J8 and J9 as you did J6 and J7.

(V Step 64. Install Q3 (2N4360) in its location to the left of C67. Install Q3 with its flat "side" at the bottom. Push straight down on transistor until it is stopped by the leads, solder and trim.

CAUTION

THE 2N4360 IS STATIC SENSITIVE. REFER TO CAUTION ON PAGE III-8.

(Step 65. Install Q4 and Q5 (2N2222) in their locations above and to the left of Ul08. For both transistors, the emitter lead (closest to tab on can) is oriented toward the left and the base lead toward the right. Push straight down on transistor until it is stopped by the leads, solder and trim.

- (Step 66. Install diodes D13 and D14 (lN4001) in their locations in the lower right corner of the board. Position both diodes with their dark band (cathode) at the bottom.
- () Step 67. Install DIP reed relays in locations Kl and K2 to the right of Ull3. Be sure to install Kl and K2 with their end notch at the bottom)pin l in lower right corner). These relays are soldered to the board. (Refer to "Loading DIP Devices" in Appendix IV.)
- () <u>Step 68</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO.	TYPE	
(V) U69*	TMS6011NC*	
() U98*	4023*	
() U99*	4030*	
() U100*	4013*	
(U) U101*	4027*	
() U108	1458CP or 1558CP	
(JU109*	4049*	
(Ullo*	4046*	
(W) Ulll*	4019*	
(W U112*	4520*	
(Ull3*	4013*	

*MOS device. Refer to CAUTION on Page III-8.

- (V Step 69. Install Augat pins in mounting holes H, I and J (located to left of C70). (Refer to "Installing Augat Pins" in Appendix IV.) Using #24 bare wire, install a jumper between pins I and J.
- () Step 70. Adjust VR3.
 - (J) Using a cable with a male phono jack on both ends, connect ACI audio output (J6) to ACI audio input (J7).
 - () Apply power to Sol-PC.
 - (Set VR3 fully clockwise (CW).
 - (Measure the DC voltage at pin 13 of UllO and write the measured voltage down. (Call this Voltage A.)
 - (Set VR3 fully counterclockwise (CCW).

(Step 70 continued on Page III-39.)

- (Measure the DC voltage at pin 13 of Ullo and write the measured voltage down. (Call this Voltage B.)
- (J) Add Voltages A and B and divide the sum by 2. (Call the result Voltage C.) An example follows:

Voltage A (VR3 full CW): 3.45 V dc Voltage B (VR3 full CCW): 1.80 V dc

A + B = 5.25 V dc

Voltage C = 5.25 V dc / 2 = 2.63 V dc

- (Adjust VR3 so that the voltage at pin 13 of UllO equals Voltage C. (In the preceding example this would be 2.63 V dc.)
- () <u>Step 71</u>. If your recorder has only a microphone input, remove the I-to-J jumper you installed in Step 69 and install a jumper (#24 bare wire is recommended) between the I and H pins.

Otherwise, leave the I-to-J jumper in and go on to Step 72.

() Step 72. Install 100-pin edge connector, Jll. Using two 4-40 x 7/16 binder head screws, install 100-pin edge connector in location Jll (center of PC board). Seat the pins in the mounting holes. Then thread screws from front (component) side of board into the threaded inserts that are pre-installed in the Jll mounting holes. Tighten screws and solder pins to board.

CONGRATULATIONS! At this point you have successfully assembled your Sol-PC Single Board Terminal Computer and tested it for proper operation. It is now ready for use.

measured voltage down. (Call this voltage A.



*** NOTICE TO ALL Sol-PC OWNERS ***

The "Parts List" (Table 3-1 on Pages III-2, 3 & 4 in this manual) includes components for the Sol-ACI Audio Cassette Interface section of the Sol-PC Single Board Terminal Computer TM as well as sockets (Sol-SS IC Socket Kit) for the IC's used in the unit.

If you did not order sockets with your original purchase, ignore Step 1 of the Sol-PC Assembly and Test instructions (Section III in this manual); if you did not order the ACI option, ignore Steps 58 through 66. Also delete the following items as appropriate from Table 3-1:

INTEGRATED CIRCUITS

1	1458CP	or	1558CP	(U108)
The second second		-		(0100)

TMS6011NC (U69)

2 4013 (U100,113)

1 4019 (Ulll)

1 4023 (U98)

1 4027 (U101) 1 4030 (U99)

1 4046 (Ullo)

4049 (Ul09)

4520 (Ull2)

RESISTORS

1	100	ohm.	1	watt,	5%
-	100	OTHILL,	4	Wate,	2/0

1 470 ohm, \(\frac{1}{4} \) watt, 5%

5.6K ohm, 4 watt, 5%

7 10K ohm, ¼ watt, 5%

1 47K ohm, 4 watt, 5%

50K ohm, Potentiometer

3 100K ohm, ¼ watt, 5%

2 150K ohm, ¼ watt, 5%

lM ohm, ½ watt, 5%

2.2 ohm, \(\frac{1}{4} \) watt, 5%

CONNECTORS

Miniature Phone Jack (J6,7)

2 Subminiature Phone Jack (J8,9)

TRANSISTORS

2N4360 (Q3)

2N2222 (Q4,5)

DIODES

lN4001 (D13,14)

RELAYS

2 DIP Reed, Sigma 191-TELA15S

(K1, 2)

CAPACITORS

.001 ufd disc

.001 ufd Mylar Tubular

.01 ufd Mylar Tubular

.047 ufd disc 3

5 .l ufd disc

1 ufd, tant dip

MISCELLANEOUS

4 8-pin DIP Socket

29 14-pin DIP Socket

74 16-pin DIP Socket

1 24-pin DIP Socket

3 40-pin DIP Socket

Both the Sol-ACI and Sol-SS are available from Processor Technology at the following prices*: (The Sol-SS IC socket kit is highly recommended for kit construction.)

Sol-SS IC Socket Kit

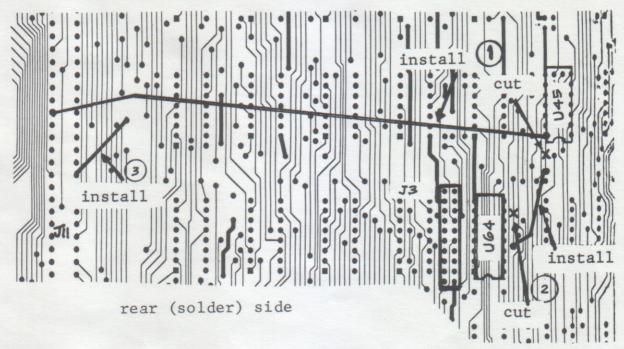
\$40

Sol-ACI Audio Cassette Interface \$55

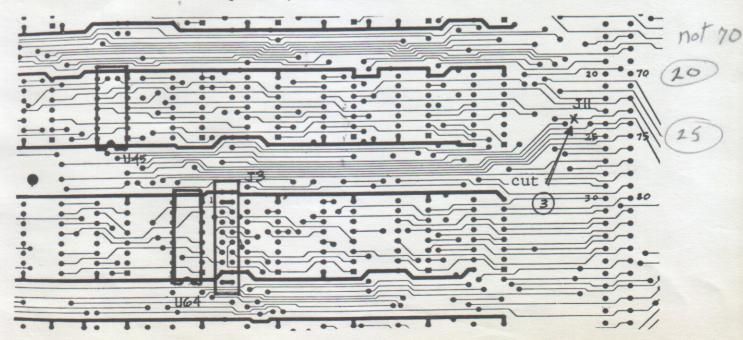
*Prices are net and subject to change without notice.

Due to layout errors connections to pins 28, 73 and 74 have been interchanged. These signals are used by DMA and interrupt devices. For or requires three cuts and installation of three jumpers. Use 24 gauge wire supplied with the kit for these changes.

- 1. Cut trace on rear side of board connecting pin 1 of U45 with feedthrough directly below. Install jumper wire on rear side of board connecting pin 1 of U45 with pin 73 of J11.
- 2. Cut trace connecting the feedthrough adjacent to pins 13 and 14 of U64 with the feedthrough directly above (on rear side of board). Install jumper wire as shown on the rear side of the board.
- 3. Cut trace on front side of the board connecting the feedthrough immediately below and to the left of the "J11" designation with pin 73 of J11. Install a jumper wire from this feedthrough to pin 28 of J11 on the rear side of the board.



front (component) side



SECTION IV

ASSEMBLY

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the Marriette I at makin agid vide TEST off trag daon off to

YIQQE (I-III egsq) "III nolinez le

Sol PERSONALITY MODULE



4.1 PARTS AND COMPONENTS

Check all parts and components against the "Parts List", Table 4-1. If you have difficulty in identifying any parts by sight, refer to Figure 3-1 on Page III-5 in Section III of this manual.

Table 4-1. PM5204 Personality Module Parts List.

PM5204 PC Board 5204 or 5204Q EPROM (U1 & U2)	2	l ufd Capacitor, Tantalum Dipped
74LS155 (U5)	71	16-pin DIP Socket
10K ohm, 4 watt, 5% Film Resistor	2	24-pin DIP Socket
.047 ufd Capacitor, Disc Ceramic	1	Handle Bracket (Sol-1045)
MM 52048	2	2-56x1/8 Binder Head Screw

4.2 ASSEMBLY TIPS

For the most part the assembly tips given in Paragraph 3.2 of Section III (Page III-1) apply to assembling the personality module.

4.3 ASSEMBLY PRECAUTIONS

For the most part the assembly precautions given in Paragraph 3.3 in Section III (Page III-6) apply to assembling the personality module.

4.4 REQUIRED TOOLS, EQUIPMENT AND MATERIALS

The following tools, equipment and materials are recommended for assembling the personality module:

- 1. Needle nose pliers
- 2. Diagonal cutters
- 3. Screwdriver
- 4. Controlled heat soldering iron, 25 watt
- 5. 60-40 rosin-core solder (supplied)
- 6. Small amount of #24 solid wire

4.5 ORIENTATION

Resistor location R7 will be located in the lower righthand corner of the board when the edge connector is positioned at the

left end of the board. In this position the component (front) side of the board is facing up. Subsequent position references related to the personality module circuit board assume this orientation.

4.6 ASSEMBLY-TEST

4.6.1 Circuit Board Check

() Visually check circuit board for broken traces, shorts (solder bridges) between traces and similar defects.

Check circuit board to insure that the +5-volt bus, +12-volt bus and -12-volt bus are not shorted to each other or to ground. Using an ohmmeter, make the following measurements (refer to personality module assembly drawing in Section IX):

(1) +5-volt Bus Test. Measure between edge connector pin B14 (back side, second pin from bottom) and pin B1 (back side, top pin). There should be no continuity.

(1) -12-volt Bus Test. Measure between edge connector pin B2 (back side, second pin from top) and pin B1 (back side, top pin). There should be no continuity.

(W +12-volt Bus Test. Measure between edge connector pin Bl5 (back side, bottom pin) and pin Bl (back side, top pin). There should be no continuity.

5/12/(-12) Volt Bus Test. Measure between edge connector pin Bl4 (back side, second pin from bottom) and pin Bl5 (back side, bottom pin), between pin Bl5 and pin B2 (back side, second pin from top), and between pins Bl4 and B2. There should be no continuity in any of these three measurements.

If visual inspection reveals any defect, or you measure continuity in any of the preceding tests, return the board to Processor Technology for replacement. If the board is not defective, proceed to next paragraph.

4.6.2 Assembly-Test Procedure

Refer to personality module assembly drawing in Section IX.

· CAUTION

THE MEMORY IC'S USED ON THE PERSONALITY MODULE ARE MOS DEVICES. THEY CAN BE (CAUTION continued on Page IV-3)

DAMAGED BY STATIC ELECTRICITY DISCHARGE.
HANDLE THESE IC'S SO THAT NO DISCHARGE
FLOWS THROUGH THE IC. AVOID UNNECESSARY
HANDLING AND WEAR COTTON, RATHER THAN
SYNTHETIC, CLOTHING WHEN HANDLING MOS
IC'S. (STATIC CHARGE PROBLEMS ARE MUCH
WORSE IN LOW HUMIDITY CONDITIONS.)

(v) <u>Step 1</u>. Install DIP sockets. Install each socket in the indicated location with its <u>end notch oriented as shown on the circuit board and assembly drawing</u>. Take care not to create solder bridges between the pins and/or traces.

INSTALLATION TIP

Insert socket pins into mounting pads of appropriate location. On back (solder) side of board, bend pins at opposite corners of socket (e.g. pins 1 and 9 on a 16-pin socket) outward until they are at a 45° angle to the board surface. This secures the socket until it is soldered. Repeat this procedure with each socket until all are secured to the board. Then solder the pins on all sockets.

LOCATION	TYPE SOCKET
() Ul	24 pin
(J) U2	24 pin
() U3*	None
() U4*	None
(1) U5	16 pin

^{*}Spare locations, not used.

(V) <u>Step 2</u>. Install the following resistors in the indicated locations. Install these resistors vertical to the board as shown in Figure 4-1, solder and trim.

LOC	ATION VALU	JE (ohms)	COL	OR COD	E
(3) R. (3) R. (4) R. (4) R.			1		range " "

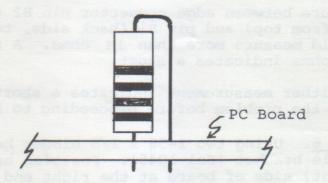


Figure 4-1. Rl through R4 installation.

Step 3. Install the following resistors in the indicated locations. Install these resistors in the normal position, parallel with the board. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	CO	LOR	CODE
() R5	10K	brown-	blac	k-orange
(V) R6	10K	II .	11	11
() R7	10K	ıı ı	11	п
(R8	10K	of eld in dea	11	II .
() R9	10K	II.	11	II

() <u>Step 4</u>. Install the following capacitors in the indicated locations. Take care to observe the proper value, type and orientation for each installation. Insert leads, bend outward on solder (back) side of board, solder and trim. (Refer to footnote at end of this step before installing C3.)

LOCATION	VALUE (ufd)	TYPE	ORIENTATION
(*) C1 (*) C2 (*) C3*	1 1 .047	Tant Dip Tant Dip Disc Ceramic	"+" lead bottom "+" lead bottom None

*Insert leads through mounting holes, remove capacitor and clear holes of any wax. Reinsert and install.

(Step 5. Check for +5-volt bus to ground and -12-volt bus to ground shorts. Using an ohmmeter, make the following measurements:

(N) Measure between edge connector pin Bl4 (back side, second pin from bottom) and pin Bl (back side, top pin). You should measure more than lM ohms. A reading less than lOK ohms indicates a short.

- (Measure between edge connector pin B2 (back side, second pin from top) and pin B1 (back side, top pin). You should measure more than 1M ohms. A reading less than 10K ohms indicates a short.
- () If either measurement indicates a short, find and correct the problem before proceeding to Step 6.
- (1) Step 6. Using two 2-56 x 1/8 binder head screws, install handle bracket (Sol-1045). Position bracket on front (component) side of board at the right end as shown in Figure 4-2. Align bracket holes with mounting holes in board, insert screws from back (solder) side of board and drive into bracket. No nuts are needed since the bracket holes are tapped.

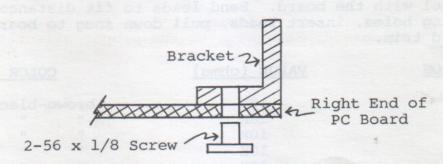


Figure 4-2. Handle bracket (Sol-1045) installation.

- (Step 7. If 5204A EPROM's are supplied with your kit, go on to Step 8. If 5204O EPROM's are supplied, install jumpers (#24 bare wire may be used) in the four Jl locations. These are located just below U3, to the left of R5, to the right of R1 and to the right of R2.
- () <u>Step 8.</u> Stop assembly at this point and proceed with Sol-PC assembly and test up through Step 48. (See Section III.) Then go on to Step 9 of this procedure.
- (<u>Step 9</u>. Plug personality module into J5 on Sol-PC, apply power to Sol-PC and make the following voltage measurements on the personality module:

MEASUREMENT POINT	VOLTAGE
Pin 1 of Ul Socket Pin 4 of Ul Socket	+5 V dc ±5% +5 V dc ±5%
Pin 12 of Ul Socket	+5 V dc +5%
Pin 1 of U2 Socket	+5 V dc +5%

(Step 9 continued on Page IV-6.)

MEASUREMENT POINT	VOLTAGE
Pin 4 of U2 Socket	+5 V dc <u>+</u> 5%
Pin 12 of U2 Socket	+5 V dc <u>+</u> 5%
Pin 23 of Ul Socket	-12 V dc <u>+</u> 5%
Pin 23 of U2 Socket	-12 V dc <u>+</u> 5%
Pin 2 of Ul Socket	Ground
Pin 2 of U2 Socket	Ground

(If any voltages are incorrect, locate and correct the cause before proceeding to Step 10.

() If the voltages are correct, turn power off, disconnect power cable, unplug personality module and go on to Step 10.

(<u>Step 10</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO.	TYPE
(\ U1*	5204A or 5204Q
(J U2*	5204A or 5204Q
(J U3	None
(* U4	None
() U5	74LS155

*MOS device. See CAUTION on Pages IV-2,3.

(Step 11. Plug personality module into J5 on Sol-PC and connect Sol-PC video output cable to video monitor. (Refer to CAUTION on Page III-22 in Section III.)

(Y Set Sl switches as follows:

No. 1 through 4: OFF

No. 5: ON

No. 6: OFF

Turn monitor on and apply power to Sol-PC.

() You should see a white display on the monitor with a blinking rectangular cursor in the upper left corner of the screen.

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() If you do not see a blinking cursor, locate and correct the problem before proceeding.

() If a blinking cursor is present, the ENter and DUmp commands should operate as described in Section IX of this manual.

() If the ENter and DUmp commands do not operate correctly, locate and correct the problem before proceeding.

(V) If the personality module is operating correctly, turn monitor and power off, disconnect power cable and video output cable and go on to Step 50 in Section III. (The personality module can be left plugged in.)

L. Piug personality module into J. on Sei-PC and con of-PC video output cable to video monitor (Refer to

SECTION IV

ASSEMBLY

and

TEST

Sol PERSONALITY MODULE



4.1 PARTS AND COMPONENTS

When ordering your Sol, you selected one of the three types of Personality Modules: CONSOL, SOLOS, or SOLED. The outer carton for your kit is stamped with the Personality Module type. All three use the same PC board, marked 5204, and differ only in the number of EPROM's and their programming. An alternative PC board marked 6834 and designed for type 6834 EPROM's is also available, but not supplied with this kit. Schematic diagram X-5 and assembly drawing X-21 refer to this alternative board. Check all parts against Table 4-1 below. If you have difficulty identifying any parts, refer to Figure 3-1 on page III-5.

Table 4-1. PM5204 Personality Module Parts List.

1 PM5204 PC Board 2 or 4 5204A or 5204Q EPROM 1 74LS155 9 10K ohm, 1/4 watt, 5% Resistor 1 .047-ufd Capacitor, Disc Ceramic	4 1 1	1-ufd Capacitor, Tantalum Dipped 24-pin DIP Socket 16-pin DIP Socket Handle Bracket (Sol-1045) 2-56X1/8 Binder Head Screw
---	-------	---

4.2 ASSEMBLY TIPS

For the most part the assembly tips given in Paragraph 3.2 of Section III (Page III-1) apply to assembling the personality module.

4.3 ASSEMBLY PRECAUTIONS

For the most part the assembly precautions given in Paragraph 3.3 in Section III (Page III-6) apply to assembling the personality module.

4.4 REQUIRED TOOLS, EQUIPMENT AND MATERIALS

The following tools, equipment and materials are recommended for assembling the personality module:

- 1. Needle nose pliers
- 2. Diagonal cutters
- 3. Screwdriver
- 4. Controlled heat soldering iron, 25 watt
- 5. 60-40 rosin-core solder (supplied)
- 6. Small amount of #24 solid wire

4.5 ORIENTATION

Resistor location R7 will be located in the lower righthand corner of the board when the edge connector is positioned at the

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SECTION IV

left end of the board. In this position the component (front) side of the board is facing up. Subsequent position references related to the personality module circuit board assume this orientation.

4.6 ASSEMBLY-TEST

4.6.1 Circuit Board Check

- () Visually check circuit board for broken traces, shorts (solder bridges) between traces and similar defects.
- () Check circuit board to insure that the +5-volt bus, +12volt bus and -12-volt bus are not shorted to each other or to ground. Using an ohmmeter, make the following measurements (refer to personality module assembly drawing in Section X):
 - () +5 volt Bus Test. On Ul, measure between pin 24, (ground) and pins 1, then 12 (+5 volts). There should be no continuity.
 - () -12 volt Bus Test. Also on Ul, measure between pin 24 (ground) and pin 23 (-12 volts). There should be no continuity.
 - () +12 volt Bus Test. Also on Ul, measure between pin 24 (ground) and the bottom edge connector pin on the componant side of the board (nearest the "+" side of Cl).
 - () Inter-bus Test. On Ul, measure between pins 1 and 23, then between the edge connector pin in the previous test and pins 23, then 1. There should be no continuity in any of these measurements.

If visual inspection reveals any defect, or you measure continuity in any of the preceding tests, return the board to Processor Technology for replacement. If the board is not defective, proceed to next paragraph.

4.6.2 Assembly-Test Procedure

Refer to personality module assembly drawing X-4.

CAUTION

THE MEMORY IC'S USED ON THE PERSONALITY MODULE ARE MOS DEVICES. THEY CAN BE (CAUTION continued on Page IV-3)

SOL PERSONALITY MODULE

DAMAGED BY STATIC ELECTRICITY DISCHARGE.
HANDLE THESE IC'S SO THAT NO DISCHARGE
FLOWS THROUGH THE IC. AVOID UNNECESSARY
HANDLING AND WEAR COTTON, RATHER THAN
SYNTHETIC, CLOTHING WHEN HANDLING MOS
IC'S. (STATIC CHARGE PROBLEMS ARE MUCH
WORSE IN LOW HUMIDITY CONDITIONS.)

() <u>Step 1</u>. Install DIP sockets. Install each socket in the indicated location with its <u>end notch oriented as shown on the circuit board and assembly drawing</u>. Take care not to create solder bridges between the pins and/or traces.

INSTALLATION TIP

Insert socket pins into mounting pads of appropriate location. On back (solder) side of board, bend pins at opposite corners of socket (e.g. pins 1 and 9 on a 16-pin socket) outward until they are at a 45° angle to the board surface. This secures the socket until it is soldered. Repeat this procedure with each socket until all are secured to the board. Then solder the pins on all sockets.

LOCATION	TYPE	SOCKET
() Ul		pin
() U2 () U3		pin pin
() U4	24	pin
() U5	16	pin

() <u>Step 2</u>. Install the following resistors in the indicated locations. Install these resistors vertical to the board as shown in Figure 4-1, solder and trim.

		LOCATION	VALUE (ohms)	C	OLOR (CODE
(()	R1 R2	 10K 10K	brown	-blac	k-orange
()	R3	10K	and the state of	11	. 11
()	R4	10K	regular "Light	i ii	II.

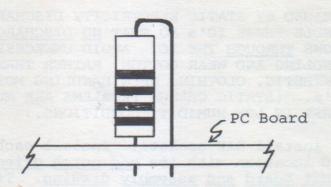


Figure 4-1. Rl through R4 installation.

() Step 3. Install the following resistors in the indicated locations. Install these resistors in the normal position, parallel with the board. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
() R5	10K	brown-black-orange
() R6	10K	II II II II
() R7	10K	and an arrangement of the second
() R8	10K	ппппппппппппппппппппппппппппппппппппппп
() R9	10K	п п

() <u>Step 4</u>. Install the following capacitors in the indicated locations. Take care to observe the proper value, type and orientation for each installation. Insert leads, bend outward on solder (back) side of board, solder and trim. (Refer to footnote at end of this step before installing C3.)

	LOCATIO	, <u>NC</u>	VALUE (ufd)	TYPE	ORIENTATION
()	C1 C2 C3*	? .	1 1 .047	Tant Dip Tant Dip Disc Ceramic	"+" lead bottom "+" lead bottom None

^{*}Insert leads through mounting holes, remove capacitor and clear holes of any wax. Reinsert and install.

- () <u>Step 5</u>. Check for +5-volt bus to ground and -12-volt bus to ground shorts. Using an ohmmeter, make the following measurements:
 - () Measure between edge connector pin Bl4 (back side, second pin from bottom) and pin Bl (back side, top pin). You should measure more than lM ohms. A reading less than lOK ohms indicates a short.

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- () Measure between edge connector pin B2 (back side, second pin from top) and pin B1 (back side, top pin). You should measure more than 1M ohms. A reading less than 10K ohms indicates a short.
- () If either measurement indicates a short, find and correct the problem before proceeding to Step 6.
- () <u>Step 6</u>. Using two 2-56 x 1/8 binder head screws, install handle bracket (Sol-1045). Position bracket on front (component) side of board at the right end as shown in Figure 4-2. Align bracket holes with mounting holes in board, insert screws from back (solder) side of board and drive into bracket. No nuts are needed since the bracket holes are tapped.

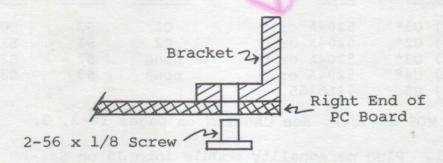


Figure 4-2. Handle bracket (Sol-1045) installation.

- () Step 7. If 5204A EPROM's are supplied with your kit, go on to Step 8. If 5204Q EPROM's are supplied, install jumpers (#24 bare wire may be used) in the four Jl locations. These are located just below U3, to the left of R5, to the right of R1 and to the right of R2.
- () <u>Step 8</u>. Stop assembly at this point and proceed with Sol-PC assembly and test up through Step 48. (See Section III.)
 Then go on to Step 9 of this procedure.
- () <u>Step 9</u>. Plug personality module into J5 on Sol-PC, apply power to Sol-PC and make the following voltage measurements on the personality module:

MEASUREMENT POINT	VOLTAGE
Pin 1 of U1, 2, 3, 4 Pin 4 of U1, 2, 3, 4 Pin 12 of U1, 2, 3, 4 Pin 23 of U1, 2, 3, 4 Pin 2 of U1, 2, 3, 4 Pin 24 of U1, 2, 3, 4	+5 V dc + 5% +5 V dc + 5% +5 V dc + 5% -12 V dc + 5% Ground Ground

- () If any voltages are incorrect, locate and correct the cause before proceeding to Step 10.
- () If the voltages are correct, turn power off, disconnect power cable, unplug personality module and go on to Step 10.
- () Step 10. Install IC's in the sockets numbered Ul through U5. Make sure the dot or notch indicating pin 1 on the IC package is in the correct position as indicated on the PC board component legend and the assembly drawing X-4. Sockets U3 and U4 are to be left empty for CONSOL modules.

	1	IC	LABEL	
IC NO.	TYPE	CONSOL	SOLOS	SOLED
() U1* () U2* () U3* () U4* () U5	5204A or Q 5204A or Q 5204A or Q 5204A or Q 74LS155	C1 C2 none none	SØ S1 S2 S3	EØ E1 E2 E3

- * MOS devices. See CAUTION on pages IV-2, 3.
- () <u>Step 11</u>. Plug personality module into J5 on Sol-PC and connect Sol-PC video output cable to video monitor. (Refer to CAUTION on Page III-22 in Section III.)
 - () Set Sl switches as follows:

No. 1 through 4: OFF

No. 5: ON

No. 6: OFF

- () Turn monitor on and apply power to Sol-PC.
- () If you have a CONSOL module, you should see a white display on the monitor with a blinking rectangular cursor in the upper left corner of the screen. A SOLOS module will have the cursor preceded by a prompt character:

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- () If you do not see a blinking cursor, locate and correct the problem before proceeding.
- () If a blinking cursor is present, the ENter and DUmp commands should operate as described in Section IX of this manual.
- () If the ENter and DUmp commands do not operate correctly, locate and correct the problem before proceeding.
- () If the personality module is operating correctly, turn monitor and power off, disconnect power cable and video output cable and go on to Step 50 in Section III. (The personality module can be left plugged in.)



ASSEMBLY PROCEDURE CHANGE NOTICE

Reference Paragraph 4.6.2, Step 6 on Page IV-5 in Section IV of the Sol-PC Single Board Terminal Computer TM Assembly and Test Instructions.

The PM5204 Personality Module Kit you have received with your Sol-PC Kit includes 2 each 2-56 x 3/16 binder head screws, 2 each #2 inside tooth lockwashers and 2 each 2-56 x 3/16 (max) hex nuts. These are used to attach the handle bracket (Sol-1045) to the PM5204 circuit board.

With your kit, use the following procedure to attach the handle bracket in place of Step 6 in Paragraph 4.6.2, Section IV: (Figure 4-2 on Page IV-5 in Section IV may still be used for reference concerning the position of the bracket.)

Position handle bracket (Sol-1045) on front (component) side of the board at the right end as shown in Figure 4-2. Align bracket holes with mounting holes in board, insert screws from back (solder) side of board, place lockwasher on each screw, start nuts and tighten.

CC #1

SECTION V

Sol KEYBOARD

Sol TERMINAL COMPUTER TM

SOL KEYBOARD SECTION V

5.1 PARTS AND COMPONENTS

Check all parts and components against the "Parts List", Table 5-1. If you have difficulty in identifying any parts by sight, refer to Figure 3-1 on Page III-5 in Section III of this manual.

5.2 ASSEMBLY TIPS

For the most part the assembly tips given in Paragraph 3.2 of Section III (Page III-1) apply to assembling the Sol keyboard.

In addition, be sure your hands are clean before handling the circuit board, especially the area containing the keyboard switch pads.

5.3 ASSEMBLY PRECAUTIONS

For the most part the assembly precautions given in Paragraph 3.3 in Section III (Page III-6) apply to assembling the Solkeyboard.

5.4 REQUIRED TOOLS, EQUIPMENT AND MATERIALS

The following tools, equipment and materials are recommended for assembling the personality module:

- 1. Needle nose pliers
- 2. Diagonal cutters
- 3. Screwdriver (thin blade)
- 4. Controlled heat soldering iron, 25 watt
- 5. 60-40 rosin-core solder (supplied)

5.5 ORIENTATION

Light emitting diode location LED3 will be located in the lower left-hand corner of the board when locations Jl and U4 through U16 are at the top of the board. In this position the component (front) side of the board is facing up and all horizontal reading legends will read from left to right. Subsequent position references related to the keyboard circuit board assume this orientation.

SECTION V

Table 5-1. Sol Keyboard Parts List.

INTEGRATED CIRCUITS					
1	555 (U3)	1	74LS30 (U25)		
1		2	7442 (U17 & 21)		
2	4051A (U19 & 22)	5	74LS74 (U8,9,11,15,26)		
4	74LS00 (U4,10,14,16)	2	7493 (U6,U5)		
1	74LS04 (U23)	1	74LS132 (U7)		
1	7406 (U24)	2	74LS175 (U1,U2)		
2	74LS10 (Ul3 & 27)	1	8334, 9334 or 83L34 (Ul2)		
		1	8574 (U18)		
6	TRANSISTORS DIODES (ZENER) DIODES (LIGHT EMITTING) 6 2N 3640 1 1N 5221B (D1) 3 MV 5752 (LED1, 2, 3) 3 2N 4274 3 MV 5752 (LED1, 2, 3)				
RES	ISTORS	CAP	ACITORS		
1	10 ohm, ½ watt, 5%	2	220 pfd, disc		
3	150 ohm, ½ watt, 5%	1	470 pfd, disc		
1	390 ohm, ½ watt, 5%		.0022 ufd, disc		
1	680 ohm, ½ watt, 5%		.01 ufd, disc		
7	1 K ohm, ¼ watt, 5%	5	.047 ufd, disc		
10	1.5K ohm, ½ watt, 5%	1	.l ufd, Mylar tubular		
1	2.2K ohm, ½ watt, 5%	2	15 ufd, tantalum dipped		
5	3 K ohm, ½ watt, 5%				
2	33 K ohm, ½ watt, 5%		CONTRACTOR A		
2	68 K ohm, ½ watt, 5%	-			
2	2.2K ohm resistor network	ROLLEG ROLLEGE	the said to suggest bush of all soun.		
2	33 K ohm resistor network	1011	transfact to qui ett to are ex		

SOL KEYBOARD SECTION V

Table 5-1. Sol Keyboard Parts List (Continued).

MISCELLANEOUS

- 1 Sol-KBD Printed Circuit Board
- 1 8-pin DIP Socket
- 17 14-pin DIP Socket
- 8 16-pin DIP Socket
- 1 22-pin DIP Socket
- 1 20-pin Header, 3M3492-2002
- 1 9-3/4" 20-conductor Rainbow Cable Assembly
- 1 70-key (Sol-10) or 85-key (Sol-20) Keyboard Assembly
- l Plastic Insert (Sol-10) for Key Pad
- 18 Torx Screw
 - 3 Fiber Spacer
 - l Length Solder

5.6 ASSEMBLY-TEST

5.6.1 Circuit Board Check

- () Visually inspect circuit board for obvious flaws. (The design of the board includes numerous unconnected traces and traces that are shorted to each other.)
- (Check circuit board to insure that the +5-volt bus is not shorted to ground. Using an ohmmeter, measure between the GND and +5V pads located in the upper left corner of the board. There should be no continuity.

If no visual inspection reveals any defect, or you measure continuity between the GND and +5V pads, return the board to Processor Technology for replacement. If the board is not defective, proceed to next paragraph.

5.6.2 Assembly-Test Procedure

Refer to keyboard assembly drawing in Section IX.

CAUTION

SOME MOS INTEGRATED CIRCUITS ARE USED ON THE Sol KEYBOARD. THEY CAN BE DAMAGED BY STATIC ELECTRICITY DISCHARGE. HANDLE MOS IC'S SO THAT NO DISCHARGE FLOWS THROUGH THE IC. AVOID UNNECESSARY HANDLING AND WEAR COTTON, RATHER THAN SYNTHETIC, CLOTHING WHEN YOU DO HANDLE MOS IC'S. (STATIC CHARGE PROBLEMS ARE MUCH WORSE IN LOW HUMIDITY CONDITIONS.)

(VStep 1. Install DIP sockets. Install each socket in the indicated location with its end notch oriented as shown on the circuit board and assembly drawing. Take care not to create solder bridges between the pins and/or traces.

(Refer to "Installation Tip" on Page III-9 in Section III.)

LOCATION	TYPE	SOCKET
() Ul and 2	16	
		pin
(J U3	8	pin
() U4 through Ull	14	pin
() U12	16	pin
(Jul3 through Ul6	14	pin
(W/Ul7 through Ul9	16	pin *
(X/U20	22	pin
(V) U21 and 22	16	pin
(JU23 through U27	14	pin

Step 2. Install the following capacitors in the indicated locations. Take care to observe the proper value, type and orientation (if applicable) for each installation. Insert leads, pull down snug to board, bend leads outward on solder (back) side of board, solder and trim.

NOTE

Disc capacitor leads are usually coated with wax during the manufacturing process. After inserting leads through mounting holes, remove capacitor and clear the holes of any wax. Reinsert and install.

LOCATION	VALUE		TYPE	ORIENTATION
() C1 () C2 () C3	15 .047 .1	ufd ufd ufd	Tantalum Disc Mylar	"+" lead top None

(Continued on Page V-5.)

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LOCATION	VALUE	TYPE	ORIENTATION
() C4 () C5	.01 ufd		None
() C6	.047 ufd		" (C) (C)
() C8 () C9	470 pfd	25 U	" PER (4)
() C10	220 pfd 220 pfd	6 aboth to as]	desent "A neith (a)
() C11 () C12	.01 ufd		THE SECOND SECON
() Cl3 () Cl4	.047 ufd		"+" lead top

() <u>Step 3</u>. Install the following resistors in the indicated locations. Bend leads to fit distance between mounting holes, insert leads, pull down snug to board, solder and trim.

LOCATION	VALUE (ohms)	COLOR CODE
() R1 () R2 () R3	150 150 150	brown-green-brown
() R4 () R5 () R6	68 K 560 K 33 K	blue-gray-orange green-blue-yellow
() R7 () R8	1 K	orange-orange brown-black-red brown-green-red
() R9 () R10 () R11	3 K 3 K 3 K	orange-black-red
(R12 (R13	3 K 1.5K	" " " brown-green-red
() R14 () R15 () R16	1.5K 1.5K 1 K	brown-black-red
(R17 (R18	390 1 K	orange-white-brown brown-black-red
() R19 () R20 () R21	10 1 K 1 K	brown-black-black brown-black-red
() R22 () R23 () R24	3 K 1 K 1 K	orange-black-red brown-black-red
() R25 () R26	1.5K 680	brown-green-red blue-gray-brown
R27 R28 R29	33 K 1.5K 1.5K	orange-orange-orange brown-green-red

(Continued on Page V-6.)

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LOCATION	VALUE (ohms)	COLOR CODE
() R30 () R31	1.5K 1.5K	brown-green-red
(X R32	68 K	blue-gray-orange
() R33	1.5K	brown-green-red
() R34	2.2K	red-red-red

- () Step 4. Install Zener diode Dl (lN522lB) in its location to the left of Rl7. Position Dl with its dark band (cathode) at the bottom.
- () Step 5. Install Q1, Q2 and Q9 (2N4274) and Q3 through Q8 (2N3640) in their respective locations at the top center of the board. The emitter lead (closest to flat side of case) is oriented toward the right of the board and the base is oriented toward the top. Insert leads until transistor is approximately 3/16" above surface of circuit board, solder and trim.
- Step 6. Install resistor networks RX1 and RX3 (2.2K ohms) and RX2 and RX4 (33K ohms) in their respective locations just above the keyboard pads. Install each network so that the dot on its package is positioned next to the dot on the circuit board. Recheck values before soldering.

CAUTION

THESE RESISTOR NETWORKS ARE DELICATE. HANDLE WITH CARE.

- (Step 7. Install light emitting diodes LED1, 2 and 3 (MV5752) in their respective locations in the lower left corner of the circuit board. Insert leads through fiber spacer, position each diode with its cathode lead (longer lead and/or the lead next to flat edge of LED package) at the bottom, insert leads into mounting holes in circuit board, pull down so that spacer and LED are snug to board, solder and trim. (If fiber spacers are not supplied with your kit, install LED's so they are approximately 3/16" above surface of circuit board.)
- (VStep 8. Install 20-pin header in location Jl (upper left corner of board). Position header so pin l is in the lower left corner. (An arrow on the header points to pin l.)
- (Step 9. Using an ohmmeter, measure between GND and +5V pads in upper left corner of the board. You should measure some resistance. Zero resistance indicates a short. If required, find and correct the problem before proceeding to Step 10.

Sol KEYBOARD SECTION V

(<u>Step 10</u>. Install the following IC's in the indicated locations. Pay careful attention to the proper orientation.

NOTE

Dots on the assembly drawing and PC board indicate the location of pin 1 of each IC.

IC NO.	TYPE
IC NO. () U1 () U2 () U3 () U4 () U5 () U6 () U7 () U8 () U9 () U10 () U11 () U12 () U13 () U14 () U15 () U16 () U17 () U18 () U19* () U20* () U21 () U22* () U23 () U24 () U25	TYPE 74LS175 74LS175 555 74LS00 7493 7493 74LS132 74LS74 74LS74 74LS00 74LS74 8334,9334 or 83L34 74LS10 74LS00 74LS74 74LS00 74LS74 74LS00 74LS74 74LS00 74LS74 74LS00 74LS74 74LS00 7442 8574 or 74187A 4051A* 2101 or 9101* 7442 4051A* 74LS04 7406 74LS30
() U26 () U27	74LS74 74LS10

*MOS device. Refer to CAUTION on Page V-4.

Step 11. Connect 20-conductor ribbon cable between Jl on keyboard to J3 on Sol-PC so that cable goes left from J3.

Step 12. Check keyboard operation.

Set Sl switches on Sol-PC as follows:

No. 1 through 4: OFF

No. 5: ON

No. 6: OFF

SOI KEYBOARD SECTION V

(Connect TV monitor to Sol-PC.

(With personality module installed, apply power to Sol-PC.

Using a CLEAN finger, touch key pad #62 (MODE SELECT).

(You should get a carriage return and line feed and see a "greater than" sign () on the screen above the cursor.

NOTE

You may have to touch pad #62 several times to obtain the specified display.

() If you are unable to obtain the specified display, locate and correct the problem before proceeding.

(If the keyboard is operating correctly, turn monitor and Sol-PC power off, disconnect 20-conductor ribbon cable at Jl on the keyboard and go on to Step 13.

Step 13. Place keyboard assembly carefully over key pads on PC board. Carefully align holes in PC board (18 in all) with threaded mounting holes on bottom of keyboard assembly. Insert Torx screws from solder (back) side of board and, using a thin blade screwdriver, drive into keyboard assembly mounting holes. Drive screws evenly and tighten just enough to hold keyboard assembly in place.

CAUTION

DO NOT OVERTIGHTEN THESE SCREWS.

(Step 14. Reconnect 20-conductor ribbon cable to Jl on key-board.

(V Step 15. Test keyboard for proper operation.

(Apply power to monitor and Sol-PC.

(Strike MODE SELECT key.

(Strike UPPER CASE key. Indicator light should come on.

(Strike UPPER CASE key again. Indicator light should go off.

(Strike LOCAL key. Indicator light should come on.

(Strike LOCAL key again. Indicator light should go off.

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(Step 15 continued.)

- ___ (Strike SHIFT LOCK key. Indicator light should come on.
 - () Strike either SHIFT key. Indicator light should go off.
 - (Verify operation of all alphanumeric keys. (As you strike each key you should observe the corresponding character on the monitor.)
 - (V Should the keyboard fail any of the preceding checks, locate and correct the problem before proceeding.
 - () If the keyboard passes all of the preceding tests, congratulations on a job well done.

At this point you have successfully assembled the Sol keyboard and tested it for proper operation. It is now ready for use with the Sol-PC Single Board Terminal Computer $^{\mathrm{TM}}$.

Having completed the Sol keyboard, power supply, Sol-PC and personality module, you are now ready to assemble the Sol cabinet-chassis. Cabinet-chassis assembly instructions are provided in Section VI.

SECTION VI

Sol CABINET-CHASSIS

SOL TERMINAL COMPUTER TM

*

6.1 INTRODUCTION

This section covers assembly of the Sol-10 and Sol-20 chassis and cabinet. The instructions contained herein assume that you have already assembled the power supply and Sol-PC Single Board terminal Computer $^{\rm TM}$...including the personality module and the Sol keyboard (Sol-KBD).

6.2 PARTS AND COMPONENTS

Check all parts and components against the appropriate "Parts List(s)", Table 6-1 and 6-2. If you have any difficulty in identifying any parts by sight, refer to Figures 6-1 and 6-2 on Pages VI-4 and VI-4.

6.3 ASSEMBLY TIPS

6.3.1 General

- 1. Scan Section VI in its entirety before you start to assemble your Sol cabinet-chassis.
- 2. IT IS IMPORTANT that you follow the step-by-step instructions in the order given when assembling the Sol cabinet-chassis if your assembly is to be done correctly and with minimum effort.
- 3. Assembly steps and component installations are preceded by a set of parentheses. Check off each installation and step as you complete them. This will minimize the chances of omitting a step or component.
- 4. Should you encounter any problem during assembly, call on us for help if needed.

6.3.2 Electrical

- 1. Use a low-wattage soldering iron, 25 watts maximum, for all soldering.
 - 2. Solder neatly and as quickly as possible.
- 3. Use only 60-40 rosin-core solder. NEVER use acid-core solder or externally applied fluxes.
- 4. (Sol-20 only.) DO NOT press tip of iron on pads or traces when installing components and/or attaching leads to a PC board. To do so can cause the pad or trace to "lift" off the board and permanently damage it.

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Table 6-1. Sol-10 Cabinet-Chassis Parts List.

CHASSIS and SUBCHASSIS

- 1 Main Chassis
- 1 Expansion Chassis
 - 1 Power Supply Subchassis
 - 1 Fan Closure Plate

BRACKETS

- Power Supply Subchassis
 Bracket
- 2 Keyboard Bracket

CABINET

- 1 Left Side Piece, Walnut
- 1 Left Side Piece, Masonite
- l Right Side Piece, Walnut
- 1 Right Side Piece, Masonite
- 1 Keyboard Cover
- 1 Top Cover

MISCELLANEOUS

- 2 Finger Well Label, Black
- 1 Printed Trim Plate, Paper
- l Plexiglass Strip
- 1 Serial Number Label
- 1 Connector Identification Label

HARDWARE

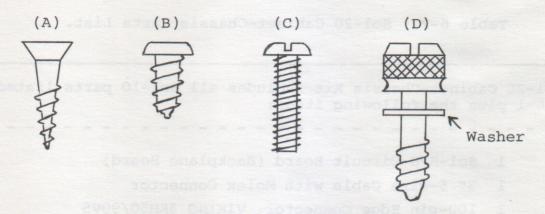
- 4 4-40 x 3/16 Screw, Machine
- 16 4-40 x 5/16 Screw, Machine
- 8 4-40 Hex Nut
- 22 #4 Lockwasher, Internal Tooth
- 16 6-32 x ½ Screw, Machine
 - 8 6-32 Hex Nut
- 16 #6 Lockwasher, Internal Tooth
- 11 8-32 x ½ Screw, Machine
 - 2 8-32 x 1 Screw, Machine
 - 3 8-32 Hex Nut.
 - 3 #8 Lockwasher, Internal Tooth
 - 2 10-24 Thumb Screw
- 21 #6 x ½ Screw, Sheet Metal
- 4 #6 x 5/16 Screw, Sheet Metal
- 12 5/8 Screw, Wood
- 2 #4 Solder Lug
- 10 Tinnerman Plastic Inserts, Tapped
 - 2 4" Spacer, 4-40 Tapped
 - 4 Self-stick Protective Pads

Table 6-2. Sol-20 Cabinet-Chassis Parts List.

The Sol-20 Cabinet-Chassis Kit includes all Sol-10 parts listed in Table 6-1 plus the following items:

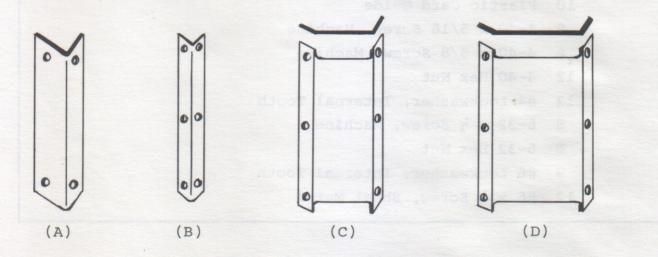
- 1 Sol-BPB Circuit Board (Backplane Board)
- 1 3" 5-wire Cable with Molex Connector
- 1 100-pin Edge Connector, VIKING 3KH50/90V5
- 5 100-pin Edge Connector, TI H322150
- 2 Right Angle Backplane Bracket
- 1 Gusset Bracket, Left
- 1 Gusset Bracket, Right
- 10 Plastic Card Guide
- 6 4-40 x 5/16 Screw, Machine
- 6 4-40 x 5/8 Screw, Machine
- 12 4-40 Hex Nut
- 12 #4 Lockwasher, Internal Tooth
- 8 6-32 x ½ Screw, Machine
- 8 6-32 Hex Nut
- 9 #6 Lockwasher, Internal Tooth
- 12 #6 x ½ Screw, Sheet Metal

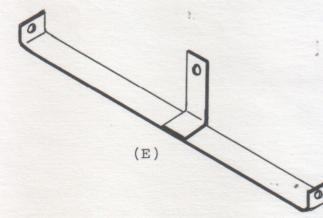
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- (A) Flat Head Wood Screw (C) Binder or Pan Head Screw
- (B) Sheet Metal Screw (D) Thumb Screw

Figure 6-1. Types of screws used in Sol cabinet-chassis assembly.





- (A) Keyboard Bracket
- (B) Backplane Bracket, Right Angle
 - (C) Gusset Bracket, Left
 - (D) Gusset Bracket, Right
 - (E) Power Supply Subchassis Bracket

Figure 6-2. Brackets used in Sol cabinet-chassis assembly.

6.3.2 Electrical (continued)

- 5. (Sol-20 only.) The Backplane PC board (Sol-BPB) has plated-through holes. Solder flow through to the component side of the board can produce solder bridges (shorts). Check for such bridges after you install each component or wire.
- 6. (Sol-20 only.) The Backplane PC board (Sol-BPB) has an integral solder mask (a lacquer coating) that shields selected areas on the board. This mask minimizes the chances of creating solder bridges during assembly.

6.3.3 Mechanical

- 1. If you do not have the proper screwdrivers (see Paragraph 6.5), we recommend that you buy them rather than using a knife point, a blade screwdriver on a Phillips screw, and other makeshift means. Proper screwdrivers minimize the chances of stripping threads, disfiguring screw heads and marring decorative surfaces.
- 2. To assure a correct fit and tight assembly, be sure you use the screws specified in the instructions.
- 3. Lockwashers are widely used in the Sol cabinet-chassis assembly so that screws will not loosen when subjected to stress or vibration. When a lockwasher is specified, do not omit it and make sure you install it correctly.
- 4. Some instructions call for prethreading holes. This is done to make assembly easier by giving you maximum working space for installing relatively hard-to-drive sheet metal screws. If you bypass prethreading instructions you will only make your cabinet-chassis assembly more difficult.

To prethread a hole, insert specified screw in the hole and position it as straight as possible. While holding the screw in this position, drive it into the metal with the proper screwdriver. If started straight the screw will continue to go straight into the metal so that the head and sheet metal surfaces are in full contact.

5. The diameter of the shank (threaded portion) of a screw increases in relation to its number. For example, a 6-32 screw is larger in diameter than a 4-40 screw. Also, a #8 lockwasher is larger than a #4 lockwasher.

SECTION VI

6.4 REQUIRED TOOLS, EQUIPMENT AND MATERIALS

The following tools, equipment and materials are recommended for assembling the Sol cabinet-chassis. (Unless indicated otherwise, none of the following items are supplied with your kit.)

- 1. Needle nose pliers
- 2. Diagonal cutters
- 3. Screwdriver, thin 4" blade
- 4. Screwdriver, #2 Phillips
- 5. Controlled heat soldering iron, 25 watt
- 6. 60-40 rosin-core solder (supplied)
- 7. Silicon grit abrasive paper, 220 & 400 grit
- 8. Boiled linseed oil
 - 9. Turpentine or mineral spirits
- 10. Masking tape
- 11. Transparent tape
- 12. Rubber mallet or small hammer

6.5 ORIENTATION

6.5.1 Sol Backplane Board, Sol-BPB (Sol-20 Only)

The PC board identification (Sol-BPB) and revision level will be located in the upper left-hand corner of the board when the edge connector (gold contacts) is positioned at the bottom of the board. In this position, the component (front) side of the board is facing up. Subsequent position references related to the Sol-BPB assume this orientation.

6.5.2 Sol Cabinet-chassis

Unless specified otherwise, all position references (e.g., left, right, front, back, bottom and top) in the cabinet-chassis assembly instructions assume the Sol cabinet is viewed from the front (keyboard) when it is sitting in its normal position (keyboard up).

6.6 ASSEMBLY-TEST

NOTE

Instructions that apply <u>only</u> to the Sol-20 are preceded by an asterisk. Skip these instructions if you are assembling a Sol-10.

*6.6.1 Backplane Board (Sol-BPB) Assembly

Refer to Drawing No. 101000, Sheet 2.

*(Step 1. Visually inspect Sol-BPB PC board for obvious flaws such as solder bridges (shorts) between traces, broken traces and similar defects.

If visual inspection reveals any defects, return the board to Processor Technology for replacement. If the board passes inspection, go on to Step 2.

*(Step 2. Install VIKING 3KH50/9VC5 100-pin edge connector on top edge of PC board.

NOTE

This connector is supplied as a troubleshooting aid. It is not critical to normal operation of the Sol-20.

Position connector on PC board so that its pins are aligned with the traces on the board. While holding the connector

NOTE

You may have to bend the connector pins slightly so that both rows of pins are in light contact with the traces on the board. DO NOT CLOSE CONNECTOR PINS SO MUCH THAT YOU WILL DAMAGE THE TRACES WHEN PLACING THE CONNECTOR OVER THE EDGE OF THE BOARD.

and board in position, place board (solder side down) on a book, or other flat surface that is higher than your work surface, so the connector extends fully over the edge. That is, the connector should not rest on the book. Reposition connector if needed to align the pins and traces. On the component (front) side of board, solder a pair of pins at each end of the connector to their respective traces on the

(Step 2 continued on Pave VI-8.)

board. Then solder the remaining 46 pins on the component side to traces.

Turn PC board over and solder the other 50 pins to the traces on the solder side of the board.

- -*(VStep 3. Install the other five 100-pin edge connectors.

 Position connector on front side of board and insert pins.

 On solder (back) side of board, solder pins at opposite corners of the connector to hold it in place. Then solder remaining 98 pins. (Refer to Paragraph 6.6.1 on Page VI-6 for definition of front side of board.)
 - *(Step 4. Connect 3" 5-wire cable to circuit board to uppermost pads in top right corner.

Insert wires from solder (back) side of board and solder on component (front) side of board. Connect cable leads as follows:

CABLE	TEAD	
CABLE	LICIAL	

PAD

	。 200 V 2 V 2 C C C C C C C C C C C C C C C C
White	Ground (fifth hole from right)
White	Ground (fourth hole from right)
Blue	+8 V dc (third hole from right)
Red-White	+16 V dc (second hole from right)
Yellow-White	-16 V dc (first hole from right)

NOTE

Pad orientations given above are as <u>viewed</u> <u>from component (front) side of circuit</u> board.

*() Step 5. Fill all exposed (not covered with lacquer) feethrough holes on right-hand side of board.

The backplane board is now assembled. Set it to one side for later installation in the cabinet-chassis.

6.6.2 Wooden-masonite Parts

Refer to Drawing No's. 101007 and 101008 in Section X.

() Step 6. Finish walnut side panels.

The sides of the Sol cabinet are solid black walnut which have been sanded to a smooth surface. If there should be any blemishes, remove them with 220 grit abrasive paper. SAND WITH THE GRAIN...NEVER ACROSS THE GRAIN.

We recommend an oil finish be applied to the walnut since such a finish lies "in" the wood, not on "top" of it. Also, no wax is necessary with an oil finish.

> You may obtain a good finish by using a half-and-half mixture of boiled linseed oil and turpentine. Apply mixture with rag, soaking all surfaces. (End grain may require more oil than face grain.) Let stand for one-half hour, recoating any dry spots, and wipe dry with a clean cloth. Repeat as often as needed to obtain a lustrous finish. (It may take several days.)

You may also use a commercially available penetrating oil such as Watco Danish Oil or Tung Oil. Follow directions on the container if you use such an oil. For a more durable finish when using a penetrating oil:

- 1. Sand between applications with 220 grit silicon carbide abrasive paper. (Wipe clean after 15 minutes to avoid build-up.)
- 2. Repeat the following day using 400 grit paper between applications.
- 3. Repeat as often as desired, using a still finer grit paper between applications. DO NOT sand after final application, but wipe the surfaces clean and let dry for one day. Then coat with previously mentioned linseed oil-turpentine mixture and wipe dry.

() Step 7. Using a black broad tipped felt pen, darken all edges of the two masonite parts.

() <u>Step 8</u>. Mate the left walnut and masonite side pieces. (Refer to Drawing No. 101007.)

NOTE

When the walnut and masonite side pieces are correctly mated, the countersink side of the six countersunk (funnel-shaped enlargement) holes in the masonite will be next to the main chassis.

Insert five Tinnerman, plastic inserts in the holes indicated on Drawing 101007. Insert these from the side that mates wi with the walnut. These inserts may be seated by gently tapping them with a hammer until fully seated.

() <u>Step 9.</u> Insert remaining five Tinnerman inserts in right masonite side piece as you did the left side piece. (Refer to Drawing 101008.)

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) <u>Step 10</u>. Attach left masonite side piece to left walnut side piece with six 5/8" flat head wood screws. Drive these screws through the countersunk holes in the masonite into the walnut. (Refer to Drawing No. 101007.)

NOTE

Lead holes have been predrilled in the walnut to make driving these screws easier.

Step 11. Attach right masonite side piece to right walnut side piece as you did the left side pieces. (Refer to Drawing 101008.)

Step 12. Set both side piece assemblies to one side.

6.6.3 Sol Assembly

Refer to Drawing No. 101000 in Section X. Figure 6-3 and 6-4 show complete Sol assemblies without covers.

(-) <u>Step 13</u>. Mount keyboard support bracket (heavy gauge right angle brackets) to each side of the main chassis as shown in Drawing No. 101000. These are mounted with the narrower side of the bracket at the top.

Attach each bracket to main chassis with two 6-32 x $\frac{1}{2}$ binder or pan head screws and #6 lockwashers. Place lockwasher on screw, insert screw from outer surface of main chassis side wall and drive into the threaded bracket mounting holes.

- Step 14. Attach power supply subchassis bracket (short leg "T" shaped bracket) to top front of power supply subchassis as shown in Drawing No. 101000. (Note that leg of "T" is closer to side wall of subchassis. This leg is for mounting a "power on" indicator light--not supplied.) Insert #6 x ½ sheet metal screw from right side of side wall and drive into bracket.
- Step 15. To gain access to the rear area of the power supply subchassis side wall, remove the #6 x ½ sheet metal screw that attaches the fan closure plate to the subchassis. You should not have to disconnect the transformer (black wires) or AC receptacle ground (green wire) leads since they have sufficient slack to permit moving the closure plate out of the way. (Set screw to one side for use in re-installing the fan closure plate.)

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Figure 6-3. Sol-20 with covers removed. Front (or keyboard) is in foreground, power supply is in right rear corner, expansion chassis (with 8KRA Memory installed) is to left of power supply. The vertical board just behind white connector on left is the backplane board.



Figure 6-4. Sol-20 with covers removed. Rear side of assembly is in foreground and Sol-PC is just visible at lower right rear of assembly. 8KRA Memory is installed in expansion chassis above Sol-PC.

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(Step 16. Install power supply subchassis in main chassis as shown in Drawing No. 101000.

Place subchassis over the rear right corner of main chassis and lower it almost vertically into position. Attach subchassis to main chassis using eight #6 x ½ sheet metal screws. Five screws are driven through the bottom of the main chassis into the subchassis. The other three are driven through the right side of the main chassis into the subchassis.

() Step 17. Place right side walnut-masonite assembly in proper position against right side of main chassis and outline the finger well on the chassis. Remove backing from one black finger well label and affix it to the right side of main chassis. Position label to cover the finger well outline you made. Be sure label extends beyond all edges of the outline.

Step 18. Using five 8-32 x ½ binder or pan head screws, attach right side walnut-masonite assembly to main chassis and power supply subchassis as shown in Drawing No. 101000. Insert screws from inside surface of chassis and drive into the plastic inserts you installed in Step 9. Note that the two front screws are driven through the main chassis, the two lower rear screws are driven through both the power supply subchassis, and the upper rear screw is driven through the power supply subchassis.

) Step 19. Assemble expansion chassis ("U" shaped chassis).

) Prethread 12 mounting holes (six on each side) on expansion chassis side walls for backplane brackets with #6 x ½ sheet metal screws. Three of these holes on each side are located near the front edge of the main chassis. The remaining three holes on each side are about 1½ to 2 inches behind the front three. Leave screws installed.

() Install female coaxial connector on the tab that extends out from the lower right front of the expansion chassis. Insert connector through tab so threaded end faces left as shown in Drawing No. 101000. Insert three 4-40 x 5/16 binder or pan head screws from left side of tab through the two front and lower rear mounting holes. Place #4 lockwahser on each and secure with 4-40 hex nuts. Insert another 4-40 x 5/16 binder or pan head screw through upper rear mounting hole and install 4-40 hex nut. (Leave this nut loose.)

*() Install 10 plastic card guides (five on each side) on inside surface of both side walls of the expansion chassis.

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These are installed over the ventilation grills with the curved ends near the backplane bracket holes. To install, simply insert posts on guide into appropriate mounting holes and push in until they snap into place.

() <u>Step 20</u>. Install expansion chassis on main chassis as shown in Drawing No. 101000.

Position expansion chassis with coaxial connector at the front (near FWB3 on power supply subchassis) over left rear area of main chassis and lower into place. Attach expansion chassis to main chassis using eight #6 x ½ sheet metal screws. Four screws are driven through the bottom of the main chassis into the expansion chassis, three are driven through the left side of the main chassis into the expansion chassis, and one is driven through the lower left corner of the back side of the main chassis into the expansion chassis.

- () <u>Step 21</u>. Attach left end of power supply subchassis bracket to expansion chassis as shown in Drawing No. 101000. Drive one 6 x ½ sheet metal screw through expansion chassis into bracket.
- () <u>Step 22</u>. Route coaxial cable from connector on fan closure plate along left side of power supply subchassis to connector on expansion chassis.
- () Step 23. Using the #6 x ½ sheet metal screw you removed in Step 15, re-attach fan closure plate to power supply subchassis. (Make sure side lip on plate is on right side of expansion chassis side wall.
- Step 24. Attach fan closure plate to expansion chassis with two #6 x 1/4 sheet metal screws. Drive screws through expansion chassis into fan closure plate.

NOTE

If lip on fan closure plate and expansion chassis are not in contact, insert one or two ½" flat washers as needed between the two surfaces. Place washers so screws pass through them.

() Step 25. Connect free end of coaxial cable from connector on fan closure plate to connector on expansion chassis. Solder inner conductor to pin of connector. Remove hex nut on upper rear connector mounting screw, place lockwasher lug (coaxial shield) on screw and secure with nut.

() <u>Step 26</u>. Install male coaxial connector on free end of coaxial cable that is connected to Sol-PC (the composite video output cable). Install connector as follows (refer to Figure 6-5):

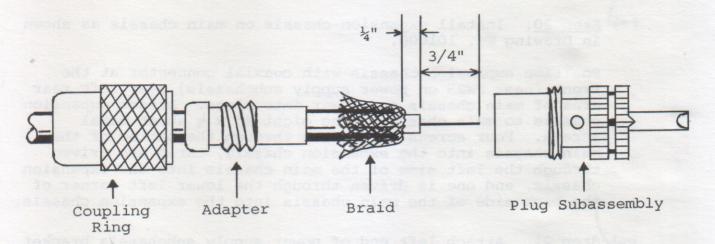


Figure 6-5. Sol-PC coaxial cable connector assembly.

() Slide coupling ring and adapter on cable in that order and cut end of cable even.

Remove one inch of outer insulation.

) Fan braid slightly and fold back over outer insulation as shown.

() Slide adapter fully up under braid and press braid down over adapter body.

() Trim braid so that it does not interfer with adapter threads.

() Remove 3/4" of inner conductor insulation and tin exposed conductor.

Slide cable fully into plug subassembly and screw subassembly on adapter.

() Solder braid to plug subassembly shell through solder holes. (Use enough heat to create a good bond between braid and shell.)

() Solder center conductor to plug contact by filling contact with solder. Cut off excess conductor.

() Slide coupling ring over plug subassembly and screw it onto plug.

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(Step 27. Install Sol-PC in expansion chassis.

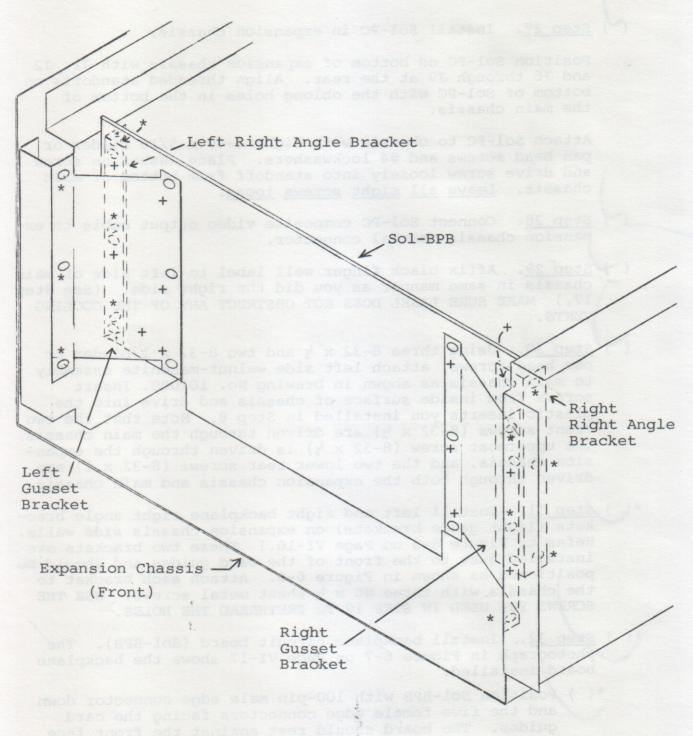
Position Sol-PC on bottom of expansion chassis with J1, J2 and J6 through J9 at the rear. Align threaded standoffs on bottom of Sol-PC with the oblong holes in the bottom of the main chassis.

Attach Sol-PC to chassis with eight 4-40 x 5/16 binder or pan head screws and #4 lockwashers. Place washer on screw and drive screw loosely into standoff from bottom of main chassis. <u>Leave all eight screws loose</u>.

Step 28. Connect Sol-PC composite video output cable to expansion chassis coaxial connector.

- () <u>Step 29</u>. Affix black finger well label to left side of main chassis in same manner as you did the right side. (See Step 17.) MAKE SURE LABEL DOES NOT OBSTRUCT ANY OF THE COOLING VENTS.
- () Step 30. Using three 8-32 x ½ and two 8-32 x 1 binder or pan head screws, attach left side walnut-masonite assembly to main chassis as shown in Drawing No. 101000. Insert screws from inside surface of chassis and drive into the plastic inserts you installed in Step 8. Note that the two front screws (8-32 x ½) are driven through the main chassis, the uppermost screw (8-32 x ½) is driven through the expansion chassis, and the two lower rear screws (8-32 x 1) are driven through both the expansion chassis and main chassis.
- *() Step 31. Install left and right backplane right angle brackets (light gauge brackets) on expansion chassis side walls. Refer to Figure 6-6 on Page VI-16.) These two brackets are installed just to the front of the card guides and should be positioned as shown in Figure 6-6. Attach each bracket to the chassis with three #6 x ½ sheet metal screws. USE THE SCREWS YOU USED IN STEP 19 TO PRETHREAD THE HOLES.
- *() <u>Step 32</u>. Install backplane circuit board (Sol-BPB). The photograph in Figure 6-7 on Page VI-17 shows the backplane board installed.
 - *() Position Sol-BPB with 100-pin male edge connector down and the five female edge connectors facing the card guides. The board should rest against the <u>front</u> face of the right angle brackets as shown in Figure 6-6. Adjust position of Sol-PC as needed so that you can plug the Sol-BPB edge connector into Jll on the Sol-PC.
 - *() Align holes on left and right ends of Sol-BPB with those in right angle brackets.

(Step 32 continued on Page VI-17)



*#6 x 1/4 sheet metal screw

+4-40 x 5/8 binder or pan head screw, #4 lockwasher and 4-40 hex nut

Figure 6-6. Backplane board (Sol-BPB) installation.

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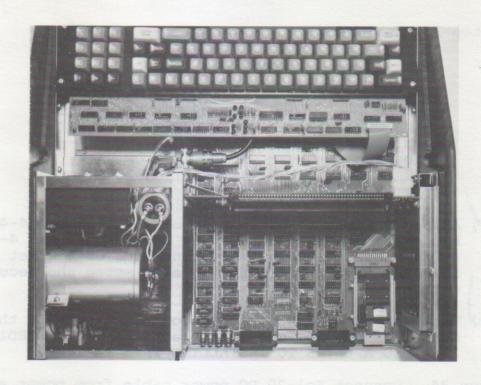


Figure 6-7. Backplane board (Sol-BPB) installation. Rear of Sol is at bottom and Sol-BPB is to right of power supply subchassis in line with C8 and transformer.

(Step/32 continued)

- *() Attach Sol-BPB to brackets with three 4-40 x 5/16 binder or pan head screws, #4 lockwashers and 4-40 hex nuts on each side. Insert screws from the back side of bracket through Sol-BPB, place lockwasher on each screw and secure each with nut.
- *(Step 33. Install left and right gusset brackets as shown in Figure 6-6 on Page VI-16.
 - *() Fit narrower gusset bracket on left side so that its flanges are flat against the expansion chassis side wall and the backplane board. (You may have to bend the flange slightly to obtain a proper fit.)
 - *() Attach bracket to expansion chassis side wall with the three $\#6 \times \frac{1}{4}$ sheet metal screws you used in Step 19 to prethread the holes.

See WARNING on Page VI-18.

(Step 33 continued on Page VI-18.)

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(Step 33 continued.)

WARNING

IT IS QUITE EASY TO SCRATCH OR CUT YOUR HAND ON THE SOLDER SIDE OF THE BACKPLANE BOARD WHEN DRIVING THESE SCREWS. PLACE A SUITABLE PROTECTIVE BARRIER, SUCH AS CARDBOARD, AGAINST SOLDER SIDE OF BACKPLANE BOARD DURING INSTALLATION TO PREVENT SUCH INJURY.

*() Attach bracket to backplane board with three 4-40 x 5/8 binder or pan head screws, #4 lockwashers and 4-40 hex nuts. Insert screws from front side of bracket through Sol-BPB, place lockwasher on each screw and secure each with nut.

Install wider gusset bracket on right side in the same manner as you did the left bracket. THE PRECEDING WARN-ING ALSO APPLIES TO INSTALLING THIS BRACKET.

() <u>Step 34</u>. Connect Sol-20 DC power cable from power supply subchassis to the Sol-BPB power cable you installed in Step 4.

Step 35. Check that Sol-PC is in optimum position and tighten the eight screws holding the Sol-PC to the expansion-main chassis assembly. (See Step 27.)

Step 36. Connect Sol-PC power cable (4-wire) to J10 on

CAUTION

MAKE SURE CABLE CONNECTOR MATES EXACTLY WITH J10; THAT IS PIN 1 TO PIN 1, PIN 2 TO PEN 2 ETC. ANY OTHER MATING RELATION-SHIP WILL "BLOW" THE IC'S ON THE SOL-PC. (REFER TO STEP 15 IN SECTION III.)

Step 37. Position keyboard (Sol-KBD) near its mounting brackets and connect 20-conductor ribbon cable supplied with Sol keyboard kit between Jl on keyboard and J3 on Sol-PC. Plug connector into J3 so the cable goes to front of J3 (next to U64).

() Step 38. Attach keyboard to keyboard brackets with two 6-32 x ½ binder or pan head screws and #6 lockwashers on each side. Place washer on each screw and drive screws loosely into threaded holes in brackets.

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- () <u>Step 39</u>. If your kit does not include the 15-key numeric pad, install the plastic insert supplied with your Sol keyboard kit to the keyboard cover. Attach it on the right end and to the bottom of the cover with masking tape.
- (<u>Step 40</u>. Remove protective cover from one side of Plexiglass strip and attach "Sol Terminal Computer" trim plate to Plexiglass with small pieces of transparent tape. Place trim plate with <u>printed side against Plexiglass</u>.
- () <u>Step 41</u>. Remove protective cover from other side of Plexiglass and slide it into the channel above the keyboard

NOTE

A hole is provided in the sheet metal behind the trim plate. This may be used for a "power on" indicator light if desired.

() <u>step 42</u>. Install keyboard cover. Hook front of cover under front edge of main chassis and lower it over the keyboard. (A slight adjustment of the keyboard position may be needed to obtain a proper fit.)

Position keyboard within cutout in cover if needed and tighten keyboard mounting screws.

- () Step 43. Install top cover.
 - () Be sure power cord is not plugged into 110 V ac outlet and disconnect cord from fan closure plate receptacle.
 - () Remove fuse holder cap and fuse.

CAUTION

NEVER REMOVE OR INSTALL FUSE WITH POWER ON.

- () Hook top cover over back edge of keyboard cover and lower it down into place over the rear of the main chassis. Install the two thumb screws (one at the lower left corner and the other to the right of the fan closure plate coaxial connector) to attach cover to rear of main chassis.
- () <u>Step 44</u>. Re-install fuse and plug power cord into receptacle. BE SURE POWER CORD IS NOT PLUGGED INTO 110 V ac OUTLET.

See CAUTION on Page VI-20.

(Step 44 continued.)

CAUTION

NEVER REMOVE OR INSTALL FUSE WITH POWER ON.

- () <u>Step 45</u>. Remove backing from connector identification label and affix it to rear of top cover. Position label just above Sol-PC connector opening in cover so that "J9" is aligned with left most (as viewed from rear of Sol) subminiature phone jack and "J1" is aligned with right most 25-pin female connector.
- () <u>Step 46</u>. Remove backing from serial number label and affix it to rear of top cover. Position label to right (as viewed from rear of Sol) of fan opening in cover.
- () <u>Step 47</u>. Affix self-stick protective pads to bottom of Sol as shown in Figure 6-8.

You have now completed assembly of your Sol Terminal Computer TM. It is ready for use as a stand-alone computer or CRT terminal. Congratulations on a job well done.

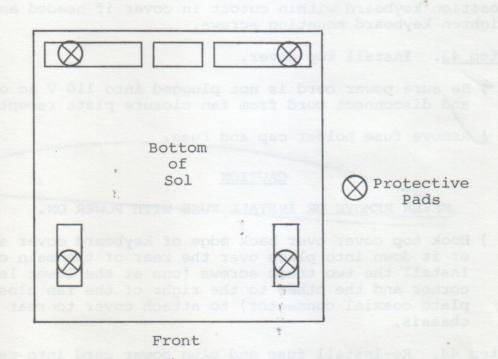


Figure 6-8. Protective foot pad installation.

SECTION IX

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SOFTWARE SOFTWARE

Deluging a 8% assembly language version of chapter on its spinited contract

Sol TERMINAL COMPUTER TM

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SECTION IX

9.1 CONSOL

SOL SOFTWARE

CONSOL is a 1024 byte program designed to allow the Sol TER-MINAL/COMPUTER to operate as a standard CRT terminal and to provide access to the essential computer capabilities of the Sol. Using CONSOL, self test and small diagnostic programs can be entered to system memory and executed. This in addition to providing verification of correct system operation helps in finding errors in case of a malfunction.

In addition, CONSOL contains standardized entry points for all normal I/O operations. These routines are common with all Sol System Software allowing each personality module in the Sol line to interface with external programs in an almost identical manner.

A cassette read routine is also resident in the CONSOL module allowing Sol Software to be loaded and run in a system with additional memory. Sol System Software as of November 1976 includes BASIC, FOCAL, a Scientific Calculator and numerous "game" packages including a 8K assembly language version of STARTREK called TREK8Ø.

When power is applied to the Sol unit, CONSOL initializes the system RAM area, clears the screen, and enters the terminal mode.

In this mode the Sol System acts as a standard CRT terminal sending keyboard data to an output port and displaying received data on the screen. The COMMAND KEYS of the keyboard are not transmitted to the output port but are interpreted as direct internal operation keys. CURSOR MOVEMENT, HOME and CLEAR SCREEN all operate in this manner, while MODE SELECT causes an immediate change in the operation of the unit.

When the MODE key is depressed CONSOL issues a prompt character (>) and waits for a command line to be input. The Sol is now operating as a computer and is ready to accept one of the following commands:

DUmp Dump memory locations to screen

Enter data to memory

Execute a program in external memory

BAsic Execute a program located at address zero

TErminal Return to terminal mode

TLoad Load program or data from cassette tape

MODE Press MODE SELECT key to start new command line

SOL SOFTWARE SECTION IX

9.1.1 DUmp (addr) (addr)

The DUmp command displays memory data on the screen in a Hexidecimal representation. As with all Sol commands the command is recognized by the first two characters and up to ten additional characters can be input without an error being forced.

Thus, DU; DUST; DUMP; DUMPTHESE would all be recognized as being a DUmp command.

At least one address must follow the command or a error displaned on the screen. If two addresses are input then all values from the first address to the last will be displayed.

DUMP Ø EF

Up to ten blanks may be inserted between each parameter without forcing an error condition. Errors are indicated by a question mark (?) replacing the character where the error occurred. For example if the DU command were given without an address the question mark would appear ten spaces to the right of the "U".

9.1.2 ENter addr

The ENter command places sequential bytes into memory beginning at the specified address. Data, represented as hexidecimal values, are input from the keyboard for entry to memory. All CONSOL commands except MODE SELECT are executed when the RETURN key is pressed. After the ENTER, (address), RETURN sequence the Sol Displays a colon (:) prompt character. Values are then input one line at a time with each line terminated by a carriage return or linefeed. The ENter function itself is terminated with a slash (/) and the Sol goes back to the command mode when the slash is encountered.

With all command functions of CONSOL, input lines are terminated with a carriage return or line feed. If the terminator is a C/R, CONSOL will erase all characters from the current cursor location to the end of the screen line. In this case, all valid input should be to the left of the cursor. If an error occurred during input the cursor may be moved to the left using the "cursor-left" key and the erroneous characters changed. A linefeed would then be used as a terminator since LF does not erase the line prior to processing the characters. This is particularly useful when using the ENter command since the input line can be visually scanned and errors corrected prior to the actual entry of input data to memory.

9.1.3 TLoad (speed)

Included within CONSOL are routines to read standardized cassette tape Software which is recorded with a sixteen byte header that includes NAME, LOAD INFORMATION, FILE TYPE and execute address. CONSOL, because of space limitations, is unable to search for a

SECTION IX

Sol SOFTWARE

program or file by name. After receiving the TLoad command, CONSOL turns on the cassette player and waits for the next header, then uses the header information and loads the file to memory. The cassette recorder must be in play mode and properly connected before executing the TLoad command.

After loading the data, CONSOL returns to the command mode where the EXEC command can be used to execute the just loaded program. Also, a return can normally be made to the command mode by pressing the MODE SELECT key. Space limitations again limited escape during the header search, so if the system locks up in this routine the standard Sol restart must be used. To restart the Sol press UPPER CASE and REPEAT keys simultaneously.

The CUTS cassette interface electronics within the Sol will record or receive data at either of two standard speeds. TLoad will accept a parameter to select this speed, Ø being high speed and 1 being low. (1200 and 300 bits per second respectively). If no parameter is given CONSOL will default to high speed operation as all standard Processor Technology Sol-System Software is recorded at this speed.

9.1.4 EXecute addr

The execute command is used to run programs located in external memory. CONSOL branches to the external routine in a manner similar to an 8080 CALL instruction so the program can return to the command mode using a standard 8080 RET instruction if normal stack operations are used.

9.1.5 BAsic

The BAsic command is provided for executing programs whose starting address is Ø, such as Sol-BASIC5.

9.2 STANDARD I/O ROUTINES

All Sol System personality modules contain similar I/O code for input/output operations. CONSOL, using lK of memory, has routines for KEYBOARD and SERIAL PORT input as well as Serial Communications Channel and VIDEO DISPLAY OUTPUT. Although the same code for SOLOS and SOLED contains expanded functions, the I/O operations appear almost identical when used with external software.

Sol-BASIC5, for example, performs all I/O using the jump table of the personality modules. Thus, without altering BASIC the user may output to either the serial port or to the display screen. Provision is also made within BASIC to programatically change to any of the four available Input or Output options. CONSOL is of course limited to the two provided.

**

ALS-8 FROGRAM DEVELOPMENT SYSTEM

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF.

*** ***

9000

COOO C000

CUBBB

COOD C000 C000 C000 C000 C000 C000

COOD COOD

9000 0000

CUBB COOD 6000 8000

SYSTEM SOLFTWARE

<<>> CONSOL <<>>>

C000

C000 C000 C000 C000 C000

RELEASE: 10.11.76 VERSION: 1.0:5

9101

COOD CUBB

COOR C000 COOD

IT PROVIDES ALL NECESSARY DISPLAY ROUTINES ALONG WITH STANDARDIZED CALLING POINTS FOR INPUT/OUTPUT OPERATIONS. THIS PROGRAM IS THE MINIMUM SOL OPERATING SYSTEM.

COMMANDS ARE ALSO AVAILABLE TO ENTER DATA TO MEMORY AND TO DISPLAY MEMORY DATA ON THE SCREEN. AN EXECUTE COMMAND IS PROVIDED TO ALLOW PROGRAM EXCUTION OUTSIDE OF THE CONSOL PROM AND PROVISION IS MADE FOR CASSETTE TAPE LOAD OF PROGRAMS OR DATA. 3025 0026 0027 0028 0029 0030

NOTE: CONSOL, SOLOS AND SOLED ARE REGISTERED TRADEMARKS 0031 0033 0034

PROCESSOR TECHNOLOGY CORP. EMERYVILLE, CALIF

0036

COOO C000 COOO

C000 COOD C000 COOD COOD

THE FOLLOWING CODE IS THE PROPERTY OF PROCESSOR TECHNOLOGY CORP. IT IS DISTRIBUTED ON A 'PERSONAL USE BASIS FOR THE BENIFIT OF SOL SYSTEM OWNERS. ALL FORMS OF THE CODE ARE COPYRIGHT 1976 BY PROCESSOR TECHNOLOGY AND ALL RIGHTS THERIN ARE RESERVED. 0038 0037 6600

AUTO-STARTUP CODE 0045 * 0047

STRTA

FOUR PHASE WONDER

JMP BGIN

> C2 65 00

COOD COOL

C004

C004

0050 0049

PAGE

PAGE

*

*

-== CONSOL ==-COPYRIGHT 1976

SOL SYSTEM I/O ROUTINES =---

THE FOLLOWING CODE IS STANDARDIZED FOR ALL SOL SYSTEM SOLFTWARE IT PROVIDES COMMON ENTRY POINTS FOR INPUT AND OUTPUT OPERATIONS. CONSOL DOES NOT HAVE PROVISION FOR PARALLEL I/O OPERATIONS BECAUSE OF SPACE LIMITATIONS.

00052 00053 00055 00056 00057

CU04

C004 CO04 COU4 COO4 C004 C004 C004 C004 C004 C004 C004 CO04 CO04 C004 CU04 C004 CU04 CO04 CO04 CO04

6500 0900

1900 0062

JUMP TABLE INPUT/OUTPUT ROUTINES

THE OUTPUT DEVICE POINTED TO BY THE CURRENT OUTPUT SELECT THIS ROUTINE OUTPUTS THE CHARACTER IN REGISTER 'B' TO 0064 0063

THE DEVICES ARE DEFINED AS FOLLOWS: REGISTER. 9999 1900

PARALLEL OUTPUT PORT (NOT AVAILABLE ON CONSOL) ERROR HANDLER - VDM SCREEN - SERIAL OUTPUT PORT VDM SCREEN 8900 0071 0072 6900 0000

C004

SOUT SELECTS CURRENT OUTPUT DEVICE AOUT SELECTS DEVICE IN REGISTER 'A ENTRY AT: 0073 9074

GET PORT NUMBER FROM MEMORY LOCATION WE'LL RESTORE IT LATER KEEP IT IN CONTROL OPORT LDA SOUT AOUT 0075

08

COU4

CUB4

3A 03 E6 03 E5

COOD

H,OTAB DISPT PUSH RLC MOV 00076 00077 00079 00080 00081

C1

84

21 85

C009 COOA COOE CUID

COOD

COOF

CO

71

COMPUTE ADDRESS POINT TO TABLE

WE HAVE IT GO TO HL....

THIS ROUTINE INPUTS A CHARACTER TO REGISTER 'A' FROM 66685 66886 66886 68888 68888

C013

THE CURRENT INPUT DEVICE POINTED TO BY THE CURRENT INPUT ENTRY POINTS ARE DEFINED: SELECT REGISTER. 0600 1600

PUSH LDA ANI LXI AINP 6600 0010 0102 0103 0101

82

34

C013

63

Cl 8C

E5 21 07

C018 C 119 CUIC

C016

COID 85

RLC

POINT TO TABLE SAVE H&L THE MATH H, ITAB

DONE

GET PORT NUMBER FROM MEMORY LOCATION

WE MUST BE REASONABLE

PARALLEL INPUT (NOT AVAILABLE ON CONSOL)

ERROR HANDLER SERIAL INPUT

IPORT

KEYBOARD INPUT

*

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CO

71

COIF C3

C022 C022 C022 CØ 22 C022 C022 FA

C022 C024

C026 C027 C027

C027

C027 C027 C027

E6 C9

WE HAVE THE ADDRESS...GO TO HEAVEN RESTORE HL FROM JUMP TABLE ENTRY ENTRY AT KREAD, GETS THE DATA FROM THE RETURN THE CHARACTER IS IN REGISTER 'A' GET SERIAL STATUS WORD TEST FOR SERIAL DATA READY ROUTINE TESTS THE KEYBOARD STATUS AND RETURNS JUMP TABLE ENTRY POINT NORMAL ENTRY POINT TEST KEYBOARD BIT FLAGS ARE SET PROCESSOR TECHNOLOGY CORP. 94608 GET STATUS WORD GO BACK WITH IT WAIT FOR INPUT WAIT FOR INPUT GET DATA BYTE FLAGS ARE SET CHECK STATUS EMERYVILLE, CALIF. WE HAVE IT 6200 HOLLIS STREET GET DATA KEYBOARD INPUT STATUS CHECK SERIAL INPUT STATUS CHECK KEYBOARD DATA INPUT THE TEST BITS SET. DISPT STAPT KSTAT SDATA KREAD KDATA SERST SREAD SSTAT SERIAL DATA OUTPUT SDR KDR SERIAL DATA INPUT THIS ROUTINE, NO POP POP RET JMP IN JNZ
IN
RET JZ IN RET KEYBOARD. IN RET WITH THIS 3132 SSTAT 0113 KSTAT 3123 KREA1 KREAD 3140 SREAD SREAL 0120 8010 0124 0121 0122 01130 9136 0110 0131 3135 9138 9107 0111 0114 0125 0126 0129 0133 1127

000

22

C028 C02B C030

CECCE

CUZE

CUSI C031

C031

F8

C031

CØ36

C036

C 136

C036

E6 C9

LOOP UNTIL TRANSMITTER BUFFER IS EMPTY GET THE CHARACTER BACK

SEND IT OUT
AND WE'RE DONE

SDATA

JUMP TABLE ENTRY POINT

GET PORT STATUS PUT HIGH BIT IN CARRY

SERST

0148 SEROT 0149 SDROT

E1 DB F8 17

C040

000

CAP

C03A C03D

C040

SDROT

POP IN IN JNC MOV OUT

0150 0151 0152 0153

D2 41 CØ 78 D3 F9 C9

C048 C64A

C04B

9155

A,B

SYSTE	
DEVELOPMENT	
PROGRAM	
ALS-8	
N.	

**

W

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET 94608 EMERYVILLE, CALIF.

VIDEO DISPLAY DRIVER ROUTINES

0159 0160 1910

C04B C04B

C04B CØ4B C04B C04B C04B C04B C04B C04B CØ4B C04B CØ4B

C04B

C04B

CU4B

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SAVE IN B... STRIP PARITY BEFORE SCREEN! OPERATIONS. ON ENTRY, THE CHARACTER FOR OUTPUT IS IN REGISTER B AND ALL REGISTERS ARE UNALTERED ON RETURN. THE 'CONSOL' VERSION OF THIS ROUTINE IS A MINIMUM IMPLEMENTATION OF ROUTINES ORIGINATED BY: SOLOS AND SOLED CONTAIN THE ESC SEQUENCES AND OTHER FULL IMPLEMENTATION FEATURES. FOUND ONE...SAVE ADDRESS REMOVE CURSOR ENTRY FROM DEVICE SELECT THESE ROUTINES ALLOW FOR STANDARD VIDEO TERMINAL RESTORE ALL REGISTERS GET SCREEN ADDRESS GET CHR FROM TABLE CURSOR IS BACK ON ZERO IS THE LAST TEST THE CHR EXIT FROM VDMOT SAVE EVERYBODY POINT FORWARD GO PROCESS COLLEGE STATION, TEXAS IAN KETTLEBOROUGH H, TBL TSRCH VDADD CREM CHAR NEXT A,B M, A PSW A, M PSW A, M 80H B SOLOS AND PUSH PUSH PUSH PUSH LXI PUSH CALL CALL MOV MOV ORI MOV POP POP POP POP RET MOV ORA JZ CMP INX 0183 0184 * 0185 GOBACK 0186 0178 VDMO1 VDMOT 0195 * 0196 TSRCH 0189 GOBK 0163 0165 0168 0162 9910 0110 6910 0173 0175 7710 0180 0167 9172 0181 0187 0610 0192 0194 0198 0202 1610 0200 0201 0204 0193 0197 CO 3D C1 CO CN C1

65

E5 C5 78 78 C5 C5

CU4E C050 C056 CØ56 C05A CØSC CUSD CØ5E COSF

C04F C053

C04D

C04C

C04B

62

21

80 CD 7E F6

C059

FI CO CO CO CO

C060 C061

C062 C062 C062 C064 THIS ROUTINE DISPATCHES TO THE ADDRESS POINTED TO THE RETURN ADDRESS IS THE BY THE HL REGISTER PAIR. LAST ENTRY ON THE STACK.

0206 0207 0209

0205

16

23 C22 E5

CNEC

CØ68 C069 C06D

CD E1

C070 C071 CU71 C071 C071

78

7E

C863 C867

CA BB

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608	0211 DISPT MOV A,M GET LOW BYTE 0212 INX H	VOM	GO TO IT	*	NEXT	JMP	Ø221 *	0223 CHAR MOV A,B GET CHARACTER	ORA A	CDI TEURN I	RZ . GO	SECON ON 18 18 180 MORE	0229 *	OCHAR	MOV A,B	ANI 7FH NO HIGH		CPI 63 END	30	0238 LDA LINE END OF SCREEN?	JNZ OK	0241 *	*	A	ST'S	SKOL	XRA A	CALL	9251 INR A	ANI	JMP	02554 * TNOREMENT LINE COUNTER IF NECESSARV	*	0257 OK LDA NCHAR GET CHR POSITION 0258 INR A		RC	0262 XRA A WE'RE PAST THE END REWIND THE COUN	
	W W	00		9	3	3 3	0	201	03	21 0	0	0	00 00		03 0	20 0	9 0	0	00 0	9 0	0	00 0	9 09	0	29 0	00	0	00 0	20 02	1	0	Ø 2	9 69	000	000	00	00	
-== CONSOL ==- COPYRIGHT 1976	C071 7E					C078 C3 62 C0	CØ7B	CØ7B 78		COVD C8	0.28	CØ81	CØ81		78	C087 77	C088 3A 00 C8	FE 3F		FE OF	C2	8 6 8 8	8690				AF	CD E9	C0A7 3C			CWAD		CORD 3A 00 C8		08	C088 32 00 C8	

ALS-8 PROGRAM DEVELOPMENT SYSTEM **	PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608	LINE GET THE LINE COUNT	MOD 15 INC	LINE STORE THE NEW		BEN	H, VDMEM POINT TO SCREEN	IS I	HALLO THE COUNTY	H GET H	H THE TOP	482	ERASI PUT IN A BLANK		A SHO OF SCHOOL	* ZERO LINE	NCHAR LEFT SIDE OF SCREEN	DSTAT RESET SCROLL PARAMETERS	BEGINNING OF			GET CURRENT SCF	HAR CURR		M. ALL SPACED OUT	· · · · · · · · · · · · · · · · · · ·	20 0112	CLINI LOUP TO END OF LINE	OR		NCHAR	CUR		DOWN ONE LINE	LINE	15	. HOW FAR IS DOWN?	A	CUR	MOVE THE CURSOR UP ONE LINE	Eac	LINE GET LINE COUNT
*		LDA	ANI	STA		ERASE SCREEN	LXI	MVI	TNY	MOV	CPI	JNC	TWL		XRA	STA	STA	TUO	STA	RET		CALL	LDA	CPI	MVI	INX	INR	JEC O	HOME CURSOR	*0>	STA	JMP		E CURSOR	LDA	CPI	RZ	INR	JMP	ROUTINE TO M	103	חחח
				CUR	*	* *	PERSE		FRAGI	TOWN				*	ERAS2		*	ERAS3			*	CLINE		CLINI				*	#	awond.	FROME		*	* MOVE	PDOWN				*	* ROU	* DIID	FOF
		0264	0266	9267	0269	0270	0272	0273	9274	0276	0277	0278	0280	0281	0282	0283	4878	0286	0287	0288	0290	0291	0292	0293	0295	0296	0297	0299	0300	1030	0303	0304	0305	0306	0308	6388	0310	TTCO	0313	0314	0315	2100
																- 1																										
	1976	83	0	200			CC					CE	CO			800	ca		60			C1	80				00	9			82	CO			C8			00	2		8	,
		01	OF				99						CA			10			02			21		40	20		00	E				CI				ØF		5			-	
	CONSOL	3A 3C		32			21			70			C3			32			32			CD		FE			30)			32							250			3.8	
	-== CONSOI COPYRIGHT	CUBB	COBF	CUCL	COCS	COCS	COCS	COCE	COCA	COCB	COCC	COCE	COD3	CODE	COD6	CODY	Cabb	CODD	CODE	COEZ	COES	COE3	CWE	COES	COEC	COEE	COEF	COF3	COF3	COF	COF	CUET	COFA	COFA	COFA	CUFL	COFF	רפוט	C104	C104	CIES	240

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608

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EMENIVILLE, CALIF. 34000	A STATE OF THE PROPERTY OF THE		A	CUR	OR LEFT ONE POSITION			A	DON T GO MORE BACK THAN BACK			and minora	KIGHT ONE POSITION	NCHAR		. HOW RIGHT CAN WE BE?	PCUR		TO CALCULATE SCREEN ADDRESS	: RETURNS:		CURRENT SCREEN ADDRESS	AD LINE 'A', CHARACTER POSITION 'C'		AR GET	LINE DOSTATION		GET T			IA I. HAS IT	MOD TH		A, <vdmem low="" offset<="" screen="" th=""><th></th><th>NOW H IS I</th><th>A'L TWIST L'S ARM</th><th></th><th>L. C</th><th>H & L ARE NOW PERVERTED</th><th>ROUTINE TO REMOVE CURSOR</th><th></th><th>VDADD GET CURRENT SCREEN ADDRESS</th></vdmem>		NOW H IS I	A'L TWIST L'S ARM		L. C	H & L ARE NOW PERVERTED	ROUTINE TO REMOVE CURSOR		VDADD GET CURRENT SCREEN ADDRESS
	ORA	RZ	DCR	JMP	MOVE CURSOR			OKA D2	DCB	STA	RET		CURSOR	LDA	CPI	K2 TND	JMP		ROUTINE TO	ENTRY AT:		VDADD	VDAD		A CA	LDA	MOV	LDA	ADD	RRC	MOV	ANI	MOV	IVM	ADD	MOV	MOV	AND	MOV	RET	ROUTINE		CALL
•					WO *	*	PLEFT			PCUR		K 4	t 4t	PRIT				*	* *	*	* 1		*	*	VDADD	VDAD2	VDAD														* *		CREM
	0317	0318	0319	0320	0322	0323	0324	9220	9320	0328	0329	0330	0332	0333	0334	9336	6337	0338	0339	0341	0342	0343	0345	0346	9348	0349	0320	0351	0352	0353	0355	0356	0357	0358	0359	0360	1050	9363	0364	0365	0366	0368	0369
																. 1																											
				CO			C8			C8				C8			C1								°	C8		C8								*							C1
	87	C8	30	3 C1			3A 00	200	30	32 00	6			3A 00	FE 3F	0 (1	3 13		1					N 000	2	3A 01		A 02	5	2 6	(E)	6 03		E CC	75	- (200		e Ge	6			0 21
					0							- 1					E C3	7		17.					4 4F					S S S					5 82					60 0	99		Q Q
	C107	C108	C109	CIGA	CIOD	CIOD	CIBD	CILL	C112	C113	C116	7117	C117	C117	CILA	CIID	CILE	C121	C121	C121		1212	C121	C121	C124	C125	C128	C129	C12C	CIZE	C12F	C130	C132	C133	CIS	CT30	C13	C13	C13B	C13C	C13D C13D	C13D	C13

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608	MOV A,M STRIP OFF THE CURSOR MOV M,A RET	ROUTINE TO BACKSPACE	PBACK CALL PLEFT CALL VDADD GET SCREEN ADDRESS MVI M, PUT A BLANK THERE		ROUTINE TO PROCESS A CARRIAGE RETURN	L CLINE CLEAR F	XRA A REWIND IT JMP PCUR AND STORE THE NEW VALUE		ROUTINE TO PROCESS LINEFEED	LINE	CPI 15 ARE WE AT THE BOTTOM?				JMP SROL		BLE DEFINES THE CHARACTERS FOR SI	PROCESSING. IF THE CHARACTER IS NOT IN THE TABLE IT GOES TO THE SCREEN.		TBL DB CLEAR SCREEN			DW PDOWN		DW PLEFT	PRIT		DB CR CARRIAGE RETURN	DW PCR TIME BEEN	PLF	DB BACKS PACE DW PBACK
	0370 0371 0371 0373	0375		38.0	0382		0386	0387 *	389		0391	393	394	0395 *	398	399	0401	0402 *	0404 *		0407	0408	410	411	412	414	415	0417	0418	420	421
	00000	000	0000	9 6	000	0	00	000	2 0	0	000	0 00	0	00	00	000	00	00	0	000	00	000	0 0	0	00 0	000	9 6	00	000	00	00
1976			CL			Co	C1			C8	17	1	CO		CØ																
	7.		20 21 20 20			E3	13			0	6 F)	CI		90					00		Cl	CO		7	C1	00		C1	C1	C1
CON	7E E 6 77 C 9 C 9 C 9		3600	U			A U				FE			AF	O	15															5F
-== CONSO	C146 C1443 C1443 C1445	C145	C148 C148 C148	C14E	C14E	C14E	C151	C155	C155	C155	C158	C15L	CISE	C161	C165	C165	C165	C165	C165	C165	C168	C169	C16C	C16E	C16F	C172	C174	C177	C178	C178	C17E

CORP.		94608
TECHNOLOGY	STREET	CALIF.
PROCESSOR TI	6200 HOLLIS	EMERYVILLE,

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608		6425 DB 6 END OF TABLE	0427 * OUTPUT DEVICE TABLE	OTAB DW VDMOI	DW SEROT	DW ERROT ERROR HANDLER	0433 * INPUT DEVICE TABLE		ITAB DW KREAI	0438 DW ERROT ERROR HANDLER (FOR CONSOL)	DW ERROT ERROR HANDLER	0440 * 0441 *	0442 * COMMAND TABLE	163	0444 * THIS TABLE DESCRIBES THE VALID COMMANDS FOR CONSOL 0445 *	0446 COMTAB ASC TE'	MO	0448 ASC DU	ASC	0451 DW ENTER	MO	ASC	DW TLOAD CDECTAT COMMAND TO EVECTIME	4 0	458 DB Ø END OF TABLE MARK	04559 *	0461 * CONSOL PORT ERROR HANDLER		0463 EKKUT AKA A A DERAHIT TO SCDEEN	STA OPORT DEFAULT	0466 *	0468 *	* *	0471 * = COMMAND MODE=	0472 * THIS ROUTINE GETS AND PROCESSES COMMANDS	475 COMND LXI SP,SYSTP SET STACK POINTER	
	90	996	900	90	9 6	0	200	80	40	9 9	04	400	. 04	90	400	99	94	20 2	9	40	40	90	20 2	90	94	4. 4.	04	40	400	40	40	40	40	20	9 9 9	9 0	
-== CONSOL ==- COPYRIGHT 1976	C180 80	00	C184 C184	C184 4C C0	AD		CISC	-	C18C 27 C0		AD	C194	C194	C194	C194	54 4	70	C198 44 55			35				CIAC 00	CIAD	CIAD		94	32	C184	C184	C1B4	C184	C184	C184 31 00 CC	

ALS-8 PROGRAM DEVELOPMENT SYSTEM

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608	CALL PROMPT PUT PROMPT ON SCREEN CALL GCLIN GET COMMAND LINE CALL COPRC PROCESS THE LINE JMP COMND OVER AND OVER		THIS ROUTINE READS A COMMAND LINE FROM THE SYSTEM KEYBOARD AND PROCESSES IT TO THE SCREEN.		E RESTARTS THE COMMAND LINE.	CALL KREAD READ KEYBOARD		JAP GCLIN	PROCESS CONTROL KEYS	I CCR	CPI LF	RZ . IF SO GO PROCESS JMP GCLIN NO CONTROL CHARS TO SCREEN		RET . CLINE CLEAR REMAINING LINE RET .		FIND AND PROCESS COMMAND	CALL CREM REMOVE THE CURSOR MAIL C.1 SET BOD CHADACHED DOCTOR	L VDAD2	CALL SCHR SCAN PAST BLANKS	. SE	LXI D, COMTAB POINT TO COMMAND TABLE	THIS ROUTINE SEARCHES THROUGH A TABLE, POINTED TO BY DE', FOR A DOUBLE CHARACTER MATCH OF THE 'HL' MEMORY CONTENT. IF NO MATCH IS FOUND THE SCAN ENDS BY PLACING A OUESTION MARK WITHIN THE SEARCH STRING.	D	ORA A TEST FOR TABLE END
		.4.4	* THIS * KEYBO!	* C/R	* MODE	GCLIN	ENC	TWO .	* PRO	PROCS			* * *	CRFRC	K 4	* *	COPRC				*	* THIS * BY DI * MEMOR	F DCOM	
	0476 0478 0479	0481	20000 4444 20000 20000	04486	0489	0491	0493	0496	0498	0500	0502	0503	0200	0508	0510	0511	0513	0515	0517	0519	0520	0522 0523 0524 0525	0526	0528
								1																
-== CONSOL ==- COPYKIGHT 1976	C187 CD 12 C2 C18A CD C3 C1 C18D CD E1 C1 C1CØ C3 84 C1	Clea	C1C3 C1C3	C1C3 C1C3	C1C3		CIC8 47 CIC9 DA D2 C1	C3 C3	C1D2 C1D2	FE	FE DA	SO	C	62	CIEI	CIEI		CD		EB		CIF4 CIF4 CIF4 CIF4		0

CORP.		94608
CHNOLOGY	STREET	
PROCESSOR TECHNOLOGY	6200 HOLLIS STREET	EMERYVILLE,
PR	62	EM

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ERR2 NOT FOUNDCOMMAND ERROR H SAVE START OF SCAN ADDRESS M TEST FIRST CHR	H D NOW SECOND CHARACTER NCOM GOODNESS	B CLEAR THE STACK DE HAS SCAN ADDRESS H HL HAS COMMAND ADDRESS DISPT DISPATCH TO IT	D GO TO NEXT ENTRY D GET BACK ORIGINAL ADDRESS FDCOM CONTINUE SEARCH	F FOLLOWED BY A PROMPT L OPERATIONS ARE ON THE SCREEN)	CRLF B,'>' THE PROMPT VDMOT PUT IT ON THE SCREEN	B, LF LINE FEED VDMOT B, CR CARRIAGE RETURN VDMOT PUT IT OUT AND RETURN	C,12 MAXIMUM COMMAND STRING	SCHR GOT A BLANK NOW SCAN PAST IT D NO MORE THAN TWELVE	Δ,	C,10 SCAN TO FIRST NON BLANK CHR WITHIN
JZ PUSH H CMP M INX D JNZ	INX H LDAX D CMP M JNZ N	POP B XCHG . INX H JMP D	INX INX JAP JAP	OUTPUT A CR	PT CALL MVI JMP	MVI CALL MVI JMP	MVI LDAX	CPI JZ INX DCR	JNZ RET RET CAN PAST UP TO NON BLANK CHAR	MVI
0529 0530 0531 0532 0533	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	0546 NCOM 0547 0548 05549 0555	66552 66552 66552 66553		CRL	SBL SBL		6574 65775 65775 65776 8578 8 * * * 8	0581 SCHR
CA 8F C3 E5 BE 113 C2 ØB C2	23 1A BE C2 0B C2	C1 EB 23 C3 71 C0	13 13 13 E1 C3 F4 C1			06 0A CD 4B C0 06 0D C3 4B C0	0E 0C	328	C2 26 C2 C9 26 C2	UE UA
	C155 C266 C262 C262 C262 C263		C200 1 C200 1 C200 1 C200 C			C221 C C224 C C2				C232 Ø

DEVELOPMENT SYSTEM	CORP.		.94608
PME	VDO	L	
DEVELO	PROCESSOR TECHNOLOGY CORP.	STREET	CALIF.
AM	R TE	CIS	LE,
ALS-8 PROGRAM	ESSO	HOLLIS	EMERYVILLE,
8	ROC	6200	MER
ALS-	Q.	9	9
*			

-== CONSOL ==-COPYRIGET 1976

SCHRI LDAX D GET NEXT CHARACTER CPI SPACE WE'RE PAST THEM RNZ . WE'RE PAST THEM INX D NEXT SCAN ADDRESS DCR C COMMAND ERROR * THIS ROUTINE SCANS OVER CHARACTERS, PAST BLANKS AND * CONVERTS THE FOLLOWING ADDRESS TO HEX. ERRORS RETURN TO * THE ERROR HANDLER.	SCONV CALL SBLK * THIS ROUTINE CONVERTS ASCII DIGITS INTO BINARY FOLLOWING * A STANDARD HEX CONVERSION. THE SCAN STOPS WHEN AN ASCII * SPACE IS ENCOUNTERED. PARAMETER ERRORS REPLACE THE ERROR * CHARACTER ON THE SCREEN WITH A QUESTION MARK.		DAD H CALL HCOVI DO THE CONVER JNC ERRI NOT VALID HEX ADD L MOV L,A MOVE IT IN INX D JMP SHEI	HCOVI SUI 48 REMOVE ASCII BIAS CPI 10 IF LESS THAN 9 SUI 7 IT'S A LETTER?? CPI 10H WITH TEST IN HAND * SYSTEM START UP, CLEAR PART OF RAM AND SET STACK * POINTER, FALLING THROUGH TO TERMINAL MODE.	STRTA XRA A STRTA XRA A MOV C,A LXI H,SYSRAM POINT TO SYSTEM RAM CLERA MOV M,A
		2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			0628 0638 0631 0631 0633 0633 0633
1A CF 20 CF 20 13 DD C8 C3 34 C2	CD 24 C2 CA 8E C3	21 00 00 1A FE 20 C8 29	29 CD 58 C2 D2 8E C3 85 6F C3 47 C2	P6 36 PE 0A D6 67 C9 10	AF 21 00 C8 77 23
CC2338 CC2338 CC2338 CC2338 CC2338 CC2338 CC2338	00000000000000000000000000000000000000	00000000000000000000000000000000000000	C C C C C C C C C C C C C C C C C C C	C C C C C C C C C C C C C C C C C C C	C265 C266 C267 C267 C267 C268 C268

EMERYVILLE, CALIF. 94608

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THIS ROUTINE DUMPS CHARACTERS FROM MEMORY TO THE CURRENT OUTPUT DEVICE. (WITH CONSOL ALL OUTPUT GOES TO THE VALUES FROM ADDRI TO ADDR2 ARE THEN OUTPUT TO THE OUTPUT DEVICE. IF ONLY ADDRI IS SPECIFIED THEN THE VALUE AT THAT ADDRESS IS OUTPUT. OUTPUT IT TO THE SERIAL PORT THIS ROUTINE GETS CHARACTERS FROM THE SYSTEM KEYBOARD PORT BUT ARE INTERPRETED AS DIRECT SOL COMMANDS.
THE MODE COMMAND, RECEIVED BY THE KEYBOARD, PUTS THE TERMINAL. COMMAND KEYS ARE NOT OUTPUT TO THE OUTPUT HEX. AND OUTPUTS THEM TO THE SERIAL OUTPUT PORT. IT IS INTENDED TO CONFIGURE THE SOL AS A STANDARD VIDEO NO HIGH BITS FROM HERE IT'S OUTPUT FROM 'B' THE SCREEN). ALL VALUES ARE DESPLAYED AS ASCII CLEAR FIRST 256 BYTES IS THERE ONE WAITING? LOOP OVER AND OVER SLOW DOWN THE TAPES SET STACK POINTER GET SERIAL STATUS GET THE CHARACTER CLEAR THE SCREEN COMMAND KEY? LOOP IF NOT PROCESS IT GET DATA THE COMMAND FORM IS AS FOLLOWS: TERM COMMAND SOL IN THE COMMAND MODE. DUmp addrl addr2 SP, SYSTP DUMP COMMAND CLERA PERSE SSTAT SDATA VDMOT KSTAT KDATA SDROT VDMOT TOFF TOOL B, A. B, A 80H KIN LIN MIL FH LXI CALL CALL CALL CALL CALL CALL ANI MOV JMP INE JNZ IN ZD TERM TOOL TIN 9655 KIN 0637 9644 0650 3664 6639 0642 0643 0645 0647 9651 3654 8678 9636 0640 9646 6190 9890 9648 9649 8653 959 3658 629 8990 1665 9996 6996 3675 9676 1198 9682 9898 8652 9657 099 199 662 899 0196 3672 1890 889 888 0641 1667 3674 3684 8673 1671 C2 00 COCC CO C2 2000 2000 6A ED FC 80 4B 4B 0C2 C3 DB E6 CD DB 47 E6 CD CA 63 CD CA C26D C26C C28A C28D C29E C279 C27C C29A C29B C270 C270 C270 C270 C270 C273 C276 C27F C282 C284 C287 C28D C290 C293 C296 C298 C270 C270 C270 C270 C270 C270 C270 C270 C270 C279 C270 C2A1 C281 C2A1 C2A1

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. '94608	SCONV SCAN TO FIRST ADDRESS AND CONVERT IT	SAVE THE VALUE	120	POVER NO SECOND VALUE	HEX	THIS	NPASS MIND BENDERS	D, H NO SECOND PARAMETER COPY FIRST TO DE		HE HAS STAKE, DE HAS END	CRLF	MODE YEY' WILL ESCAPE THE DUMP	COMND OUTPUT ADDRESS	ANOTHER SPA	,16 VALUES PER LINE	AA,M GET THE CHR	B SAVE VALUE COUNT	COMPARE ADDRESSES	OMND ALL DON	VALUES PER LINE	BUMP THE LINE COUNT	DLPI NOT ZERO IF MORE FOR THIS LINE	TO A LICA DELONE THE	HEX 16 BIT VALUE	A, H H FIRST	TO THE PERSON OF	A,L THEN L FOLLOWED BY A SPACE	HEOUT	VDMOT CONSOL PUTS IT ON THE SCREEN	C,A GET THE CHARACTER	MOVE THE HIGH FOUR DOWN	STATE OF STREET	A,C THIS TIME THE LOW FOUR	ØFH FOUR ON THE PLOOR
	CALL SC	PUSH H			CALL SE		JMP GMC.			YCEG.	CALL CH	I	CALL		MVI C,		PUSH B			POP B		JNZ DI	,	CUTPUT HL AS HE		CALL HE		CALL HEC		MOV C,	RRC .		MOV A,	ANI 0E
	8688 * 8689 DUMP	0690	0692	3693	8695	9690	* 8698	8699 POVER		0702 *	9703 DLOOP	0705	3707	9708	3710 *	711 DLP1	0/12	1714	9715	0717	9718	9719	6721 *	. 40	1724 ADOUT	0725	3727 *	3728 HBOUT		0732 HEOUT	0734	9736	6738	1740 HEOUI
-== CONSOL ==- COPYRIGHT 1976	2A1 2A1 CD 3E C2	2A4 E5	2A8 E1	2A9 CA B4 C2	2AD CD 44 C2	280 01	281 C3 B6 C2 284	284 54 284 54	285 5D	287	287 CD 1A C2	2BC FE 80	2C1 CD DD C2	2C4 CD E5 C2	2C9 WE IN	200 7E	2CB CD E2 C2	2CE CD 02 C3	2D1 D2 B4 C1	2D5 23	206 00	2D7 C2 C9 C2	2DD 2DD	2DD	2DD 7C	2DE CD EA C2	2E2 / D	2E2 CD EA C2	2E7 C3 4B C0	2EA 4F	2EC 0F 2ED 0F	ZEE OF	9	2F3 E6 0F

ALS-8 PROGRAM DEVELOPMENT SYSTEM

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608	## MAKE IT A LETTER ## WE WORK WITH ASCII HERE ## B743 ## CPI 58 ## B0-97 ## B0-9	THIS ROUGH THEM INTO INTO INTO INTO INTO INTO INTO INTO
-== CONSOL ==- COPYRIGHT 1976	NNNNNnnnnnnnnnnn	C387 C387 C387 C387 C387 C387 C388 CD 1A C2 C388 CD 1A C2 C388 CD CC C388 CD CC C318 CD

SYSTEM	
DEVELOPMENT	
PROGRAM	
ALS-8	

**

3E

C335

C339 C33C C33F C342 C345

C335 C338

C335 C335 CD E9

*

COUNT IS ZERO-TURN OFF TAPE AND RETURN THIS MANY PRIOR TO CRC TEST SCAN PAST BLANKS AND GET PARAMETER WAIT WHILE THE TAPE UNIT WINDS UP IT CAN DO A STANDARD 'RET'URN TO THE CONSCL COMMAND MODE. DEFAULT TO HIGH SPEED IF NONE NO CARRY, IT'S THE LAST BLOCK START TAPES AND SELECT SPEED THIS ROUTINE GETS THE FOLLOWING PARAMETER AND DOES A * PROGRAM JUMP TO THE LOCATION GIVEN BY IT. IF PROPER * STACK OPERATIONS ARE USED WITHIN THE EXTERNAL PROGRAM THE READ DATA INTO MEMORY. WHILE SPACE WITHIN CONSOL TAPE1+TAPE2 CONSOL STARTS BOTH TAPES DOES NOT ALLOW FOR 'STANDARD' TAPE ROUTINES THIS COMMAND WILL LOAD SOL- BASIC5 AND OTHER STANDARD SOL GO..... (AMD TAKE NOTE) THIS ROUTINE READS FROM EITHER TAPE UNIT PLACING SCAN TO SPEED PARAMETER ONLY BIT ZERO COUNTS CLEAR THE UART FLAGS IF ERROR START OVER PROCESSOR TECHNOLOGY COFP. EMERYVILLE, CALIF. '94628 PRETEND ITS SLOW READ PAST HEADER GET LOAD ADDRESS GET BLOCK SIZE A LITTLE MATH MAKE IT FAST ZERO THE CRC SYSTEM SOLFTWARE FOR DIRECT EXECUTION. COUNT TO HL 256 TO READ ROUND ROBIN CONVERT IT 6200 HOLLIS STREET GET VALUE GET COUNT ... TO DE TAPE LOAD COMMAND B,-256 SCONV BLOCK LOADR SETSP DELAY RHEAD STAPT **LDATA** rLOD1 A,32 DFLT SHEX TOFF LBLK ALL A,D B, 0 0,0 PCHL CALL CALL CALL LHLD LHLD XCHG XCHG CALL CALL XCHG XRA MOV MVI TUO JNZ MOV ORA JZ DAD MVI ANI JNZ JNC MVI Z 0834 * 0835 LOLOOP 0836 0814 TLOAD SETSP 0844 RDBLK TLOD1 0800 EXEC DFLT 0842 0845 1830 * 8795 7670 0810 8610 0802 7080 8080 6880 0823 0803 0804 9888 0812 0813 3828 6610 0805 0815 9180 8180 9819 0820 3822 3825 9826 0827 0829 0837 0801 0811 7186 3821 0824 0831 8833 0840 0839 0841 -== CONSOL ==-COPYRIGHT 1976 C2 C2 C3 C3 C3 C3 FF C2 C3 80 C8 63

20 4B

3E C2

CD 20 E6

C339

ED

7A B3 CA

C362

El 00

02

C36B

90 DE

01 EB

94

C2

CD

C354 C357

C354

CD

D3

C34D

F6

AF

C34A C34B C34F

C34A

OC OE

C35A C35D

C35A

2A EB

2A

C35E C361 C363 C366 C369 C36A C36E C370

C361

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608	0846 RIBYT CALL TAPIN GET CHARACTER 0847 MOV M,A STORE IT 0848 INX H BUMP MEMORY LOCATION 0849 XRA C UPDATE THE CRC 0850 CMA C	MOV DCR JNZ	0856 CALL CRCCK CHECK CRC AND FALL THROUGH TO ERROR IF NO GOOD 0857 JZ LOLOOP TEST OK	0859 TERR MVI B,'G'-40H BELL CHARACTER 0860 CALL VDMOT PUT IT ON THE SCREEN 0861 JMP COMND	0863 * 0864 * CONSOL ERROR HANDLER	ERRI XCHG ERR2 MVI	* JMP	0870 * READ THE HEADER	0872 RHEAD MVI B,10 FIND 10 NULLS 0873 RHEA1 IN STAPT GET A BYTE	ANI TDR J2 RHEAl	IN	0878 JNZ RHEAD 0879 DCR B	JNZ	0882 * WAIT FOR THE START CHARACTER	0884 SOHL CALL TAPIN 0885 DCR A	ZNC	0887 * NOW GET THE HEADER	LXI H, THEAD POINT TO BUFFER	* LXI B, HLEN*256	0893 RHEDI CALL TAPIN GET BYTE	Ç III (CMA .	0898 SUB C SQUEEZE IT
-=-	8		23	9			7			3		3	3		3	3		00 5	9	3			
19	9	3 0	1 C3	7 B B		Œ	O		AA	O	В	4 C	6 C3		6 C3	7 C3		25	1 0	0 9			
CONSOL	0 CE 641	7 7	D C A 6	9 Q Q 8		B 3	3 8		9 8	6 40 A 96	18	2 3	2 9		COO	2 A		1 0	1	200	mo	7 64	1
CO	OLUANO	400	00	200	வைவ	田門	9	4 4	90	E C	BD	CO	O		UM	O	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	20	2	Or	NA	501	9
-== CONSOL COPYRIGHT	C373 C376 C377 C378 C379	C37 C37 C37	C388		C388	C38 C38	C39	C39	C39 C39	C39	C39 C39	C3A	C3A	C3A	C3A	C3A	C3A	C3A	C3B	C3B	C3B	C3B	C3B

**

C3F1

C3F1 C3F1 C3F4

C3ED

C3E1

COPYKIGHT 1976 -== CONSOL ==-

PARALLEL DATA VDM DISPLAY PARAMETER PORT SERIAL CARRIER DETECT SERIAL DATA SET READY SERIAL PARITY ERROR STATUS PORT GENERAL SERIAL STATUS PORT VDM SCREEN MEMORY KEYBOARD SPECIAL KEY ASSIGNMENTS SOL SYSTEM EQUATES >> SENSE SWITCHES KEYBOARD DATA SERIAL DATA TAPE DATA BACKSPACE LOAD KEY BIT ASSIGNMENT MASKS ASSIGNMENTS VDM PARAMETERS X -40H ОССОВН BLANK 08EH OFBH OFBH OFBH OFCH OFCH OFFH 93H 8CH 80H 8BH PORT EQU RET 777777 0962 VDMEM RIGHT CLEAR STAPT SDATA KDATA PDATA BLANK SPACE BACKS SENSE LEFT LOADK TDATA DOWN MODE HOME SDSR SCD UP LF CR 0955 0956 0957 0953 0958 0959 0960 960 9960 888 0954 6969 1960 0973 6975 6976 6978 6978 0982 0984 8860 0660 9660 9660 7660 8660 8960 6960 0972 0860 0981 0983 9860 1660 1860 9660 1760 0992 6660 C3FA C9 C3FB CBEB C3FB C3FB C3FB CBFB C3FB CBFB C3FB CBFB C3FB C3FB C3FB CBEB C3FB C3FB C3FB C3FB CBFB

SERIAL TRANSMITTER BUFFER EMPTY

SERIAL DATA READY

164

SPE SFE SOE SCTS

1000

1001 1003

6660

C3FB C3FB C3FB STBE

SDR

1002 1004

C3FB

SERIAL FRAMING ERROR SERIAL OVERRUN ERROR SERIAL CLEAR TO SEND ALS-8 PROGRAM DEVELOPMENT SYSTEM

EMP'FY

PROCESSOR TECHNOLOGY CORP. 6200 HOLLIS STREET EMERYVILLE, CALIF. 94608		KEYBOARD DATA READY PARALLEL DATA READY	LLEL DEVIC		OVERF	TAPE DATA KEADY TAPE TRANSMITTER BUFFER		SCROLL OK FLAG	TABE ONE 'ON' BIT	TWO				GLOBAL AREA		START OF 1K RAM AREA	1000	STACK IS AT THE TOP			AREA		CURRENT CHARACTER POSITION	IG OF		INPUT PORT				THIS BYTE MUST BE ZERO	BLOCK SIZE	LOAD ADDRESS	AUTO EXECUTE ADDRESS	SPARES	LENGTH OF HEADER	5			D C184	
PROCESSOR TI 6200 HOLLIS EMERYVILLE,						8				8				SYSTEM GI		ВСВВОН		5+1024			CONSOL PARAMETER														C-THEAD		AOUT	BLOCK	COMND	CRPRC
I B.R.	-	7 7	4	8	16	128		1	64	128				SoL		OG C	•	s t	·		d JOSNC	,		1 -	1	1			5	٦,	10	10	7	m	2	,	CØ16	0020 C07B	CØE3	CZIA
		EQU	EQU	EQU	EQU	EOU	K	EQU	1100	EQU						ORG		100 E	מ		Ö		DS	DS	DS	DS			DS	DS	200	DS	SO	DS	FOL	Si .	AINP	BLANK	CLINE	CRLF
		1006 KDR				1011 TUR		1014 SOK	0 4		1018 *	* 6101	21 *	1022 *	123 *	1024		1026 SYSKAM		1029 *	1030 *	1031 *	1032 NCHAR			1036 IPORT	1037 *	1039 *	1040 THEAD		1042 HIYPE			1046 HSPR		1050 *	C2DD	CØ01 C2E5	CØE9 CICC	C13D
	16	31	16	16	16	1.0	16	16	70	16	16	16	16	16	16	16	16	- I	16	16	16	16	37 -	1 7	1,0	11	1,6	17	16	1,	77		īĀ	7-	1	177	ADOUT	BOUT	CLINI	CREM
CONSOL ==- RIGHT 1976																																					C3 0 2	005F	C26A	C3C1
-== CONSO COPYRIGHT	C3FB	CSFB	C3FB	C3FB	CSFB	CSFB	C3FB	C3FB	CSFB	C3FB	C3FB	CSFB	CSFB	C3FB	C3FB	C3FB.	Case	C & & & & & & & & & & & & & & & & & & &	C. C	CSBB	C800	C800	CSEE	CSWZ	C803	C804	C805	C885	C805	CBBA	Cases	3000	C81W	C812	C010	C815 C815	ACOMP	BACKS	CLERA	CRCCK

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** ALS-8 PROGRAM DEVELOPMENT SYSTEM

6200 HOLLIS STREET
EMERYVILLE, CALIF. 94608

C34A	C2C9	C31C	COCA	C38F	C1C3	C24B	0010	C804	C279	C3E1	Ø W 8 C	C800	C081	CZFE	OGED	COF3	C117	0004	C3B4	C226	C234	OOF9	OOFF	8000	0010	0000	C09C	C265	0800	0040	C805	0010	C062	C125	C04B		
DFLT	DLP1	ENLO1	ERASI	ERR2	GCLIN	HCONV	HLEN	IPORT	KIN	LBLK	LOADK	NCHAR	OCHAR	OUTH	PDATA	PHOME	PRIT	PXDR	RHEDI	SBLK1	SCHR1	SDATA	SENSE	SFE	SOE	SPACE	SROL	STRTA	TAPE2	TDR	THEAD	TOE	TSRCH	VDAD2	VDMOT		
	_						-	~														A								-	10	_	2	-			
C3F1	C3F4	C2A1	C307	C38E	C1F4	C2E2	CZEA	CROE	0001	C022	C801	0089	C2B6	C184	C113	COCS	C2B4	C104	C394	C224	C232	0020	0002	C34E	C013	C004	C037	0080	0046	OOFE	8000	C354	C3D7	C128	C040		
DELAY	DLOP1	DUMP	ENTER	ERRI	FDCOM	HBOUT	HEOUT	HTYPE	KDR	KSTAT	LINE	MODE	NPASS	OTAB	PCUR	PEKSE	POVER	PUP	RHEAD	SBLK	SCHR	SCIS	SDSK	SETSP	SINP	SOUT	SREAD	STBE	TAPEL	TDATA	TFE	TLODI	TREDY	VDAD	VDMO1		
0018	C2B7	OUFE	C30B	CODD	C335	CØSD	C2F3	~C812	UNFC	C028	BOODA	C361	C076	C803	C14E	0002	C155	C212	C396	C373	0001	C098	C 0 41	00F8	C244	0001	C036	UNFA	CCBB	C165	C386	C339	C28D	7600	CCBB		
CX	DLOOP	DSTAT	ENLOP	ERAS3	EXEC	GOBK	HEOUL	HS PR"	KDATA	KKEAD	LF	LOLOO	NEXT	OPORT	PCR	PDR	PLF	. PROMP	RHEAL	RTBYT	SCD	SCROL	SCHOT	SERST	SHEX	SOK	SREAL	STAPT	SYSTP	TBL	TERR	TLOAD	TOOT	UP	VDMEM		
COCI	C071	NØ9A	C324	COD6	CIAD	CØ56	C258	008E	C18C	C027	U081	CBUE	CZØB	COAD	C145	COFA	CIND	CID2	C370	6600	C161	C23E	2040	C040	C247	C3A7	6664	CØ31	C800	6306	C270	C290	C3ED	0800	C121	C81W	
CUR	DISPT	DOWN	ENLO2	ERAS2	ERROT	GOBAC	HCOV1	HOME	ITAB	KKEAL	LEFT	LOADR	NCOM	OK	PBACK	PDOWIN	PLEFT	PROCS	RDBLK	RIGHT	SC.	SCONV	SDR	SEROT	SHEI	SOHL	SPE	SSTAT	SYSRA	TAPIN	TERM	TIN	TOFF	TTBE	VDADD	XEQAD	
															*																						

SECTION X

DRAWINGS

Sol-PC SINGLE BOARD TERMINAL COMPUTER TM



NOTES: UNLESS 1 . ALL 2 . ALL 3 . ALL 00 3 PART OF 5 0 0 0 @ Q (10)

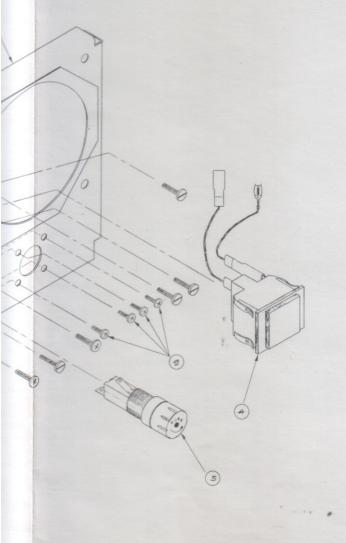
c .

LESS OTHERWISE SPECIFIED:

ALL SCREWS PART NO. 7

ALL LOCKWASHERS PART NO. (2

ALL NITE PART NO A

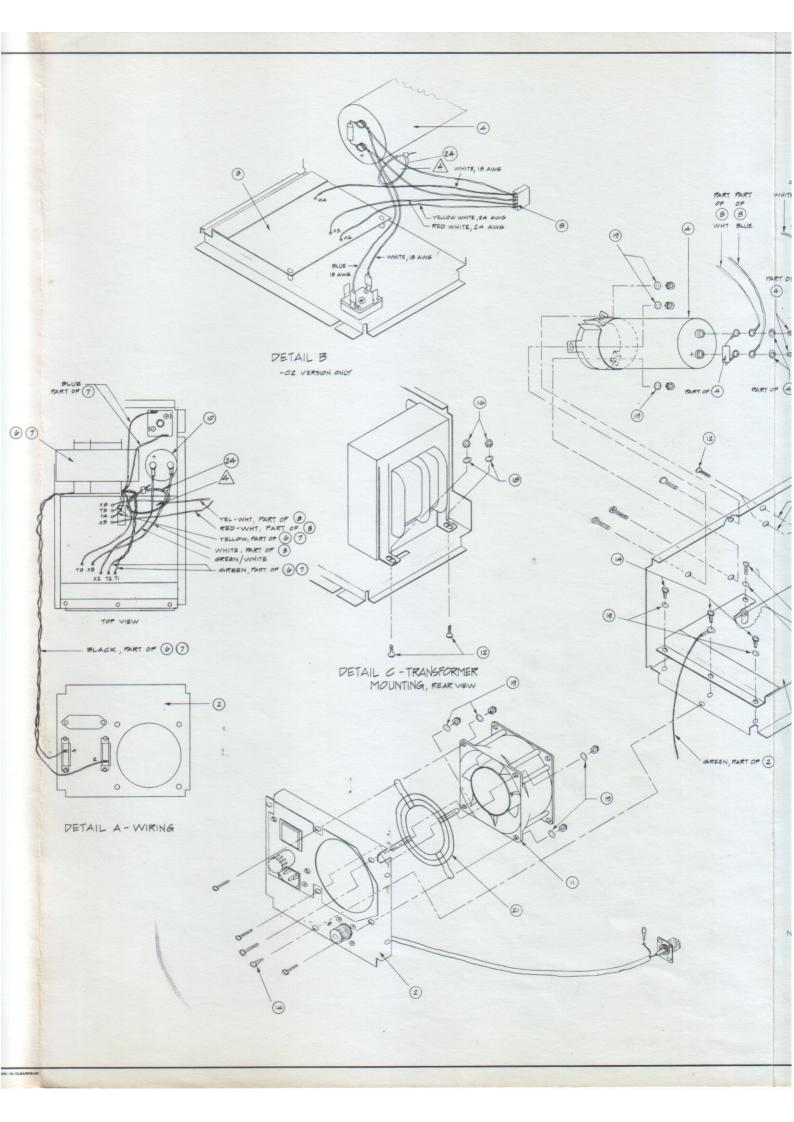


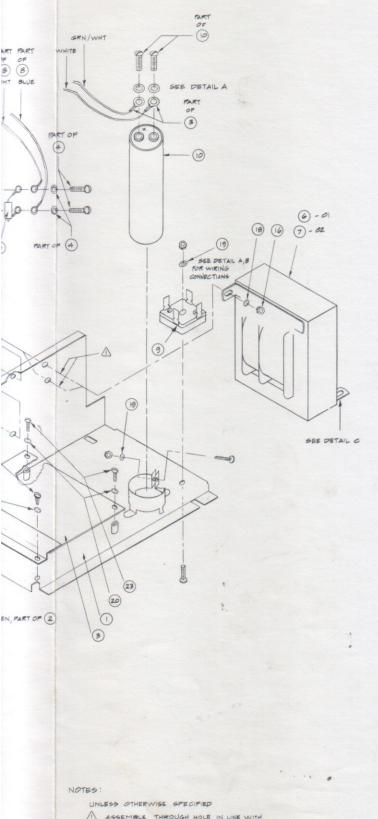
12		LOCKWASHER, INT. TOOTH # 6	6	
11		NUT , HEX , 4 -40	4	
10		LOCKWASHER, INT, TOOTH #4	3	
9		SCREW, MACHINE, 4-40 × 3/6" PAN HEAD	4	
8		NUT, HEX , 6-32	6	
7		SCREW, MACHINE, 6-32 x /2", PAN HEAD	6	
6		COMMONING BLOCKS	2	
5		FUSE POST, W/ HUT & LOCKWASHER	1	
4	105022	ASSEMBLY, AC SWITCH	1	
3	105018	ASSEMBLY, AC CONNECTOR	1	
2	105016	ASSEMBLY, VIDEO CABLE	1	
1	105031	SHEET METAL, FAN CLOSURE	1	
EF.	PART OR DWG. NO.	PART DESCRIPTION	-01	

ASSE	MBLY, FAN CL	LOSURE
LE: -	APPROVED BY:	DRAWN BY L
101-2-11	R MARCH	REVISED

PROCESSOR TECHNOLOGY

DRAWING NUMBER





		1			
24 23 22 20 9 8 7 9 5 4 3 2 1 0	105 <i>0</i> 02 105 <i>0</i> 03	TIE, CABLE, PLASTIC SCREW, 4-40 * 1/6 PAN HEAD SCHEMATIC, SOI-PWR, SOI-20 SCHEMATIC, SOI-PWR, SOI-10 LOCKWASHER, # 6 INT. TOOTH LOCKWASHER, # 6 INT. TOOTH LOCKWASHER, # 8 INT. TOOTH LOCKWASHER, # 6 INT. TOOTH LOCKWASHER, # 6 INT. TOOTH LOCKWASHER, # 8 INT. TOOTH SCREW, 6-32 × 1/2 PAN HEAD SCREW, 6-32 × 1/2 PAN HEAD SCREW, 8-32 × 1/2 PAN HEAD SAPACITOR, ALUM. 18,000,04F, 12 V	12-R2 3 324 30-	2 3 3 2 4 3	
987654321	105007 105028 105026 105026 105008 105004 105004	RECTIFIER BRIDGE CABLE ASSEMBLY, BPD DC PWR TRANSFORMER, Sol - 20 TRANSFORMER, Sol - 10 FINGER GUARD, FAN CAPACITOR ASSEMBLY, 54000 MF REGULATOR ASSEMBLY CHASSIS ASSEMBLY CHASSIS ASSEMBLY	000-00	0	
REF	PART OR DWG. NO.	PART DESCRIPTION		-02	

- ASSEMBLE THROUGH HOLE IN LINE WITH TRANSPORMER MOUNTING.

 2. ALL SCREWS ARE PART # 13

 3. ALL NUTS ARE PART # 17

 WIRES CINCHED WITH 24

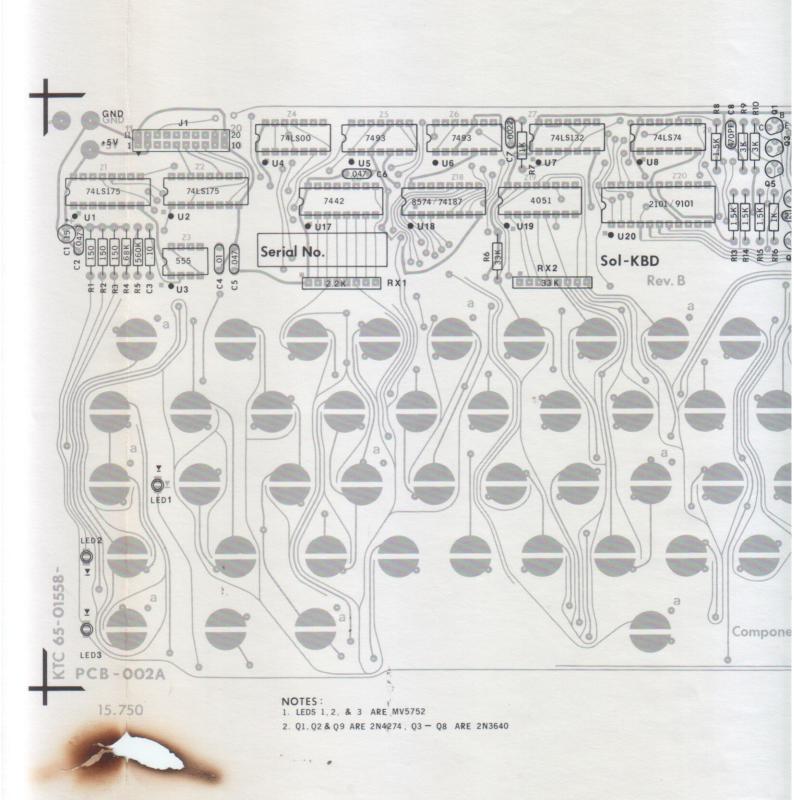
105001

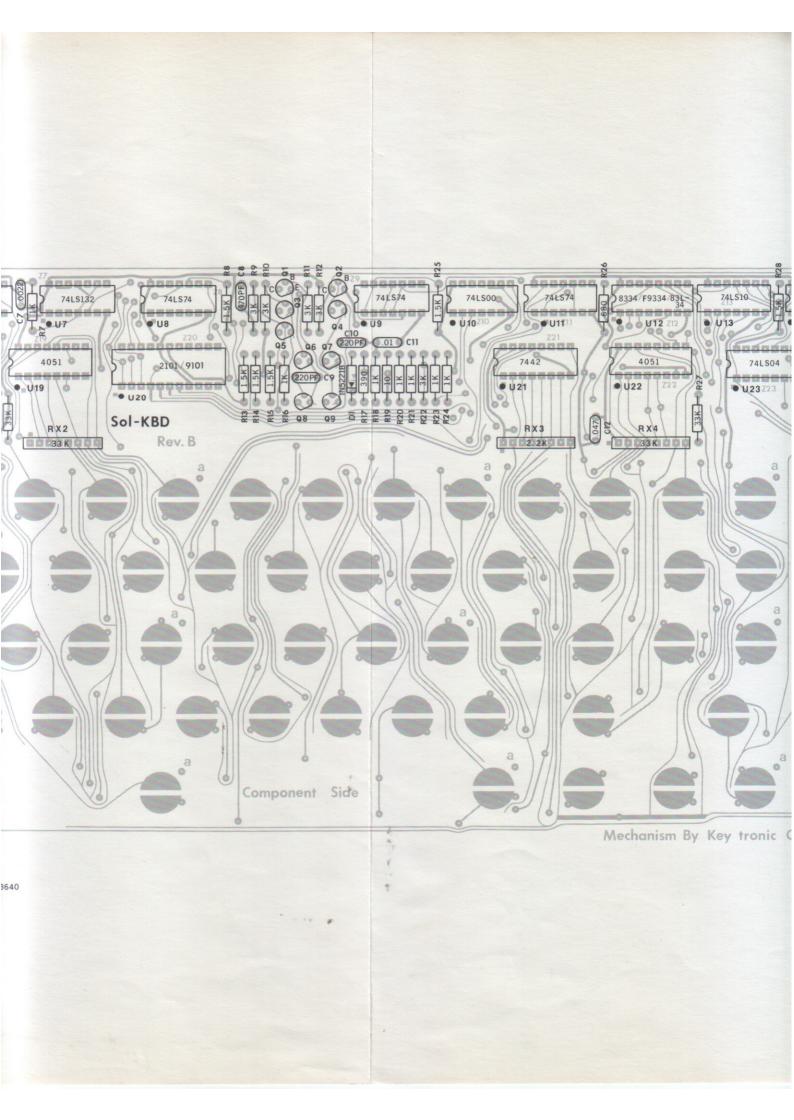
SCALE:	APPROVED BY:	DRAWN BY LITO
DATE: 12-29-76	R. MARSH	REVISED

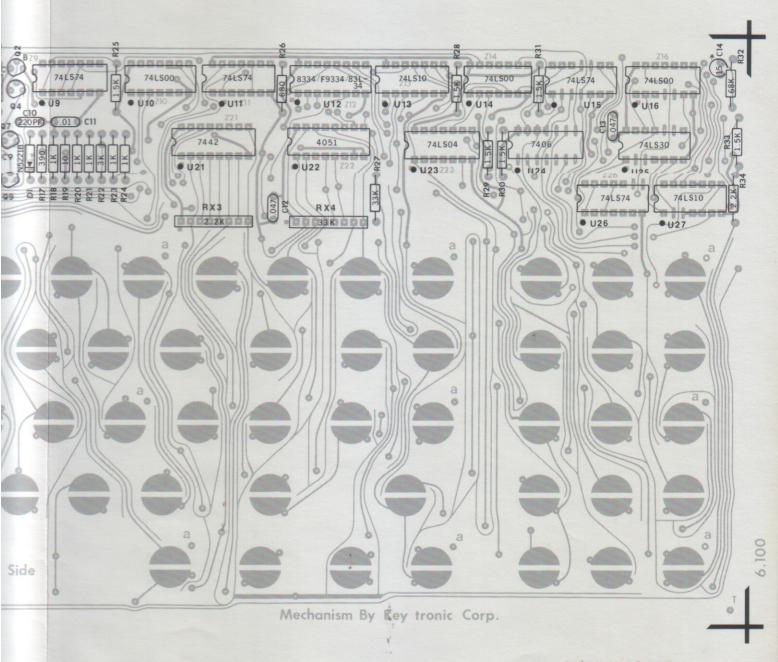
(50) 10 \$ 501 20) 105001-01 \$ 105001-02

PM 6834

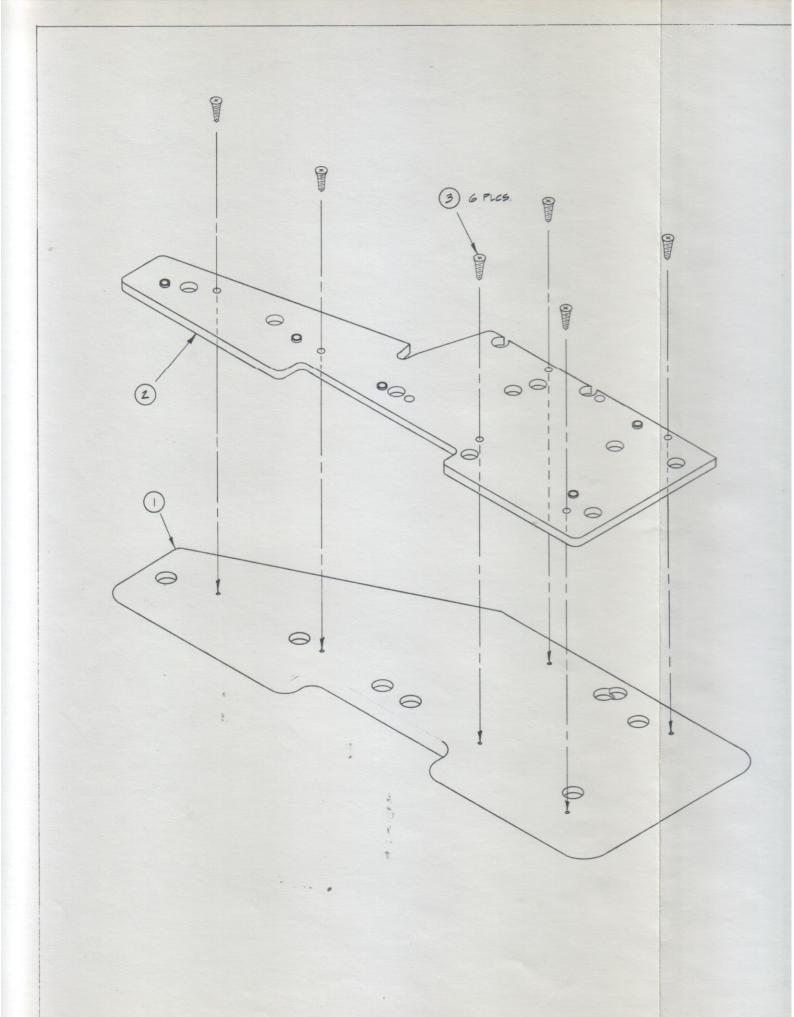
ASSEMBLY







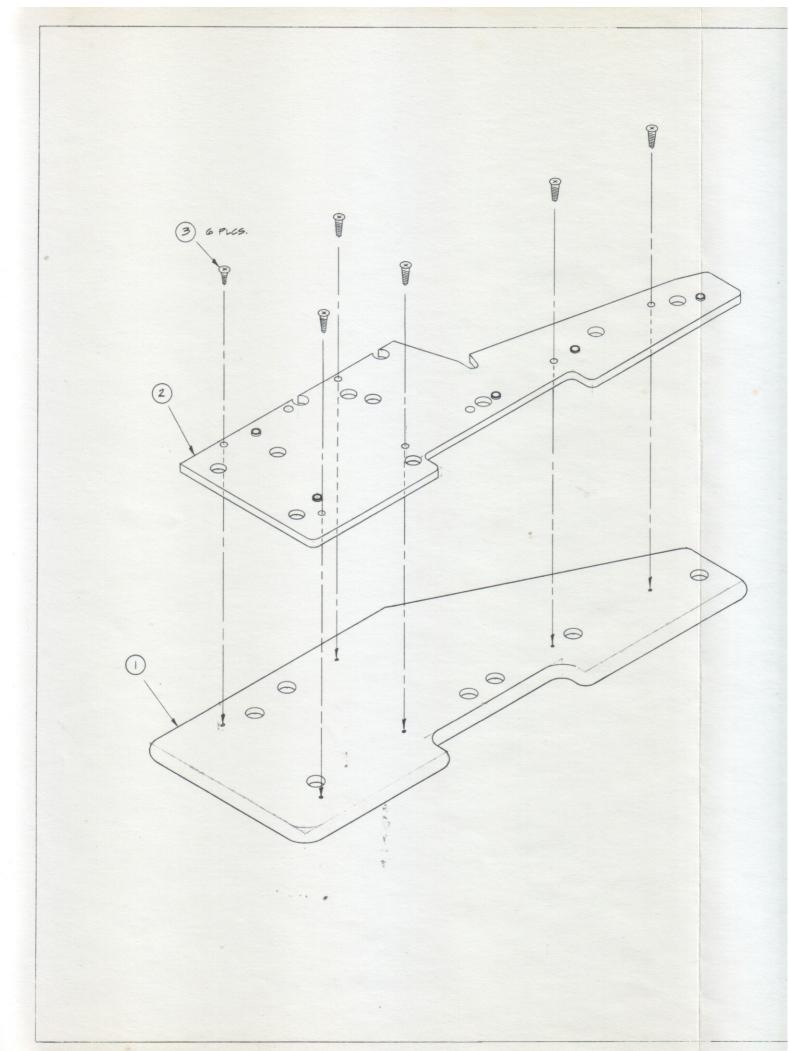
Sol-KEYBOARD ASSEMBLY

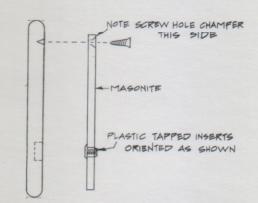


4 SCREW, WOOD, FLAT HEAD #6 x 5/8" 3 SPACER, LEFT SIDE PANEL 2 101011 SLAB, LEFT SIDE PANEL 101009 1 DWG. NO. PESCRIPTION

ASSEMBLY, SIDE PANEL, LEFT HAND

Rev. A DRWG. NO .: 101007



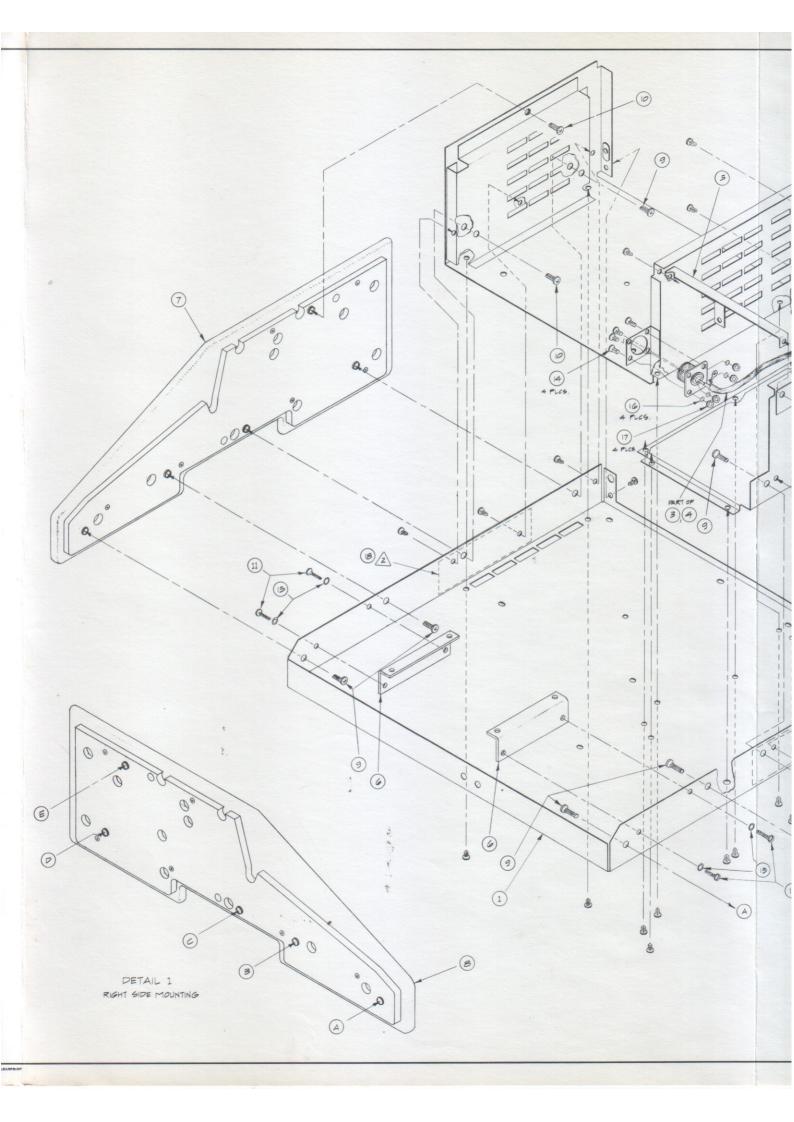


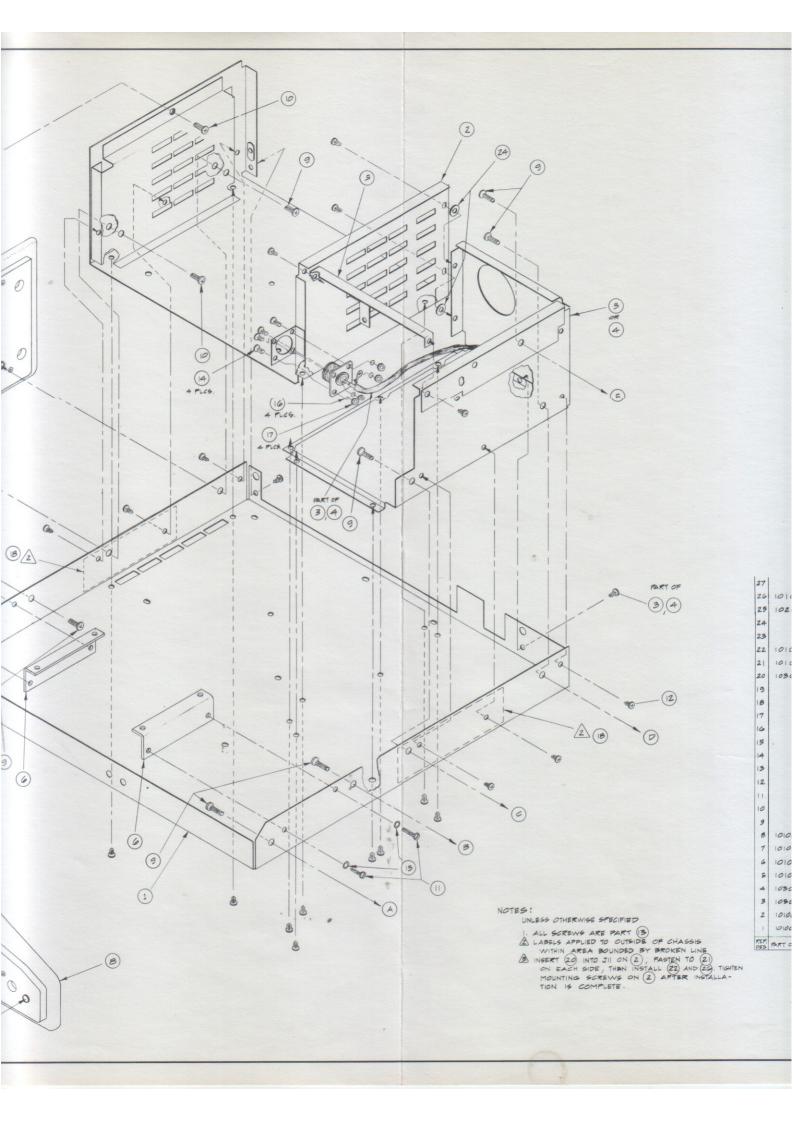
DETAIL - ORIENTATION OF MASONITE CROSS SECTION

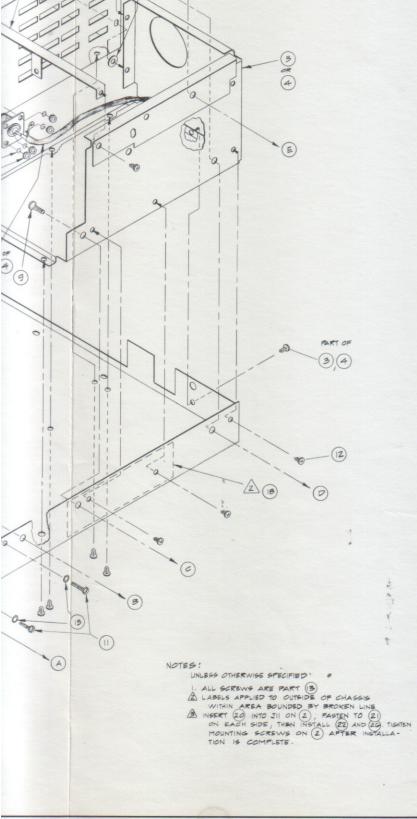
TEF. DBS.	DWG. NO.	DESCRIPTION	
	101010	SLAB, RIGHT SIDE	1
2	101012	SPACER, RIGHT SIDE	1
3		SCREW, FLAT HEAD, WOOD, #6 x 5/8"	6

ASSEMBLY, SIDE PANEL, RIGHT HAND

Rev A DRWG. No.: 101008





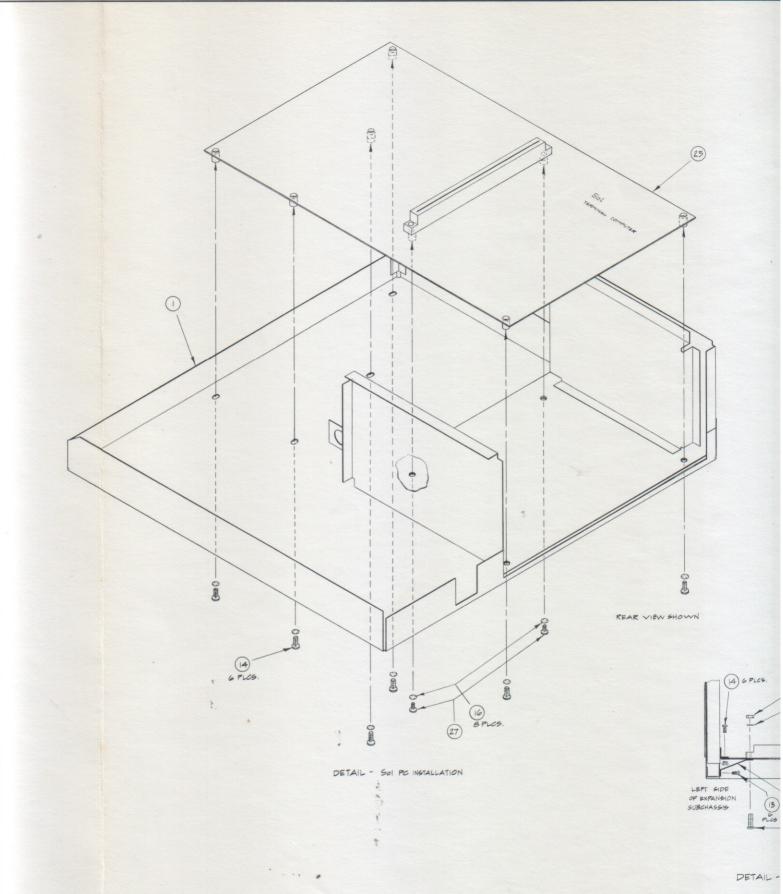


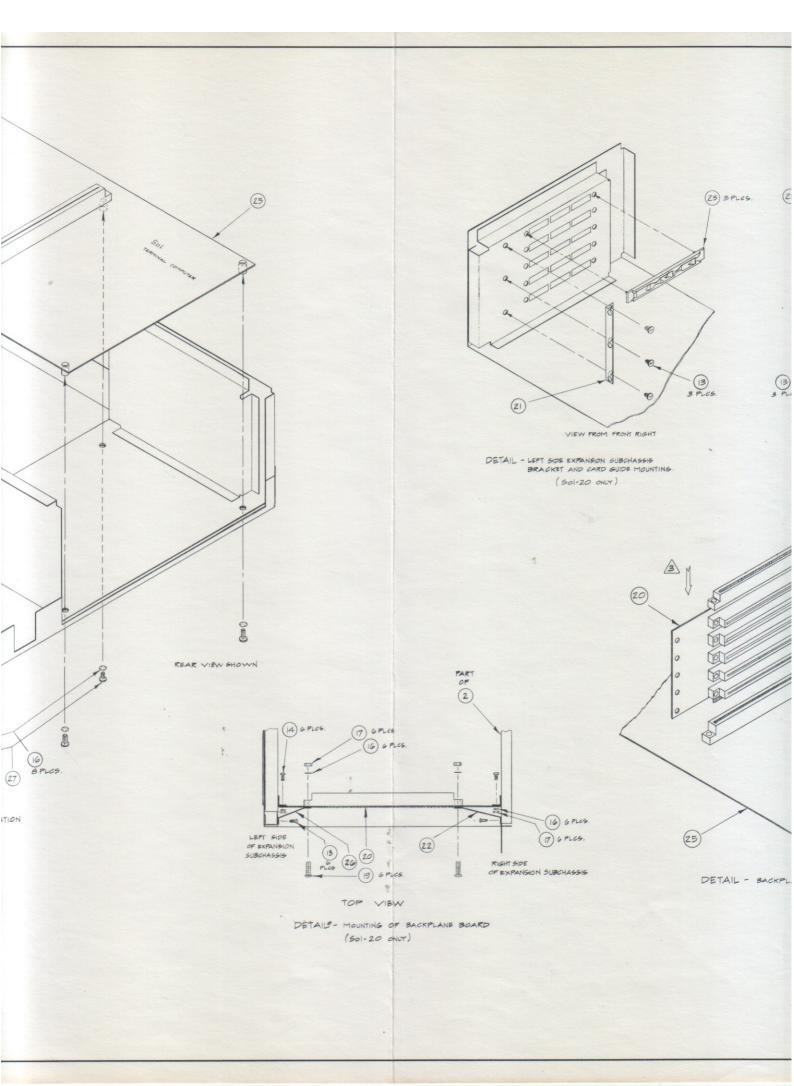
(24)

9

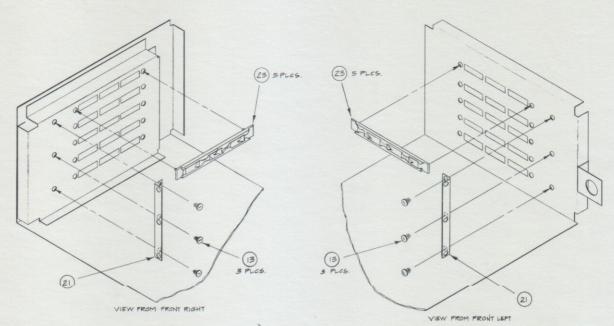
EF.	PART OF DWG. NO.	PART DESCRIPTION	-10	-20	1	1
1	101003	MAIN CHASSIS	1			
2	101004	EXPANSION SUBCHASSIS	1	1		
3	105001-01	POWER SUPPLY, SOI-10	1	-		
4	103001-02	POWER SUPPLY, Sol-20	-	1		
5	101005	BRACKET, CONNECTING	1	1		
6	101006	BRACKET, KEYBOARD SUPPORT	2	2		
7	101007	SIDE ASSEMBLY, LEFT-HAND	1	1		
8	101008	SIDE ASSEMBLY, RIGHT-HAND	1			
9		SCREW, MACHINE, 8-32 × 1/2" PAN HEAD	8	8		
0		11 11 8-32 × " 11 11	Z	2		
11		SCREW, MACHINE, 6-32 × 1/2" PAN HEAD	4	4		
2		SCREW, SHEET METAL, # 6 x 5/16 PAN HEAD				
3		SCREW, SHEET METAL, # 6 × 1/4" PAN HEAD	19	31		
4		SCREW, MACHINE, 4-40 × 9/16 PAN HEAD	10	16		
5		LOCKWASHER, # 6, INTERNAL TOOTH	4	4		
6		LOCKWASHER, # 4, INTERNAL TOOTH	3	3		
7		NUT, #4-40, HEX	4	4		
8		LABEL , FINGER WELL, BLACK	Z	2		
9		SCREW, MACHINE, 4-40 × 5/8, PAN HEAD	-	6		
20	103000	BACK PLANE BOARD ASSEMBLY	-	1		
21	101016	GUSSET, BACKPLANE, RIGHT HAND BRACKET, BACKPLANE RIGHT ANGLE	-	2		
22	101017		-	10		
23		CARD GUIPE	2	2		
24		WASHER, FLAT, 1/2" O.D. 3/16" I.D. , 1/16" THK	1	1		
26		GUSSET, BACKPLANE , LEFT - HAND	0	1		
27	101001	SCREW, MACHINE, 4-40 X // PAN HEAD	2	Z		

ASSE	MBLY, SOI	
SCALE:	APPROVED BY:	DRAWN BY LITO
DATE: 01-17-77	R. MARSH	REVISED
PROCES.	SOR TECHNOLO	DGY CORP.
		DRAWING NUMBER



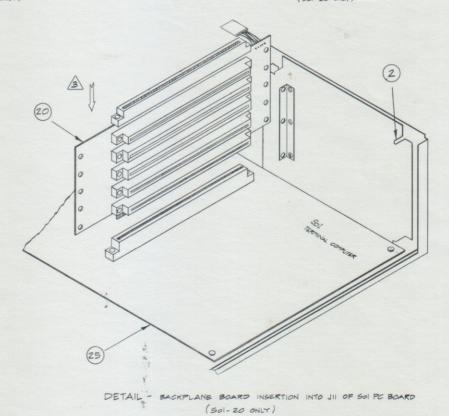


X-11



DETAIL - LEFT SIDE EXPANSION SUBCHASSIS BRACKET AND CARD GUIDE MOUNTING (SOI-20 ONLY)

DETAIL - RIGHT SIDE EXPANSION SUBCHASSIS
BRACKET AND CARD GUIDE MOUNTING
(SOI-20 ONLY)



PART OF

2

10 G PLCS.

10 G PLCS.

RIGHT SIDE OF EXPANSION SUBCHASSIS

OF BACKPLANE BOARD

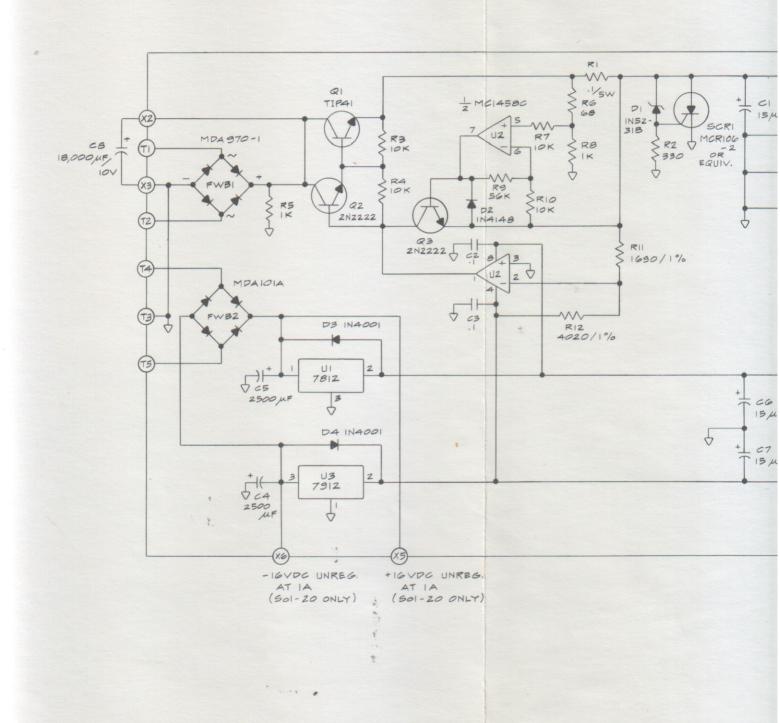
ASSEMBLY, SOI

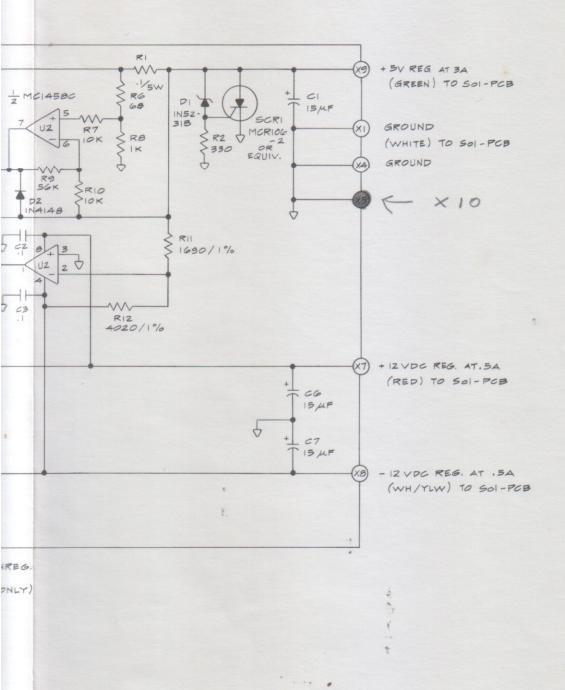
BCALE: — APPROVED BY:

DATE: 01-20-77 R. MARSH REVISED

PROCESSOR TECHNOLOGY CORP.

REV. A SHEET 2 DRAWING NUMBER 1010000



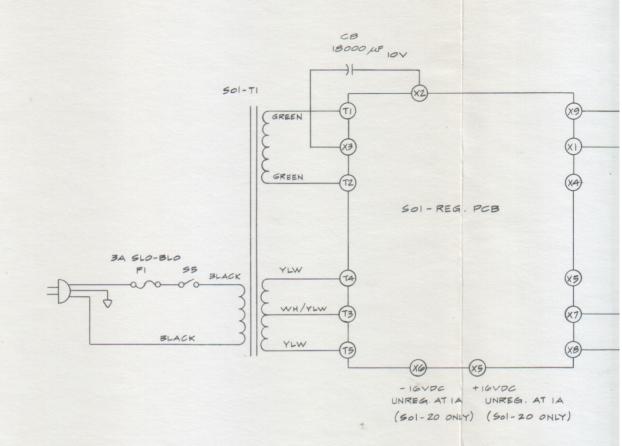


SCHEMATIC, SOI-REGULATOR PCB

SCALE: — APPROVED BY:
DATE: II-12-76 R. MARSH

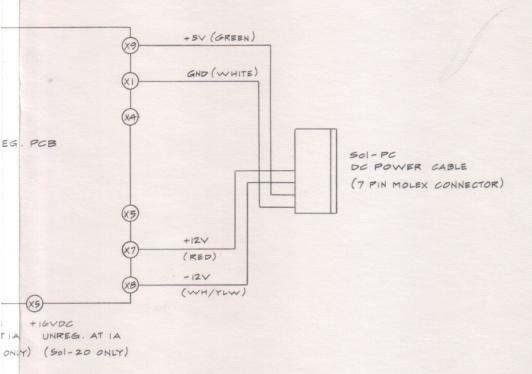
DRAWN BY: LITO

PROCESSOR TECHNOLOGY CORP.



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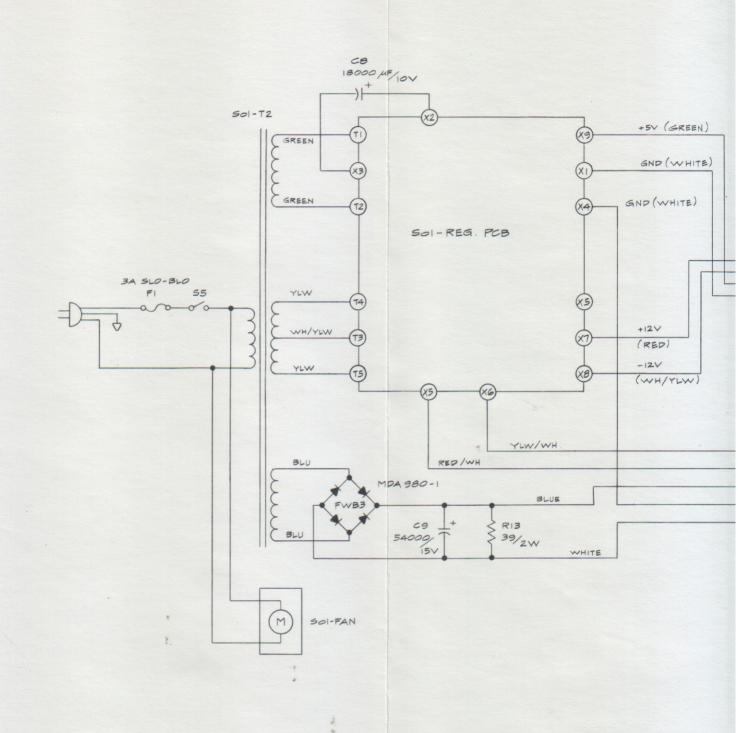
SCHEMATIC, SoI-10 POWER SUPPLY

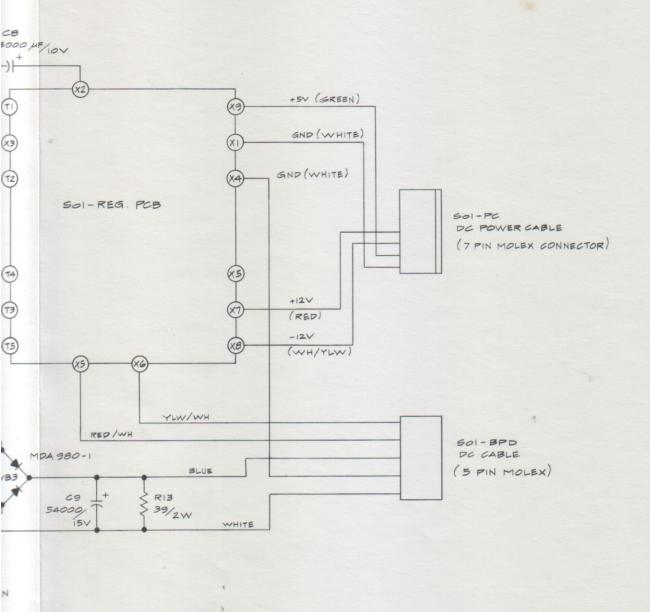
SCALE: — APPROVED BY:

DATE: II-12-76 R. MARSH

DRAWN BY: LITO

PROCESSOR TECHNOLOGY CORP.



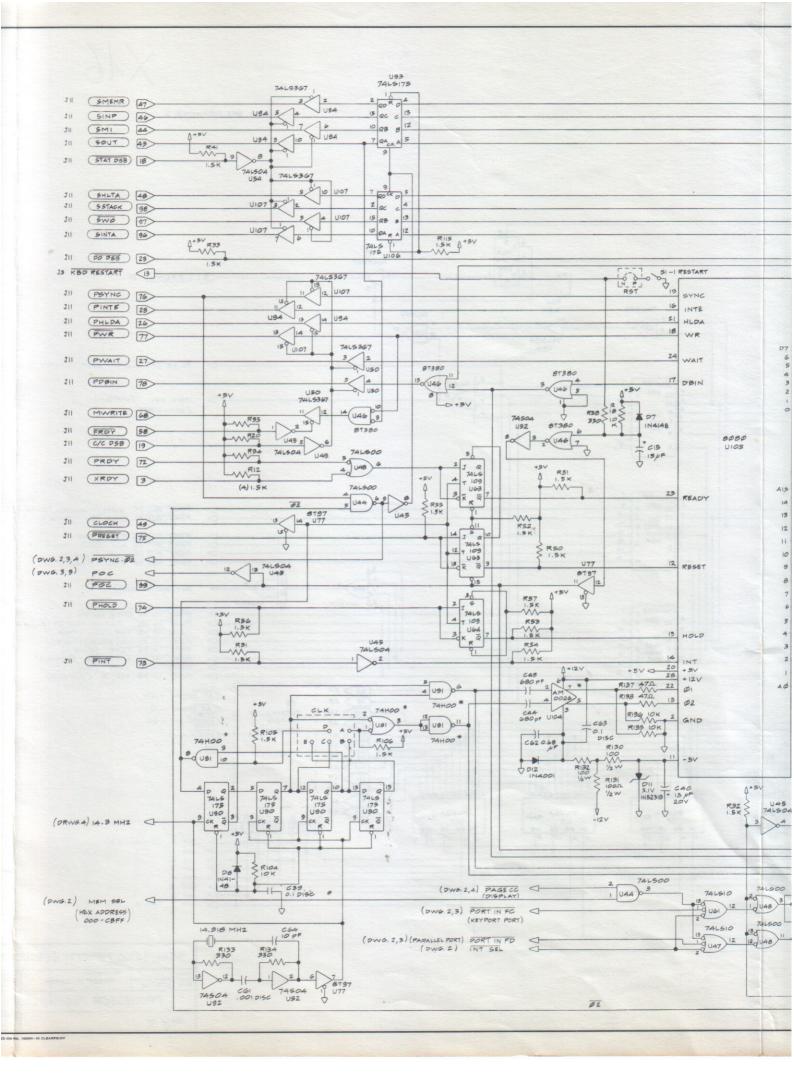


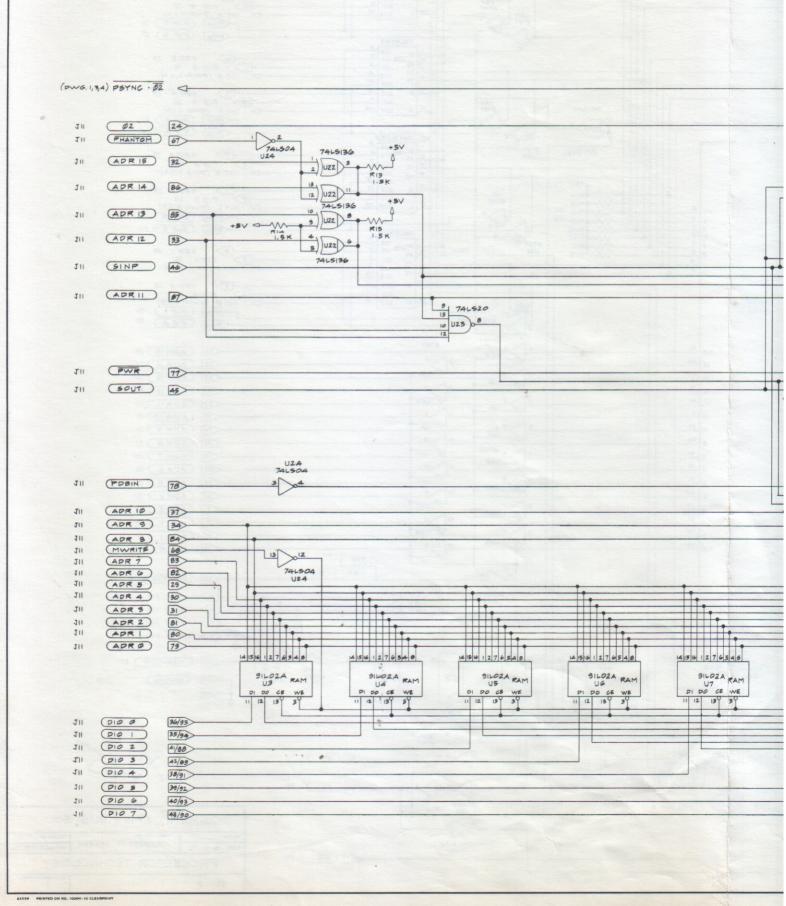
SCHEMATIC, SOI-20 POWER SUPPLY

SCALE: APPROVED BY:
DATE: 11-10-76

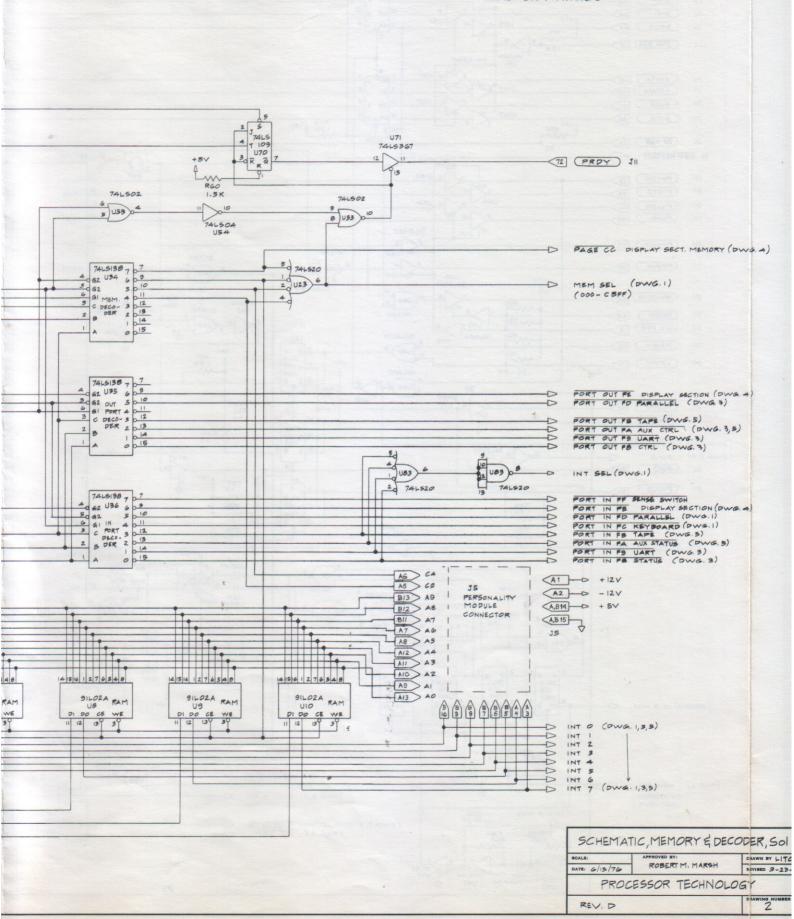
PROCESSOR TECHNOLOGY CORP.

Rev. B

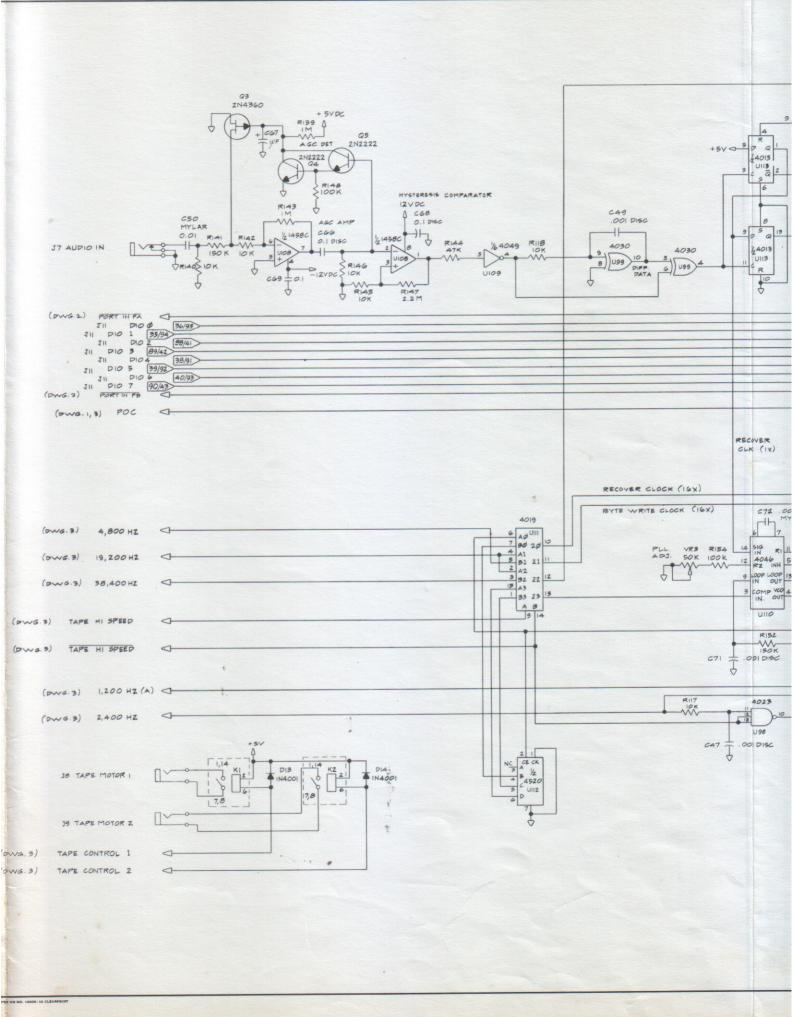


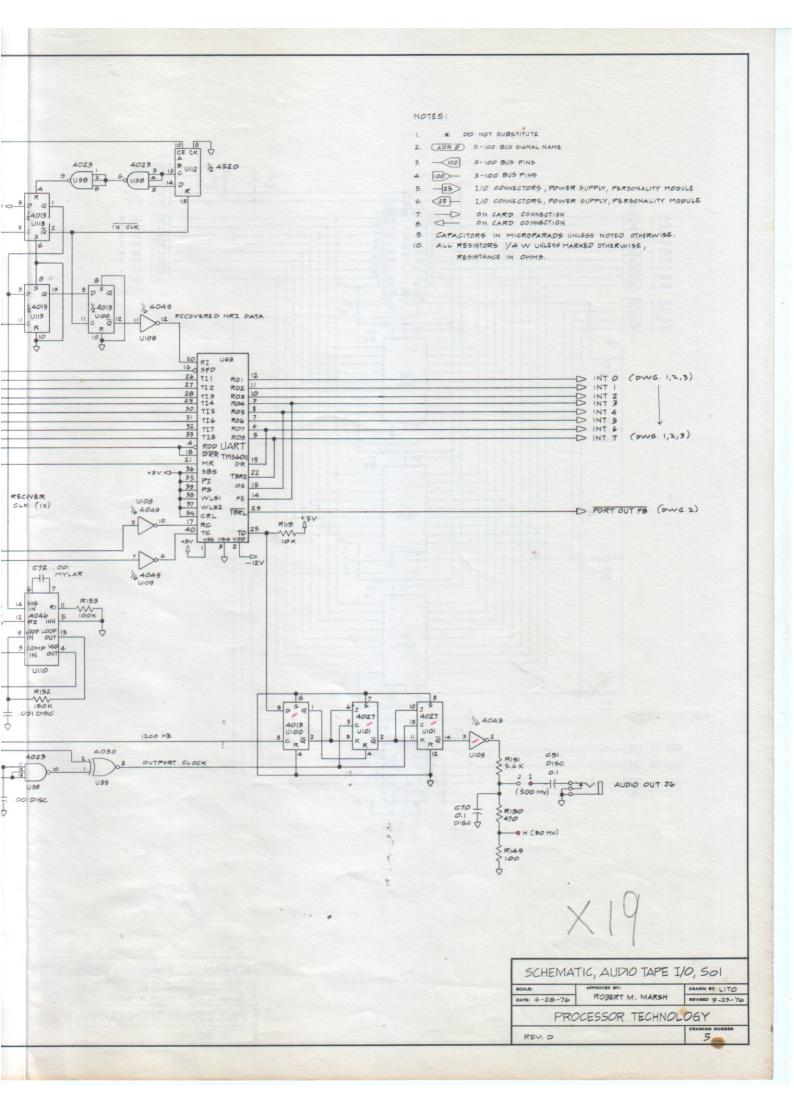


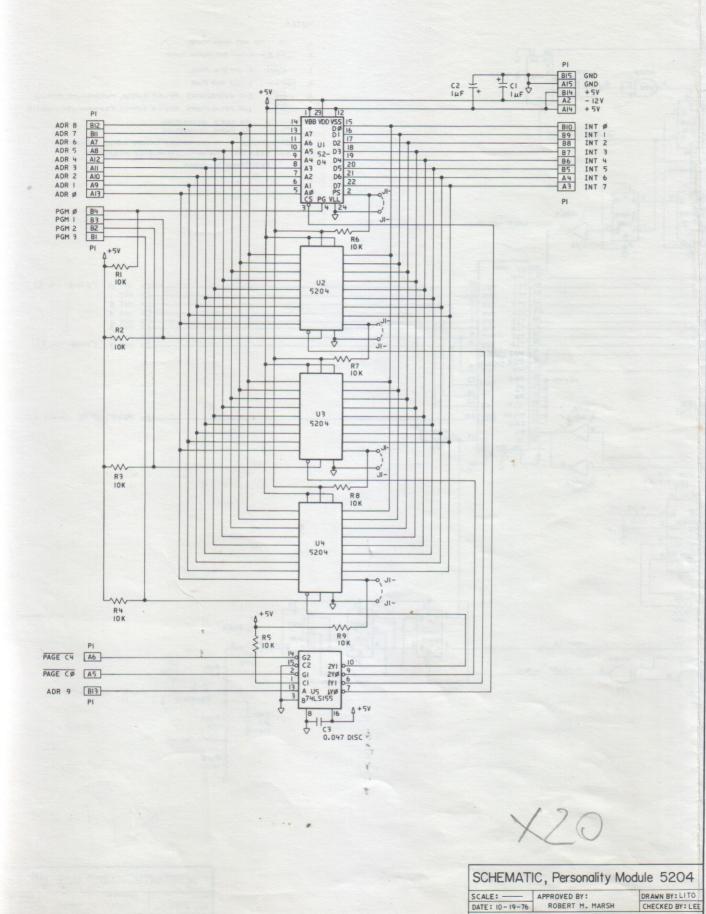
NOTE: SEE DRAWING 5



NOTE: SEE DRAWING 5 U71 74LS367 PRDY JI U53 0 10 D PAGE CC DISPLAY SECT. MEMORY (DWG. 4) MEM SEL (DWG.1) PORT OUT FE DISPLAY SECTION (DWG. 4) PORT OUT FB TAPE (DWG.5)
PORT OUT FA AUX CTRL (DWG.3,5)
PORT OUT FS WART (DWG.3)
PORT OUT FS CTRL (DWG.3) 0 P 4 1083 6 INT SEL (DWG.1) 0 741520 20 741520 PORT IN FF SENSE SWITCH
PORT IN FB DISPLAY SECTION (DWG. 4)
PORT IN FD PARALLEL (DWG. 1)
PORT IN FC KEYPOARD (DWG. 1)
PORT IN FB TAPE (DWG. 5)
PORT IN FA AUX STATUS (DWG. 5)
PORT IN FB UART (DWG. 3)
PORT IN FB STATUS (DWG. 3) P 0 44 A6 C4 A5 CØ (A1 - + 12V A2 - 12V PERSONALITY MODULE CONNECTOR (A,B14) - + 5V A,B 15 J5 B B B B A A 3 INT 0 (DWG. 1, 3, 5) 200000 (DWG. 1,3,5) SCHEMATIC, MEMORY & DECODER, Sol APPROVED BY DRAWN BY LITO DATE: 6/15/76 REVISED 9-23-176 PROCESSOR TECHNOLOGY DEAWING N REV. D

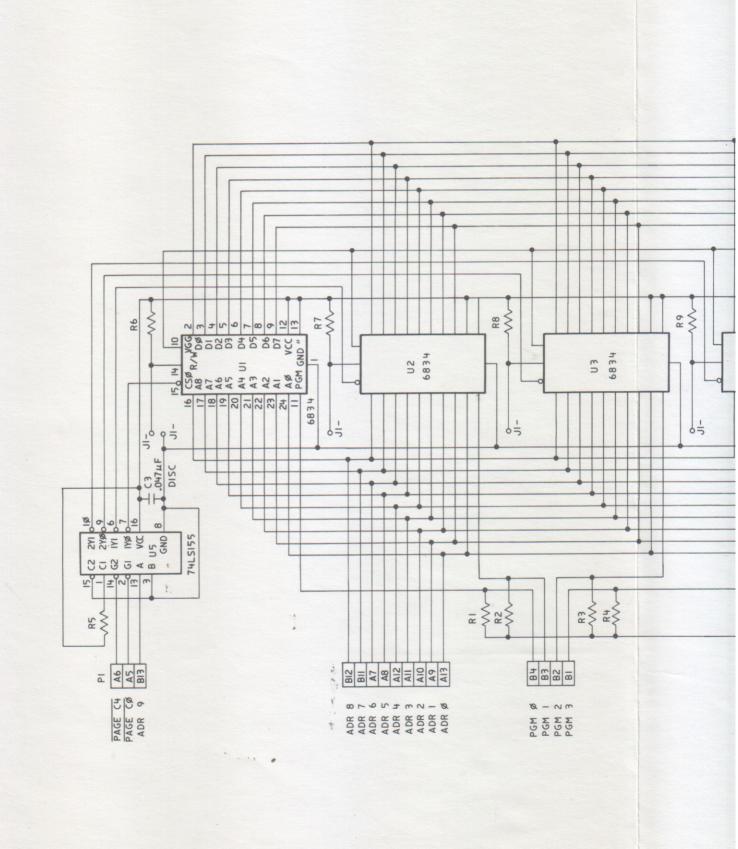


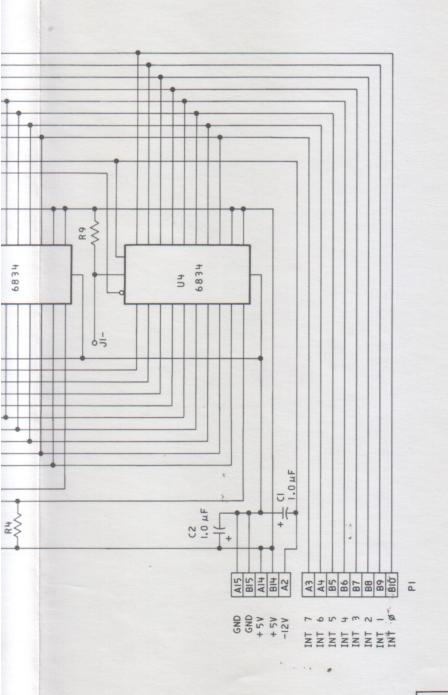




PROCESSOR TECHNOLOGY CORP.

Sol





ALL RESISTORS IOK, I/ 4W, 5%

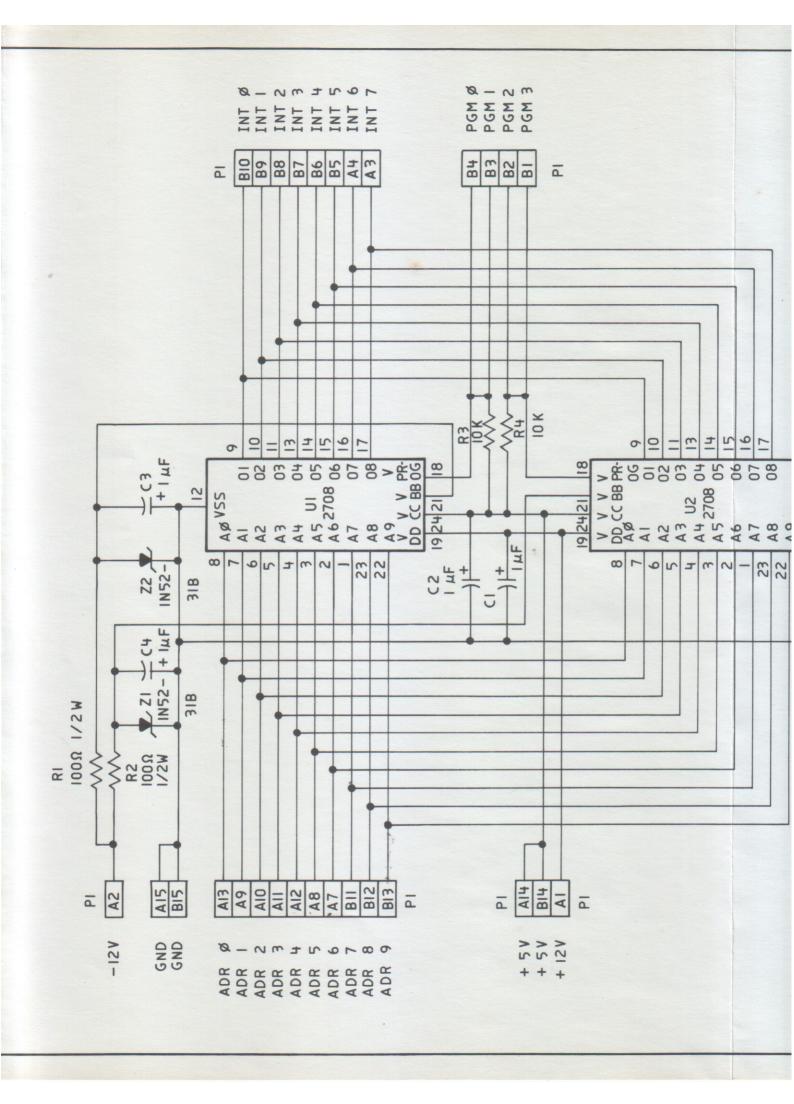
SCHEMATIC, Personality Module 6834

SCALE: — APPROVED BY:
DATE: 10-20-76 ROBERT M. MARSH DATE: 10-20-76

DRAWN BY: LITO CHECKED BY: LEE

PROCESSOR TECHNOLOGY CORP.

Sol





SCHEMATIC, Personality Module 2708

SCALE: ---

DATE: 10-20-76

APPROVED BY:

ROBERT M. MARSH

DRAWN BY: LITO
CHECKED BY: LEE

PROCESSOR TECHNOLOGY CORP.

Sol

APPENDICES

I Statement of Warranty

through control factory discribition and any part which tells because of cells to

- II 8080 Operating Codes
- III Standard Color Code
 - IV Loading DIP Devices, Soldering Tips and Installing Augat Pins
 - V IC Pin Configurations
 - VI TV Interface
 - VII Memory and I/O Allocation Chart



Warranty

PROCESSOR TECHNOLOGY CORPORATION, in recognition of its responsibility to provide quality components and adequate instruction for their

proper assembly, warrants its products as follows:

All components sold by **Processor Technology Corporation** are purchased through normal factory distribution and any part which fails because of defects in workmanship or material will be replaced at no charge for a period of 3 months for kits, and one year for assembled modules, following the date of purchase. The defective part must be returned postpaid to **Processor Technology Corporation** within the warranty period.

Any malfunctioning module, purchased as a kit directly from **Processor Technology** and returned to the factory within the three-month warranty period, which in the judgement of **PTC** has been assembled with care and not subjected to electrical or mechanical abuse, will be restored to proper operating condition and returned, regardless of cause of malfunction, without charge. Kits purchased from authorized **PTC** dealers should be returned to the selling dealer for the same warranty service.

Any modules purchased as a kit and returned to **PTC**, which in the judgement of **PTC** are not covered by the above conditions, will be repaired and returned at a cost commensurate with the work required. In any case, this charge will not exceed \$20.00 without prior notification and approval of the owner.

Any modules, purchased as assembled units are guaranteed to meet specifications in effect at the time of manufacture for a period of at least one year following purchase. These modules are additionally guaranteed against defects in materials or workmanship for the same one year period. All warranted factory assembled units returned to **PTCO** postpaid will be repaired and returned without charge.

This warranty is made in lieu of all other warranties expressed or implied and is limited in any case to the repair or replacement of the module involved.

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ZŁ	RET	77	1 1	70	CALL	ACI	AST	RNC	POP	SNC	DOUT	CNC	PUSH	SUI	RST	RC		20	Z	00	::	SBI	HST	RPO	POP	JPO	XTH	CPO	PUSH	ANI	RST	RPE	PCHL	JPE	XCHG	CPE	::	XRI	RST
C8	60	CA	CB	00				00					05				60		DB											93	E7	E8	E9	EA	EB	EC	ED	EE	EF
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8	O	0	Ш	I	_	Σ	A	8	O	0	Ш	I	7	Σ	A	8	0	0	ш	I	7	Σ	A	8	0	0	Ш	I	7	Σ	A		В	A	A	A	H B		0
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AO	A1	A2	A3	A4	A5	A6	A7	A8	6A	AA	AB	AC	AD	AE	AF	80	81	82	B3	84	85	86	87	88	89	BA	88	BC	80	BE	BF	00	5	C2	63	C4	CS	Ce	C7
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MOV	MOV	MOV	MO	MO	MO	MO	MOV	ADD	ADE	ADD	ADD	ADD	ADD	ADC	ADC	ADC	ADC	ADC	ADC	ADC	ADC	ADC	ADC	SUE	SUE	SUE	SUE	SUB	SUE	SUE	SUE	SBE	SBE	SBE	SBE	SBE	SBE	SBE	SBE
78	79	7A	78	72	70	7E	7F	80	81	82	83	84	85	86	87	88	88	8A	8B	80	80	8E	8F	90	91	92	93	94	98	96	97	86	66	94	98	96	90	9E	9F
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	B.D16	8	8	8	8	B.D8			8	8	8	0	0	C.D8			D,D16	0	0	0	0	D.D8			0	0	0	E	ш	E.D8			H.D16	Adr	I	I	I	H.D8	
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D16 = constant, or logical/arithmetic expression that evaluates to a 16 bit data quantity.

D8 = constant, or logical/arithmetic expression that evaluates to an 8 bit data quantity.

Adr = 16 bit address



Processor Technology Corp.

APPENDIX II

(8)	(exception: INX & DCX affect no Flags)	(exception: iiv		япестед	= only CARRY affected			
	all Flags except CARRY affected;	** = all Flags exce		a quantity.	to a 16 bit data quantity		io ari o ori data quarrinty.	To all Elone (C 7
		11	sion that evaluates	constant, or logical/arithmetic expression that evaluates	D16 = constant, or le	in that evaluates	constant, or logical/arithmetic expression that evaluates	D8 = constant, or logical/arithm
		A7 ANA A	MOV	57 MOV D,A	Z	32 STA Adr	38 DCX SP	X
		ANA			D3 OUT D8	SHLD	DCX	23 NX H
PSW SEI 6			NOW	MOV			18 DCX D	XX
SET		A3 ANA E	MOV	53 MCV D.E	THOUT INDIVI	O STAY B	X	XX
		ANA		MOV		3A LDA Adr	3D DCR A	Z
SET	DW D16 []	ANA	MOV		3F CMC+	0	DCR	34 NR M
SET		ANA	MOV	MOV	37 STC+	LDAX	DCR	N'A
	DS D16		THE REAL PROPERTY.					24 NR H
SET		SBB	77 MOV M.A	MOV	27 DAA*		DCR	NA
SET	EQU Di6			MOV		LOAD/STORE	DCR	N. N.
SET		9D SBB L	75 MOV M.L	4D MOV C.L				Y I
A SET 7	ORG Adr	9C SBB H	74 MOV M.H	4C MOV C.H	SPECIALS			
		9B SBB E	MOV				Mary .	
SETS	INSTRUCTION	9A SBB D	MOV	MOV		39 DAD SP	DECREMENT	INCREMENT
STANDARD	PSEUDO	SBB	MOV	MOV				D HOES BU
		98 SBB B	70 MOV M.B	48 MOV C.B	E3 XTHL	DAD		
	BF CMP A	97 SUB A	6F MOV L,A	47 MOV B,A		09 DAD B		
			MOV	MOV	POP	DOUBLE ADDT		
	CMP	95 SUB L	MOV	MOV	aca			
 	BC CMP H	94 SUB H		44 MOV B,H				
	BB CMP E		MOV	43 MOV B,E	000			
	CMP		MOV	MOV	F5 PUSH PSW	K	D8 DE SBI D8	MY I'M
				MOV	ES PUSH	_		- N
OPERATORS	BB CMP B	90 SUB B	68 MOV L.B	40 MOV B.B	DS PUSH			I/W
	ORA	ADC	MOV	MOVE	C5 PUSH B	01 LXI B.	C6 ADI)	06 MVI B.)
A. B.			NOW		STACK OPS	IMMEDIALE	IMMEDIALE	IMMEDIALE
TEST ASCII	B4 ORA H	8C ADC H	64 MOV H,H			LOAD	Acc	MOVE
	ORA	ADC	MOV					
00110B Binary	ORA	ADC	MOV					
			MOV					
_	BO ORA B	88 ADC B	60 MOV H,B	dON 00				
720 Octal	AF XRA A	87 ADD A	SF MOV E,A	CONTROL	RST	F8 RM	FC CP	FA 'M
	XHA		MOV		F7 RST 6			,
105 Decimal	XRA	ADD	MOV		RST		CPO	
1050	AC XBA H	83 ADD E	SO MOV E.E.		RST			200
1AH	XHA	ADD	MOV	17 HAL			ON CO	N SC
0BDH Hex	XRA	ADD	MOV		CF RST 1	CO RNZ	C4 CNZ	C2 NZ
			MOV			C9 RET		C3 JMP
DEFINITION								
CONSTANT		ACCUMULATOR	MOVE (cont)	ROTATET	RESTART	KEIUKN	CALL	JUMP

APPENDIX II

STANDARD COLOR CODE FOR RESISTORS AND CAPACITORS

COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLIER	TOLERANCE (%)	VOLTAGE RATING*
Black	0	abas offi	ice side of	nogge
Brown	1	10	marena libra e	100
Red	2	100	STREET STREET	200
Orange	3	1,000	hond out	300
Yellow	4	10,000	and of said	400
Green	5	100,000	fithm mon	500
Blue	6	1,000,000		600
Violet	7 sa 1	10,000,000	entwelle set	700
Gray	8	100,000,000	the bins w	800
White	9	1,000,000,000		900
Gold	witseog- is an	0.1	5	1000
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^{*}Applies to capacitors only.

(4) in soldering, wipe the tip, apply a right coarding of new

(2) Use a small pointed tip and keep it clean. Meer, a damp pint of sponge by the iron and wipe the tip on it after each use

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LOADING DIP (DUAL IN-LINE PACKAGE) DEVICES

Most DIP devices have their leads spread so that they can not be dropped straight into the board. They must be "walked in" using the following procedure:

- (1) Orient the device properly. Pin 1 is indicated by a small embossed dot on the top surface of the device at one corner. Pins are numbered counterclockwise from pin 1.
- (2) Insert the pins on one side of the device into their holes on the printed circuit card. Do not press the pins all the way in, but stop when they are just starting to emerge from the opposite side of the card.
- (3) Exert a sideways pressure on the pins at the other side of the device by pressing against them where they are still wide below the bend. Bring this row of pins into alighment with its holes in the printed circuit card and insert them an equal distance, until they begin to emerge.
- (4) Press the device straight down until it seats on the points where the pins widen.
- (5) Turn the card over and select two pins at opposite corners of the device. Using a fingernail or a pair of long-nose pliers, push these pins outwards until they are bent at a 45° angle to the surface of the card. This will secure the device until it is soldered.

SOLDERING TIPS

- (1) Use a low-wattage iron--25 watts is good. Larger irons run the risk of burning the printed-circuit board. Don't try to use a soldering gun, they are too hot.
- (2) Use a small pointed tip and keep it clean. Keep a damp piece of sponge by the iron and wipe the tip on it after each use.
- (3) Use 60-40 rosin-core solder ONLY. DO NOT use acid-core solder or externally applied fluxes. Use the smallest diameter solder you can get.
 - NOTE: DO NOT press the top of the iron on the pad or trace. This will cause the trace to "lift" off of the board which will result in permanent damage.
- (4) In soldering, wipe the tip, apply a light coating of new solder to it, and apply the tip to both parts of the joint, that is, both the component lead and the printed-circuit pad. Apply the solder against the lead and pad being heated, but not directly to the tip of the iron. Thus, when the solder

melts the rest of the joint will be hot enough for the solder to "take", (i.e., form a capillary film).

- (5) Apply solder for a second or two, then remove the solder and keep the iron tip on the joint. The rosin will bubble out. Allow about three or four bubbles, but don't keep the tip applied for more than ten seconds.
- (6) Solder should follow the contours of the original joint. A blob or lump may well be a solder bridge, where enough solder has been built upon one conductor to overflow and "take" on the adjacent conductor. Due to capillary action, these solder bridges look very neat, but they are a constant source of trouble when boards of a high trace density are being soldered. Inspect each integrated circuit and component after soldering for bridges.
- (7) To remove solder bridges, it is best to use a vacuum "solder puller" if one is available. If not, the bridge can be reheated with the iron and the excess solder "pulled" with the tip along the printed circuit traces until the lump of solder becomes thin enough to break the bridge. Braid-type solder remover, which causes the solder to "wick up" away from the joint when applied to melted solder, may also be used.

INSTALLING AUGAT PINS

Augat pins are normally supplied on carriers (e.g., 8-pin and 16-pin carriers). In many cases the PC board layout permits Augat pins to be installed while still attached to the carrier or a portion of the carrier. In other cases the pins must be installed singly.

To install two or more pins that are still attached to the carrier, proceed as follows:

NOTE

It is perfectly alright to appropriately cut a carrier to accommodate the installation. For example, an 8-pin carrier can be cut in half (4 pins each) across the short dimension to fit a 4-pin, 4-corner layout. It may also be cut in half along the long dimension to fit a 4-pin, inline layout.

- (1) Insert pins in the mounting holes from the front (component) side of board. (The carrier will hold the pins perpendicular to the board.)
- (2) Solder all pins from back (solder) side of board so the solder "wicks up" to the front side.

- (3) Check for solder bridges.
- (4) Remove carrier.

To install single pins, proceed as follows:

- (1) Hold board between two objects so that it stands on edge.
- (2) Insert pins in the mounting holes from front (component) side of board.
- (3) Solder pins from back (solder) side of board so the solder "wicks up" to the front side. (This will hold the pins firmly in place.)
- (4) Insert a component lead into one pin and reheat the solder.

 Using the component lead, adjust pin until it is perpendicular to board. Allow solder to cool while holding the pin as steady as possible. Remove component lead. Repeat this procedure with other pins.

NOTE

If cooled solder is mottled or crystallized, a "cold joint" is indicated, and the solder should be reheated.

(5) Check each installation for cold joints and solder bridges.

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Television Interface

Anyone with a bunch of memory circuits, control logic and a wire wrap gun can whip up a digital video generator with TTL output levels. The problem as I see it is to get that digital video signal into a form that the TV set can digest. The care and feeding of digital inputs to the TV set is the subject of Don Lancaster's contribution to BYTE 2 — an excerpt from his forthcoming book, TV Typewriter Cookbook, to be published by Howard W. Sams, Indianapolis, Indiana.

... CARL

We can get between a TV typewriter and a television style display system either by an rf modulator or a direct video method.

In the rf modulator method, we build a miniature, low power, direct wired TV transmitter that clips onto the antenna terminals of the TV set. This has the big advantage of letting you use any old TV set and ending up with an essentially free display that can be used just about anywhere. No set modifications are needed, and you have the additional advantage of automatic safety isolation and freedom from hot chassis shock problems.

There are two major restrictions to the rf modulator method. The first of these is that transmitters of this type must meet

certain exactly spelled out FCC regulations and that system type approval is required. The second limitation is one of bandwidth. The best you can possibly hope for is 3.5 MHz for black and white and only 3 MHz for color, and many economy sets will provide far less. Thus, long character line lengths, sharp characters, and premium (lots of dots) character generators simply aren't compatible with clip-on rf entry.

In the direct video method, we enter the TV set immediately following its video detector but before sync is picked off. A few premium TV sets and all monitors already have a video input directly available, but these are still expensive and rare. Thus, you usually have to modify your TV set, either

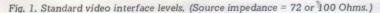
adding a video input and a selector switch or else dedicating the set to exclusive TV typewriter use. Direct video eliminates the bandwidth restrictions provided by the tuner, i-f strip, and video detector filter. Response can be further extended by removing or shorting the 4.5 MHz sound trap and by other modifications to provide us with longer line lengths and premium characters. No FCC approval is needed, and several sets or monitors are easily driven at once without complicated distribution problems.

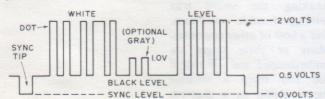
There are two limitations to the direct video technique. One is that the set has to be modified to provide direct video entry. A second, and far more severe, restriction, is that many television sets are "hot chassis" or ac-dc sets with one side of their chassis connected to the power line. These sets introduce a severe shock hazard and cannot be used as TV typewriter video entry displays unless some isolation technique is used with them. If the TV set has a power transformer, there is usually no hot chassis problem. Transistor television sets and IC sets using no vacuum tubes tend to have power transformers, as do older premium tube type sets. All others (around half the sets around today) do not.

Direct Video Methods

With either interface approach, we usually start by getting the dot matrix data, blanking, cursor, and sync signals together into one composite video signal whose

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Parker AZ 85344





form is useful to monitors and TV sets. A good set of standards is shown in Fig. 1. The signal is dc coupled and always positive going. Sync tips are grounded and blacker than black. The normal open circuit black level is positive by one-half a volt, and the white level is two volts positive. In most TV camera systems, intermediate levels between the half volt black level and the two volt white level will be some shade of gray, proportionately brighter with increasing positive voltage. With most TV typewriter systems, only the three states of zero volts (sync), half a volt (black), and two volts (white dot) would be used. One possible exception would be an additional one volt dot level for a dim but still visible portion of a message or a single word.

The usual video source impedance is either 72 or 100 Ohms. Regardless of how far we travel with a composite video output, some sort of shielding is absolutely essential.

For short runs from board to board or inside equipment, tightly twisted conductors should be OK, as should properly guarded PC runs. Fully shielded cables should be used for interconnections between the TVT and the monitor or TV set, along with other long runs. As long as the total cable capacitance is less than 500 pF or so (this is around 18 feet of RG178-U

miniature coax), the receiving end of the cable need not be terminated in a 72 or 100 Ohm resistor. When terminated cable systems are in use for long line runs or multiple outputs, they should be arranged to deliver the signal levels of Fig. 1 at their output under termination. Generally, terminated cable systems should be avoided as they need extra in the way of drivers and supply power.

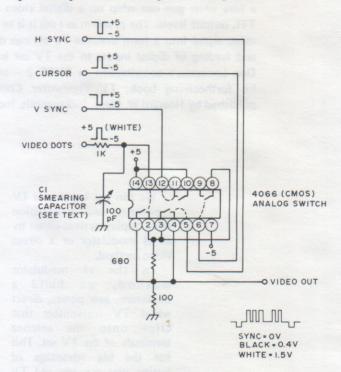
The exact width of the horizontal and vertical sync pulses isn't usually too important, so long as the shape and risetime of these pulses are independent of position control settings and power supply variations. One exception to this is when you're using a color receiver and a color display. Here, the horizontal sync pulse should be held closely to 5.1 microseconds, so the receiver's color burst sampling does in fact intercept a valid color burst. More on this later.

Intentional Smear

Fig. 2 shows us a typical composite video driver using a 4066 quad analog switch. It gives us a 100 Ohm output impedance and the proper signal levels. Capacitor C1 is used to purposely reduce the video rise and fall times. It is called a smearing capacitor.

Why would we want to further reduce the bandwidth and response of a TV system that's already hurting to begin with? In the case of a quality video monitor, we wouldn't. But if we're using an ordinary run-of-the-mill TV set, particularly one using rf entry, this capacitor can

Fig. 2. Analog switch combiner generates composite video.

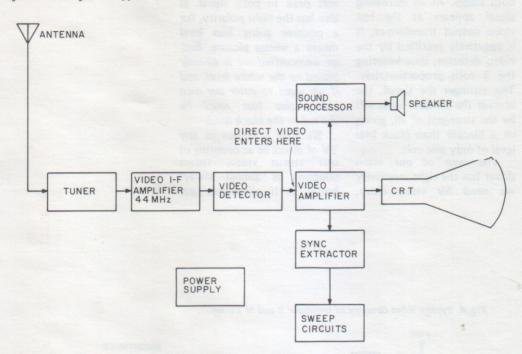


very much improve the display legibility and contrast. Why?

Because we are interested in getting the most legible character of the highest contrast we can. This is not necessarily the one having the sharpest dot rise and fall times. Many things interact to determine the upper video response of a TV display. These include the tuner settings and the i-f response and alignment, the video detector response, video peaking, the sound trap setting, rf cable reflections, and a host of other responses. Many of these stages are underdamped and will ring if fed too sharp a risetime input, giving us a ghosted, shabby, or washed out character. By reducing the video bandwidth going into the system, we can move the dot matrix energy lower in frequency, resulting in cleaner characters of higher contrast.

For most TV displays, intentional smearing will help the contrast, legibility, and overall appearance. The ultimate limit to this occurs when the dots overlap and become illegible. The

Fig. 3. Block diagram of typical B and W television.



optimum amount of intentional smear is usually the value of capacitance that is needed to just close the inside of a "W" presented to the display.

Adding a Video Input

Video inputs are easy to add to the average television set, provided you follow some reasonable cautions. First and foremost, you must have an accurate and complete schematic of the set to be modified, preferably a Sams Photofact or something similar. The first thing to check is the power supply on the set. If it has a power transformer and has the chassis properly safety isolated from the power line, it's a good choice for a TVT monitor. This is particularly true of recent small screen, solid state portable TV sets. On the other hand, if you have a hot chassis type with one side of the power line connected to the chassis, you should avoid its use if at all possible. If you must use this type of set, be absolutely certain to use one of the safety techniques outlined later in Fig. 8.

A block diagram of a typical TV set appears in Fig. 3. UHF or VHF signals picked up by the tuner are downconverted in frequency to a video i-f frequency of 44 MHz and then filtered and amplified. The output of the video i-f is transformer coupled to a video detector, most often a small signal germanium diode. The video detector output is filtered to

remove the carrier and then routed to a video amplifier made up of one or more tubes or transistors.

At some point in the video amplification, the black and white signal is split three ways. First, a reduced bandwidth output routes sync pulses to the sync separator stage to lock the set's horizontal and vertical scanning to the video. A second bandpass output sharply filtered to 4.5 MHz extracts the FM sound subcarrier and routes this to a sound i-f amplifier for further processing. The third output is video, which is strongly amplified and then capacitively coupled to the cathode of the picture tube.

The gain of the video amplifier sets the contrast of the display, while the bias setting on the cathode of the picture tube (with respect to its grounded control grid) sets the display brightness. Somewhere in the video amplifier, further rejection of the 4.5 MHz sound subcarrier is usually picked up to minimize picture interference. This is called a sound trap. Sound traps can be a series resonant circuit to ground, a parallel resonant circuit in the video signal path, or simply part of the transformer that is picking off the sound for more processing.

The video detector output is usually around 2 volts peak to peak and usually subtracts from a white level bias setting. The stronger the signal, the more negative the swing, and the blacker the picture. Sync tips are blacker than black, helping to blank the display during retrace times.

Fig. 4 shows us the typical video circuitry of a transistor black and white television. Our basic circuit consists of a diode detector, a unity gain emitter follower, and a variable gain video output stage that is capacitively coupled to the picture tube. The cathode bias sets the brightness, while the video gain sets the contrast. Amplified signals for sync and sound are removed from the collector of the video driver by way of a 4.5 MHz resonant transformer for the sound and a low pass filter for the sync. A parallel resonant trap set to 4.5 MHz eliminates sound interference. Peaking coils on each stage extend the bandwidth by providing higher impedances

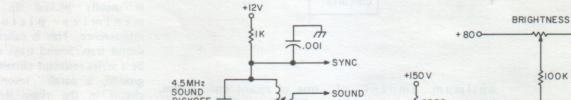
and thus higher gain to high frequency video signals.

Note particularly the biasing of the video driver. A bias network provides us with a stable source of 3 volts. In the absence of input video, this 3 volts sets the white level of the display, as well as establishing proper bias for both stages. As an increasing signal appears at the last video output transformer, it is negatively rectified by the video detector, thus lowering the 3 volts proportionately. The stronger the signal, the blacker the picture. Sync will be the strongest of all, giving us a blacker than black bias level of only one volt.

The base of our video driver has the right sensitivity we need for video entry,

accepting a maximum of a 2 volt peak to peak signal. It also has the right polarity, for a positive going bias level means a whiter picture. But, an unmodified set is already biased to the white level, and if we want to enter our own video, this bias must be shifted to the black level.

We have a choice in any TV of direct or ac coupling of our input video. Direct coupling is almost always better as it eliminates any



SIOOK PICKOFF A 6800 3V (WHITE) V (SYNC) VIDEO DETECTOR VIDEO LAST VIDEO 620µH (PEAKING) DRIVER \$4.3K +150 (2.4V) VIDEO OUTPUT +12V 250₄H (1.8V) (PEAKING) 0+12KV 470 4.5MHz \$1.5 K 47 (3V) \$470 SOURCE 100 µF PICTURE TUBE CONTRAST

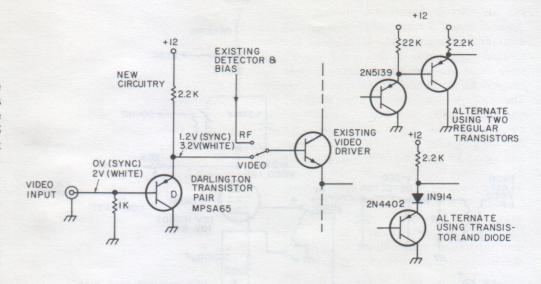
Fig. 4. Typical video circuitry of transistor B and W TV set.

Fig. 5. Direct coupled video uses 1.2 volt offset of Darlington

shading effects or any change of background level as additional characters are added to the screen. Fig. 5 shows how we can direct couple our video into a transistor black and white set. We provide a video input, usually a BNC or a phono jack, and route this to a PNP Darlington transistor or transistor pair, borrowing around 5 mils from the set's +12 volt supply. This output is routed to the existing video driver stage through a SPDT switch that either picks the video input or the existing video detector and bias network.

The two base-emitter diode drops in our Darlington transistor add up to a 1.2 volt positive going offset; so, in the absence of a video input or at the base of a sync tip. the video driver is biased to a blacker than black sync level of 1.2 volts. With a white video input of 2 volts, the video driver gets biased to its usual 3.2 volts of white level. Thus, our input transistor provides just the amount of offset we need to match the white and black bias levels of our video driver. Note that the old bias network is on the other side of the switch and does nothing in the video position.

Two other ways to offset our video input are to use two ordinary transistors connected in the Darlington configuration, or to use one transistor and a series diode



to pick up the same amount of offset, as shown in Fig. 5. If more or less offset is needed, diodes or transistors can be stacked up further to pick up the right amount of offset.

The important thing is that the video driver ends up with the same level for white bias and for black bias in either position of the switch.

Ac or capacitively coupled video inputs should be avoided. Fig. 6 shows a typical circuit. The TV's existing bias network is lowered in voltage by adding a new parallel resistor to ground to give us a voltage that is 0.6 volts more positive than the blacker than black sync tip voltage. For instance, with a 3 volt white level, and

2 volt peak to peak video, the sync tip voltage would be 1 volt; the optimum bias is then 1.6 volts. Input video is capacitively coupled by a fairly large electrolytic capacitor in parallel with a good high frequency capacitor. This provides for a minimum of screen shading and still couples high frequency signals properly. A clamping diode constantly clamps the sync tips to their bias value, with the 0.6 volt drop of this diode being taken out by the extra 0.6 volts provided for in the bias network. This clamping diode automatically holds the sync tips to their proper value, regardless of the number of white dots in the picture. Additional bypassing of the bias network by a large electrolytic may be needed for proper operation of the clamping diode, as shown in Fig. 6. Note that our bias network is used in both switch positions - its level is shifted as needed for the direct video input.

Tube type sets present about the same interface problems as the solid state versions do. Fig. 7 shows a typical direct coupled tube interface. In the unmodified

Fig. 6. Ac coupled video needs shift of bias to black level plus a clamping diode.

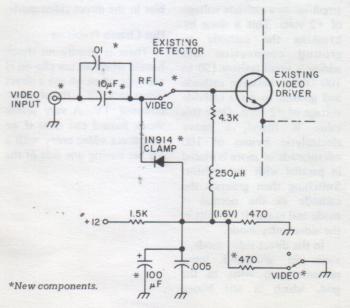
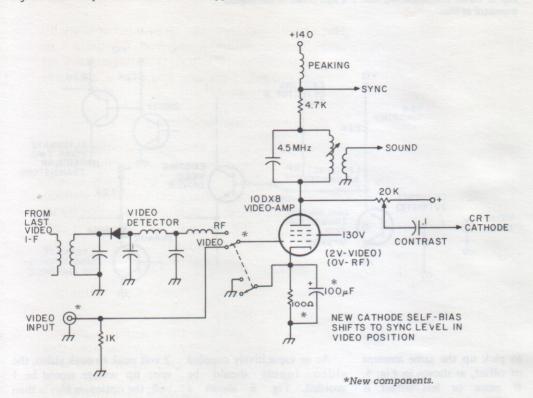


Fig. 7. Direct coupled video added to tube type B and W television.



circuit, the white level is zero volts and the sync tip black level is minus two volts. If we can find a negative supply (scarce in tube type circuits), we could offset our video in the negative direction by two volts to meet these bias levels.

Instead of this, it is usually possible to self bias the video amplifier to a cathode voltage of +2 volts. This is done by breaking the cathode to ground connection and adding a small resistor (50 to 100 Ohms) between cathode and ground to get a cathode voltage of +2 volts. Once this value is found, a heavy electrolytic bypass of 100 microfarads or more is placed in parallel with the resistor. Switching then grounds the cathode in the normal rf mode and makes it +2 volts in the video entry mode.

In the direct video mode, a sync tip grounded input presents zero volts to the grid, which is self biased minus two volts with respect to the cathode. A white level presents +2 volts to the grid, which equals zero volts grid to cathode.

Should there already be a self bias network on the cathode, it is increased in value as needed to get the black rather than white level bias in the direct video mode.

Hot Chassis Problems

There is usually no shock hazard when we use clip-on rf entry or when we use a direct video jack on a transformer-powered TV. A very severe shock hazard can exist if we use direct video entry with a TV set having one side of the

power line connected to the chassis. Depending on which way the line cord is plugged in, there is a 50-50 chance of the hot side of the power line being connected directly to the chassis.

Hot chassis sets, particularly older, power hungry tube versions, should be avoided entirely for direct video entry. If one absolutely must be used, some of the suggestions of Fig. 8 may ease the hazard. These include using an isolation transformer, husky back-to-back filament transformers, three wire power systems, optical coupling of the video input,

Fig. 8. Getting Around a Hot Chassis Problem.

and total package isolation. Far and away the best route is simply never to attempt direct video entry onto a hot chassis TV.

Making the Conversion

Fig. 9 sums up how we modify a TV for direct video entry. Always have a complete schematic on hand, and use a transformer style TV set if at all possible. Late models, small screen, medium to high quality solid state sets are often the best display choice. Avoid using junk sets, particularly very old ones. Direct coupling of video is far preferable to ac capacitor coupling. Either method has to maintain the black and white bias levels on the first video amplifier stage. A shift of the first stage quiescent bias from normally white to normally black is also a must. Use short, shielded leads between the video input jack and the rest of the circuit. If a changeover switch is used, keep it as close to the rest of the video circuitry as you possibly can.

Extending Video and Display Bandwidth

By using the direct video input route, we eliminate any bandwidth and response restrictions of an rf

modulator, the tuner, video i-f strip, and the video detector filter. Direct video entry should bring us to a 3 MHz bandwidth for a color set and perhaps 3.5 MHz for a black and white model, unless we are using an extremely bad set. The resultant 6 to 7 million dot per second rate is adequate for short character lines of 32, 40, and possibly 48 characters per line. But the characters will smear and be illegible if we try to use longer line lengths and premium (lots of dots) character generators on an ordinary TV. Is there anything we can do to the set to extend the video bandwidth and display response for these longer line lengths?

In the case of a color TV, the answer is probably no. The video response of a color set is limited by an essential delay line and an essential 3.58 MHz trap. Even if we were willing to totally separate the chrominance and luminance channels, we'd still be faced with an absolute limit set by the number of holes per horizontal line in the shadow mask of the tube. This explains why video color displays are so expensive and so rare. Later on, we'll look at what's involved in adding color to the shorter line lengths.

With a black and white TV, there is often quite a bit

Hot chassis problems can be avoided entirely by using only transformer-powered TV circuits or by using clip-on rf entry. If a hot chassis set must be used, here are some possible ways around the problem:

1. Add an isolation transformer.

A 110 volt to 110 volt isolation transformer whose wattage exceeds that of the set may be used. These are usually expensive, but a workable substitute can be made by placing two large surplus filament transformers back to back. For instance, a pair of 24 volt, 4 Amp transformers can handle around 100 Watts of set.

2. Use a three wire system with a solid ground.

Three prong plug wiring, properly polarized, will force the hot chassis connection to the cold side of the power line. This protection is useful only when three wire plugs are used in properly wired outlets. A severe shock hazard is reintroduced if a user elects to use an adaptor or plugs the system into an unknown or improperly wired outlet. The three wire system should NOT be used if anyone but yourself is ever to use the system.

3. Optically couple the input video.

Light emitting diode-photocell pairs are low in cost and can be used to optically couple direct video, completely isolating the video input from the hot chassis. Most of these optoelectronic couplers do not have enough bandwidth for direct video use; the Litronix IL-100 is one exception. Probably the simplest route is to use two separate opto-isolators, one for video and one for sync, and then recombine the signals inside the TV on the hot side of the circuit.

4. Use a totally packaged and sealed system.

If you are only interested in displaying messages and have no other input/output devices, you can run the entire circuit hot chassis, provided everything is sealed inside one case and has no chassis-to-people access. Interface to teletypes, cassettes, etc., cannot be done without additional isolation, and servicing the circuit presents the same shock hazards that servicing a hot chassis IV does.

Fig. 9. How to Add a Direct Video Input to a TV Set.

we can do to present long lines of characters, depending on what set you start out with and how much you are willing to modify the set.

The best test signal you can use for bandwidth extension is the dot matrix data you actually want to display, for the frequency response, time delay, ringing, and overshoot all get into the act. What we want to end up with is a combination that gives us reasonably legible characters.

A good oscilloscope (15 MHz or better bandwidth) is very useful during bandwidth extension to show where the signal loses its response in the circuit. At any time during the modification process, there is usually one response bottleneck. This, of course, is what should be attacked first. Obviously the better a TV you start with, the easier will be the task. Tube type gutless wonders, particularly older ones, will be much more difficult to work with than with a modern, small screen, quality solid state portable.

Several of the things we can do are watching the control settings, getting rid of the sound trap, minimizing circuit strays, optimizing spot size, controlling peaking, and shifting to higher current operation. Let's take a look at these in turn.

Control Settings

Always run a data display at the lowest possible contrast and using only as much brightness as you really need. In many circuits, low contrast means a lower video amplifier gain, and thus less of a gain-bandwidth restriction.

Eliminate the Sound Trap

The sound trap adds a notch at 4.5 MHz to the video response. If it is eliminated or switched out of the circuit, a wider video bandwidth automatically

- Get an accurate and complete schematic of the set — either from the manufacturer's service data or a Photofact set. Do not try adding an input without this schematic!
- 2. Check the power supply to see if a power transformer is used. If it is, there will be no shock hazard, and the set is probably a good choice for direct video use. If the set has one side of the power line connected to the chassis, a severe shock hazard exists, and one of the techniques of Fig. 8 should be used. Avoid the use of hot chassis sets.
- 3. Find the input to the first video amplifier stage. Find out what the white level and sync level bias voltages are. The marked or quiescent voltage is usually the white level; sync is usually 2 volts less. A transistor TV will typically have a +3 volt white level and a +1 volt sync level. A tube type TV will typically have a zero volt white level and a -2 volt sync level.
- 4. Add a changeover switch using minimum possible lead lengths. Add an input connector, either a phono jack or the premium BNC type connector. Use shielded lead for interconnections exceeding three inches in length.
- 5. Select a circuit that couples the video and biases the first video amplifier stage so that the white and sync levels are preserved. For transistor sets, the direct coupled circuits of Fig. 5 may be used. For tube sets, the circuit of Fig. 7 is recommended. Avoid the use of ac coupled video inputs as they may introduce shading problems and changes of background as the screen is filled.
- 6. Check the operation. If problems with contrast or sync tearing crop up, recheck and adjust the white and sync input levels to match what the set uses during normal rf operation. Note that the first video stage must be biased to the white level during rf operation and to the sync level for direct video use. The white level is normally two volts more positive than the sync level.

Fig. 10. Removing the sound trap can extend video bandwidth.

(b) Parallel resonant trap -(a) Response short or bypass. 4.5 MHz VIDEO WITH SOUND TRAP VIDEO OUTPUT FREQUENCY WITHOUT A FREQUENCY CONTRAST (d) Combined trap and SOUND I-F pickoff - open or (c) Series resonant trap remove (series resonant); 4.5MHz open or remove. short or bypass (parallel resonant). VIDEO VIDEO VIDEO VIDEO 45MHz

results. Fig. 10 shows us the response changes and the several positions for this trap. Generally, series resonant traps are opened and parallel resonant traps are shorted or bypassed through suitable switching or outright elimination. The trap has to go back into the circuit if the set is ever again used for ordinary program reception. Sometimes simply backing the slug on the trap all the way out will improve things enough to be useful.

TRAP

Minimizing Strays

One of the limits of the video bandwidth is the stray capacitance both inside the video output stage and in the external circuitry. If the contrast control is directly in the signal path and if it has long leads going to it, it may be hurting the response. If you are using the TV set exclusively for data display, can you rearrange the control location and simplify and shorten the video output to tube picture interconnections?

Additional Peaking

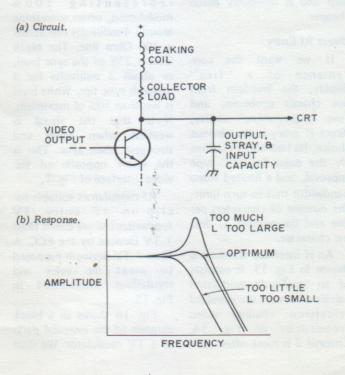
SOUND

Most TV sets have two peaking networks. The first of these is at the video detector output and compensates for the vestigial sideband transmission signal that makes sync and other

MHZ

low frequency signals double the amplitude of the higher frequency ones. The second of these goes to the collector or plate of the video output stage and raises the circuit impedance and thus the effective gain for very high

Fig. 11. Adjusting the peaking coil can extend video response.



frequencies. Sometimes you can alter this second network to favor dot presentations. Fig. 11 shows a typical peaking network and the effects of too little or too much peaking. Note that the stray capacitance also enters into the peaking, along with the video amplifier output capacitance and the picture tube's input capacitance. Generally, too little peaking will give you low contrast dots, while too much will give you sharp dots, but will run dots together and shift the more continuous portions of the characters objectionably. Peaking is changed by increasing or decreasing the series inductor from its design value.

Running Hot

Sometimes increasing the operating current of the video output stage can increase the system bandwidth - IF this stage is in fact the limiting response, IF the power supply can handle the extra current, IF the stage isn't already parked at its gain-bandwidth peak, and IF the extra heat can be gotten rid of without burning anything up. Usually, you can try adding a resistor three times the plate or collector load resistor in parallel, and see if it increases bandwidth by 1/3. Generally, the higher the current, the wider the bandwidth, but watch

carefully any dissipation limits. Be sure to provide extra ventilation and additional heatsinking, and check the power supply for unhappiness as well. For major changes in operating current, the emitter resistors and other biasing components s h o u l d a l s o b e proportionately reduced in value.

Spot Size

Even with excellent video bandwidth, if you have an out-of-focus, blooming, or changing spot size, it can completely mask character sharpness. Spot size ends up the ultimate limit to resolution, regardless of video bandwidth.

Once again, brightness and contrast settings will have a profound effect, with too much of either blooming the spot. Most sets have a focus jumper in which ground or a positive voltage is selected. You can try intermediate values of voltage for maximum sharpness. Extra power supply filtering can sometimes minimize hum and noise modulation of the spot.

Anything that externally raises display contrast will let you run with a smaller beam current and a sharper spot. Using circularly polarized filters, graticule masks, or simple colored filters can

Fig. 12. Contrast Enhancing Filter Materials.

Circularly polarized filters:

Polaroid Corp. Cambridge MA 02139

Anti-reflection filters:

Panelgraphic Corp. 10 Henderson Dr. West Caldwell NJ 07006

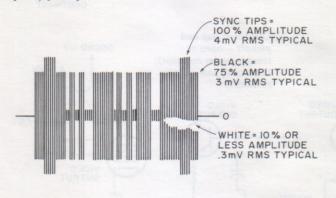
Light control film:

3M Visual Products Div. 3M Center St. Paul MN 55101

Acrylic plexiglas filter sheets:

Rohm and Haas Philadelphia PA 19105

Fig. 13. Standard rf interface levels. Impedance = 300Ω . Carrier frequency per Fig. 14.



minimize display washout from ambient lighting. Fig. 12 lists several sources of material for contrast improvement. Much of this is rather expensive, with pricing from \$10 to \$25 per square foot being typical. Simply adding a hood and positioning the display away from room lighting will also help and is obviously much cheaper.

Direct Rf Entry

If we want the convenience of a "free" display, the freedom from hot chassis problems, and "use it anywhere" ability, direct rf entry is the obvious choice. Its two big limitations are the need for FCC type approval, and a limited video bandwidth that in turn limits the number of characters per line and the number of dots per character.

An rf interface standard is shown in Fig. 13. It consists of an amplitude modulated carrier of one of the standard television channel video frequencies of Fig. 14. Channel 2 is most often used with a 55.250 MHz carrier frequency, except in areas where a local commercial Channel 2 broadcast is intolerably strong. Circuit cost, filtering problems, and stability problems tend to increase with increasing channel number.

The sync tips are the strongest part of the signal, representing 100% modulation, often something around 4 millivolts rms across a 300 Ohm line. The black level is 75% of the sync level, or about 3 millivolts for 4 millivolt sync tips. White level is less than 10% of maximum. Note that the signal is weakest when white and strongest when sync. This is the exact opposite of the video interface of Fig. 1.

Rf modulators suitable for clip-on rf entry TV typewriter use are called Class 1 TV Devices by the FCC. A Class 1 TV device is supposed to meet the rules and regulations summarized in Fig. 15.

Fig. 16 shows us a block diagram of the essential parts of a TV modulator. We start

Fig. 14. Television Picture Carrier Frequencies.

Channel 2 55.25 MHz

Fig. 15. FCC Regulations on Class 1 TV Devices. More complete information appears in subpart H of Part 15 and subpart F of Part 2 of the Federal Communications Commission Rules and Regulations. It is available at many large technical libraries.

A Class 1 TV device generates a video modulated rf carrier of a standard television channel frequency. It is directly connected to the antenna terminals of the TV set.

The maximum rms rf voltage must be less than 6 millivolts using a 300 Ohm output line.

The maximum rf voltage on any frequency more than 3 MHz away from the operating channel must be more than 30 dB below the peak in-channel output voltage.

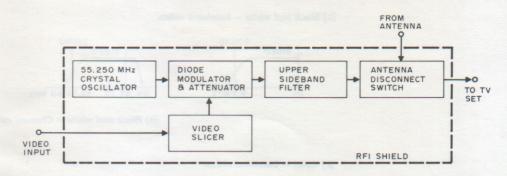
An antenna disconnect switch of at least 60 dB attenuation must be provided.

No user adjustments are permitted that would exceed any of the above specifications.

Residual rf radiation from case, leads and cabinet must be less than 15 microvolts per meter.

A Class 1 TV device must not interfere with TV reception.

Type approval of the circuit is required. A filing fee of \$50 and an acceptance fee of \$250 is involved.



with a stable oscillator tuned to one of the Fig. 14 frequencies. A crystal oscillator is a good choice, and low cost modules are widely available. The output of this oscillator is then amplitude modulated. This can be done by changing the bias current through a silicon small signal diode. One milliampere of bias current makes the diode show an ac and rf impedance of 26 Ohms. Half a mil will look like 52 Ohms, and so on. The diode acts as a variable resistance attenuator in the rf circuit, whose bias is set and changed by the video circuit.

Since diode modulators are non-linear, we can't simply apply a standard video signal to them and get a standard rf signal out. A differential amplifier circuit called a video slicer may be used to compensate for this non-linearity. The video slicer provides three distinct currents to the diode modulator. One of these is almost zero for the white level, while the other two provide the black and sync levels. A contrast control that sets the slicing level lets you adjust the sync tip height with respect to the black level. The video slicer also minimizes rf getting back into the video. An attenuator to reduce the size of the modulated signal usually follows the diode modulator.

An upper side band filter removes most of the lower sideband from the AM modulated output, giving us a vestigial sideband signal that stays inside the channel band limits. This same filter eliminates second harmonic effects and other spurious noise. The filter's output is usually routed to an antenna disconnect switch and the TV's antenna terminals. A special switch is needed to provide enough isolation.

Some of the actual circuitry involved is shown in Fig. 17. The video slicer consists of a pair of high gain, small signal NPN transistors, while the oscillator is a commercially available module.

Rf entry systems always must be direct coupled to the antenna terminals of the set and should never provide any more rf than is needed for a minimum snow-free picture. They should be permanently tuned to a single TV channel. Under no circumstances should an antenna or cable service hookup remain connected to the set during TVT use, nor should radiation rather than a direct rf cable connection ever be used. .

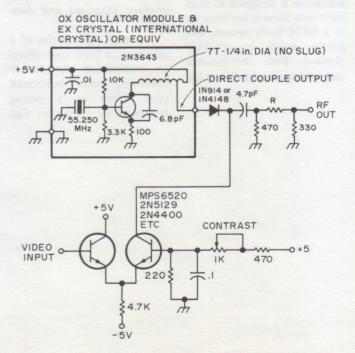
Color Techniques

We can add a full color capability to a TV typewriter system fairly easily and cheaply — provided its usual black and white video dot rate is low enough in frequency to be attractively displayed on an ordinary color TV. Color may be used to emphasize portions of a message, to attract attention, as part of an electronic game, or as obvious added value to a graphics display. Color techniques work best on TV typewriter systems having a horizontal frequency very near 15,735 Hertz.

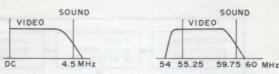
All we basically have to do is generate a subcarrier sine wave to add to the video output. The phase of this subcarrier (or its time delay) is shifted with respect to what the phase was immediately after each horizontal sync pulse to generate the various colors.

Fig. 18 shows us the differences between normal color and black and white operation. Black and white baseband video is some 4 MHz wide and has a narrow 4.5 MHz sound subcarrier. The video is amplitude modulated, while the sound is narrow band frequency

Fig. 17. Channel two oscillator, modulator, video slicer and attenuator. R sets output level.



(a) Black and white - baseband video.



(b) Black and white - Channel two rf.

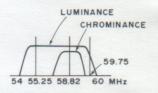
(c) Color - baseband video.

modulated. This translates up to a 6 MHz rf channel with a vestigial lower sideband as shown in Fig. 18(b).

To generate color, we add a new pilot or subcarrier at a magic frequency of 3.579545 MHz — see Fig. 18(c). What was the video is now called the luminance, and is the same as the brightness in a black and white system. The new subcarrier and its modulation is called the chrominance signal and determines what color gets displayed and how saturated the color is to be.

Since the black and white information is a sampled data system that is scanned at the vertical and horizontal rates, there are lots of discrete holes in the video spectrum that aren't used. The color subcarrier is designed to stuff itself into these holes (exactly in a NSTC color system, and pretty much in a TVT display). Both chrominance and luminance signals use the

LUMINANCE CHROMINANCE SOUND



(d) Color - Channel two rf.

same spectral space, with the one being where the other one isn't, overlapping comb style.

The phase or relative delay of the chrominance signal with respect to a reference determines the instantaneous color, while the amplitude of this signal with respect to the luminance sets the saturation of the color. Low amplitudes generate white or pastel shades, while high amplitudes of the chrominance signal produce saturated and deep colors.

At least eight cycles of a reference or burst color phase are 'transmitted immediately following each horizontal sync pulse as a timing reference, as shown in Fig. 19. The burst is around 25% of maximum amplitude, or about the peak to peak height of a sync pulse.

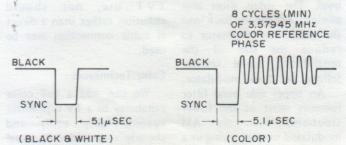
The TV set has been trained at the factory to sort all this out. After video detection, the set splits out the chrominance channel with a bandpass amplifier and then synchronously demodulates it with respect to an internal 3.58 MHz reference. The phase of this demodulation sets the color and the amplitude sets the saturation by setting the

ratios of electron beam currents on the picture tube's red, blue and green guns.

Meanwhile, the luminance channel gets amplified as brightness style video. It is delayed with a delay line to make up for the time delay involved in the narrower band color processing channel. It is then filtered with two traps the 4.5 MHz sound trap, and a new trap to get rid of any remaining 3.58 MHz color subcarrier that's left. The luminance output sets the overall brightness by modulating the cathodes of all three color guns simultaneously.

Just after each horizontal sync pulse, the set looks for the reference burst and uses this reference in a phase

 F_{ig} . 19 Adding a color reference burst to the back porch of the horizontal sync pulses.



J3 Keyboard Connector (between U64 and U65)

Sol-PC, Rev. 2,E 10/18/76

1 ground 11 ground 2 +5v 12 +5v 3 Kbd Data Ready 13 Restart 4 Break 14 Local 5 Kbd Data Ø 15 KBd Data 4 6 Kbd Data 1 16 KBd Data 5 7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7 9 +5v 19 +5v	
3 Kbd Data Ready 13 Restart 4 Break 14 Local 5 Kbd Data Ø 15 KBd Data 4 6 Kbd Data 1 16 KBd Data 5 7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7	
3 Kbd Data Ready 13 Restart 4 Break 14 Local 5 Kbd Data Ø 15 KBd Data 4 6 Kbd Data 1 16 KBd Data 5 7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7	
Break 14 Local 5 Kbd Data Ø 15 KBd Data 4 6 Kbd Data 1 16 KBd Data 5 7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7	
5 Kbd Data Ø 15 KBd Data 4 6 Kbd Data 1 16 KBd Data 5 7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7	
6 Kbd Data 1 16 KBd Data 5 7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7	
7 Kbd Data 2 17 KBD Data 6 8 Kbd Data 3 18 KBD Data 7	
8 Kbd Data 3 18 KBD Data 7	
7	
10 ground 20 ground	

J4 Display Expansion Connector (between U28, 29)

pin no.	Signal name	pin no.	Signal name
1	ground	11	ground
2	N.C.	12	N.C.
3	Char. addr. 4	13	Dot Clock, 14.318MHz
4	Character clock	14	Composite sync. out
5	Char. addr. Ø	15	TTL Serial Data Out
6	Char. addr. 1	16	Composite blanking out
7	Char. addr. 2	17	Scan advance out
8	Char. addr. 3	18	Char. addr. 5
9	N.C.	19	N.C.
10	ground	20	ground

J5 Personality Module Edge Connector

pin no.	Signal name	pin no.	Signal name	
B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1	Ground +5VDC Addr. 9 Addr. 8 Addr. 7 INT Bus Ø INT Bus 1 INT Bus 2 INT Bus 3 INT Bus 4 INT Bus 5 Program Ø Program 1 Program 2 Program 3	A15 A14 A13 A12 A11 A10 A9 A8 A7 A6 A5 A4 A3 A2 A1	Ground +5VDC Addr. Ø Addr. 4 Addr. 3 Addr. 2 Addr. 1 Addr. 5 Addr. 6 C4 CØ INT Bus 6 INT Bus 7 -12VDC +12VDC	11 81 12 12 12 12 12 12 12 12 12 12 12 12 12

- J6 Audio Out for CUTS Cassette Interface: Mini-phone jack at rear panel
- J7 Audio In for CUTS Cassette Interface: Mini-phone jack at rear panel
- J8 Tape Motor Control 1: (See output port FA, bit 7) Sub-mini jack at rear panel
- J9 Tape Motor Control 2: (See output port FA, bit 6) Sub-mini jack at rear panel

Ground	0
+5VDC	0
-12 VDC	0
+12 VDC	0
-12 VDC	0
+5 VDC	0
Ground	0

S-100 Bus Definitions

PIN	CVMDOT	NAME	FINCTION
NUMBER 1	SYMBOL +8V		FUNCTION egulated voltage on bus, supplied PC boards and regulated to 5V
			olied by Sol-20 supply
2	-16V	-16 Volts Pos:	itive unregulated voltage supplied by -20 power supply
3	XRDY	EXTERNAL READY Exte	ernal ready input to CPU ready
4	VIO	Vectored Interrupt Line #0	cuitry
5	VII	Vectored Interrupt Line #1	
6	VI2	Vectored Interrupt Line #2	
7	VI3	Vectored Interrupt Line #3	
8	VI4	Vectored Interrupt Line #4	
9	VI5	Vectored Interrupt Line #5	
10	VI6	Vectored Interrupt Line #6	emen lanul? on man
11	VI7	Vectored Interrupt Line #7	
12 13	XRDY2	EXTERNAL READY #2	not used by Sol-PC
to 17	TO BE DEF	INED	
18	STAT DSB	STATUS DISABLE	-Allows the buffers for the 8 status lines to be tri-stated
19	C/C DSB	COMMAND/CONTROL DISABLE	-Allows the buffers for the 6 output command/control lines to be tri-stated
20	UNPROT	UNPROTECT	- not used by Sol-PC electronics
21	SS	SINGLE STEP	- not used by Sol-PC
22	ADD DSB	ADDRESS DISABLE	-Allows the buffers for the 16 address lines to be tri-stated
23	DO DSB	DATA OUT DISABLE	-Allows the buffers for the 8 data output lines to be tri-stated
24	Ø2	PHASE 2 CLOCK)
25	Ø1	PHASE 1 CLOCK	
26	PHLDA	HOLD ACKNOWLEDGE	Processor command/control output signal that appears in response to

Processor command/control output signal that appears in response to the HOLD signal; indicates that the data and address bus will go to the high impedance state and processor will enter HOLD state after completion of the current machine cycle.

S-100 Bus Definitions-continued

DIN			
PIN NUMBER	SYMBOL	NAME	FUNCTION
27	PWAIT		Processor command/control signal that
			appears in response to the HOLD signal;
			indicates that the data and address bus
			vill go to the high impedance state and
			rocessor will enter HOLD state after
			completion of the current machine cycle
28	PINTE		Processor command/control output signal;
		ENABLE	ndicates interrupts are enabled, as
		d	letermined by the contents of the CPU
			nternal interrupt flip-flop. When the
			lip-flop is set (Enable Interrupt
			nstruction), interrupts are accepted by
			the CPU; when it is reset (Disable
			interrupt instruction), interrupts are
29	AF		nhibited.
30	A5 A4	Address Line #5	
31	A3	Address Line #4	
32	A15	Address Line #15	(MSB)
33	A12	Address Line #12	
34	A9	Address Line #9	
35	DIO1	Data In/Out line	#1 same as pin 94
36	DIOØ	Data In/Out line	
37	A10	Address Line #10	
38	DIO4	Data In/Out Line	
39	DIO5	Data In/Out Line	
40	DIO6	Data In/Out Line	
41	DIO2	Data In/Out Line	
42	DIO3	Data In/Out Line	
43	DIO7	Data In/Out Line	
44	SM1	MACHINE CYCLE 1	-Status output signal that indicates
			that the processor is in the fetch
			cycle for the first byte of an
45	COUTT	OUTPUT	instruction -Status output signal that indicates
43	SOUT	OUIFUI	the address bus contains the address
			of an output device and the data bus
	LIE STATE		will contain the ouput data when PWR
			is active
46	SINP	INPUT	-Status output signal that indicates
Toronto al	1.	The same of the same	the address bus contains the address
			of an input device and the input data
		Hamari Misa a ana 1974	should be placed on the data bus when
		etwyltia slidw	PDBIN is active
47	SMEMR	MEMORY READ	-Status output signal that indicates
		i destruction re	the data bus will be used to read
		A STRONGER OF BORD	memory data
48	SHLTA	HALT ACKNOWLEDGE	- Status output signal that acknowledges
elage	un in <u>icata d</u> osi	e to enimized .	a HALT instruction
49	CLOCK	CLOCK	- Inverted output of the Ø2 CLOCK
50	GND	GROUND	
51	+8V	+8 Volts	Unregulated input to 5 volt
			regulators supplied by Sol-20
52	-16V	-16 Volts	power supply
32	-100	-10 VOILS	Negative unregulated voltage supplied by Sol-20 power supply
			by bor-20 power suppry

S-100 Bus Definitions-continued

DIN			
PIN NUMBER 53 54 55	SYMBOL SSWI EXT CLR RTC	NAME SENSE SWITCH INPUT EXTERNAL CLEAR REAL TIME CLOCK	not used by Sol-PC electronics not used by Sol-PC electronics
56 57	STSTB DIGI	STATUS STROBE DATA INPUT GATE #1	not used by Sol When low forces PDBINS low and forces CPU input multiplexers to the DIO bus. During CPU DBIN cycle, disables CPU DIO bus drivers
58 59	FRDY	FRONT PANEL READY	-When low disables MWRITE driver
to 64	TO BE DEI	FINED	
65	MREQ	MEMORY REQUEST	-Z 80 signal not used by Sol-PC electronics
66	REF	REFRESH	- Z 80 signal not used by Sol-PC electronics
67	PHANTOM	PHANTOM DISABLE	-Output from CPU section used to disable RAM or ROM during power on initialization program execution
68	MWRITE	MEMORT WRITE	-Indicates that the data present on the Data Out Bus is to be written into the memory location currently on the address bus
69	PS	PROJECT STATUS	-not used by Sol-PC electronics -not used by Sol-PC electronics
70 71	PROT RUN	PROTECT	- not used by Sol-PC electronics
72	PRDY	PROCESSOR READY	- Memory and I/O input to the CPU Board wait circuitry
73	PINT	INTERRUPT REQUEST	- The processor recognizes an interrupt request on this line at the end of the current instruction or while halted. If the processor is in the HOLD state or the Interrupt Enable flip-flop is reset, it will not honor the request.
sadhba		HOLD	-Processor command/control input signal that requests the processor enter the HOLD state; allows an external device to gain control of address and data buses as soon as the processor has completed its use of these buses for the current machine cycle
75	PRESET	RESET	-Processor command/control input; while activated, the content of the program counter is cleared and the instruction register is set to 0
76	PSYNC	SYNC	-Processor command/control output; provides a signal to indicate the beginning of each machine cycle
		WRITE BESSELVES TO	-Processor command/control output; used for memory write or I/O out- put control. Data on the data bus
78	PDBIN	DATA BUS IN	is stable while the PWR is active -Processor command/control output; indicates to external circuits that the data bus is in the input mode

S-100 Bus Definitions-continued

PIN	grado.	TO SIZONARY OF GOTING
NUMBER	SYMBOL	NAME FUNCTION
79	A0	Address Line #0 (LSB)
80	A1	Address Line #1
81	A2	Address Line #2
82	A6	Address Line #6
83	A7	Address Line #7
84	A8	Address Line #8
85	A13	Address Line #13
86	A14	Address Line #14
87	A11	Address Line #11
88	DIO2	Data In/Out Line #2 same as pin 41
89	DI03	Data In/Out Line #3 same as pin 42
90	DIO7	Data In/Out Line #7 same as pin 43
91	DI04	Data In/Out Line #4 same as pin 38
92	DI05	Data In/Out Line #5 same as pin 39
93	DI06	Data In/Out Line #6 same as pin 40
94	DI01	Data In/Out Line #1 same as pin 35
95	DIOØ	Data In/Out Line #0 same as pin 36
96	SINTA	○ INTERRUPT ACKNOWLEDGE -Status output signal; acknowledges
		signal for INTERRUPT request
97	SWO	WRITE OUT -Status output signal; indicates
		that the operation in the current
		machine cycle will be a WRITE
0.0	COMACIZ	memory or output function
98	SSTACK	STACK -Status output signal indicates
		that the address bus holds the
		pushdown stack address from the
00	700	Stack Pointer
99	POC	POWER-ON CLEAR
100	GND	GROUND

SWITCH FUNC	TION DEFINITION -	- Display CtrlSch	ematic Drawing #4
		Function	
Switch No.	Mnemonic	ON	OFF
S1-1	RST	Restart to Zero	RUN (Dwg. #1)
S1-2	not used		
51-3	BLANK	Blank Ctrl Charact	ers Display Ctrl Char.
51-4	Polarity		
S1-5	BLINK	Blinking cursor	*Solid or NO cursor
S1-6	SOLID'	Solid cursor	*Blinking or NO cursor

*NO cursor if S1-5 and S1-6 are off at same time. Both switches should <u>not</u> be <u>on</u> at the same time.

Drawing #3	Sense Switch	Function		
Switch No.	Mnemonic	ON	OFF	
S2-1	SSWØ	LSB, data bit	Ø=LO	HI
S2-2thruS2-7		etc.	LO	HI
S2-8	SSW7	MSB data bit 7	LO	HI

SERIAL I/O BAUD RATE SWITCH -- Schematic Drawing #3
Function

		Function						
Switch No.	Mnemonic	ON OFF						
S3-1	75	75 BAUD Do not turn more than						
S3-2	11	110 BAUD * one switch on at a time						
S3-3	15	150 BAUD						
S3-4	30	300 BAUD						
S3-5	60							
		600 BAUD						
S3-6	12	1200 BAUD						
S3-7	24/48	2400 or 4800(normally 2400 if not jumpered K to M)						
S3-8	96	9600 BAUD						
Switch No.	CONTROL Schema Mnemonic	ON						
S4-1	PS	Parity even Parity odd (if S4-5 on)						
S4-2	WLS 1	Data word length (8bits 7bits 6bits 5bits)						
S4-3	WLS 2	ON ON OFF OFF ON OFF ON OFF						
S4-4	SBS	1 stop bit 2 stop bits (1.5 if 5bits/word)						
S4-5	PI	Parity No parity						
S4-6 F/H		Half duplex Full duplex						
5 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Tengle 100 120 H							
MI	EMORY ALLOCATION:	ON CARD						
Hexidecimal		Function						
CØØØ -		Personality Module ROM or PROM (2048 words)						
C800 -	CBFF	System RAM (1024 words)						
CCØØ -	CFFF	Display RAM Memory (1024 characters)						
/ / 1965	reatible sizele esci	MIROS /						
01	N CARD INPUT PORT	ALLOCATION						
	. 011110 1111 01 1 0111	7/12/ 10-7/103 1						
Hexidecimal	Port	(E)						
	TOIL	Function						
Address		Function						
F8		Status, Serial Comm. channel						
F9		Serial Communication Channel Data						
FA	1111	Aux. Status, Cassette tape interface, parallel I/O, keyboard input						
FB		Audio Cassette (CUTS) Data						
FC		Keyboard Data (from J3)						
FD		Parallel Port Data (from J2)						
FE		Display Status						
FF		Sense Switch (S2-1 thru S2-8)						
Testur	of the second second							
	OUTPUT PORTS							
Hex Port A	Address	Function						
F8		Control, Serial Comm. Channel						
F9		Data, 'Serial Comm. Channel						
FA		Control, Parallel I/O, CUTS Cassette I/O						
FB		Data, CUTS audio cassette Interface						
FC		Alarm (optional)						
FD		Data, Parallel output Data channel						
FE FF		Scroll control, Display Section						
H H								
FF		not used in Sol-PC						

STATUS PORT INPUT BIT ASSIGNMENTS

PORT F8 (STATUS, SERIAL COMM. CHANNEL)	PORT	F8	(STATUS,	SERIAL	COMM.	CHANNEL)
--	------	----	----------	--------	-------	---------	---

BIT	SIGNAL NAME	FUNCTION	ACTIVE DIRECTION
Ø 1 2 3 4 5 6 7	SCD SDSR SPE SFE SOE SCTS SDR STBE	Serial Carrier Detect (EIA) Serial Data Set Ready (EIA) Serial Parity Error Serial Framing Error Serial Overrun Error Serial Clear to Send (EIA) UART Serial Data Ready UART Serial Transmit Buffer Empty	<pre>l carrier link ok error error error clear ready empty</pre>
PORT FA	(AUX. STATUS, C	ASSETTE TAPE INTERFACE, PARALLEL I/O,	KEYBOARD INPUT)
BIT	SIGNAL NAME	FUNCTION	ACTIVE DIRECTION
Ø 1 2 3 4 5 5 6	KDR PDR PXDR TFE TOE not used	Keyboard Data Ready Parallel Data Ready Parallel eXternal Device Ready Tape Framing Error Tape Overrun Error	<pre>Ø ready Ø ready Ø ready l error l error</pre>
6 7	TDR TTBE	Tape Data Ready Tape Transmitter Buffer Empty	1 ready 1 empty
PORT FE (DISPLAY STATUS		
BIT	SIGNAL NAME	FUNCTION	ACTIVE DIRECTION
Ø	SOK	Scroll OK; 4 sec timeout after scroll	Ø time complete

CONTROL PORT OUTPUT BIT ASSIGNMENTS

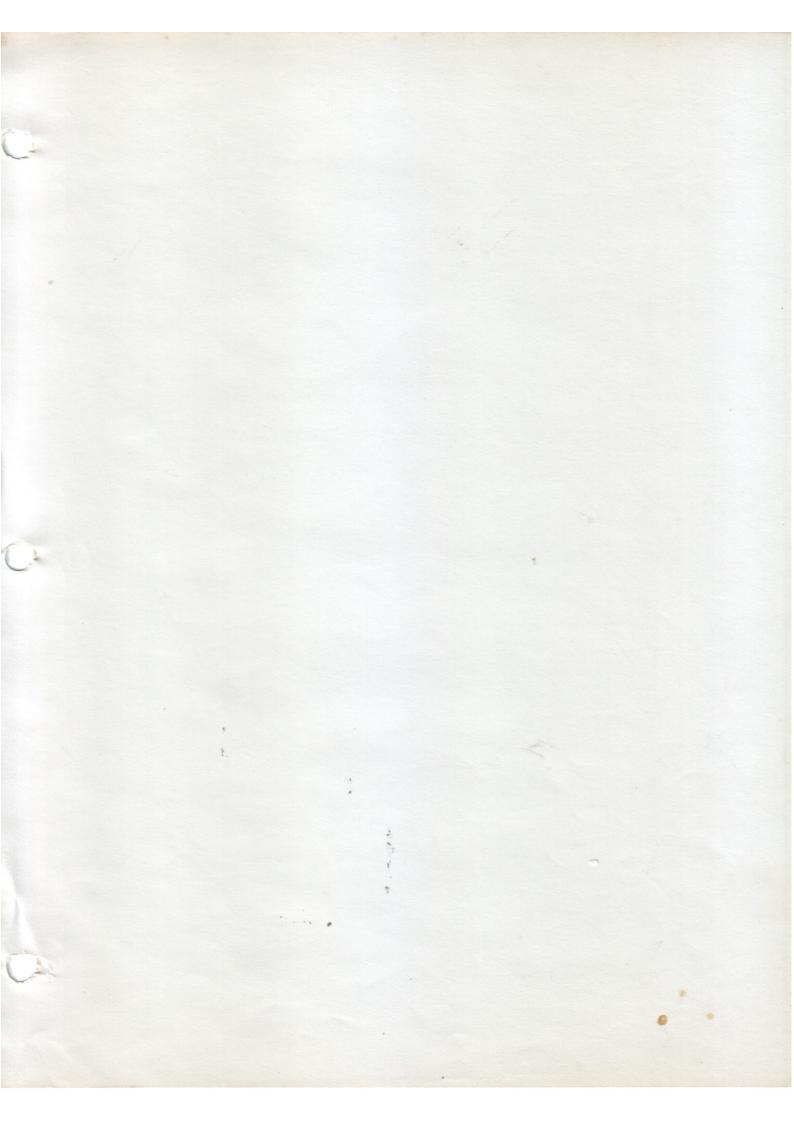
PORT F8 (CONTROL, SERIAL COMM. CHANNEL)

(001/11/0	2) BERTAL COMM. CHANNE	L)	
BIT SIGNAL	NAME	FUNCTION	ACTIVE DIRECTION
4 SRTS	Serial Request	t to Send	l request
PORT FA (CONTRO	L, PARALLEL I/O, CUTS (CASSETTE I/O)	
BIT SIGNAL	NAME	FUNCTION	ACTIVE DIRECTION
3 PIE 4 PUS 5 TBR 6 TT2 7 TT1	Parallel Input Parallel Unit Tape Baud Rate Tape Transport Tape Transport	Select e (300/1200) t 2	1 pin 3 J2 low 0 pin 14 J2 low 0 1200 Baud 0 run tape 0 run tape
PORT FE (SCROLL	CONTROL, DISPLAY SECTI	ION)	
BIT SIGNAL	NAME:	ZINOTION	AGENTIN STREET

FORT FE	(SCROLL CONTROL	J, DISPLAY SECTION)	
BIT	SIGNAL NAME	<u>FUNCTION</u>	ACTIVE DIRECTION
Ø - 3	BDLA	Beginning Display Line Absolute address	4-bit data nybble
4 - 7	FDSP	First Displayed Line Screen Position	4-bit data nybble

CONNECTOR DESIGNATION

J6	Cassette Tape Audio Out
J7	Cassette Tape Audio In
J8	Tape Motor 1
J9	Tape Motor 2
J10	PC Power
J11	S-100 Bus Expansion
	J8 J9 J10





The Sol Systems Manual is organized in a modular fashion. Purchasers of different Sol models will receive the appropriate sections of the manual. This mailing is to purchasers of Sol-PC, Sol-10 and Sol-20 units and includes Sections I, III, IV, IX and X, as well as numerous appendices. Please see the Table of Contents on pages i and ii. Sol-10 and Sol-20 owners will also receive sections II and V through VIII.

We will soon be sending more sections to you as they are printed. At the same time we will ship the Sol System binder and Sol-BASIC5 cassette along with two computer games and further diagnostic software. Sol-PC purchasers will also receive section VIII and Appendix V.

SOI-REG (DOES NOT APPLY TO REV B AND ABOVE



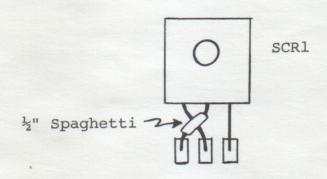
ASSEMBLY PROCEDURE CHANGE NOTICE #2

The Sol-REG PC board shipped with your kit contains an error that existed in our original art and a silk screen (legend) error. These errors relate specifically to the SCRl installation portion of Step 10 and the Sol-20 DC cable installation instruction (Step 13) in Section II of the Sol Systems Manual.

Reference Section II, Step 10, SCR1 Installation

With your kit, use the following procedure to install SCRl in place of the instructions provided on Page II-8 of the manual:

() Position SCR1 (IR106B2 or MCR106-2) on heat sink with component nomenclature up and observe how the left and center leads must be bent to install SCRl as shown in Figure 1. Bend these two leads as required and install a ½" piece of spaghetti over the center lead. Place circular mica insulator between heat sink and SCR1, insert leads and fasten SCRl-insulator-sink to PC board with a 4-40 x 7/16 screw, lockwasher and nut. Insert screw from back (solder) side of board and drive nut finger tight.



SCRl installation. Figure 1.

Reference Section II, Step 13'.

On the Sol-REG PC board you received, two pads are labeled X5. One is located in the upper right-hand area of the board above C4 and to the right of pad T3; the other is located between C5 and FWB2 just above pad T4.

IGNORE THE X5 PAD LOCATED ABOVE C4.

Connect the red-white lead of the Sol-20 DC cable to the X5 located between C5 and FWB2.

CN #2

Sol POWER SUPPLY



ASSEMBLY PROCEDURE CHANGE NOTICE #4

Reference Section II, Page II-9

Add the following step to "Assembly-Test Procedure":

() Step 13. Test Sol-REG for short circuits. Check for continuity between FWB1 (MDA970-1) mounting screw and the following points. The resistance should be greater than 20 ohms in all cases.

X2 T2

T1

Q1, Emitter

Q1, Base

Q1, Collector

D1, right-hand lead

R1, left hand lead

D3, top lead

D4, top lead *D3, bottom lead

*D4, bottom lead

*Resistance will be initially low due to C4 and C5, but it should increase to greater than 20 ohms after a few seconds.

Sol-BPB

REVISION LEVEL B BOARDS ONLY



ASSEMBLY PROCEDURE CHANGE NOTICE #5

Reference Section VI, Step 4, Page VI-8

On some Rev B boards, the blue and two white leads on the cable are too large for the mounting holes. To overcome this problem, prepare these three leads as follows:

- 1. Cut off end of white and blue wires, about 1/8" back into insulation.
- 2. Cut off as many strands of each wire as needs in order to insert through mounting hole.

CN#5A



ASSEMBLY PROCEDURE CHANGE NOTICE #6-2

A problem was detected in early Sol-Reg regulator boards in which the "crowbar" circuit would trigger without adequate reason and short-circuit the 5-volt output. A circuit change was made which will be reflected on revision level C and above.

Refer to the three Engineering Change Orders numbered ECO 10017, ECO 10018, and ECO 10019.

Reference Section 2.7.2, step 10;

Following visual inspection carry out the trace cuts shown on ECO 10017.

Reference Section 2.7.2, step 14;

Install the following components as shown in ECO 10019:

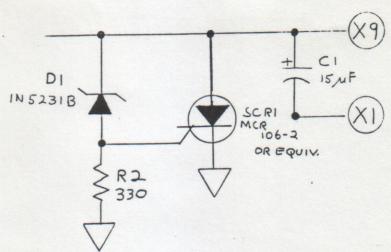
	R13	3.30	orange-orange-brown
()	R14	100	brown-black-brown
()	C8	.047uf	disc ceramic capacitor

Reference Schematic, Regulator

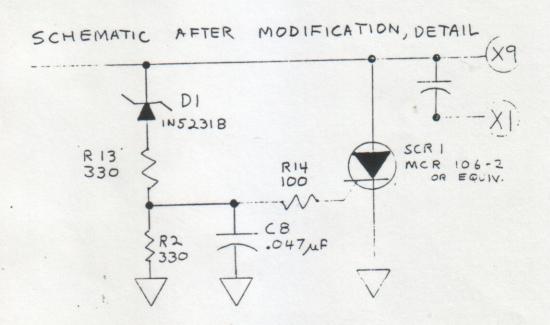
Attach ECO 10018 to the schematic or insert the new components as indicated in this ECO.

CN #6-2

ENGINEERING CHANGE ORDER

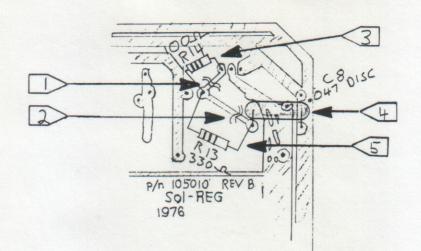


SCHEMATIC BEFORE MODIFICATION, DETAIL



REF. DES.	PART C	OR DWG. NO.	PART DESCRIPTION		
NEXT	ASSY.	USED ON	Processor	DRAWN: A. ATTARIA NI	
Ecol	0017	105010	Technology	DATE: 2/8/77	DATE: 2-1-17
			Corporation	CHECKED: K. Jorgenson	RELEASED: R. Marsh
			6200 Hollis Street Emeryville, CA 94608	DATE: 2/9/77	DATE: 2-9-77
			MODIFICATION Schen	$C \setminus A$	

ENGINEERING CHANGE ORDER



BOTTOM VIEW (Solder Side) NOTES. UNLESS OTHERWISE SPECIFIED:

D CUT Trace Connecting Anode of DI with gATE Of SCRI.

2) CUT trace Connecting RZ with DI.

3) Solder RIH (New) To pads of DI ANODE + SCRIGATE.

4) SOLDER (8 (New) TO PAds of R2 (both Ends).

5) Solder RI3 (New) TO pads of DI (ANOOE) + RZ.

		REF. D	RAWING NO	o. 10	0510	>					
			FICATION, F				,C	Parl	BAR		
		66 Er	200 Hollis Street meryville, CA 94608		CHECKED: K. Jacobs DATE: 2/9/		en	DATE:		10-7	
ECO 10018 105009		TAIRCUIL LOIOGA -		THE RESIDENCE OF THE PARTY OF T	219171			DATE: 2-10-77 RELEASED: (1. Mark			
NEXT ASSY.	USED ON		rocesso	r	DRAWN: A ATTA	ARIAL	T	ENGR:	-	you	
REF. PAR	OR DWG. NO.		PART_DESCRI	PTION							
20	EW	-0471	IF Discock	APACITO	D.R						
	EW		2 5% KW	FILM	RESISTOR	1					
214 L N	EW	100-	2 5070 14W	Film	RESISTOR	1					



The first few pages of this section of the Sol manual are revisions to other pages already in the manual. Please note the correct section and page that they refer to, and replace the appropriate page or pages as necessary.

New pages are easily identified by the "Rev A" in the lower lefthand corner of the page.



ASSEMBLY PROCEDURE CHANGE NOTICE #5

Reference Section VI, Step 4, Page 5

When attaching the cable to the Sol-BPB, insert wires from solder (back) side of board and solder on component (front) side.

NOTE

Pad orientations given in Step 4 are as viewed from component side of board.

The blue and two white leads on the cable are too large for the mounting holes. To overcome this problem, prepare these three leads as follows:

- 1. Cut off end of white and blue wires, about 1/8" back into insulation.
- 2. Cut off as many strands of each wire as needed in order to insert through mounting hole.



Sol MANUAL ERRATA SHEET #1

Reference Drawing No. 101007 in Section X (Page X-8)

The plastic tapped insert on the top edge of the left-hand masonite piece is incorrectly shown installed in the second hole from the back edge. This insert should be installed in the third hole from the back edge.

The second insert on the bottom edge is also shown incorrectly installed in the hole to the left of the center large hole. Install this insert in the hole to the immediate right of the large center hole.

ES #1

Sol-KBD

MODIFICATIONS

MOD 1

Applies to Revision Level A Boards (Revision level not included on silk screen)



Three layout errors exist on the Sol-KBD PC board you received. These errors must be corrected before you check the circuit board and start assembly. How these errors are corrected are described below:

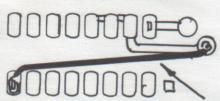
1. Key Pad #55



Using a sharp point, cut the bridge between the pad at 55 and the trace above (solder side).

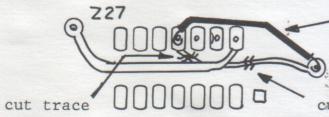
2. Ul8, Pin 8

Z18



After installation of socket at U18 (Z18 on etch), install jumper wire from pin 8 to ground trace as shown. (Solder side.)

3. U27, Pin 11



After installation of socket at U27 (Z27 on etch) install jumper wire from pin 11 to pad as shown (solder side).

cut trace

CN #3