Index 2

SpO_2 Simulator Service Manual

BIO-TEK® INSTRUMENTS, INC.

INDEX 2

SpO_2 Simulator Service Manual

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Notices

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A	12/97	Release to production

Warranty

This Warranty is limited and applies only to new products, except for computer-based software which is covered under a separate Warranty Policy, manufactured by Bio-Tek Instruments, Inc. ("Bio-Tek"). Bio-Tek makes no warranty whatsoever regarding the condition of used products.

Bio-Tek warrants the instrument (hereinafter collectively referred to as "Products" or "Product") for a period of one (1) year from the original purchase date against defective materials or workmanship. This Warranty is limited to the original purchaser (the "Purchaser") and cannot be assigned or transferred. All claims under this Limited Warranty must be made in writing to Bio-Tek, Attention: Service Department. Purchaser must ship the Product to Bio-Tek, postage pre-paid. Bio-Tek shall either repair or replace, at its option and without cost to the Purchaser, any Product which in Bio-Tek's sole judgment is defective by reason of defects in the materials or workmanship.

This Warranty is VOID if the Product has been damaged by accident or misuse, or has been damaged by abuse or negligence in the operation or maintenance of the Product, including without limitation unsafe operation, operation by untrained personnel, and failure to perform routine maintenance. This Warranty is VOID if the Product has been repaired or altered by persons not authorized by Bio-Tek, or if the Product has had the serial number altered, effaced, or removed. This Warranty is VOID if any of the Products has not been connected, installed or adjusted strictly in accordance with written directions furnished by Bio-Tek. Batteries and fuses used in any of the Products are not covered by this Warranty. Software utilized in conjunction with any of the Products is not covered by the terms of this Warranty but may be covered under a separate, Bio-Tek software warranty.

Table of Contents

Chapter 1
Introduction

This chapter defines what INDEX 2 is, how to set it up, and how to disassemble it for service.

What is INDEX 2?

INDEX 2 is a battery-operated, portable electronic test instrument, capable of verifying operation of Pulse Oximeters under a wide range of physiological and ambient conditions.

INDEX 2 has the ability to closely match individual manufacturers algorithms, and has many "on-board" algorithms. Additional information may be created and loaded into INDEX 2 through its serial communications port.

INDEX 2 can be addressed and operated from its front keyboard softkeys, using the LCD menu system interface on the front panel. INDEX 2 can optionally also be operated via use of its RS-232 port with a PC or PC-compatible computer using proper terminal software or BIO-TEK INSTRUMENTS, Inc.'s OTIS control software.

INDEX 2 also provides the ability to electrically test oximeter probes and both electrically and optically provide simulation signals to an extension.

Installation and Setup

Upon receiving INDEX 2, the unit should be charged immediately. Be sure that you use ONLY the supplied AC adapter/charger. **NEVER** replace this charger with a different charger, even if the voltages seem to be the same. **Damage is likely to result which is not covered by the standard manufacturers warranty.**

Index 2 uses a lead/acid "gel" closed cell battery. The AC adapter/charger may be left connected to INDEX 2 all the time with no degradation of battery life as long as the charger is plugged in. If only connecting the charger to charge the battery, a full charge takes at least 12 hours. Leaving the ON/OFF switch in the ON position during storage or while not in use may limit the life of the lead/acid battery.

Charging for 12 to 18 hours is recommended whenever the LOW BATTERY indicator shows up on the LCD screen, or once a month if INDEX 2 is to be stored without use for a protracted period of time. A fully charged battery should provide at least 4 hours of continuous operation.

When INDEX 2 is first powered up, the LEDs in the top of the finger should light momentarily, then extinguish. At the same time, the LCD should begin to show the startup message, followed by the **MAIN MENU 1** indication. If these do not occur at power up, refer to the TROUBLESHOOTING chapter.

Disassembly / Reassembly

To disassemble INDEX 2, you will need a Phillips-head screwdriver, and a soft, clean surface. To open the case, follow these steps:

- Place unit upside-down on a soft, clean surface.
- Loosen and remove 8 Phillips-head screws positioned 2 at each corner of the case, closest to rubber feet (these 8 screws have slightly larger diameters than the other screws on the case) on the case bottom.
- **CAREFULLY** grasp the carrying handle on case bottom, and **GENTLY** pull up and slide the case bottom to the rear at the same time. **DO NOT USE FORCE!**
- When case bottom and finger is clear of the top case, disconnect the ribbon cable and battery leads. These leads may be reconnected for testing and evaluation.
- To reassemble INDEX 2, follow the above steps in reverse. Be sure battery cables are connected properly and cannot short out to the PC boards, and be sure to reconnect the ribbon cable properly.

Chapter 2

Principles of Operation

General discussion of how INDEX 2 works. Portions of INDEX 2's circuitry are copyrighted and patented. These portions will not be discussed except in general terms.

General Explanation

Refer to figure 1 for a block diagram of INDEX 2 operation. Refer also to the INDEX 2 USER'S MANUAL chapter titled INDEX 2: AN OVERVIEW.

The INDEX 2 finger is divided into two distinct and separate sections, INPUT and OUTPUT. When a Pulse Oximeter finger cuff is properly inserted onto the finger, INDEX 2's photo sensors receive and pass information about the Oximeter's light output and frequency to the signal conditioner and modulators. This input is measured to determine light intensity, and timing information from the Oximeter.

INDEX 2 then sends modulated signals containing physiological information and optionally artifact/ambient information to the finger output LED's, which in turn send information to the Oximeter finger cuff's photosensor.

These modulated signals are controlled and changed via the User Interface, or via Computer Control. Output and control information is fed from the microprocessor to the LCD screen, and optionally to the Serial and Parallel ports.

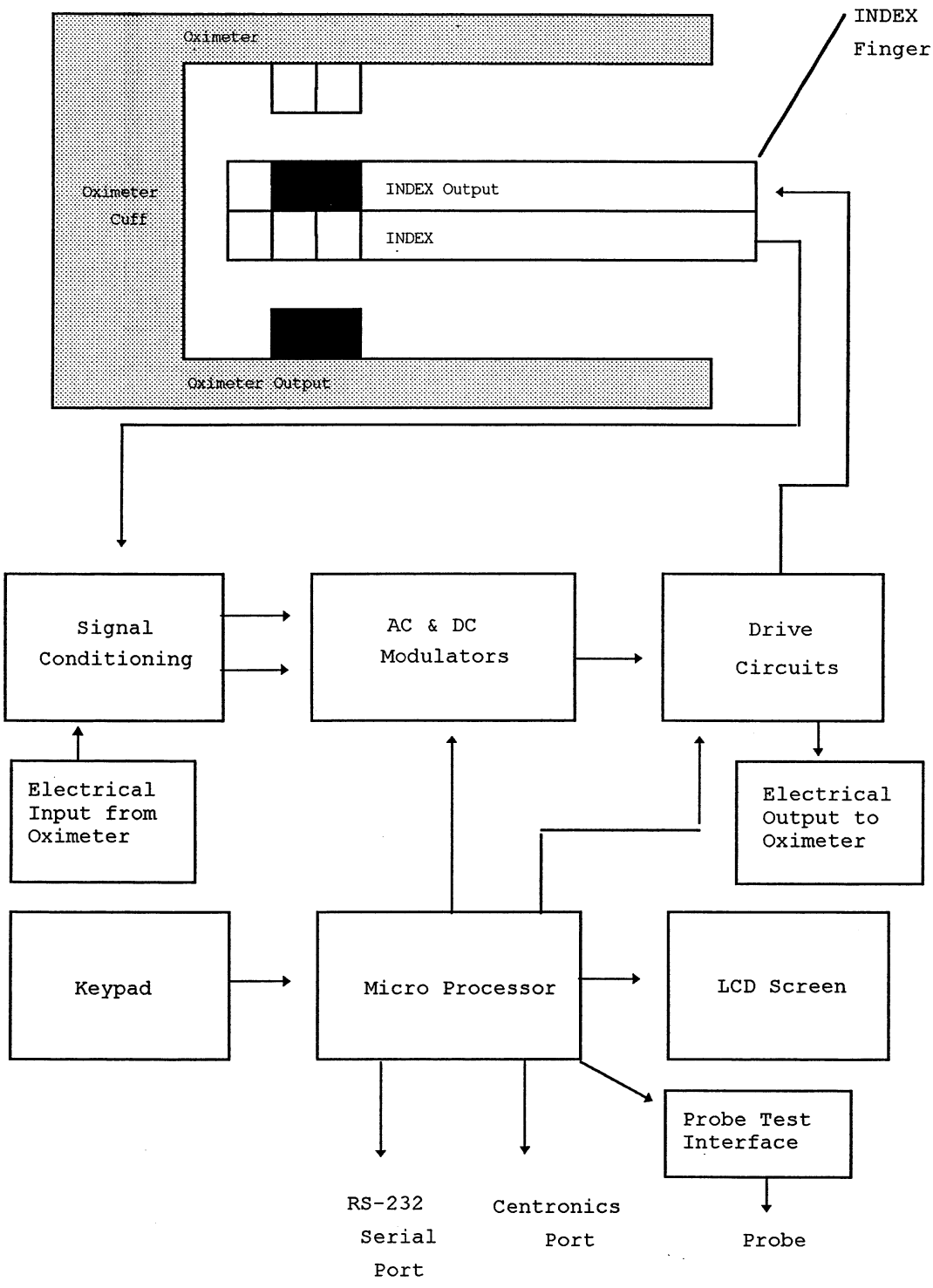

Oximeter
INDEX
Finger
Oximeter
Cuff
INDEX Output
INDEX
Oximeter Output
Signal
Conditioning
AC & DC
Modulators
Drive
Circuits
Electrical
Input from
Oximeter
Electrical
Output to
Oximeter
Keypad
Micro Processor
LCD Screen
Probe Test
Interface
RS-232
Serial
Port
Centronics
Port
Probe

Fig. 1

Chapter 3

Troubleshooting

Troubleshooting overview, test methods, troubleshooting charts, commentary on likely problems, and maintenance suggestions.

An Overview of Troubleshooting INDEX 2

Due to the level of miniaturization and likelihood of damaging components via static discharge, BIO-TEK INSTRUMENTS, INC. recommends servicing INDEX 2 by board replacement only.

Individual parts may be ordered, but they are not stocked for immediate shipment. Individual PC Board Assemblies may be quickly obtained through BIO-TEK' s SERVICE DEPARTMENT (800) 242-4685.

In many cases, INDEX 2 can be tested for faults without removing the electronics from their case. In all cases, it is important to check the Oximeter under test first, to be sure signals are being sent to INDEX 2 via the finger cuff.

Another common problem is failure to use proper finger cuff adapters for Nellcor or Ohmeda units. Nellcor disposable finger cuffs, and all Ohmeda finger cuffs have circuitry in place to tell the Oximeter about the LED wavelengths used. Because of the wide variation, these wavelengths can confuse INDEX 2 or the Oximeter seeing INDEX 2's signals. Use of the proper probe adapter between the finger probe and the Oximeter under test sets the Oximeter for nominal wavelengths, so INDEX 2 can properly test it. Please assure that you are using these adapters if necessary, and their absence is not giving false information.

Index 2 Troubleshooting Chart

With normal annual verification you should experience few problems. If you do run into problems, use the chart below to help localize your problem.

PROBLEM	SOLUTION
No Display	• Is Battery Dead? ▫ Check/Charge Battery. ▫ Try running INDEX 2 using AC adapter/charger. • Check Display PCB Header for proper electrical connection. • If display still inoperative, unit may have defective DIGITAL PCB.
Unit beeps continuously when connected to AC adapter/charger, runs OK on battery.	• Probable damage to BATTERY, CHARGER, or DIGITAL PCB. - Replace as necessary.
INDEX 2 does not appear to trigger Oximeter - **No signal on SpO_2 monitor.**	• Is SpO_2 finger cuff placed on INDEX 2 finger probe so that the cuff's LED's are on the <u>under</u> side of the finger? • Cuff placement is critical to proper operation. Carefully lift the top half of the cuff and look to see if INDEX 2's finger probe top LED's are lit. If not, try moving the finger cuff in/out/radially until finger probe LED's light up.
Finger probe LED's do not light (see previous problem)	• Remove finger cuff, set INDEX 2 to MAIN MENU 1. • Select SIM, AMB, then SUN. Does the finger probe LED's light up? If so, finger OUTPUT is OK. Press ESC to turn LED's off. • Shine a light source such as a penlight on the under side of the finger probe. If top LED's blink on momentarily when bottom sensor is hit with light, the entire circuit is functional from sensor INPUT to finger OUTPUT. • Does INDEX 2 work with other makes/models of SpO_2 units? If so, check list of verified Oximeters in INDEX 2 OPERATOR's Manual. If you are using a make/model not listed, check with BIO-TEK for updates to the list. • Possible damage to bottom finger plastic lens or filter. Check finger bottom for missing or cracked plastic lens.

All functions operate except probe test.	Replace PTHW board.
Simulation is correct with finger, but electrical testing is not functional.	Replace PTHW board.
Neither electrical nor finger simulation works.	Problem could be on either system or base boards. Replace one at a time.
Electrical simulation works; finger simulation does not.	Replace finger board. See also these troubleshooting sections of this chart: • **Index 2 does not appear to trigger Oximeter.** • **Finger probe LEDs do not light.**

Troubleshooting Ideas

- Always look at the probe from the Pulse Oximeter under test, to find the side with the visible red light coming from it. This side must be placed on the bottom of the INDEX 2 finger.
- INDEX 2 is designed for adult size finger probes. Permanent and disposable types may be tested. Disposable probes may need to be repositioned for optimum performance. Other probe types (ear probes) may be used as long as the physical size is such that their LED's may be placed on the bottom of the INDEX 2 finger probe and their photo sensors may be placed over INDEX 2's LED output.
- Probes must be properly placed on INDEX 2's finger for proper operation. Be especially careful to attach probes so that their detector window is placed directly in line with INDEX 2's LED output, and centered on this output.
- Incorrect or inconsistent readings may point to incorrect manufacturer selection at the INDEX 2 Main Menu. Since many manufacturers use different "R" curve information, it is vital that INDEX 2 be set to the proper make in order to function properly. If inconsistent or unrepeatable readings are obtained, try choosing from among all listed makes. Many R-Curves are essentially the same except for light amplitude so it is possible to find good overall response using a different make. For example, Criticon™ OxyTrak 8280 units work best using the NOVA 515 make.

INDEX 2 currently supports "R" curves for:

BCI™ 3101	Invivo Research™ 4500	Criticare™ 504
Nellcor™ N-10, N-100, N-200	Datascope™ Passport	Nihon Kohden™ Litescope
Datex™ CardioCap, Ultima, Satellite Trans, AS/3, 251	Ohmeda™ 3700, 3740, K-P	Nonin™ 4500/8500
	HP™ Merlin w/ HP probe	Kontron™
	Critikon™ OxyShuttle	Nova Metrics™ 515

Use the NELLCOR make for:

Airshields, Inc.™	Drager™ (Europe)	North American Drager™
Atom Medical Corp™	Edentec™	Pace-Tech Inc.™
Baxter™	Fukuda Denshi™	Protocol Systems™
Century Medical Inc.™	Ivy Biomedical™	Pyron Corp.™
Colin Medical™	Marquette™(Eagle)	Siemens™
Corometrics™	MDE™	Spacelabs™
Datascope™	Mennen Medical™	Witt Biomedical™

Use the OHMEDA make for:

Corometrics™	Marquette™
Hellige™	Radiometer™
S&W™	

Use the BCI make for:

Bruker™
Elmed™

- When using NELLCOR make and disposable probes, or the OHMEDA make with any probe, you must use the proper probe adapter in-line to obtain accurate readings.

Nellcor Probe Adapter BTI P/N 5173002 Ohmeda Probe Adapter BTI P/N 5173003

Compatibility Issues

INDEX 2 will work with all listed SpO_2 units, but there may be exceptions. Compatibility issues recorded to date revolve around Oximeter operation at other than "normal" physiological parameters. These problems may stem from a manufacturer's algorithm, a problem with Oximeter operation under some battery conditions, or other factors.

The list below details all problems BIO-TEK has seen with individual makes to date. Many of these problems may have been solved by manufacturers by the time you read this. If you believe you are seeing a problem described here, you should contact the SpO_2 manufacturer to ask about it. You can also contact BIO-TEK for further information.

Possible Problem Identification

Finger Probe Placement:
Placement of cuff on finger is critical. Small radial movement can result in pulse reading variations as much as 6 counts positive or negative of actual. Probes must be as far onto the finger as possible, with the transmitter LED's illuminating the bottom of the INDEX 2 finger.

Settling Time:
Can be as long as 1 minute. **DATEX** units: 2 or 3 minutes. Allow 50% longer than mfr. usually allows.

O_2 "hang-up":
Under some circumstances, SpO_2 units may seem to hang at 84% O_2. This is caused by red/infra-red output being the same intensity. Indicates a need to decrease the intensity being seen by INDEX 2 (sensors being over-driven), or to reposition the probe on the INDEX 2 finger.

Documented Problems

INVIVO:
- High LED outputs.
- Doesn't respond well to low trigger pulses (in PRESET mode) - Pulse / Tach.
- Low battery levels affect readings before LOW BATT indications on oximeter.

OHMEDA:
- When in Bradycardia, lower than 45 BPM - unit rescales, detects both humps on pleth wave intermittently.
- Low battery levels affect readings before LOW BATT indications on oximeter.
- High LED outputs.

DATEX:
- Settling time problems.

DATASCOPE:
- Low battery levels affect readings before LOW BATT indications on oximeter.

NIHON-KOHDIN:
- BPM levels always 2 beats high, due to algorithm.

NELLCOR:
- When in Bradycardia, 45 BPM or less, some older firmware may have a rescaling algorithm that prevents units from showing normal BPM's and O_2 levels when INDEX 2 returns to them.

Maintenance Suggestions

There are no adjustment points inside INDEX 2 which need to be checked periodically and reset. BIO-TEK recommends annual operational verification of the INDEX 2, see the chapter titled VERIFICATION PROCEDURES.

The battery should be checked yearly to assure there is no corrosion beginning on the slip terminals of the battery. Any corrosion found should be cleaned using emery cloth. The addition of a coat of petrolatum on the battery terminals will help prevent further corrosion. The battery should be replaced when operational time grows objectionably short between charge cycles.

Periodically check the mounting screws inside and outside the case, to be sure they are tight. Clean the outside case with gentle cleaners such as warm soapy water applied lightly with a paper towel, or a cleaner such as 409™ or similar cleaner.

Chapter 4

Verification Procedures

Information about BIO-TEK service and verification/update of INDEX 2. Procedure and worksheet for verification of INDEX 2 operation.

Bio-Tek In-House Verification

BIO-TEK INSTRUMENTS, INC. offers verification and update to current factory standards to users of INDEX 2. Our Engineering and product specifications are subject to change without notice, and products continually change during their production lifetimes.

INDEX 2 units which are returned to BIO-TEK for annual verification are automatically updated to the latest factory specification at no extra charge. These updates may involve changes to hardware, firmware, and R-Curves.

While the verification procedure is identical to the following procedure, updates are only available directly from BIO-TEK INSTRUMENTS, INC. Contact BIO-TEK SERVICE for further information.

Test/Verification Procedure

Equipment Required

Ohmeda BIOX 3700 Pulse Oximeter
Nellcore N-200 Pulse Oximeter
PC or PC Compatible (286 or Equiv)
Communications Software such as KERMIT, PROCOMM or Equiv
RS232 cable (BTI# 75032 9-25 cable, BTI# 75029-9 cable, or standard "pin to pin"
RS232 cable with null modem attached)
Probe simulation jig BT# 5170600
Datex test jig BT# 5172500
Oximeter direct connect cables BTI#5170509, and BT#5170507
Printer (DPU-411 BTI# 97115 w/power adapter, or standard Epson/Star/IBM AProPrinter) including printer cable.
AC Power Adapter supplied for INDEX (if needed) BT#48274 or Equiv
DVM: Fluke 87 or Equiv with probe applicable to SOIC

Detailed Procedure

1.00 **FIRMWARE:**

1.01 Verify the UUT current Firmware Version and check-sum are correct. Record on data sheet.

2.00 **DC Voltage checks:**

NOTE: During VDC checks observe caution so as not to cause electrical damage. All voltages are made in reference to circuit ground.

2.01 Turn the UUT -ON utilizing the external power supply if necessary. With the DVM verify the following regulated VDCs. Record on data sheet.

Location	VDC
Base PCB R102	+11.6 to +12.15
Base PCB R103	-10.6 to -12.15
Base PCB R104	+4.60 to +5.10

3.00 **THRESHOLD TEST:**

3.01 Carefully connect the DVM to (U4 pin 6) of the BASE PCB. Verify VDC of .425 to .475. Record on data sheet.

3.02 On the front panel controls sequentially press CUST, TECH, +TECH. Beeper should respond to each press. Verify VDC is between .125 to .175. Record on data sheet.

4.00 **DATEX SWITCH TEST:**

4.01 Connect the Datex test jig (9-pin D connector) to P1 of the UUT PTHW PCB. Connect the Datex test jig red wire the + battery terminal of the UUT.

4.02 Verify VDC at (U1-pin 1) is between .72 to 1.12, and VDC at (U1-pin 14) is between 1.4 to 2.2. Record on data sheet.

4.03 On front panel controls press +TEC. Verify VDC at (U1-pin 1) is between .26 to .66 and VDC at (U1-pin 14) is between .23 to .53. Record on data sheet.

4.04 Disconnect Datex test jig from UUT.

5.00 **NO LED TEST:**

5.01 With no Nellcor Oximeter probe connected to the finger of UUT, select the "Nellcor" as a "MAKE" model for the UUT. On the front panel controls press ESC (to main menu), then press SIM. The unit should display "NO RED LED NO RED LED".

5.02 Quickly connect the Nellcor probe to the UUT finger and verify that the UUT display changes to show "SIMULATIONS". Check off data sheet.

6.00 **SIMULATION TEST:**

6.01 On the front panel controls press MAN. Allowing settling time, the unit should display Oxim readings of 96% +/- 1% SpO2 75 +/- 1 bpm. Nellcor should also read these values within 5%. Check off data sheet.

6.02 On the front panel controls press 02- four times. The unit display should settle on 88% +/- 2%. Check off data sheet.

7.00 **DIRECT CONNECT TEST:**

7.01 With the UUT still running at 88% , disconnect the Oximeter probe from UUT finger and Oximeter, and reconnect the appropriate direct connect cable between the UUT (9-pin D connector) to P1 of the PTHW PCB and the Oximeter probe input. The Oximeter should also read 88% +/- 2%. Check data sheet. Disconnect Oximeter from UUT.

8.00 **SUN CURRENT SOURCE TEST:**

8.01 Connect the RS232 serial cable from the PC station to UUT J3 (9 pin D connector) of the DIGITAL PCB.

8.02 Verify that the UUT display menu is on MAIN MENU 1. Using Kermit or Procomm, send the command [amb 40] and observe the UUT finger top LED brightens slightly. **Note:** covering finger from ambient light might be necessary to observe LED.

8.03 Send the command [amb 0] and observe the finger LED dimming. Check off data sheet.

9.00 **OHMEDA CALIBRATION VIA RS232:**

CAUTION: The following information is proprietary only and is not under any circumstances available to users. The [IRCAL] command is extremely powerful and **incorrect usage can completely corrupt accurate functionality of the unit**. All Index2 units create an initial installation of default IR values upon first boot-up. [IRCAL] is the ONLY command which can modify these values. **Closely observing correct sintax is vital to insure against unit corruption.**

9.01 Verify that the printer is disabled for this test. Connect only Oximeter (Ohmeda) probe unit to the UUT finger. Connect the PC-station to the RS232 port on the UUT. With the UUT set to MAIN MENU 1, Send the command [make 8]. the PC display should show "MAKE: Ohmeda" This sets the unit into the Ohmeda mode.

9.02 Send the command [settings]. The PC should display a listing of current settings including an IRDC value. IE: IRDC = 3535 Observe the IRDC value indicated.

9.03 Send the command [oxy 65] and turn on the Ohmeda Oximeter. The settled reading on the Ohmeda should be between 61 to 68 SpO2. If this reading is within these limits, skip step 9.04 and 9.05.

9.04 To adjust the SpO2 reading, enter the two commands: [IRCAL,8,X] (where X stands for the new value. Then send [oxy 65]. The unit will then calculate the SpO2 reading with the new value you entered. IE: if the current IRDC value = 3535, and the SpO2 reading is below 65%, enter a new value by sending [IRCAL,8,3540] [oxy 65]. The unit will then re-calculate the 65% SpO2 output with the value 3540. Sending the [settings] command should then verify the new value.

9.05 Adjust the IRDC value as necessary to obtain an Ohmeda output of 65%.

9.06 Check off data sheet.

10.00 **PROBE SIMULATION TEST:**

10.01 With the PC station RS232 and the Probe simulation test jig connected to the UUT (PTHW PCB - P2), send the two commands [ohmscal 0] [probe]. The PC should display:

Probe Test Results:	
R= 1.5	(+/-.3)
IR = 1.5	(+/- .3)
PHTO = 0.6	(+/- .2)
PHOTO: R = n IR = n	(n > 200)
Pin 12 to Pin 13 = 90.9K	(+/- 4%)
Pin 11 to Pin 13 = 95.0K	(+/- 4%)
Pin 11 to Pin 12 = 4.12K	(reference only)
Pin 7 to Pin 8 = 3.83K	(+/- 4%)
Pin 5 to Pin 6 = 0.25K	(reference only)

10.02 Check off the data sheet at completion.

11.00 **INDEX-E, INDEX-EF PROBE OHMS CAL:**

11.01 Observe the value displayed from { Pin 11 to Pin 12 of PROBE TEST}. If it is 4120 ohms, skip step 11.02

11.02 Calculate an adjustment number (- /+) that if added to the displayed number would obtain a value of 4120 ohms. Send the two RS232 commands [ohmscal n] (where n = the adjustment number), [probe]. IE-1: Displayed value = 4.02K, send [ohmscal 100] [probe]. IE-2: Displayed value is 4.22K, send [ohmscal -100] [probe]. Check off the data sheet at completion insuring that the new displayed values are all within 4% tolerance.

11.03 Remove the Probe Simulation Test Jig from the UUT.

12.00 **DOWNLOADING MAKES:**

NOTE: Downloading automatically replaces UUT user "MAKES" and is only done if necessary

12.01 With the PC station RS232 connected to UUT, activate the PC software utility which downloads the default R-curve Make data to the UUT. Observe that the UUT display follows the indicated download sequences.

12.02 To verify successful download data, us the PC station utility (Kermit / Procomm) connected the UUT RS232 port. Send the command [make 15] and observe the PC display " DownloadMake: Invivo ". Check off completion on data sheet.

13.00 **PRINTER TEST:**

13.01 With the Printer serial cable connected to the UUT printer port, enter the following commands to the UUT from the UUT top panel controls ESC (to get to MAIN MENU 1), MORE, UTIL, PTST, ESC. The printer should continuously display: " ***This is a test of the printer port*** " Check of data sheet.

13.02 To de-activate, turn off the printer first, then the UUT.

14.00 **FINAL CHECK:**

14.01 Perform final visual inspection of UUT cleanliness, tightness of all fastening hardware and battery connections. Confirm battery is dated with installation date. Complete paper work as required.

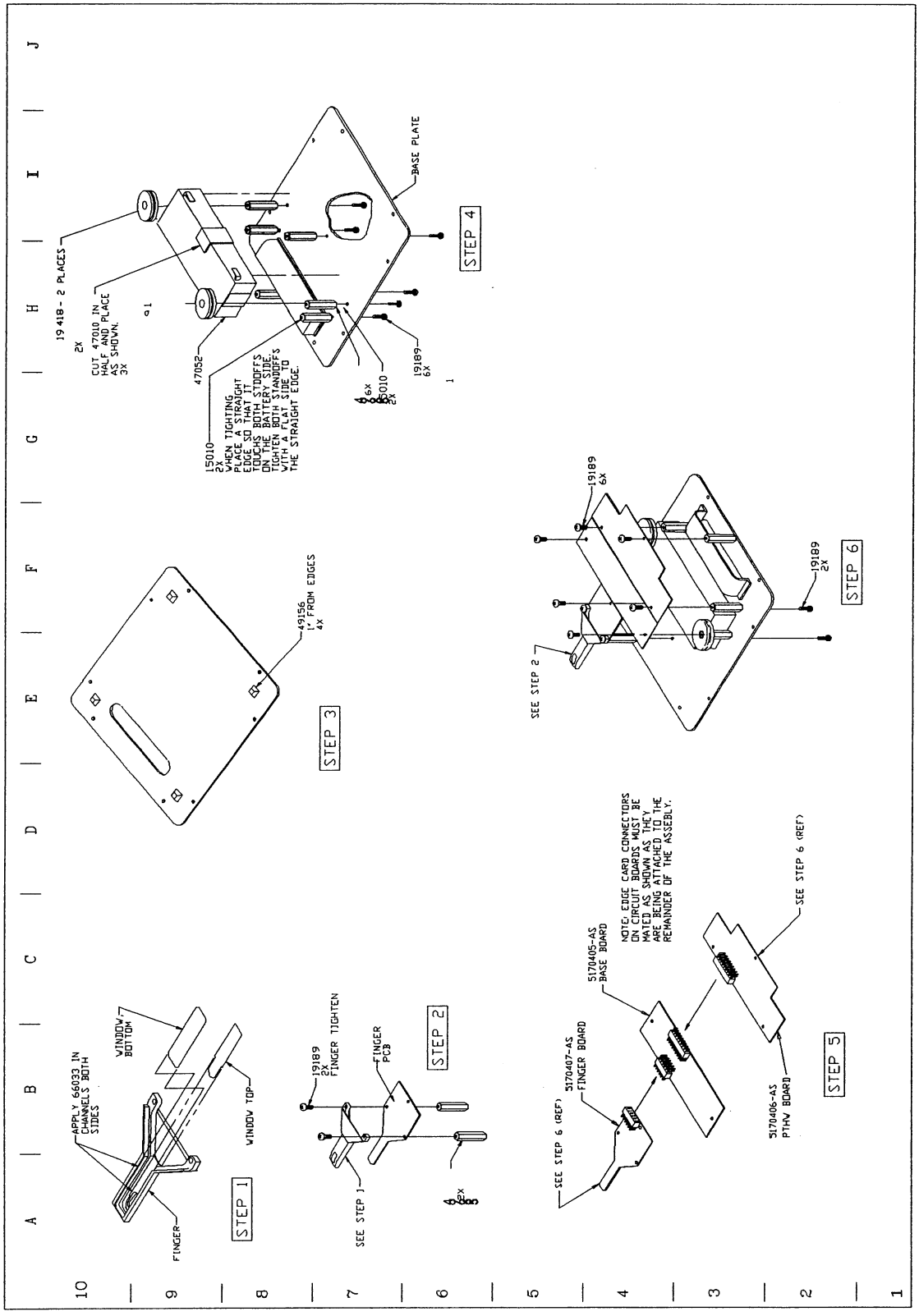
Test/Verification Data Sheet

Proc. Step #	Description	Results
1.01	Firmware Version and check-sum	
2.01	VDC - Base PCB R102 +11.6 to +12.15	
	VDC - Base PCB R103 -10.6 to - 12.15	
	VDC - Base PCB R104 +4.60 to + 5.10	
3.01	VDC - U4 - Pin 6 .425 to .475	
3.02	VDC - U4 - Pin 6 .125 to .175	
4.02	VDC - U1 - Pin 1 .72 to 1.12	
	VDC - U1 - Pin 14 1.4 to 2.2	
4.03	VDC - U1 - Pin 1 .26 to .66	
	VDC - U1 - Pin 14 .23 to .53	
5.02	NO RED LED NO IRED LED " --check--	
6.01	"96% +/- 1% SpO2 75 +/- 1 Bpm --check--	
6.02	"88% +/- 2%" --check--	
7.01	"88% +/- 2% --check--	
8.03	Finger LED responses --check--	
9.06	IRDC value 65% --check--	
10.02	Probe simulation results --check-- ** as shown on procedure**	
11.02	Probe simulation 4% tolerance --check-- ** as shown on procedure**	
12.02	Download Make: Invivo --check-- ** if necessary**	
13.01	***This is a test of the printer port*** --check--	
14.01	Visual Inspection and Hardware check --check--	

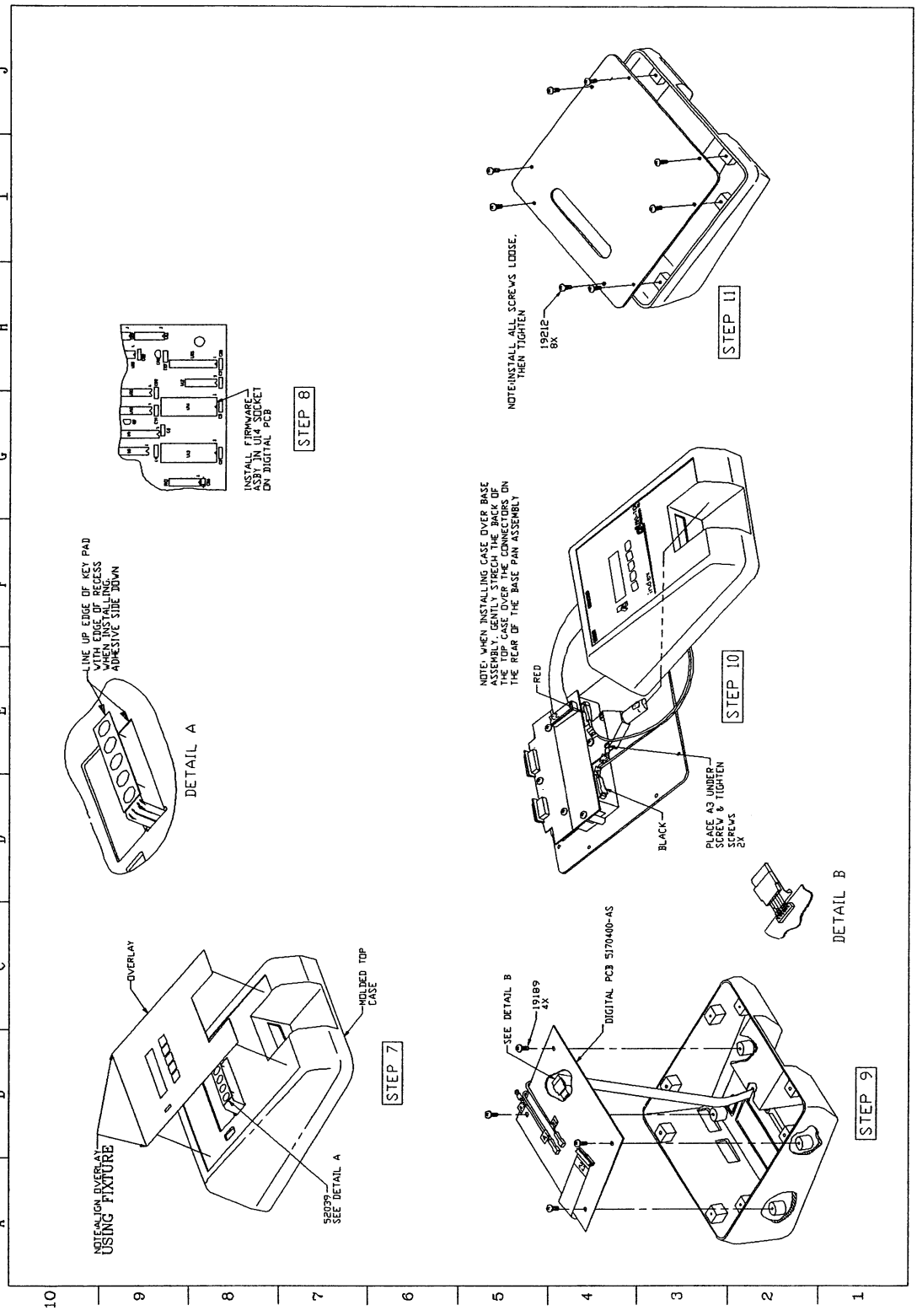
Chapter 5
Drawings

This chapter contains diagrams to help identify parts placement.

***PLEASE NOTE** that circuitry inside INDEX 2 is patented and copyrighted. BIO-TEK recommends troubleshooting to board level only, with board replacement the recommended way of dealing with circuit failures.*



Final Assembly – Index-2 FE
5170009-AS (1 of 2)



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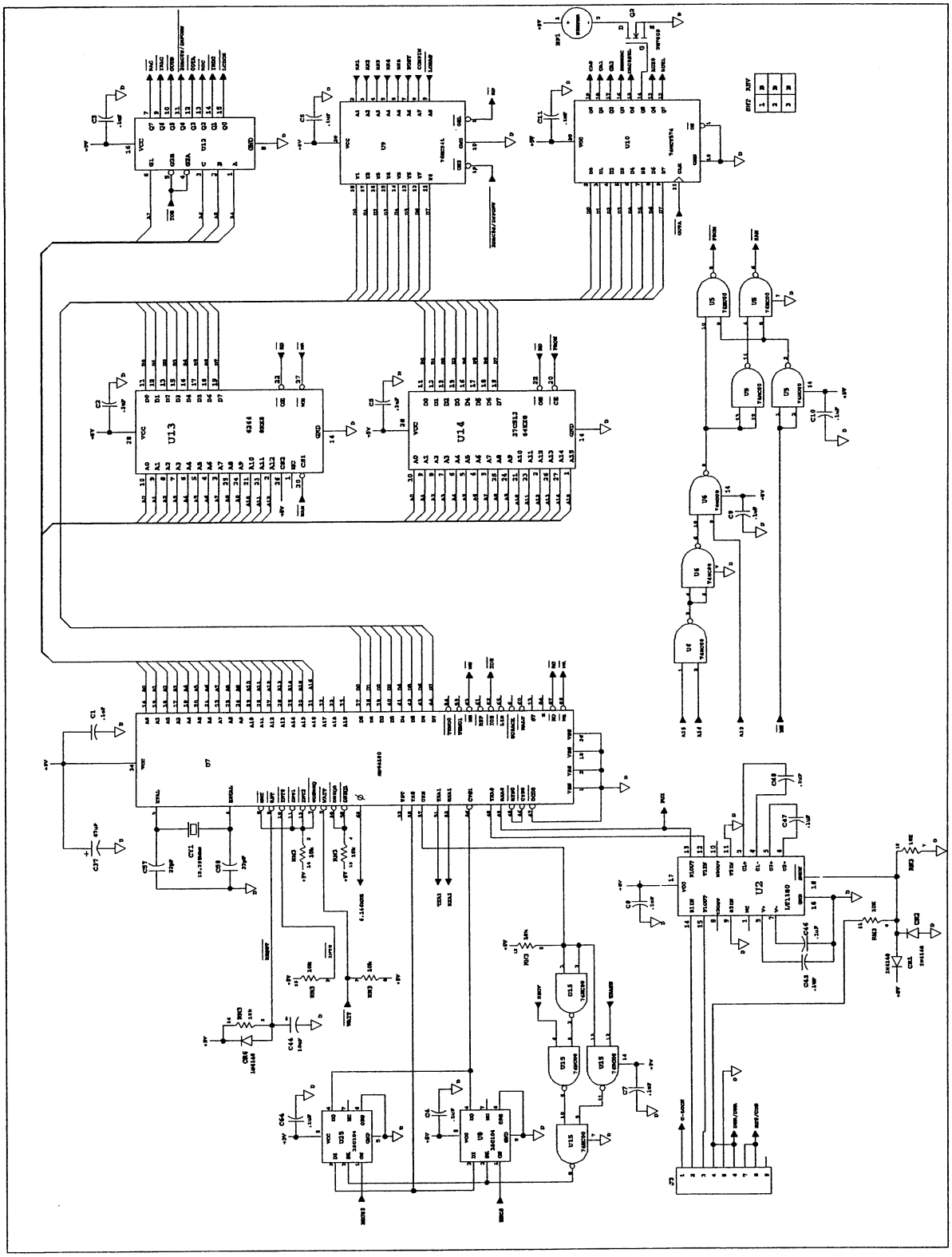

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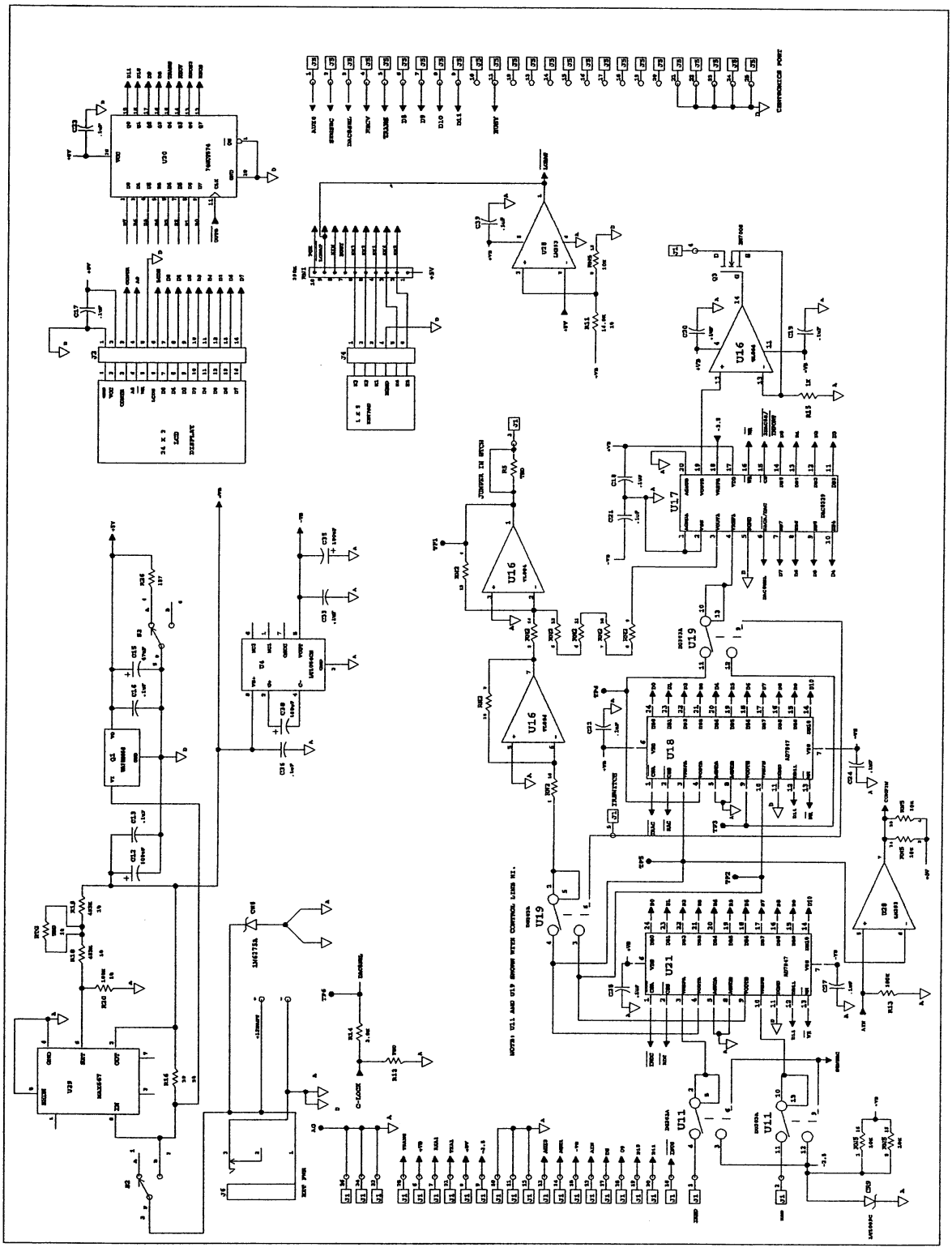

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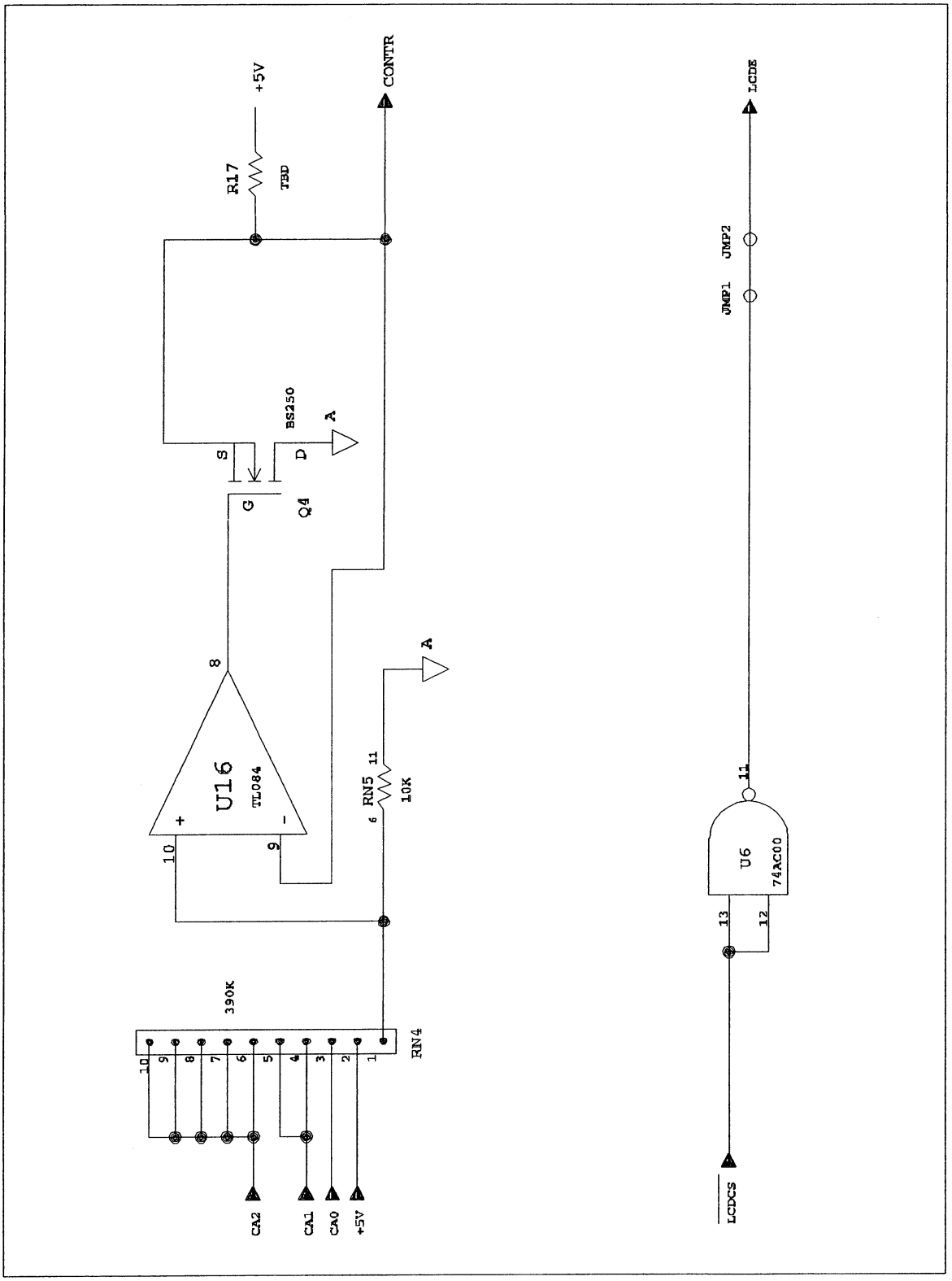
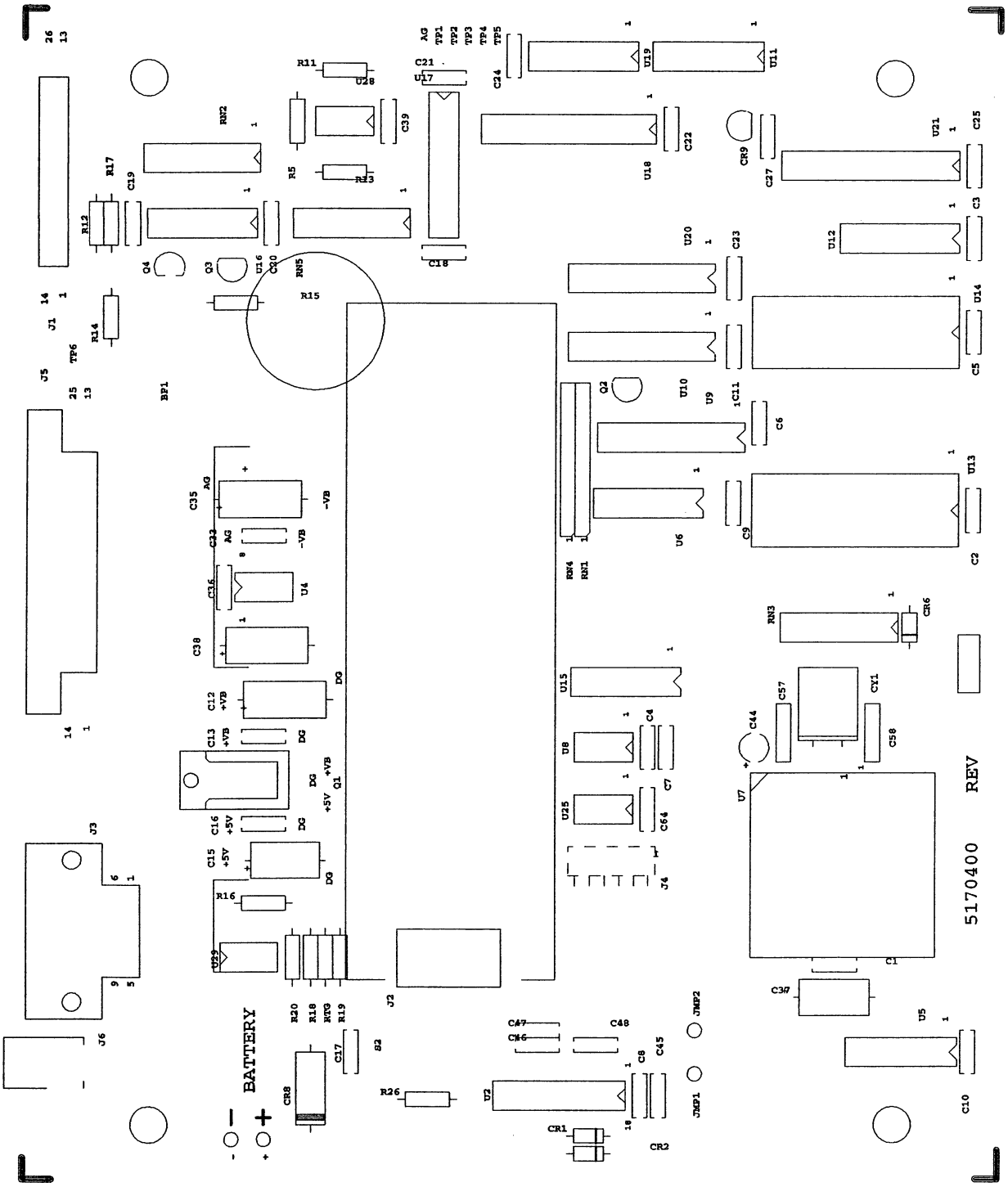
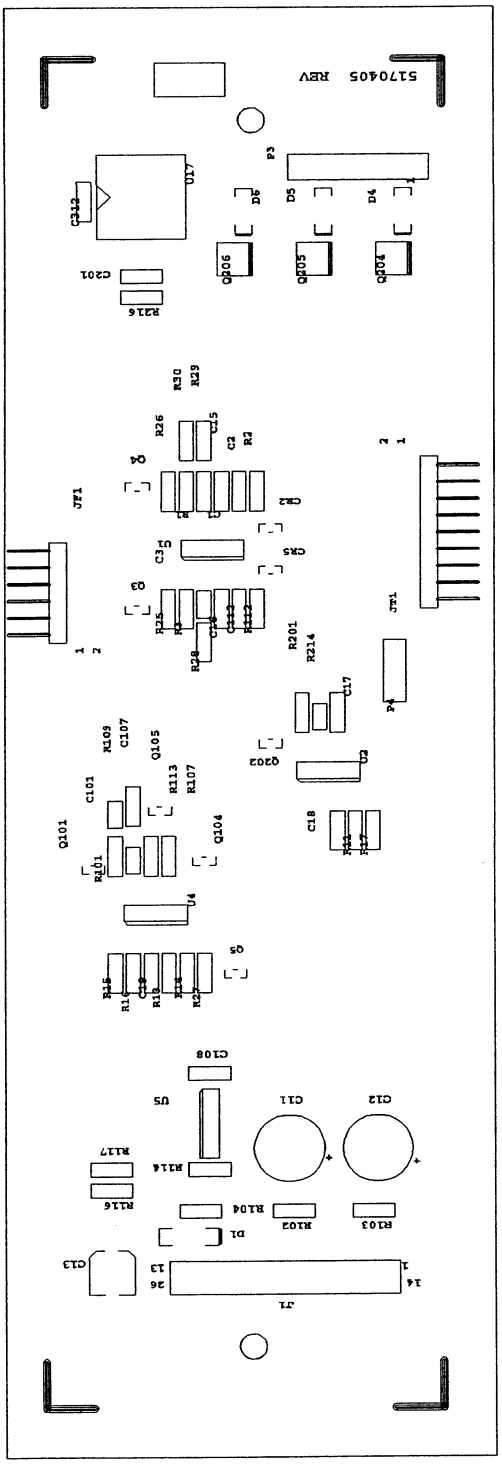


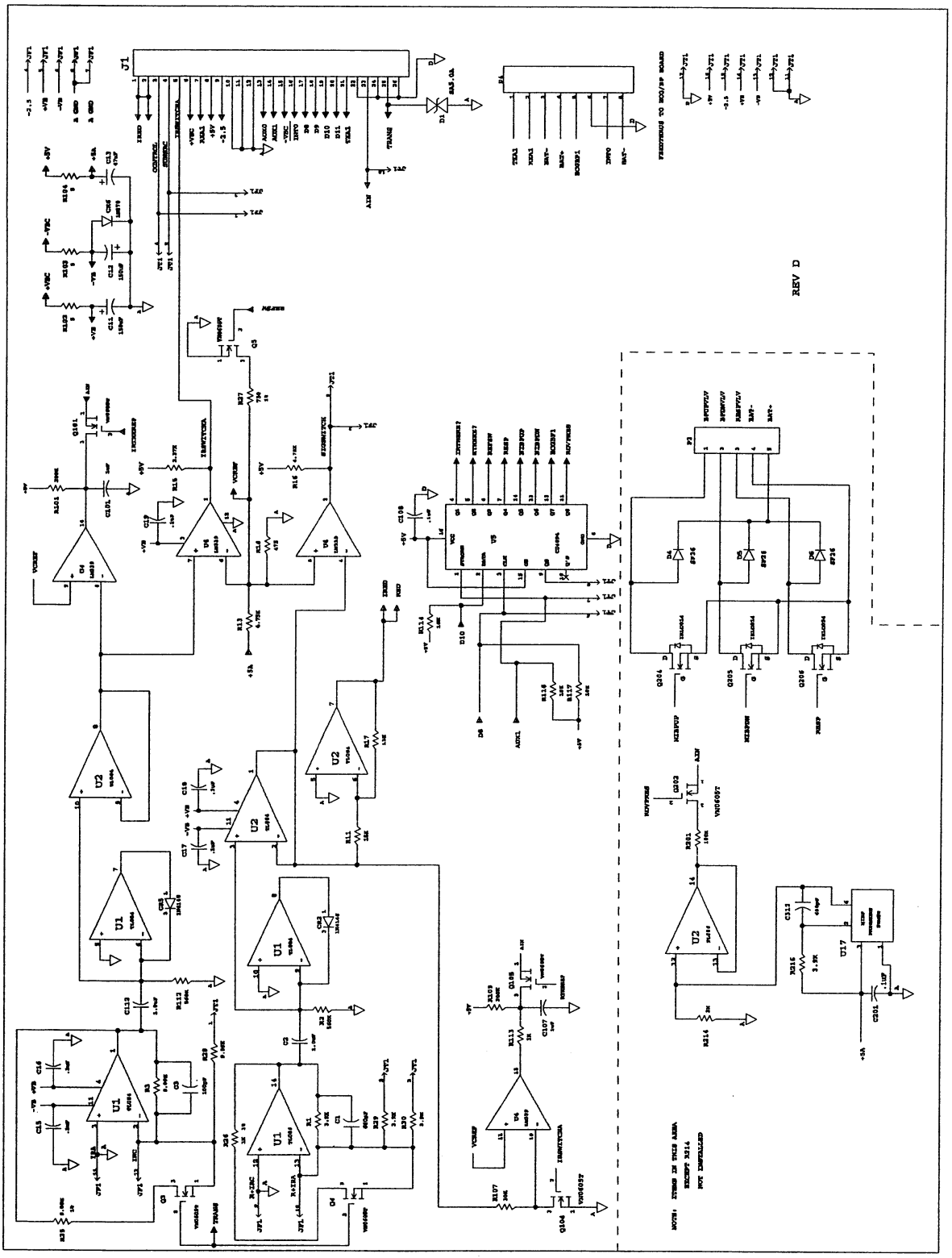
Digital PCB Assembly
5170400-SC (3 of 3)



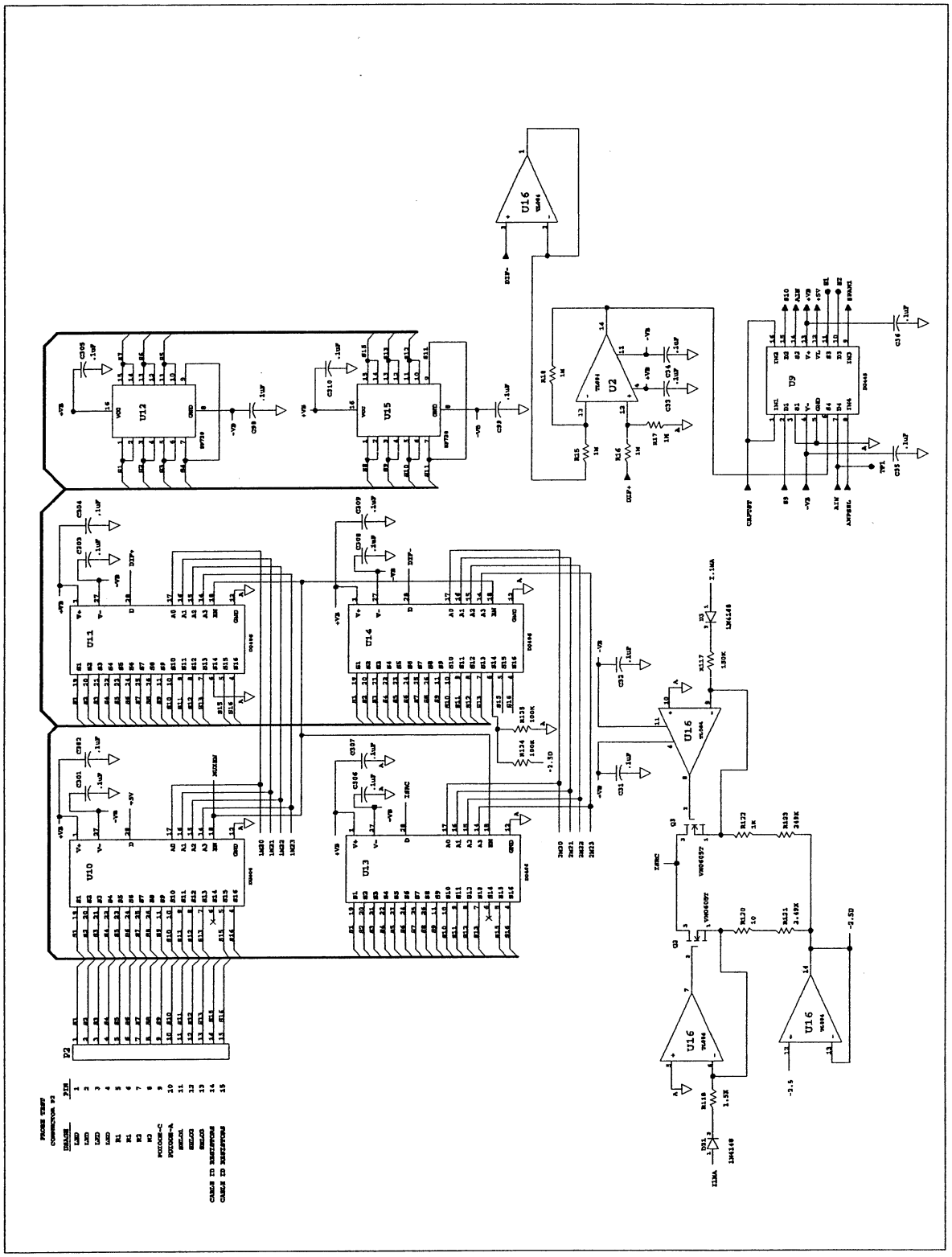
Digital PCB Assembly
5170400-AS



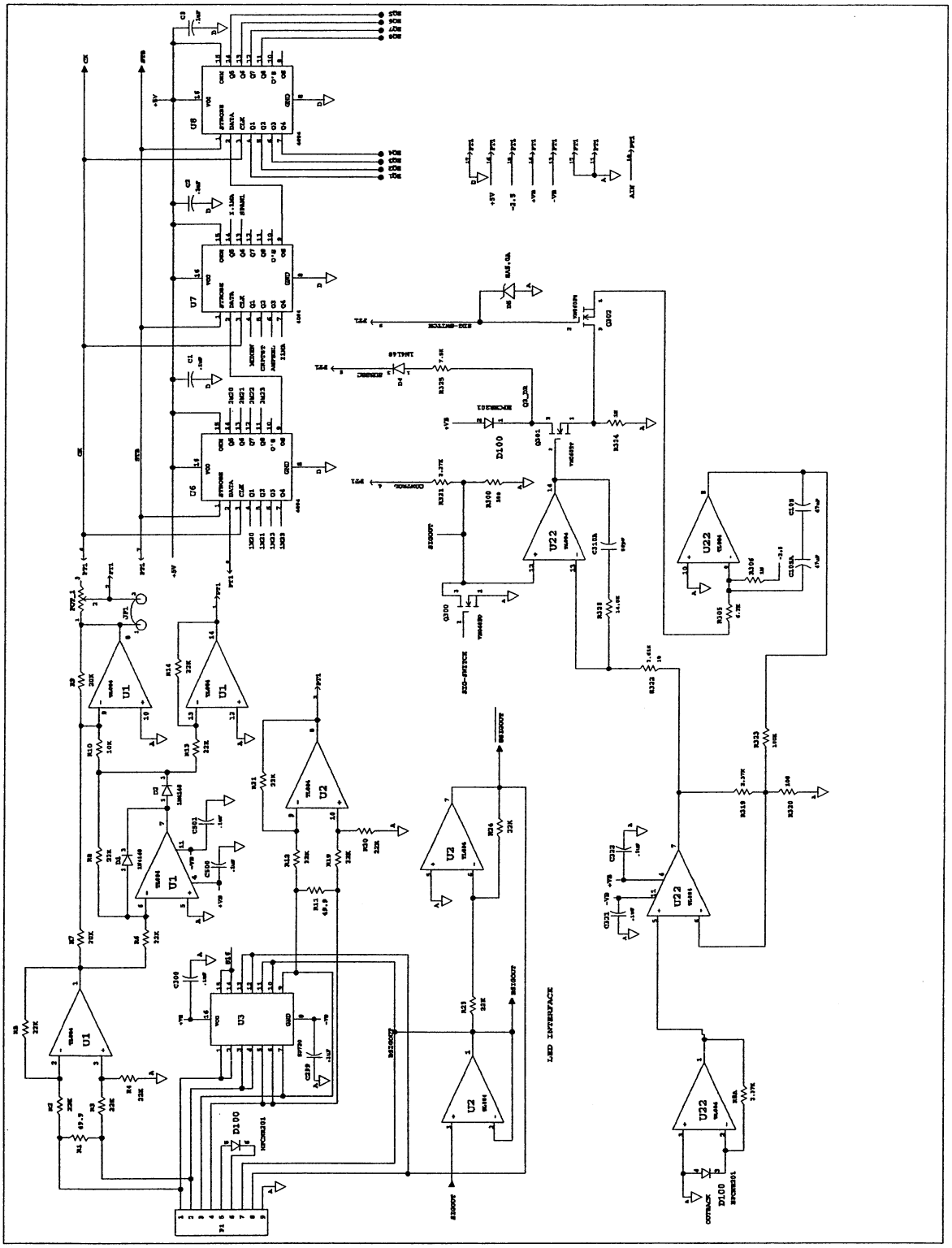
Base PCB Assembly
5170405-AS



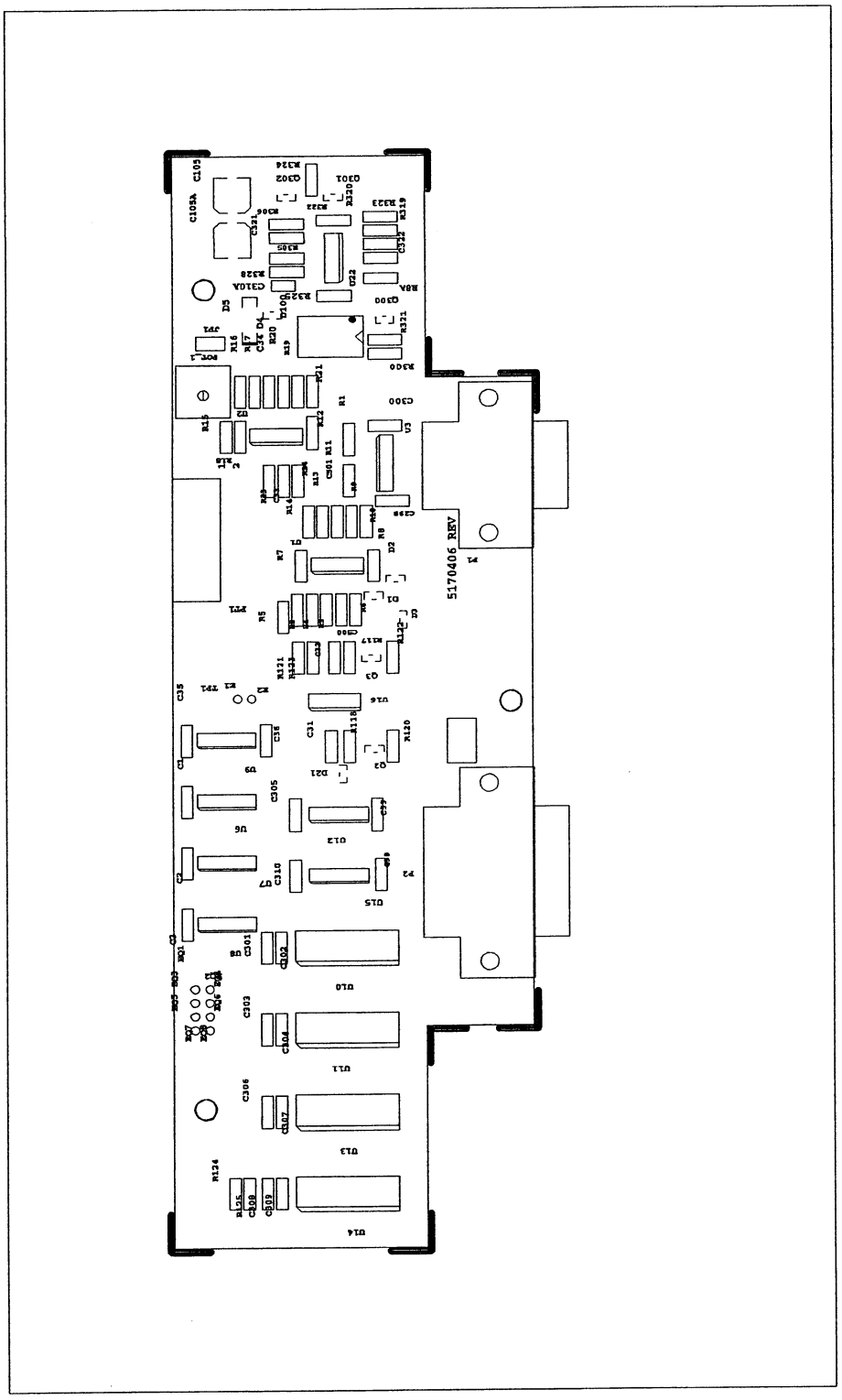
Base PCB Assembly
5170405-SC



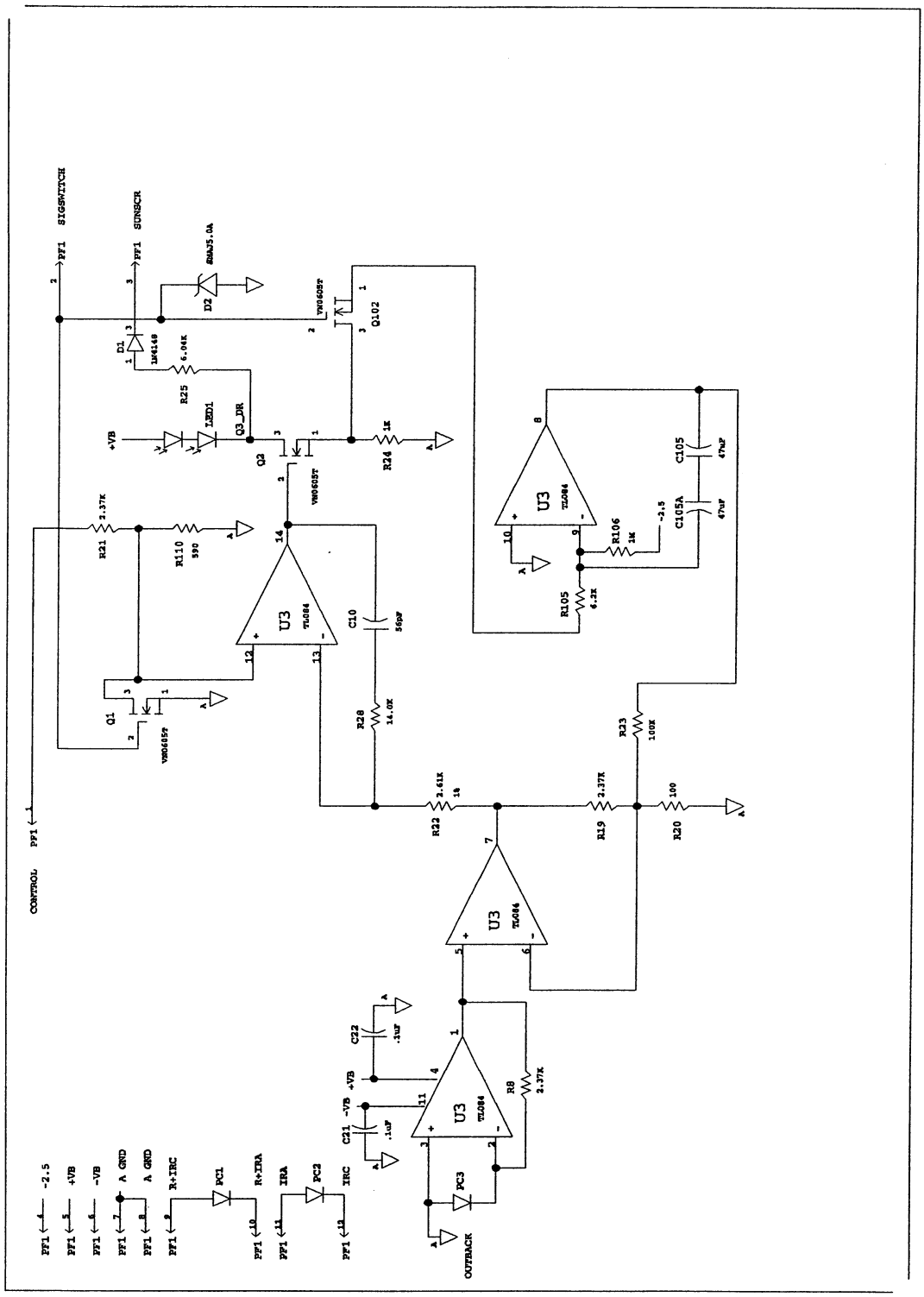
PTHW Board Assembly
5170406-SC (1 of 2)



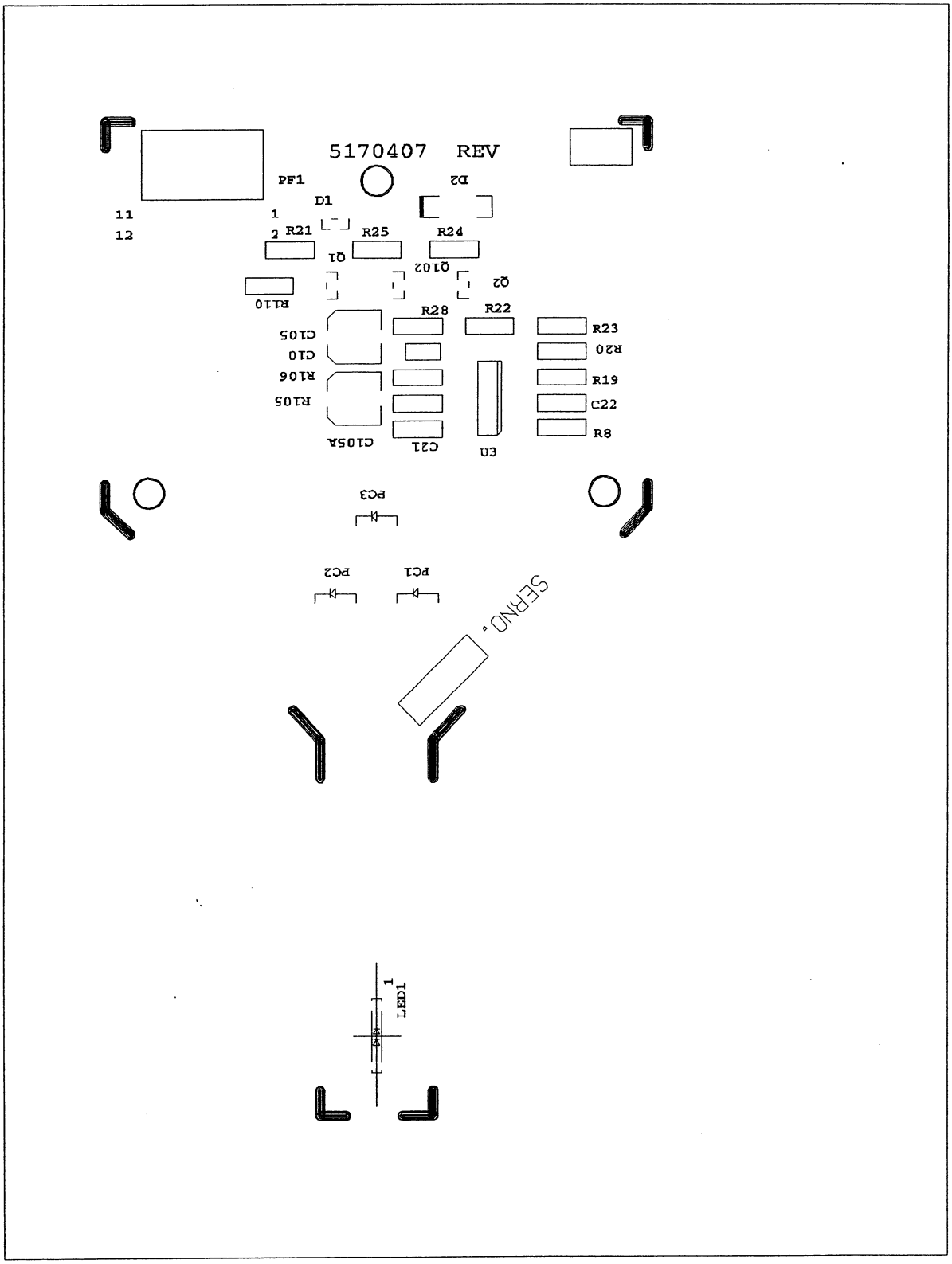
PTHW Board Assembly
5170406-SC (2 of 2)



PTHW PCB Assembly
5170406-AS



Finger PCB Assembly
5170407-SC



Finger PCB Assembly
5170407-AS

SUMMARY BILL OF MATERIALS		
PART NUMBER	**DESCRIPTION**	**QUANTITY PER ASSEMBLY**
19189	Sems 6-32x3/8 St Phil Itooth	16.00
49665	Spacer FF6-32 X 1.500 Hex	8.00
19418	Isolator Round	2.00
5170204	Frmwr Asby Index-2 V2.00	1.00
5170405	Base PCB Assembly	1.00
5170406	PTHW PCB Assembly	1.00
5170407	Finger PCB Assembly	1.00
51710009	Overlay Front Index-2	1.00
52039	Keypad 1 x 5 Com. Bus ¾" C-C	1.00
47010	Insul. Neoprene .75 x 3.25 x 1/16	2.00
47052	Battery Gel Cell 12V	1.00
49156	Foot Rubber Grey	4.00
5170400	Digital PCB Assembly	1.00
04018	LCD 2 x 24 Supertwist Display	1.00
5172001	Base Plate	1.00
5172016	Top Case Molded Index "FE"	1.00
5172011	Finger .020" Slot	1.00
5172012	Window Bottom Finger .020	1.00
5172005	Window Top Finger	1.00
5171008	Patent Label	1.00
66033	Loctite Instant Gel	0.01

ACCESSORIES	
PART NUMBER	**DESCRIPTION**
48276	Battery Charger, Schuko 12VDC-240V
48320	Battery Charger, 12V, Australian
48274	Battery Charger, 12VDC-120V, US

Chapter 6
Parts Lists

Parts are listed for final assembly.
Contact BIO-TEK INSTRUMENTS, INC. for
latest pricing and availability.

Index 2