

1865
Megohmmeter/IR Tester
Service Manual
Form 150075/A1

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100 Nickerson Road
Marlborough, Massachusetts, U.S.A. 01752
September, 1997


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800-253-1230 (Sales & Service)
Fax. 508-485-0295

The material in this manual is for informational purposes only and is subject to change, without notice. QuadTech assumes no responsibility for any error or for consequential damages that may result from the misinterpretation of any procedures in this publication.

WARNING

Potentially dangerous voltages may be present on the measurement terminals. Use all safety precautions and follow all warnings in this manual when operating or servicing this instrument. Dangerous energy levels may be stored on devices tested by this unit. **ALWAYS MAKE SURE THE HIGH VOLTAGE INDICATOR IS NOT ON WHEN CONNECTING OR DISCONNECTING THE DEVICE UNDER TEST.**

SERVICING SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY

	IEC417
Symbol on equipment signifies that the manual contains information to prevent injury or equipment damage	

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Warranty



QuadTech warrants that Products are free from defects in material and workmanship and, when properly used, will perform in accordance with QuadTech's applicable published specifications. If within one (1) year after original shipment it is found not to meet this standard, it will be repaired, or at the option of QuadTech, replaced at no charge when returned to a QuadTech service facility.

Changes in the Product not approved by QuadTech shall void this warranty.

QuadTech shall not be liable for any indirect, special or consequential damages, even if notice has been given of the possibility of such damages.

This warranty is in lieu of all other warranties, expressed or implied, including, but not limited to any implied warranty or merchantability or fitness for a particular purpose.

SERVICE POLICY

QuadTech policy is to maintain product repair capability for a period of at least five (5) years after original shipment and to make this capability available at the then prevailing schedule of charges.

Section 1

Service Policy

1.1 General

Recommended service policy on the 1865 Megohmmeter/IR Tester is for the modular replacement of major circuit assemblies and other spare parts as listed in Section 6 of this manual. Calibration and other maintenance procedures are provided in this manual for use by qualified service personnel.

To order spare parts or to obtain current pricing and availability contact QuadTech Part Sales.

QuadTech Sales: Telephone:
 U.S. 800-253-1230
 International 508-485-3500

 Fax: 508-485-0295

1.2 Repair/Exchange

A Repair/Exchange program is available for all of the principal circuit assemblies for those customers who have their own repair/calibration capabilities. A replacement circuit assembly should be requested from QuadTech Service. Upon receipt of the replacement assembly the defective/repairable assembly must be returned to QuadTech **WITHIN 30 DAYS** to ensure billing at the standard repair/exchange rate. Failure to return the defective/repairable assembly will result in billing at the full spare part price for the item involved.

Please contact QuadTech Service if you have questions about the repair/exchange procedure.

QuadTech Service: Telephone:
 U.S. 800-528-8885
 International 508-485-3500

 Fax: 508-485-0295

1.3 Instrument Return

Before returning an instrument to QuadTech for service please call our Service Department at 800-253-1230 or 508-485-3500 for return material authorization. It will be necessary to include a Purchase Order Number to insure expedient processing, although units found to be in warranty will be repaired at no-charge. For any questions on repair costs or shipment instructions please contact our Service Department at the above number. To safeguard an instrument during storage and shipping please use packaging that is adequate to protect it from damage, i.e., equivalent to the original packaging and mark the box "Delicate Electronic Instrument". Return material should be sent freight prepaid, to:

QuadTech, Inc.
100 Nickerson Road
Marlborough, MA 01752

Attention: Service Department

Shipments sent collect can not be accepted.

- Remove the fuse from the holder by prying upward using a small flat head screwdriver. Insert the replacement fuse into the fuse holder.
- Once the fuse has been installed in the holder and spare fuse (if desired) installed in the right side of the tray insert the tray back into the fuse drawer, push in and lock. The two silver contacts on the fuse tray should be positioned towards the outside.
- Once the fuse tray has been installed in the draw, reinstall the fuse draw back into the instrument ac inlet module, push in and lock.

2.3 Care of Display Panel

Use caution when cleaning the display, not to scratch it or get cleaning substances into the instrument. Use only a soft cloth with a mild glass cleaner on the cloth.

2.4 Battery Replacement

Backup power for the instruments non-volatile memory is supplied by 3 standard AA batteries. These should be replaced annually with alkaline batteries. To replace the batteries proceed as follows:

1. **Instrument power needs to be on but not in the measurement mode.**
If the batteries are removed with the power off there would be no power to the non-volatile memory and important data such as stored test conditions would be lost.
2. Place a flat head screwdriver in the groove of the battery compartment end cap and rotate counterclockwise (ccw) about 1/4 turn to remove.
3. Lift the front of the instrument up slightly so that the batteries slide out of the compartment.
4. Install three new batteries, **positive side out.**

CAUTION

Do not install the batteries backwards

5. Reinstall the end cap and rotate clockwise (cw) to secure.

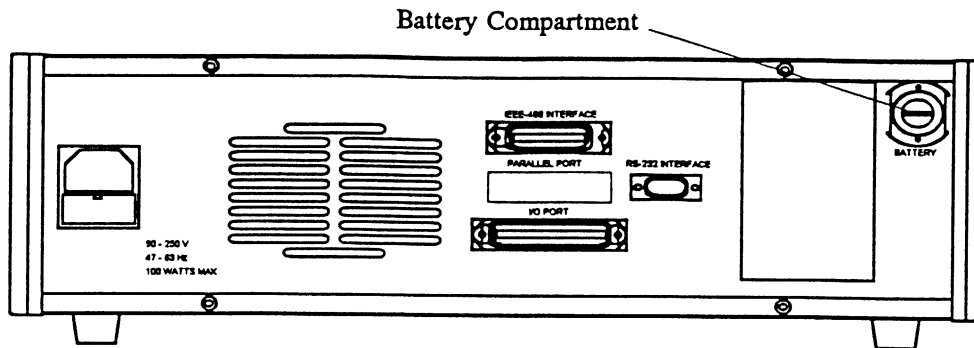


Figure 2-2
Battery Compartment

2.5 Resetting of Time and Date

If for some reason the backup power supplied by the 3 AA batteries should fail during shipment of the instrument (due to shock, vibration or extreme temperature) the unit will lose its zero, time and date, elapsed time and stored setup conditions. An indication of such an occurrence would be the display of the error message "ELAPSED TIME ERROR, SET TO 0" when the unit is first powered up. The most likely cause would be an intermittent connection to the battery due to shock or vibration. **It is very important that the time and date be reset and the instrument zeroed before proceeding with any measurements.** Proceed as follows:

1. Press **MENU** key to select menu display.
2. Press **Right or Left Arrow** key to select Utilities menu.
3. Press **Up or Down Arrow** key to select Set Time/Date.
4. Press **ENTER** key to activate the entry field.
5. Set the current time and date as instructed on the display, refer to paragraph 2.6.4.6 if necessary. After the time and date have been reset press **MENU** to return to the menu display.
6. Press **Up or Down Arrow** key to select Zero.
7. Press **ENTER** key to activate the Zero routine and follow instructions on the instrument display.
8. Once the Time and Date have been reset and the instrument zeroed the 1865 is ready for routine measurements. It's important to note that the elapsed time will have been reset back to zero during this process.

Section 3

Disassembly

3.1 General

Disassembly of the 1865 Megohmmeter/IR Tester can be done in terms of the modular components from which it is comprised and should only be done by qualified service personnel. Most parts of the instrument are accessible for service by removing the top cover, and/or power supply cover. However, in order to remove the front panel or floppy drive the bottom cover must also be removed.

WARNING

MAKE SURE THE UNIT IS DISCONNECTED FROM ITS AC POWER SOURCE FOR AT LEAST FIVE MINUTES BEFORE PROCEEDING.

Removal of instrument covers may constitute an electrical hazard and should be accomplished by qualified personnel only.

CAUTION

STATIC SENSITIVE DEVICES - USE STATIC CONTROL WRIST STRAP WITH STATIC CONTROL WORK SURFACE.

3.2 Top Cover Removal

Remove the two screws as indicated below, then lift the cover up and towards the rear to slide out of the front panel groove.

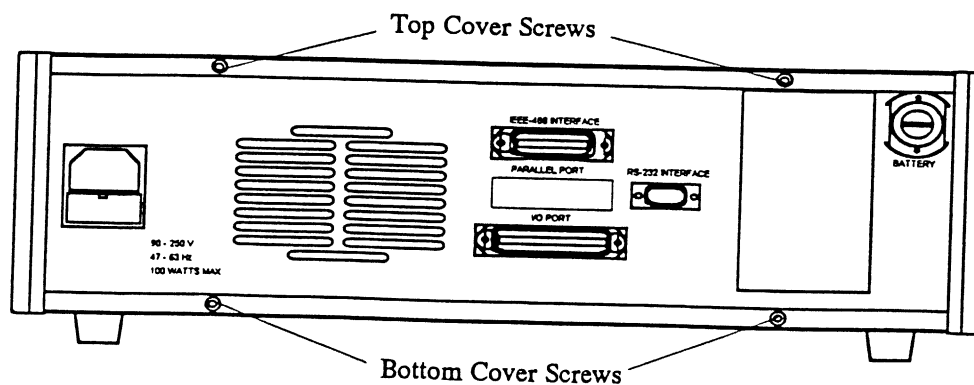


Figure 3-1
Top Cover Removal

3.3 Circuit Board Removal

3.3.1 General

The layout of the instrument circuit boards and interconnection is illustrated below with access and removal instructions in the subsequent paragraphs.

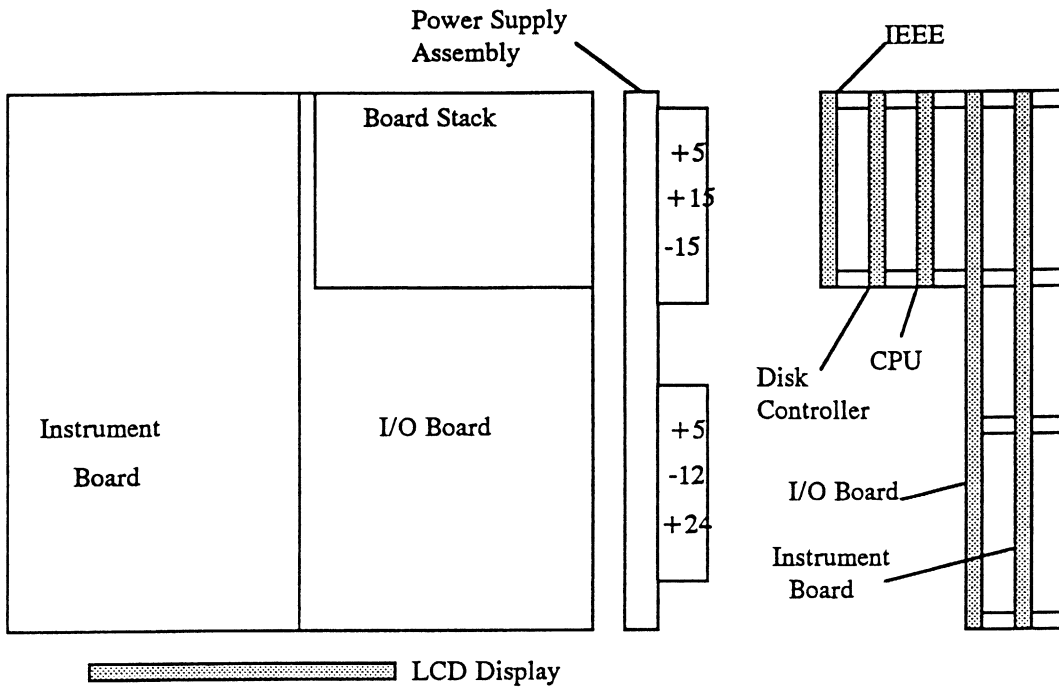


Figure 3-2
Circuit Board Location (viewed from front)

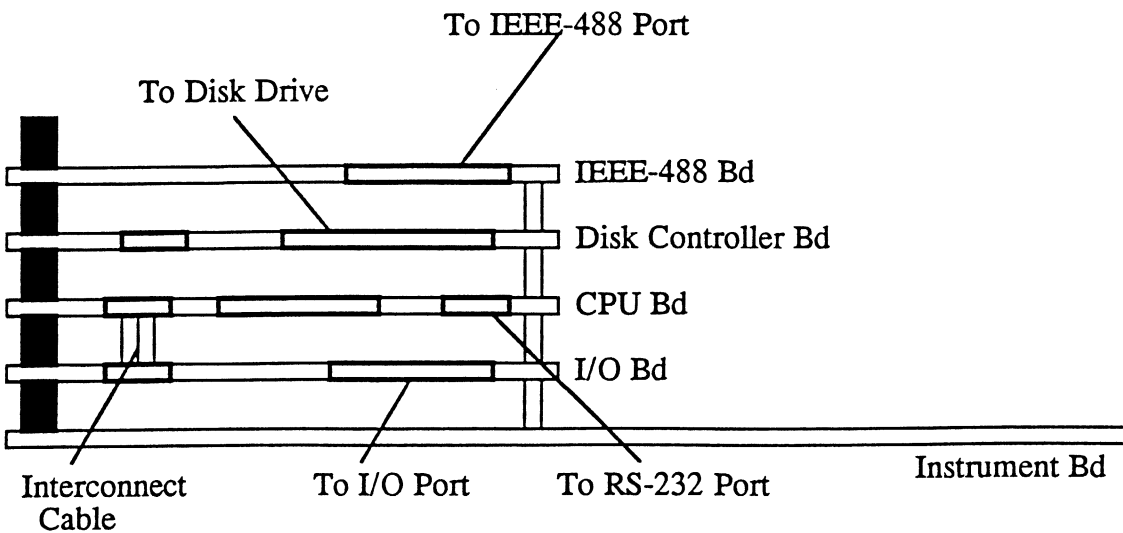


Figure 3-3
Stack Cable Connections (viewed from rear)

3.3.2 IEEE-488 Interface Board Option

The IEEE-488 Interface Board is an option to the 1865 and may or may not be present. When present it is assembled as part of the stack, its order is not important but would be the board with the ribbon cable which connects to the rear panel IEEE-488 connector. To remove this board, disconnect cable, remove the two screws (or studded spacers) on the left which secure it to the spacers below, then lift up to unplug. Refer to Figure 3-3.

3.3.3 Disk Controller Board Option

The Disk Controller Board is an option to the 1865 only when the front panel floppy drive is present. When present it is assembled as part of the stack, its order is not important but would be the board with the cable which runs to the floppy drive. To remove this board, disconnect cable, remove the two screws (or studded spacers) on the left which secure it to the spacers below then lift up to unplug. Refer to Figure 3-3.

3.3.4 CPU Board

The CPU Board is always part of the stack, and must be the first one in the stack above the larger I/O Board since it connects to the I/O Board with a short ribbon cable. Another cable connects from this board to the RS-232 rear panel connector. Disconnect cables, remove the four studded spacers and lift up to unplug. Refer to Figure 3-3.

3.3.5 I/O Board

The I/O Board is the mid size board, half the size of the instrument board but larger than those that make up the stack. To remove this board, the stack boards, referred to above must first be removed. Disconnect all cables to the board, comprised of two to the LCD assembly, and one each to the battery compartment, the keypad, the power supply assembly and the I/O Port connector on the rear panel. To simplify reconnection make note of all cable connections when removing. The board is secured by the 4 studded spacers which supported the stack plus four other screws. All must be removed before removing the board.

3.3.6 Instrument Board

The Instrument Board is the large board on which all others (I/O and stack boards) are mounted.

One way is to remove the Instrument Board from the top down, with the I/O Board and stack boards first removed as noted above. First disconnect the 3 cables to the board which connect to the front panel, positive (red), negative (black), and guard (blue).

Disconnect the cable to the light on the front input panel and the cable to the power supply assembly. To simplify reconnection make note of all cable connections when removing. There are about eight studded spacers and 4 screws which when removed will now allow the board to be lifted out.

A second way to remove the Instrument Board is to remove the 10 screws from the bottom panel which secure the standoffs on this board to the bottom panel. The bottom cover must first be removed in order to do this. The board can be removed this way as a complete assembly with all other boards (I/O and stack boards) still mounted to it, of course all cables must first be disconnected. Once the complete assembly has been removed it can be separated from all other boards from the top down as noted in the previous paragraphs.

3.3.7 Power Supply Assembly

The power supply assembly consists of two modules, a +5V, +/-15V module towards the back of the instrument (primarily for the I/O board), and a +5V, -12V, +24V module towards the front (primarily for the instrument board). To access the power supply assembly the instrument top cover must be removed and then the four screws which secure the shield over the top of the power supply.

Remove the two screws that secure the power supply assembly to the rear panel as shown.

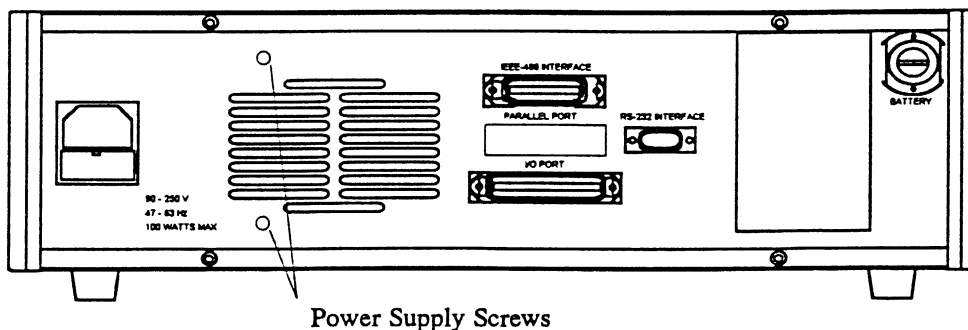


Figure 3-4
Power Supply Removal

Remove three screws that secure the power shield assembly to the bottom panel and the one screw which connects the ground wires to the instrument bottom panel. Once the power supply assembly has been lifted out either power supply module can be replaced/removed as necessary.

3.3.8 Disk Drive

The disk drive is secured by four screws on the instrument side panel. Both the top and bottom covers of the instrument must be removed to gain access to these screws.

3.3.9 LCD Assembly

To remove the display remove the four screws, and disconnect the two cables which connect to the LCD assembly.

Section 4

Performance Verification

4.1 General

This procedure is recommended for verification that the 1865 Megohmmeter/IR Tester is performing normally. If the instrument passes this test it is generally safe to assume that the instrument is within stated accuracy and functional. Refer to Section 5 for detail calibration information.

Table 4-1
Component/Equipment Recommended for Performance Verification

<u>Description</u>	<u>Requirements</u>
10 kohm Standard	Calibration known to 0.1 % and traceable
100 kohm Standard	Calibration known to 0.1 % and traceable
1 Mohm Standard	Calibration known to 0.1 % and traceable
10 Mohm Standard	Calibration known to 0.1 % and traceable
100 Mohm Standard	Calibration known to 0.1 % and traceable
1 Gohm Standard	Calibration known to 0.1 % and traceable
10 Gohm Standard	Calibration known to 0.1 % and traceable
100 Gohm Standard	Calibration known to 0.1 % and traceable
1 Tohm Standard	Calibration known to 0.1 % and traceable
Shielded Test Leads	For connection to above standards
Fluke 8842A Voltmeter	1 - 1000Vdc, 0.1 % accuracy (or equivalent)

4.2 Performance Verification Procedure

4.2.1 Zeroing

Connect the test fixture or test leads (that will be used for connection to the resistance standards) to the (+) terminal and (-) terminal. Set the test voltage to 1000 volts (Setup menu) and Zero (Utilities menu) the 1865.

4.2.2 Test Setup

- a. Using the test fixture or leads zeroed above connect (+) and (-) terminals to the standard resistors as specified in the steps below (two terminal unless noted otherwise). **Careful shielding of the standard resistors is generally required.**
- b. Connect the Fluke 8842A Voltmeter between the 1865 (+) terminal and guard.

4.2.3 Performance Verification Test

Set the 1865 test voltage as specified in the table below, connect the specified standard and verify the measured values to be within the listed limits.

Note:

Limits are based on an ideal value for each standard. Limits need to be calculated based on the actual calibrated value of each standard and accuracy listed. For low values of resistance (<20 Mohm) the measured current would be the Charge Voltage/($Z_{in} + Z_{out} + R_{unknown}$), where $Z_{in} = 5k\Omega$, $Z_{out} = 1k\Omega$.

a. 10 kohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
10 Volts	1mA	0.8% 9.920k Ω to 10.080k Ω	0.55% 994.5 μ A to 1005.5 μ A

b. 100 kohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
100 Volts	1mA	0.53% 99.470k Ω to 100.530k Ω	0.55% 994.5 μ A to 1005.5 μ A
60 Volts	1mA	0.563% 99.436k Ω to 100.563k Ω	0.583% 596.5 μ A to 603.5 μ A
20 Volts	1mA	0.73% 99.269k Ω to 100.730k Ω	0.75% 198.5 μ A to 201.5 μ A
2 Volts	100uA	0.73% 99.269k Ω to 100.730k Ω	0.75% 19.85 μ A to 20.15 μ A

c. 1 Mohm Standard (Voltage Check)

Set 1865 Voltage	Vdc Measured Limits on Fluke 8842A
2 Volts	0.98 to 3.02V
5 Volts	3.95 to 6.05V
10 Volts	8.90 to 11.1V
50 Volts	48.5 to 51.5V
100 Volts	97.0 to 103.0V
200 Volts	196.0 to 204.0V
500 Volts	493.3 to 507.0V
800 Volts	790.0 to 810.0V
1000 Volts	988.0 to 1012.0V

d. 1 Mohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	1mA	0.503% 994.97k Ω to 1.0050M Ω	0.55% 994.5 μ A to 1005.5 μ A
300 Volts	1mA	0.7% 993.80k Ω to 1.0062M Ω	0.667% 297.9 μ A to 302.0 μ A
30 Volts	100uA	0.62% 993.80k Ω to 1.0062M Ω	0.667% 29.79 μ A to 30.2 μ A
3 Volts	10uA	0.62% 993.80k Ω to 1.0062M Ω	0.667% 2.979 μ A to 3.02 μ A

e. 10 Mohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	100uA	0.5% 9.9499M Ω to 10.050M Ω	0.55% 99.45 μ A to 100.55 μ A
400 Volts	100uA	0.575% 9.9424M Ω to 10.058M Ω	0.625% 39.74 μ A to 40.25 μ A
40 Volts	10uA	0.575% 9.9424M Ω to 10.058M Ω	0.625% 3.974 μ A to 4.025 μ A
4 Volts	1uA	0.575% 9.9424M Ω to 10.058M Ω	0.625% 397.4nA to 402.5nA

f. 100 Mohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	10uA	0.5% 99.499M Ω to 10.500M Ω	0.55% 9.945 μ A to 10.055 μ A
500 Volts	10uA	0.55% 99.449M Ω to 100.55.M Ω	0.6% 4.96 μ A to 5.03 μ A
50 Volts	1uA	0.55% 99.449M Ω to 100.55M Ω	0.6% 496nA to 503nA
5 Volts	100nA	0.554% 99.445M Ω to 100.55M Ω	0.604% 49.6nA to 50.3nA

g. 1 Gohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	1uA	0.5% 994.99M Ω to 1.0050G Ω	0.55% .994 μ A to 1.006 μ A
600 Volts	1uA	0.533% 994.66M Ω to 1.0054G Ω	0.584% 596nA to 604nA
60 Volts	100nA	0.536% 994.63M Ω to 1.0054G Ω	0.586% 59.6nA to 60.4nA

h. 10 Gohm Standard (Three Terminal)

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	100nA	0.502% 9.9497GΩ to 10.050GΩ	0.55% 99.4nA to 100.5nA
700 Volts	100nA	0.524% 9.9475GΩ to 10.052GΩ	0.574% 69.6nA to 70.4nA

i. 10 Gohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
70 Volts	10nA	0.55% 9.9449GΩ to 10.055GΩ	0.6% 6.95nA to 7.04nA
7 Volts	1nA	0.807% 9.9192GΩ to 10.081GΩ	1.35% 0.691nA to 0.71nA

j. 100 Gohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	10nA	0.52% 99.479GΩ to 100.52GΩ	0.57% 9.94nA to 10.06nA
800 Volts	10nA	0.538% 99.462GΩ to 100.54GΩ	0.588% 7.95nA to 8.05nA

k. 1 Tohm Standard

Set 1865 Voltage to:	1865 Range Hold	R Accuracy & Measured Limits on 1865	I Accuracy & Measured Limits on 1865
1000 Volts	1nA	0.7% 992.99GΩ to 1.0070TΩ	1.25% 0.988nA to 1.013nA

5.1 General

Calibration of the 1865 Megohmmeter is recommended on an annual basis for compliance with many instrument certification programs. If the unit is to be returned to QuadTech, for factory calibration, refer to paragraph 1.3 for instruction. Using the procedure below the instrument can also be calibrated by a qualified service person if traceable calibration equipment and standards are available.

**Table 5-1
Equipment for Calibration**

Temperature stabilized room at 23 degrees C (73.4 F)

Precision Digital Voltmeter, 0.01 % accuracy, with calibration traceable to NIST (Fluke 8842A or equiv.)

1 Megohm standard resistor of known value (within 0.01 %) at 100V for direct connection to 1865 input terminals and traceable to NIST

5.2 Calibration Procedure

The step by step instructions for this procedure are shown on the instrument display and discussed below.

1. Select CALIBRATION on the Utilities menu. Once ENTER is selected the calibration code of 1865225 must be entered to continue. This code is to prevent unauthorized personnel from effecting the instrument calibration. The code might want to be blanked out in this manual. After the calibration code is entered the TIME and DATE should be checked and changed if necessary.

2. After completing the time and date check the stored reference voltage is displayed and can either be accepted or measured and re-entered as instructed.

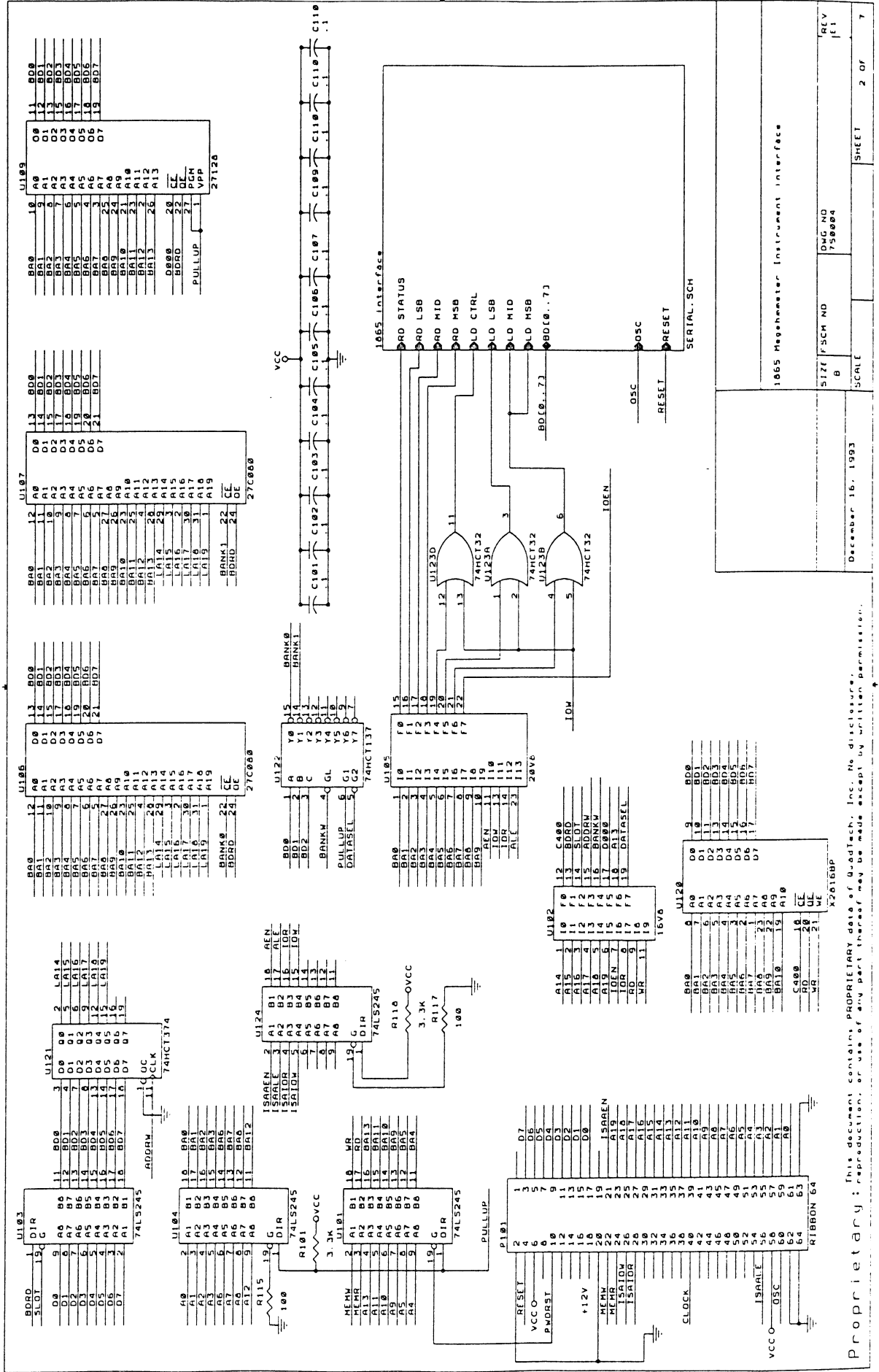
If the selection is N (no), measure the reference voltage as instructed between TP6 and TP8 (ground) on the analog instrument board and enter the measured value. To access these points it is necessary to remove the top cover, refer to Figure 1-5. Once this voltage value is entered and ENTER pressed the High Voltage (100V) will be turned on immediately.

If **Y** (yes) is selected the High Voltage (100V) will be turned on immediately.

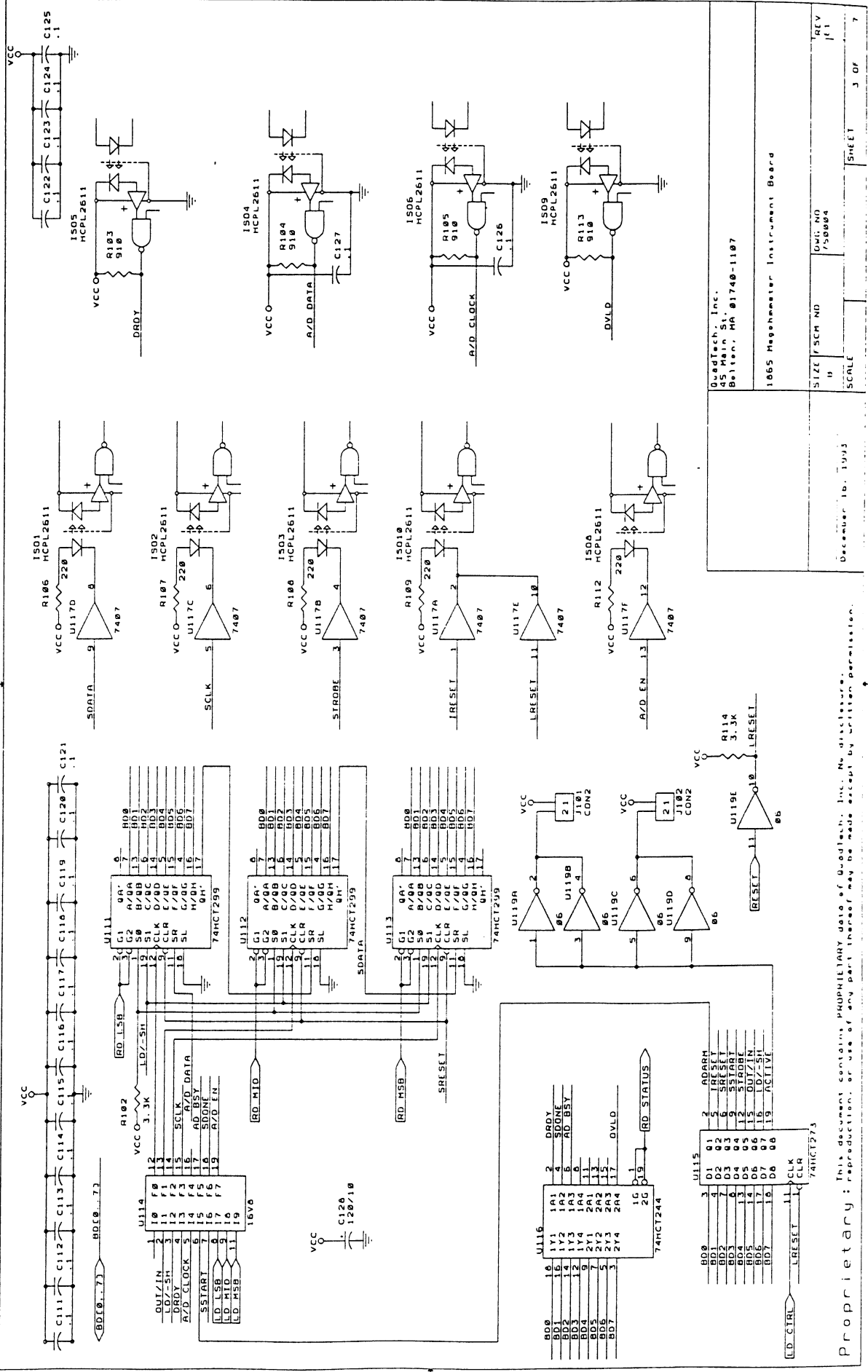
3. Proceed to measure the voltages in each case as instructed, enter the values and press **ENTER** to continue each time. Two measurements will be made at levels of 100 and 1000V and one at 10V.
4. Short the input + and - terminals to the instrument as instructed and press **START**.
5. Enter the precise known value of the 1 Mohm Standard and again press **ENTER**.
6. Remove the short and connect the standard between the + and - terminals.
7. When **START** is pressed a calibration measurement is made on the standard which takes approximately 25 seconds.
8. Once the standard is removed and **START** pressed again a **RANGE CALIBRATION** is performed which takes approximately 70 seconds.
9. Press **START**, **HIGH VOLTAGE OF 1000 VOLTS IS STILL APPLIED**, to initiate the **ZERO CALIBRATION** which takes approximately 70 seconds.
10. Once zero calibration is complete if the time and date are correct as displayed answer **Y** (yes) to store the calibration data. If they are not correct press **N** (no) to change date and time as instructed. To prevent the calibration from being changed by mistake the instrument requests final confirmation, **Y** (yes) or **N** (no) before the data is saved. Once this is complete and **MENU** selected the calibration is **COMPLETE**.

6.1 Parts List

<u>Item Part Number</u>	<u>Description</u>
150051	Overlay, Start Key
150073	User Manual
230002	Thumbnut, I/O panel
230003	Spacer, PC Stack
320053	Inlet module
350006	Foot, Rubber
350007	Bail
350008	Foot, plastic, left
350009	Foot, plastic, right
4200-0300	Power Cord, 10A, 125V, 6 feet
520002	Battery, AA, Alkaline
520004	Fuse, Slow Blow, 1.25 A (230V)
520034	Switch, Power
5330-2100	Fuse, Slow Blow, 2.5 A, (115V)
630001	IEEE Cable (IEEE-488 rear panel connector to IEEE Bd)
630002	Handler Cable (I/O Port rear panel connector to I/O Bd)
630003	Floppy Sig Cable (Floppy Controller Bd to Floppy Drive)
630004	Jumper Cable (CPU Bd to I/O Bd)
630005	RS232 Cable (RS-232 rear panel connector to CPU Bd)
630006	Display Cable
630007	Battery Holder Assembly
630016	LCD Cable
630019	Interlock Connector
630021	Cable, 24V
630080	Cable, 5V
630023	Cable, AC
700004	IEEE Board Option
700005	Disk Drive Option, 3.5", 1Mbyte
700006	Floppy Controller
700013	Power supply, 5V, 24V
700047	Power Supply, 5V, +/-15V
750004	Instrument Board
750051	I/O Board



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 1865 Magee Street
 Ballston, MA 01740-1107

1865 Magee Street Instrument Board

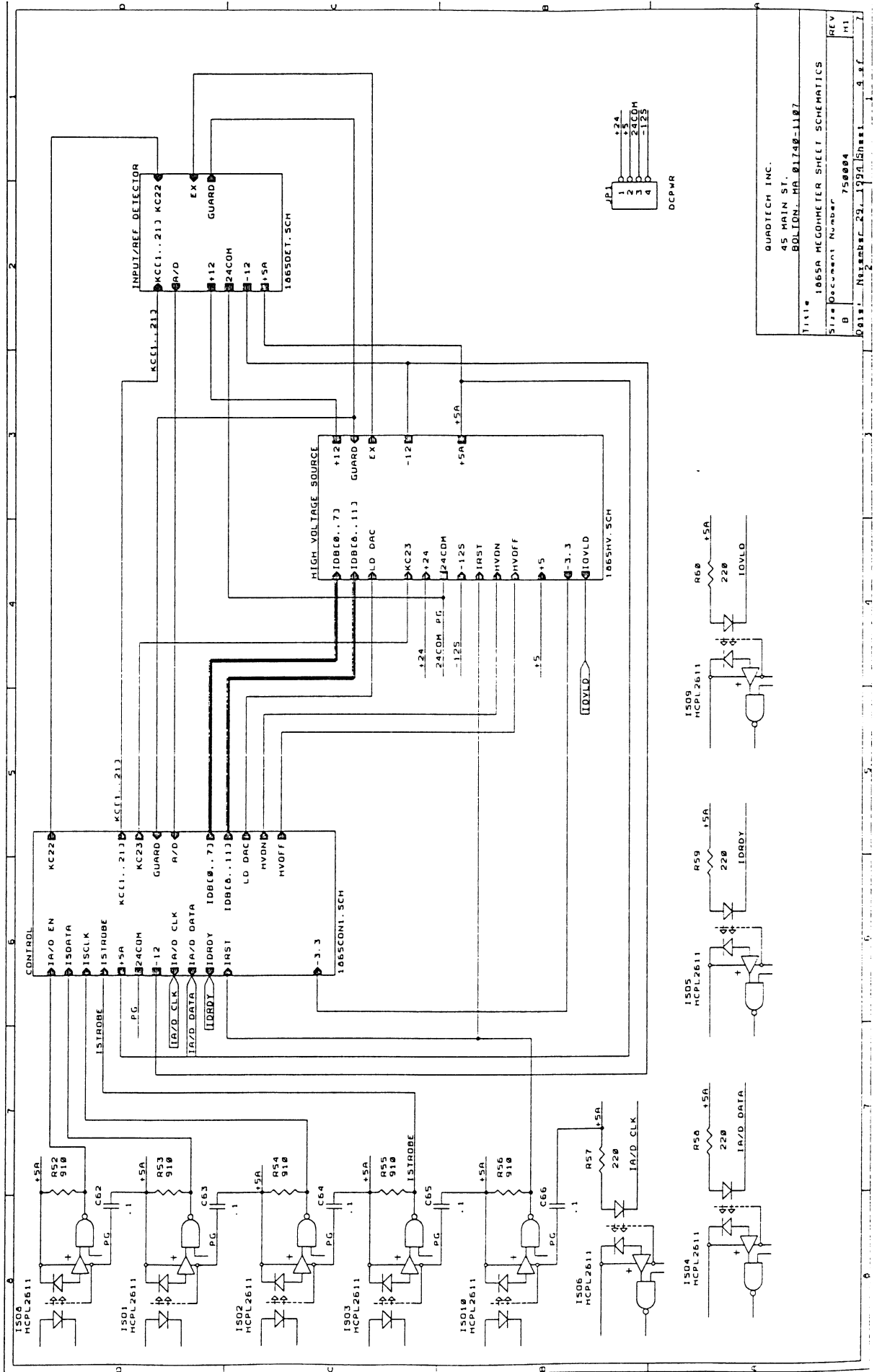
SIZE / SCHED / REV
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SCALE
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December 16, 1993

SHEET 3 OF 7

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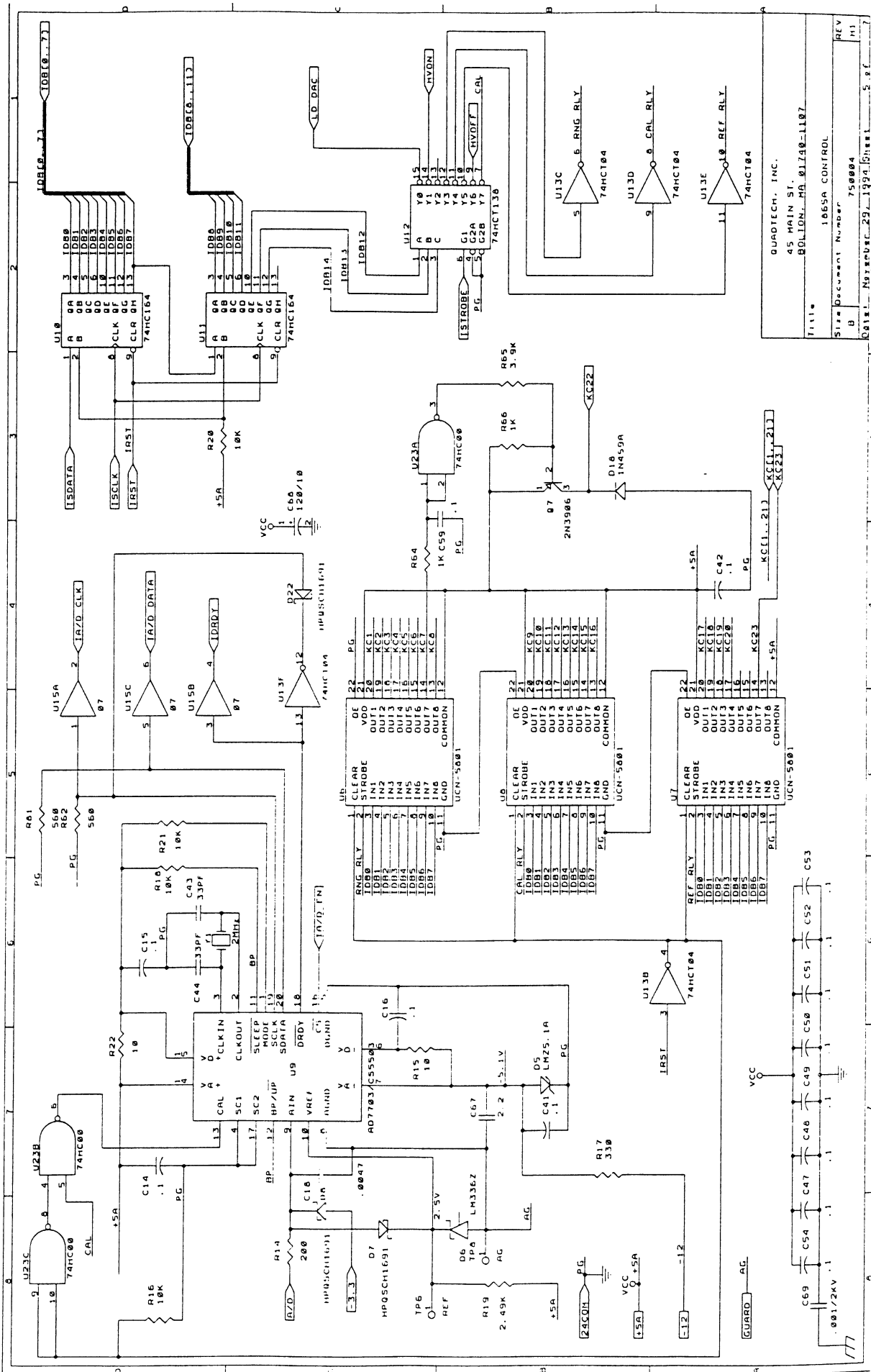
QUADTECH INC.
 45 MAIN ST.
 BOLLING, MA 01749-1107

1065A MEGOHMMETER SHEET SCHEMATICS

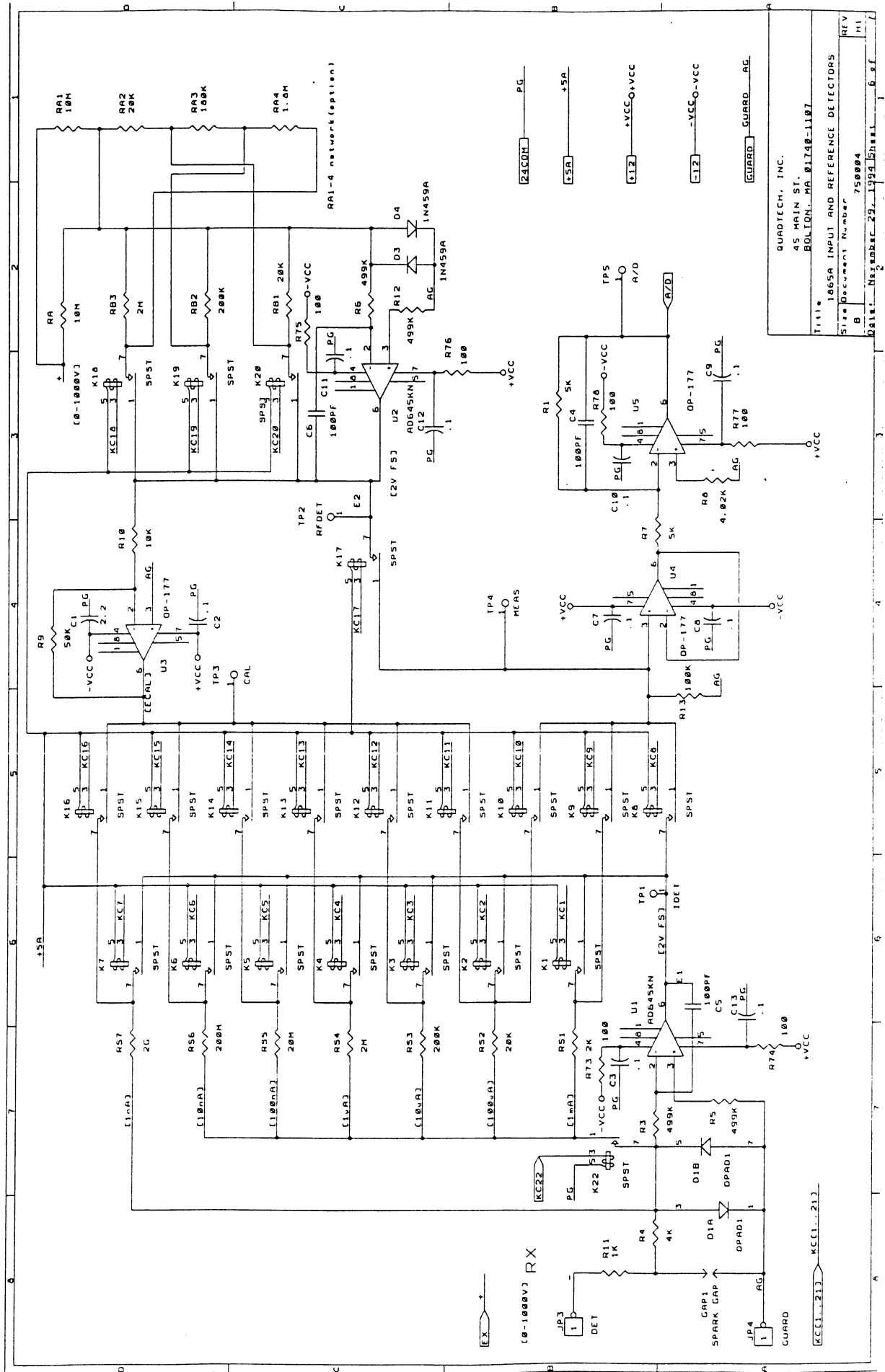
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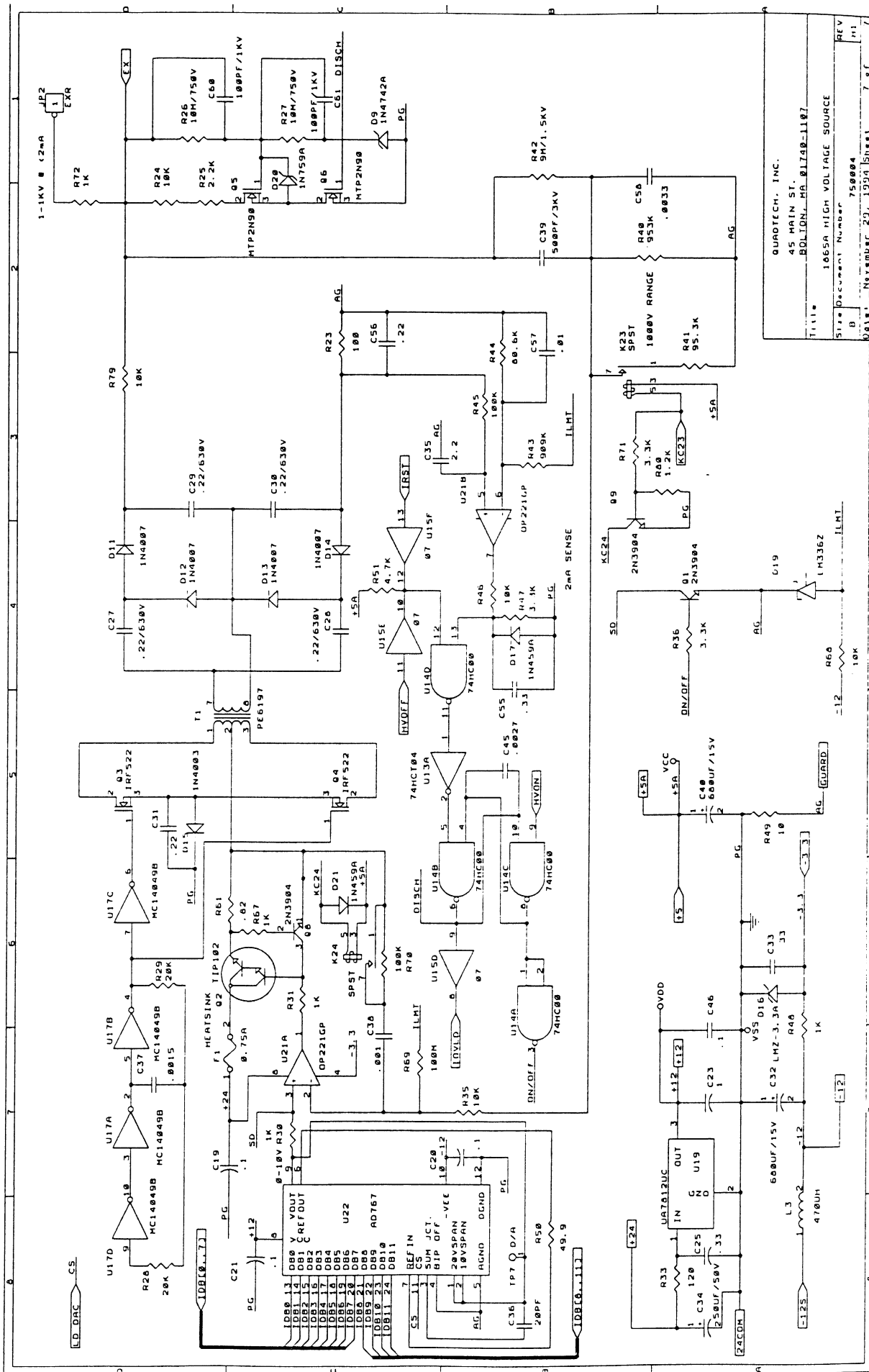
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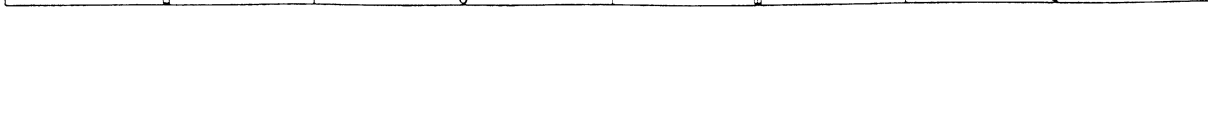
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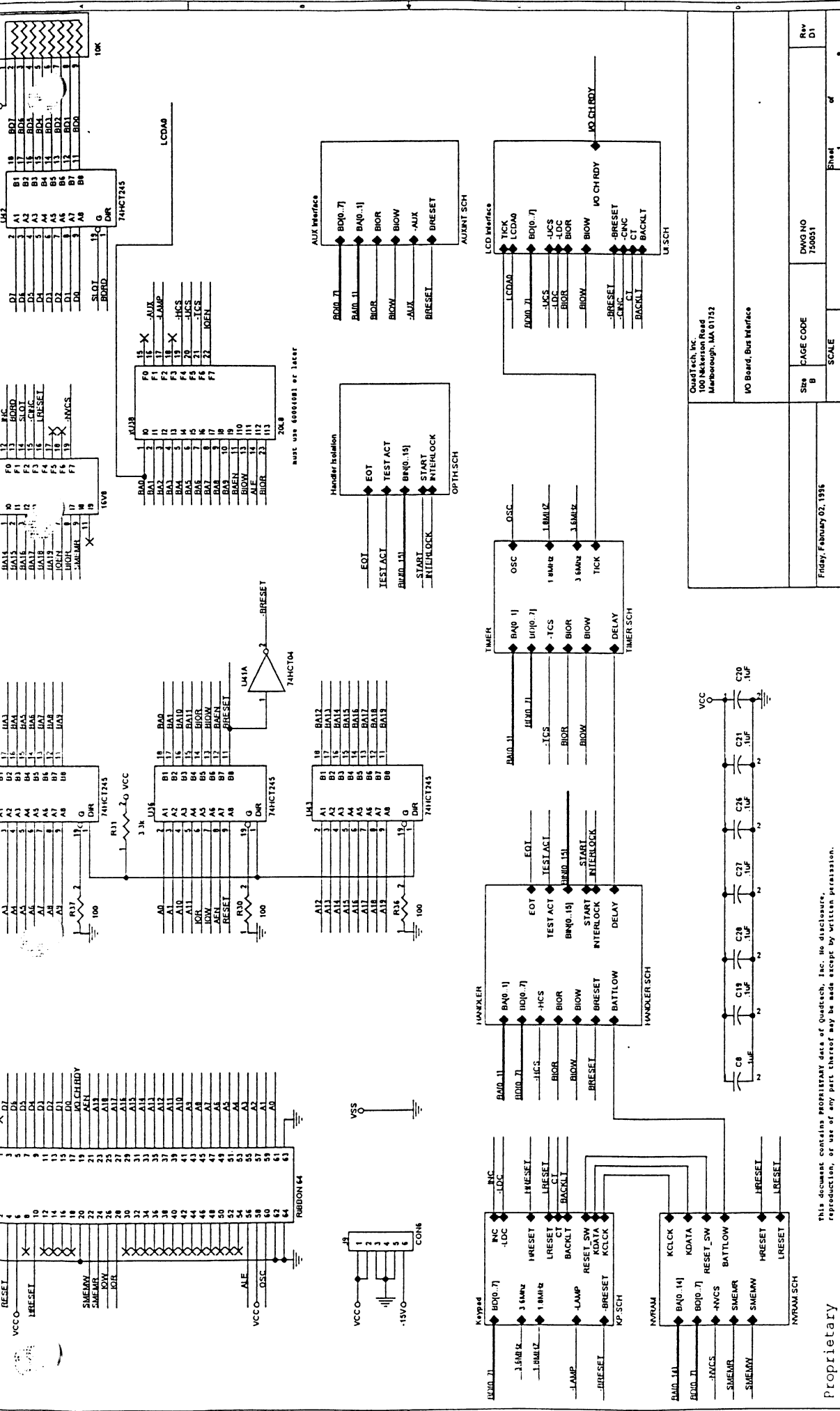
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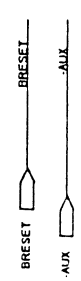
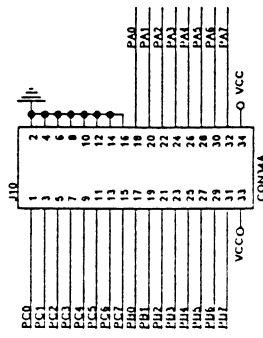
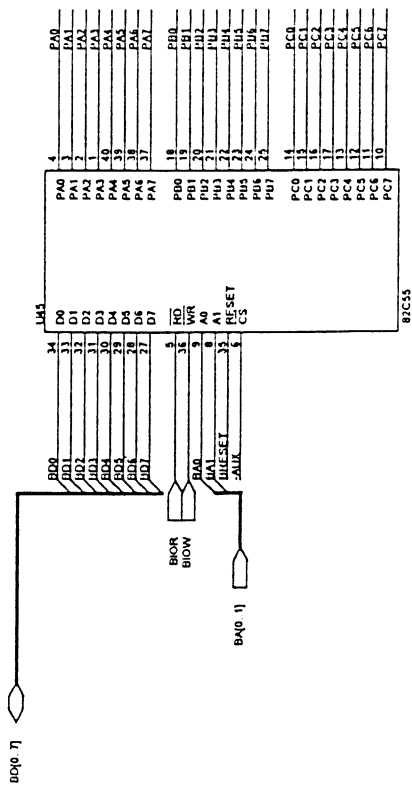
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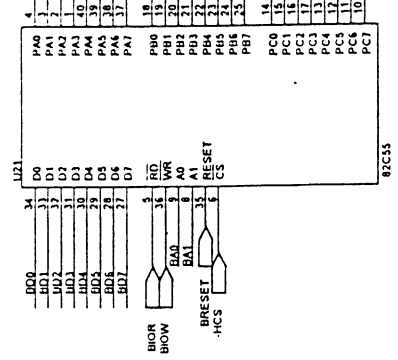
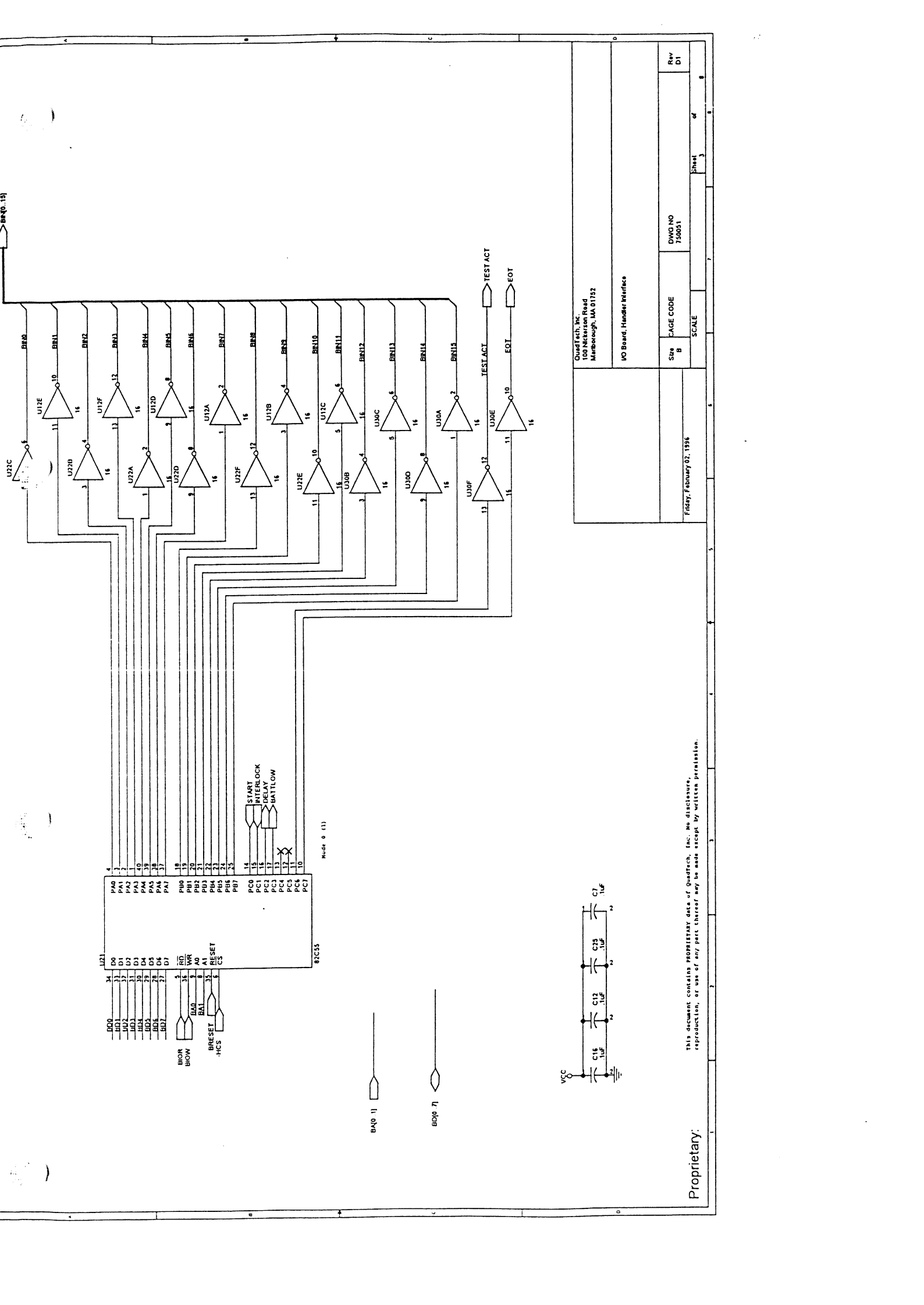
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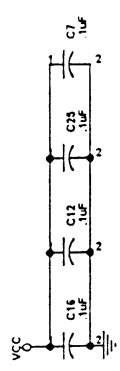
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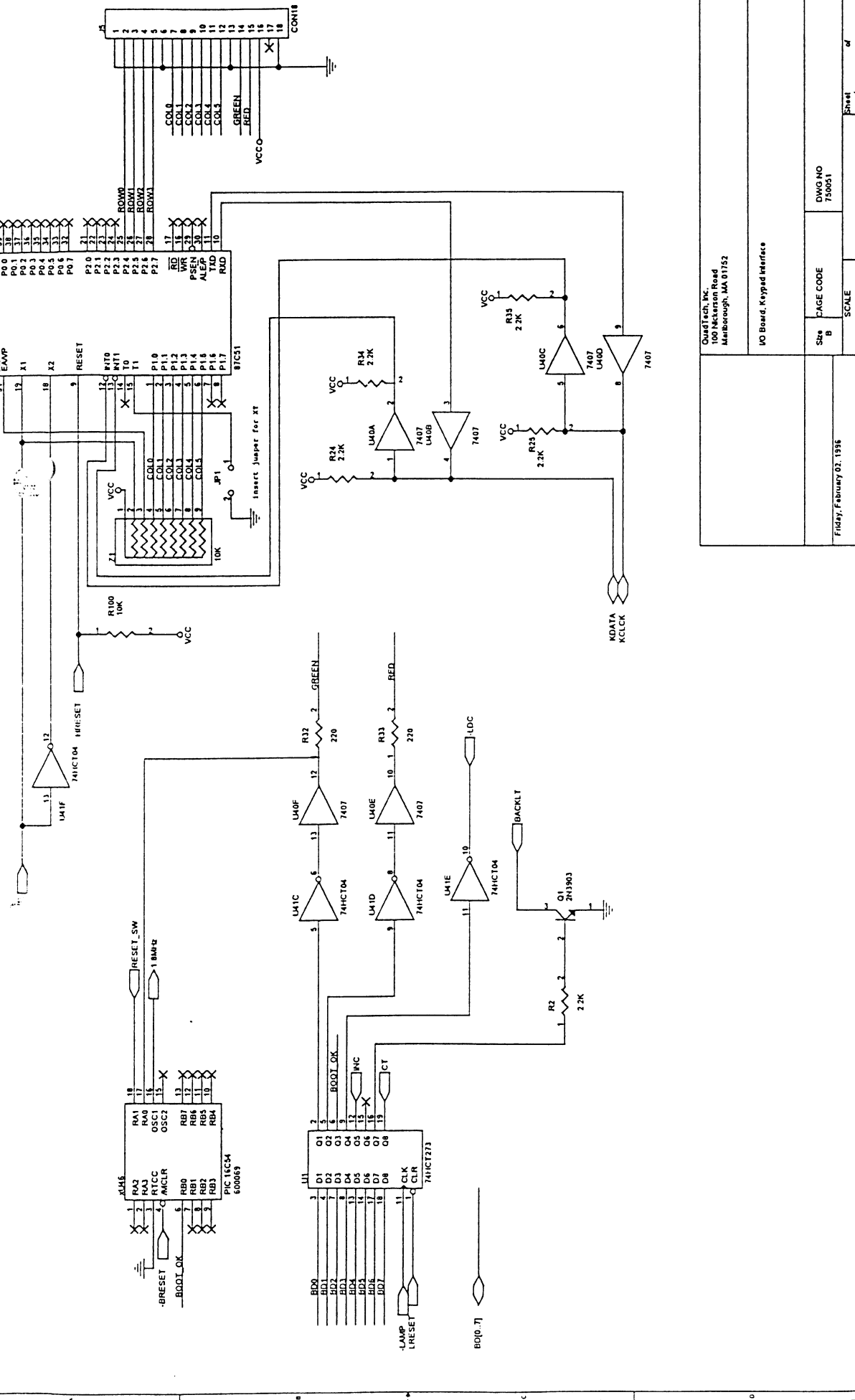
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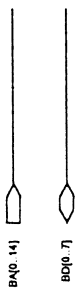
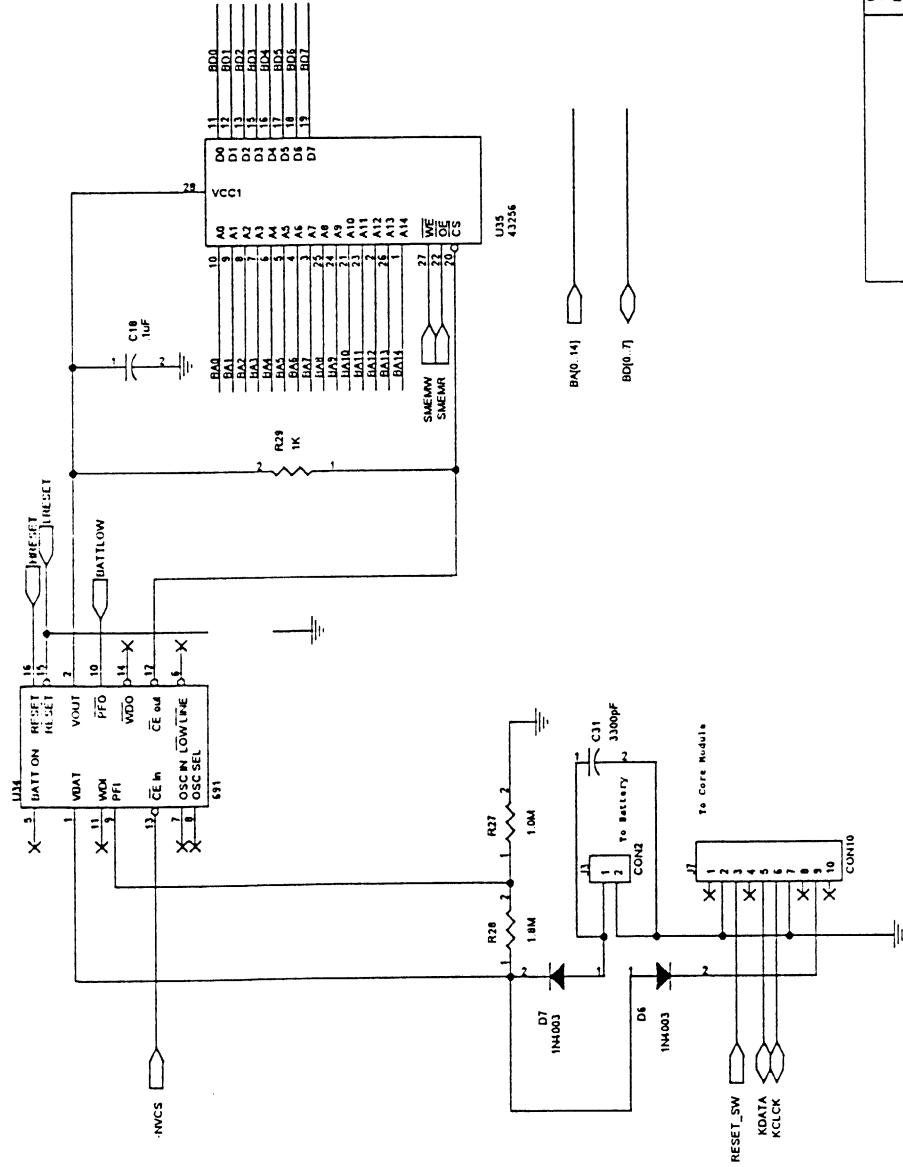


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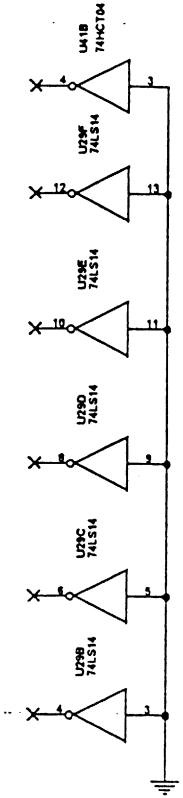
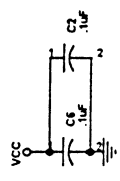
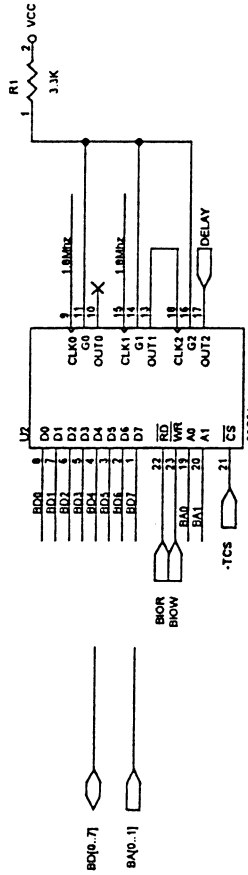
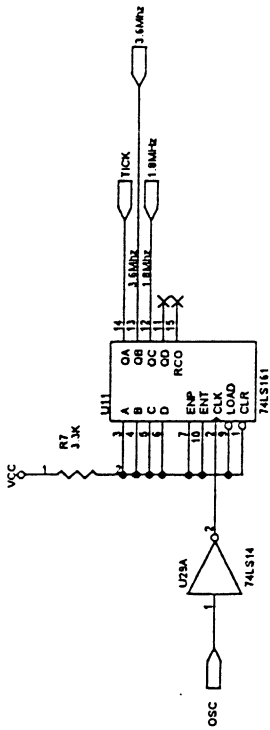
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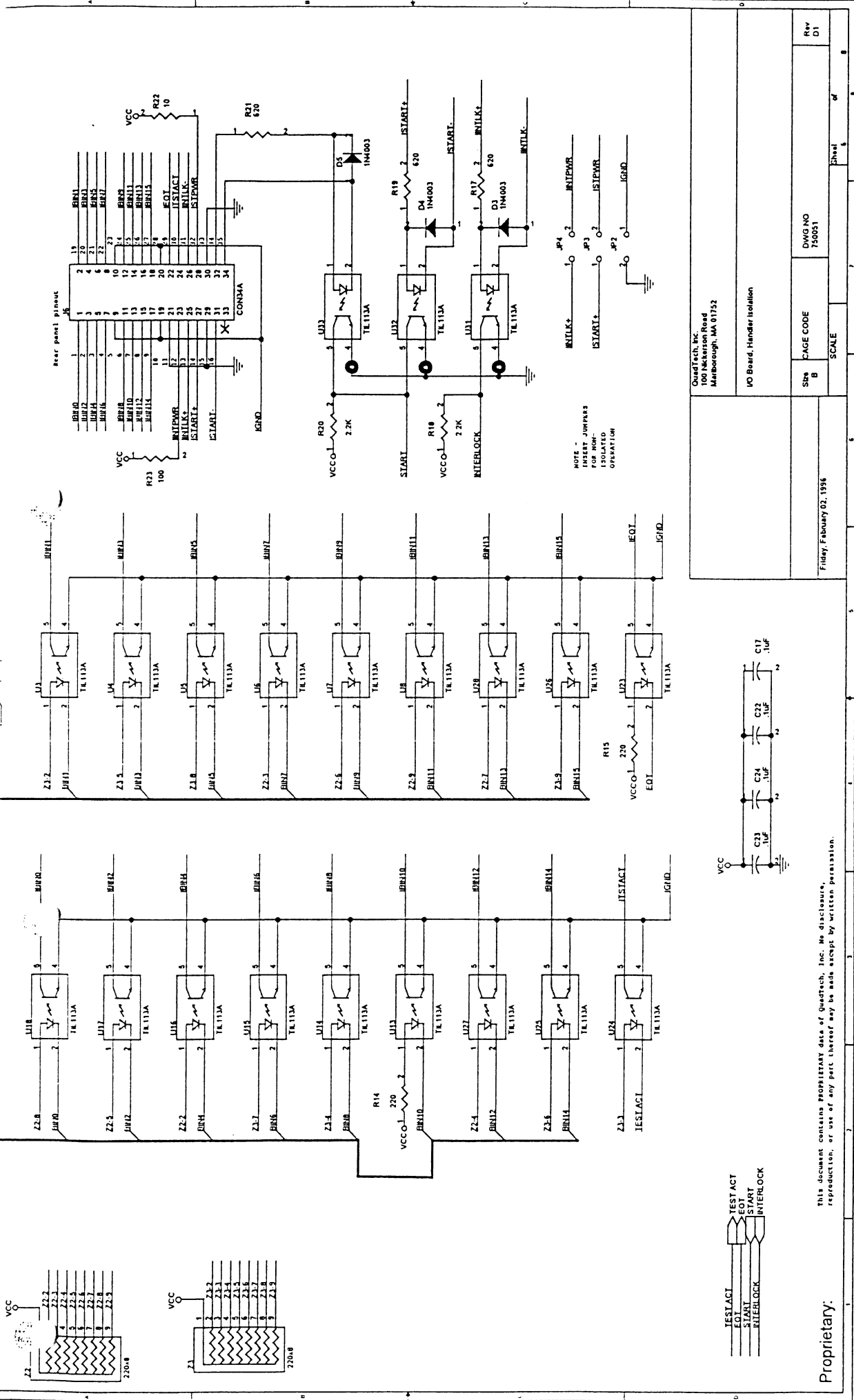
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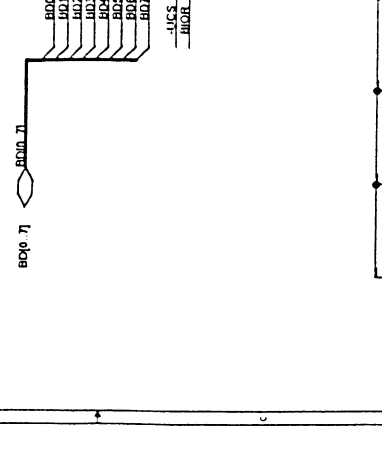
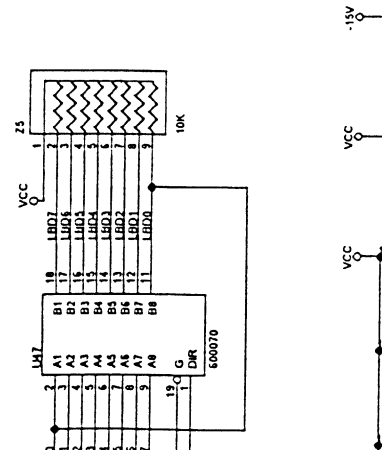
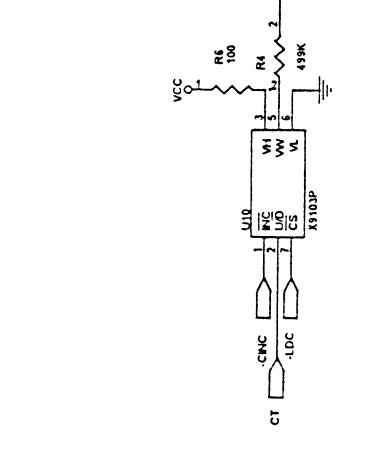
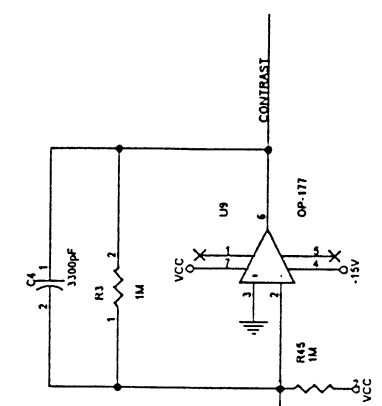
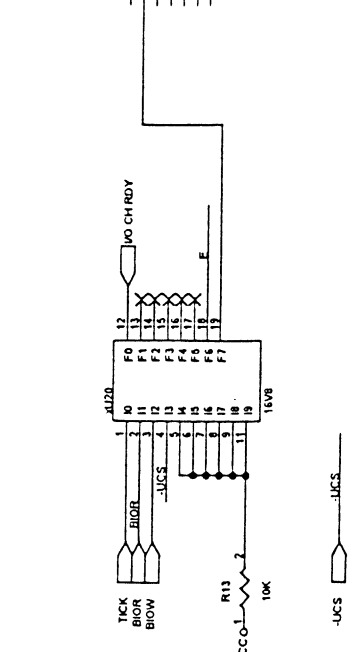
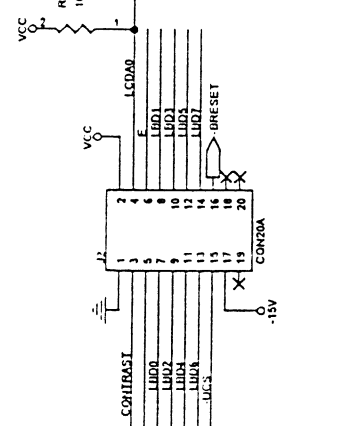
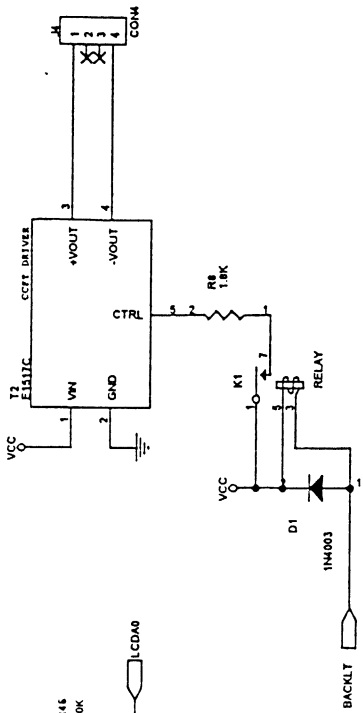
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