



LeCroy 9354A/M/L, 9354T/M

Digital Storage Oscilloscope

Service Manual



LeCroy

Innovators in Instrumentation

LeCroy 9354A/M/L, 9354T/M

Digital Storage Oscilloscope

Service Manual

Version 1.0

February 1995

First printing

LeCroy
Corporate Headquarters

700 Chestnut Ridge Road
Chestnut Ridge, NY 10977-6499

Tel : (914) 425-2000
Fax : (914) 425-8967

LeCroy
European Headquarters

2, rue du pré-de-la-Fontaine
1217 Meyrin 1 / Geneva, Switzerland

Tel : 41 (022) 719.21.11
Fax : 41 (022) 782.39.15

Table of Contents

Section 1	General Information	Page
1.1	Initial Inspection	1-1
1.2	Warranty	1-1
1.3	Product Assistance	1-1
1.4	Address of Service Centers	1-1
1.5	Maintenance Agreements	1-5
1.6	Documentation Discrepancies	1-5
1.7	Service Procedure	1-5
1.8	Return Procedure	1-5
1.9	Safety Precautions	1-6
1.10	Antistatic Precautions	1-6
Section 2	Specifications	2-1
2.1	9354A/M/L Specifications	2-2
2.2	9354T/M Specifications	2-6
2.3	Hard Disk, Floppy, RAM Card, Internal Printer options	2-10
2.4	Active Fet Probes	2-13
2.5	Active Differential Probes	2-15
2.6	WP01 Waveform Processing Package	2-17
2.7	WP02 Fast Fourier Processing Package	2-20
2.8	CKTRIG option	2-23
2.9	LeCalsoft Calibration Software	2-25
Section 3	Block Diagram and Sub-Assemblies	3-1
3.1	9354A, 9354AM, 9354AL Sub-Assemblies	3-1
3.2	9354T/M Sub-Assemblies	3-1
3.3	9354A/T Hardware Options	3-1
3.4	9354A Block Diagram	3-2
3.5	9354AM Block Diagram	3-3
3.6	9354AL Block Diagram	3-4
3.7	9354T Block Diagram	3-5
3.8	9354TM Block Diagram	3-6
Section 4	Theory of Operation	
4.1	Processor Board for 9354A/M/L & 9354T/M	4-1
4.1.1	Processor Block Diagram	4-1
4.1.2	Parallel Peripherals	4-2
4.1.3	Serial Peripherals	4-3
4.1.4	External Interfaces	4-3
4.1.5	Optional Interfaces	4-3
4.2	F9354-31 Main Board	4-4
4.2.1	Introduction	4-4
4.2.2	Microprocessor Control	4-4
4.2.3	Front End	4-4

Section 4	Theory of Operation	Page
4.2.3.1	Channel Description	4-4
4.2.2	Microprocessor Control Block Diagram	4-5
4.2.3.2	Digital Controls	4-6
4.2.3.3	Analog Controls	4-7
4.2.4	Trigger	4-8
4.2.4.1	Trigger Block Diagram	4-8
4.2.4.2	Digital Controls	4-9
4.2.4.3	Analog Controls	4-9
4.2.4.4	TV Trigger	4-9
4.2.5	Analog to Digital Converter	4-10
4.2.5.1	Introduction	4-10
4.2.5.2	ADC Block Diagram	4-11
4.2.5.3	Memories Block Diagram	4-12
4.2.6	Time Base	4-13
4.2.6.1	Introduction	4-13
4.2.6.2	Time Base Block Diagram	4-14
4.2.6.3	Digital Control	4-15
4.2.6.4	Trigger Selection	4-15
4.2.6.5	Smart Trigger	4-15
4.3	F9300-4 GPIB and RS232 Interface	4-16
4.3.1	RS232 Interface	4-16
4.3.2	GPIB Interface	4-16
4.4	F9354-5 Front Panel	4-16
4.5	F9300-6 Centronics Interface	4-16
4.5.1	Centronics Interface Option	4-16
4.5.2	Floppy Disk Drive Interface Option	4-16
4.5.3	Printer Interface Option	4-17
4.6	F9300-7 Printer Controller	4-17
4.7	F9300-8 Hard Disk Option	4-17
4.8	93XX-Display	4-17
4.8.1	General Description	4-17
4.8.2	Basic Characteristics	4-17
4.8.3	Horizontal Deflection	4-18
4.8.4	Vertical Synchronization	4-19
4.8.5	Horizontal Resolution	4-19
4.8.6	Vertical Resolution	4-19
4.9	PS9351 Power Supply	4-20
4.9.1	Power Supply Specifications	4-20
4.9.2	Power Supply Block Diagram	4-21
Section 5	Performance Verification	
5.1	Introduction	5-1
5.2	Test Equipment Needed	5-1
5.3	Turn On	5-1
5.4	Input Impedance	5-2
5.4.1	Procedure	5-2
5.4.1.a	DC 1M Ω	5-2

Section 5	Performance Verification	Page
5.4.1.b	DC 50Ω	5-3
5.4.2	External Trigger Input Impedance	5-4
5.4.2.a	DC 1MΩ	5-4
5.4.2.b	DC 50Ω	5-5
5.4.3	Internal Protective Resistor Verification	5-6
5.5	Leakage Current	5-7
5.5.1	Procedure	5-7
5.6	Average Noise Level	5-7
5.6.1	Peak to Peak	5-7
5.6.1.a	DC 1MΩ	5-7
5.6.1.b	AC 1MΩ	5-10
5.6.1.c	DC 50Ω	5-11
5.6.2	Rms Noise	5-12
5.6.2.a	DC 1MΩ	5-12
5.6.2.b	AC 1MΩ	5-14
5.6.2.c	DC 50Ω	5-14
5.6.3	Inputs Grounded	5-15
5.7	DC Linearity	5-19
5.7.1	Description	5-19
5.7.1.a	DC 50Ω	5-19
5.7.1.a.1	Positive DC Linearity	5-20
5.7.1.a.2	Negative DC Linearity	5-22
5.7.1.b	DC 1MΩ	5-24
5.8	Offset	5-27
5.8.1	Description	5-27
5.8.1.a	Negative Offset Control	5-27
5.8.1.b	Positive Offset Control	5-30
5.9	Bandwidth	5-33
5.9.1	Description	5-33
5.9.1.a	DC 50Ω	5-33
5.9.1.a.1	Trigger Bandwidth	5-38
5.9.1.b	DC 1MΩ	5-39
5.10	Trigger Level	5-42
5.10.1	Description	5-42
5.10.2	Channel (Internal)	5-42
5.10.3	External Trigger	5-50
5.10.4	External/10 Trigger	5-58
5.11	Smart Trigger	5-66
5.11.1	Trigger on Pulse Width < 10 nsec	5-66
5.11.2	Trigger on Pulse Width > 10 nsec	5-66
5.11.3	Trigger on Pulse Width < 100 nsec	5-68
5.11.4	Trigger on Pulse Width > 100 nsec	5-69
5.12	Time Base Accuracy	5-70
5.12.1	Description	5-70
5.12.2	500 MHz Clock Accuracy	5-70
5.13	Overshoot and Rise Time	5-74
5.14	Probe Calibrator Verification	5-76
5.15	Overload	5-79

Section 6 Internal Calibration and Diagnostics

6.1	Introduction	6-1
6.2	Diagnostic Summary	6-2
6.2.1	Gain and Offset Calibration Description	6-3
6.2.2	Trigger Level Calibration	6-3
6.3	Diagnostic Results	6-3
6.3.1	Gain Curves	6-3
6.3.2	Offset Curves	6-4
6.3.3	Trigger Level	6-5
6.3.4	Integral Linearity	6-7
6.4	Board Test Results	6-9
6.5	Probe Bus Verification	6-10
6.6	PP092 Verification	6-13

Section 7 Maintenance

7.1	Introduction	7-1
7.2	Disassembly and Assembly Procedure	7-1
7.2.1	Removal of the Upper Cover	7-1
7.2.2	Removal of the PS9351 Power Supply	7-1
7.2.3	Disassembly and Assembly Diagram	7-2
7.2.3.1	Figure 7.1 : 9354A/T Assembly	7-3
7.2.3.2	Figure 7.2 : 9354A/T Lower Cover Assembly	7-4
7.2.3.3	Figure 7.3 : 9354A/T Front Frame Assembly	7-5
7.2.3.4	Figure 7.4 : 9354A/T Rear Panel Assembly	7-6
7.2.4	Removal of the F9300-4 GPIB and RS232 Interface	7-7
7.2.5	Removal of the Fan	7-7
7.2.6	Removal of the Line Input Module	7-7
7.2.7	Removal of the 93XX-Video	7-7
7.2.8	Removal of the 93XX-Yoke	7-7
7.2.9	Removal of the Front Frame Assembly	7-8
7.2.10	Removal of the 93XX-Deflection	7-8
7.2.11	Removal of the 93XX-CRT	7-9
7.2.12	Removal of the F9354-5 Front Panel	7-9
7.2.13	Removal of the Front Panel Keyboard	7-9
7.2.14	Removal of the Processor	7-10
7.2.15	Removal of the F9354-31 Main Board	7-10
7.2.16	Removal of the Handle	7-11
7.2.17	Removal of the Foot Support	7-11
7.2.18	Removal of the 93XX-FD01 Floppy Disk	7-11
7.2.19	Removal of the 93XX-GP01 Graphic Printer	7-11
7.2.19	Removal of the F9300-7 Printer Controller	7-11
7.2.20	Removal of the F9300-6 Centronics Interface	7-11
7.2.21	Figure 7.5 : 9354A/T Floppy Option Assembly	7-12
7.2.22	Figure 7.6 : 9354A/T Graphic Printer Option Assembly	7-13
7.3	Software Upgrade Procedure	7-14
7.3.1	Upgrading Firmware	7-14
7.3.2	Changing Software Option	7-15
7.3.3	Software Option Selection GAL	7-16

Section 7	Maintenance	Page
7.3.4	Processor Board Exchange Procedure	7-16
7.4	Equipment and Spare Parts Recommended for Service	7-17
7.4.1	Equipment	7-17
7.4.2	Spare Parts	7-17
7.5	Troubleshooting and Flow Charts	7-18
7.5.1	Introduction	7-18
7.5.2	Line Voltage Autoranging	7-18
7.5.3	Initial Troubleshooting Chart	7-19
7.5.4	No Power Supply	7-20
7.5.4.1	Line Fuses Replacement	7-20
7.5.5	No Display	7-21
7.5.6	Abnormal Image on Screen	7-22
7.5.7	Front Panel Controls do not Operate	7-23
7.5.8	No Remote Control GPIB or RS232	7-24
7.5.9	Performance Verification Fails	7-25
7.5.10	Internal Calibration Fails	7-26
7.5.11	Floppy Disk Drive Option Fails	7-27
7.5.12	Graphic Printer Option Fails	7-28
7.5.13	Centronics Option Fails	7-29
7.5.14	Hard Disk Option Fails	7-30
7.6	Calibration Procedures	7-31
7.6.1	PS9351 Power Supply Calibration	7-31
7.6.1.1	Figure 7.7 : Power Supply	7-32
7.6.2	93XX-Display Adjustment Procedure	7-33
7.6.2.1	Introduction	7-33
7.6.2.2	Coarse Adjustment	7-34
7.6.2.3	Fine Adjustment	7-35
7.6.3	Front End Test and Calibration Procedure	7-37
7.6.3.1	Introduction	7-37
7.6.3.2	Power Supplies	7-37
7.6.3.2.1	Front End Power Supply Verification	7-37
7.6.3.2.2	ADC Power Supply Verification	7-37
7.6.3.3	16 bit DAC Verification	7-38
	Figure 7.8 : 9354A/T Front End Adjustment	7-42
7.6.3.4	Input Buffer DC Gain Adjustment	7-43
7.6.3.4.1	Channel 1 DC Gain Adjustment	7-43
7.6.3.4.2	Channel 2 DC Gain Adjustment	7-44
7.6.3.4.3	Channel 3 DC Gain Adjustment	7-45
7.6.3.4.4	Channel 4 DC Gain Adjustment	7-46
7.6.3.5	Overshoot and Risetime Adjustment	7-47
7.6.3.5.1	Channel 1 Overshoot and Risetime Adjustment	7-47
7.6.3.5.2	Channel 2 Overshoot and Risetime Adjustment	7-49
7.6.3.5.3	Channel 3 Overshoot and Risetime Adjustment	7-51
7.6.3.5.4	Channel 4 Overshoot and Risetime Adjustment	7-53
7.6.3.6	Flatness Adjustment	7-55
7.6.3.6.1	Channel 1 HF Adjustment	7-55
7.6.3.6.2	Channel 2 HF Adjustment	7-57
7.6.3.6.3	Channel 3 HF Adjustment	7-59

Section 7	Maintenance	Page
7.6.3.6.4	Channel 4 HF Adjustment	7-61
7.6.3.7	Sample & Hold Flatness Adjustment	7-63
7.6.3.7.1	Channel 1 Sample & Hold Flatness Adjustment	7-63
7.6.3.7.2	Channel 2 Sample & Hold Flatness Adjustment	7-64
7.6.3.7.3	Channel 3 Sample & Hold Flatness Adjustment	7-65
7.6.3.7.4	Channel 4 Sample & Hold Flatness Adjustment	7-66
7.6.3.8	Trigger Hysteresis Control	7-67
7.6.3.8.1	Channel 1 Trigger Hysteresis Adjustment	7-67
7.6.3.8.2	Channel 2 Trigger Hysteresis Adjustment	7-68
7.6.3.8.3	Channel 3 Trigger Hysteresis Adjustment	7-69
7.6.3.8.4	Channel 4 Trigger Hysteresis Adjustment	7-70
7.6.3.8.5	External Trigger Hysteresis Verification	7-71
7.6.3.9	DC 50Ω Overload Adjustment	7-72
7.6.3.9.1	Channel 1 DC 50Ω Overload Adjustment	7-72
7.6.3.9.2	Channel 2 DC 50Ω Overload Adjustment	7-73
7.6.3.9.3	Channel 3 DC 50Ω Overload Adjustment	7-74
7.6.3.9.4	Channel 4 DC 50Ω Overload Adjustment	7-74
Section 8	Schematics Diagrams - Parts List	8-1
8.1.1	9354A Sub Assemblies	8-2
8.1.2	9354AM Sub Assemblies	8-2
8.1.3	9354AL Sub Assemblies	8-2
8.1.4	9354T Sub Assemblies	8-3
8.1.5	9354TM Sub Assemblies	8-3
8.2	F9302-1-X Processor Board Schematic	8-4
8.2.1	F9302-1-X Processor Board Layout	8-12
8.2.2	F9302-1-X Processor Board Parts List	8-18
8.3	F9350/M-21 Acquisition Memory Schematic	8-24
8.3.1	F9350/M-21 Acquisition Memory Layout	8-29
8.3.2	F9350-21 Acquisition Memory Parts List	8-35
8.3.3	F9350M-21 Acquisition Memory Parts list	8-37
8.3.4	F9350L-2 Acquisition Memory Schematic	8-38
8.3.5	F9350L-2 Acquisition Memory Layout	8-43
8.3.6	F9350L-2 Acquisition Memory Parts List	8-49
8.4	F9354-31 Main Board Schematic	8-50
8.4.1	F9354-31 Microprocessor Control Schematic	8-51
8.4.2	F9354-31 Front End Control Schematic	8-56
8.4.2.1	F9354-31 Front End Power Supply Schematic	8-58
8.4.2.2	F9354-31 Front End Channel 1 Schematic	8-59
8.4.2.3	F9354-31 Front End Channel 2 Schematic	8-62
8.4.2.4	F9354-31 Front End Channel 3 Schematic	8-65
8.4.2.5	F9354-31 Front End Channel 4 Schematic	8-68
8.4.2.6	F9354-31 Front End Trigger Schematic	8-71
8.4.2.7	F9354-31 Front End Probe Calibrator Schematic	8-75
8.4.3	F9354-31 ADC Schematic	8-76
8.4.3.1	F9354-31 ADC Power Supply Schematic	8-77
8.4.3.2	F9354-31 ADC Control Channel 1 & 2 Schematic	8-78

Section 8	Schematics Diagrams - Parts List	Page
8.4.3.3	F9354-31 ADC Channel 1 Schematic	8-79
8.4.3.4	F9354-31 ADC Channel 2 Schematic	8-80
8.4.3.5	F9354-31 ADC Connector Channel 1 & 2 Schematic	8-81
8.4.3.6	F9354-31 ADC Buffer Channel 1 Schematic	8-84
8.4.3.7	F9354-31 ADC Buffer Channel 2 Schematic	8-85
8.4.3.8	F9354-31 ADC Control Channel 3 & 4 Schematic	8-86
8.4.3.9	F9354-31 ADC Channel 3 Schematic	8-87
8.4.3.10	F9354-31 ADC Channel 4 Schematic	8-88
8.4.3.11	F9354-31 ADC Connector Channel 3 & 4 Schematic	8-89
8.4.3.12	F9354-31 ADC Buffer Channel 3 Schematic	8-92
8.4.3.13	F9354-31 ADC Buffer Channel 4 Schematic	8-93
8.4.4	F9354-31 TimeBase Schematic	8-94
8.4.5	F9354-31 Microprocessor Control Layout	8-101
8.4.5.1	F9354-31 Front End Layout	8-105
8.4.5.2	F9354-31 Trigger Layout	8-109
8.4.5.3	F9354-31 ADC Layout	8-113
8.4.5.4	F9354-31 TimeBase Layout	8-117
8.4.6	F9354-31 Parts List	8-121
8.5	F9300-4 GPIB/RS232 Interface Schematic	8-157
8.5.1	F9300-4 GPIB/RS232 Interface Layout	8-158
8.5.2	F9300-4 GPIB/RS232 Interface Parts List	8-161
8.6	F9354-5 Front Panel Schematic	8-163
8.6.1	F9354-5 Front Panel Layout	8-164
8.6.2	F9354-5 Front Panel Parts List	8-168
8.7	F9300-6 Centronics Interface Schematic	8-169
8.7.1	F9300-6 Centronics Interface Layout	8-171
8.7.2	F9300-6 Centronics Interface Parts List	8-174
8.8	F9300-7 Printer Controller Schematic	8-176
8.8.1	F9300-7 Printer Controller Layout	8-178
8.8.2	F9300-7 Printer Controller Parts List	8-181
8.9	F9300-8 PCMCIA III Hard Disk Controller Schematic	8-184
8.9.1	F9300-8 PCMCIA III Hard Disk Controller Layout	8-185
8.9.2	F9300-8 PCMCIA III Hard Disk Controller Parts List	8-188
8.10	Deflection and Video Schematic	8-190
8.10.1	93XX-Deflection Schematic	8-190
8.10.2	93XX-Video Schematic	8-192
8.10.3	93XX-Deflection Parts List	8-193
8.10.4	93XX-Video Parts List	8-194
8.11	PS9351 Power Supply Schematic	8-195
8.12	M935X Mechanical for 9354A/T	8-197
8.13	Accessories for 9354A/T	8-198
8.14	93XX-FDGP Option Parts List	8-199
8.15	93XX-FD01 Option	8-200
8.16	93XX-GP01 Option	8-200

Section 9	Mechanical Parts	Page
9.1	Figure 9.1 : 9354A/T Exploded View	9-2
9.1.1	9354A/T Assembly Part Description	9-3
9.2	Figure 9.2 : 9354A/T Lower Cover Exploded View	9-4
9.2.1	9354A/T Lower Cover Assembly Description	9-5
9.3	Figure 9.3 : Front Frame Assembly Exploded View	9-6
9.3.1	Front Panel Assembly Description	9-7
9.4	Figure 9.4 : Rear Panel Assembly Exploded View	9-8
9.4.1	Rear Panel Assembly Description	9-9
9.5	Figure 9.5 : Power Supply Exploded View	9-10
9.5.1	Power Supply Description	9-11
9.6	Figure 9.6 : FD01 Floppy Option Assembly	9-12
9.6.1	FD01 Floppy Option Assembly Description	9-13
9.7	Figure 9.7 : GP01 Printer Option Assembly	9-14
9.7.1	GP01 Printer Option Assembly Description	9-15
9.8	Figure 9.8 : 9354A/T Front View	9-16
9.9	Figure 9.9 : 9354A/T Rear View	9-17
9.10	Figure 9.10 : 9354A/T Dimensions	9-18
Section 10	Connecting the 9354A/T to a Plotter or a Printer	
10.1	Introduction	10-1
10.2	Plotters	10-3
10.2.1	HP 7470A Plotter	10-3
10.2.2	HP 7550A Plotter	10-3
10.2.3	Hitachi 672 Graph Plotter (or NSA 672)	10-4
10.3	Printers	10-4
10.3.1	Centronics Printers	10-4
10.3.2	RS 232 Printers	10-5
10.3.2.1	Epson FX80	10-5
10.3.2.2	Citizen 120D	10-5
10.3.2.3	HP LaserJet	10-5
10.3.2.4	HP QuietJet	10-5
10.3.2.5	HP ThinkJet	10-6
10.3.2.6	HP DeskJet	10-6
10.3.2.7	Brother Printers	10-6
10.3.3	GPIB Printers	10-7
10.3.3.1	HP QuietJet	10-7
10.3.3.2	HP ThinkJet	10-7
10.3.3.3	HP PaintJet	10-7
10.4	Information on GPIB	10-8
10.4.1	Introduction	10-8
10.4.2	Functions in the GPIB	10-8

SECTION 1 GENERAL INFORMATION**1.1 Initial Inspection**

It is recommended that the shipment be thoroughly inspected immediately upon delivery to the purchaser. All material in the container should be checked against the enclosed Packing List. LeCroy cannot accept responsibility for shortages in comparison with the Packing List unless notified promptly. If the shipment is damaged in any way, please contact the Customer Service Department or local field office immediately.

1.2 Warranty

LeCroy warrants its oscilloscope products to operate within specifications under normal use for a period of three years from date of shipment. Spares, replacement parts and repairs are warranted for 90 days. The instrument's firmware is thoroughly tested and thought to be functional, but is supplied "as is" with no warranty of any kind covering detailed performance. Products not manufactured by LeCroy are covered solely by the warranty of the original equipment manufacturer.

In exercising this warranty, LeCroy will repair or, at its option, replace any product returned to the Customer Service Department or an authorized service facility within the warranty period, provided that the warrantor's examination discloses that the product is defective due to workmanship or materials and that the defect has not been caused by misuse, neglect, accident or abnormal conditions or operation.

LeCroy will return all in-warranty products with transportation prepaid.

This warranty is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. LeCroy shall not be liable for any special, incidental, or consequential damages, whether in contract or otherwise.

1.3 Product Assistance

Answers to questions concerning installation, calibration, and use of LeCroy equipment are available from the Customer Service Department, 700 Chestnut Ridge Road, Chestnut Ridge, New York 10977-6499, U.S.A., tel: (914) 578-6060, or 6061, and 2 rue du Pré-de-la-Fontaine, 1217 Meyrin 1, Geneva, Switzerland, tel : (41) 22.719.21.11, or your local field engineering office.

1.4 Addresses**Corporate Headquarters**

LECROY CORPORATION
700 CHESTNUT RIDGE ROAD
CHESTNUT RIDGE, NY 10977-6499
USA

TEL: (914) 425-2000 578-6060 or 6061
FAX: (914) 425-8967

European Headquarters

LECROY SA
2, CHEMIN PRE-DE-LAFONTAINE
CH-1217 MEYRIN 1 GENEVA
SWITZERLAND

TEL: 41 (22) 719-21-11
FAX: 41 (22) 782-39-15

Europe

LECROY GMBH
MANNHEIMERSTRASSE 177
POSTFACH 103767
D-6900 HEIDELBERG GERMANY

TEL: 49.6221.831001
FAX: 49.6221.834655

LECROY LTD
28 BLACKLANDS WAY
ABINGDON, OXON OX14 1DY
GREAT BRITAIN

TEL: 44.23.553.31.14
FAX: 44.23.552.87.96

LECROY SRL
VIA CONCESIO 325
I-00188 ROMA
ITALY

TEL: 39.6.300.97.00
FAX: 39.6.300.96.00

ESSA
EUIPOS Y SISTEMAS SA
APOLONIO MORALES 13-B
E-28036 MADRID

TEL: 34.1.359.0088
FAX: 34.1.359.0298

DEWETRON ELEKTRONISCHE
MESSGERAETE Ges.M.B.H.
FOELLINGERSTRASSE 9E
8044 GRAZ AUSTRIA

TEL: 43.316.391.804
FAX: 43.316.391.052

ORBIS OY
VANHA KAARELANTIE 9
01610 VANTAA
FINLAND

TEL: 358.0.566.4066
FAX: 358.0.531.604

LECROY BV
WAALRESEWEG 17
NL-5554 HA VALKENSWAARD
THE NETHERLANDS

TEL: 31.4902.8.9285
FAX: 31.4902.42628

LECROY SARL
1, AVENUE DE L'ATLANTIQUE
LES ULIS 91976 COURTABOEUF
FRANCE

TEL: 33.1.69.18.83.20
FAX: 33.1.69.07.40.42

LECROY SA
BAHNOFSTRASSE 18
5600 LENZBURG
SWITZERLAND

TEL: 4164.519.181
FAX: 4164.519.192

M.T. BRANDAO, LDA
RUA DO QUANZA, 150
4000 PORTO
PORTUGAL

TEL: 351.2.830.2709
FAX: 351.2.830.2710

LUTRONIC APS
NAVERLAND 2
2600 GLOSTRUP
DENMARK

TEL: 45.4342.9764
FAX: 45.4342.9765

HELLENIC SCIENTIFIC REP., LTD
11 VRASSIDA STREET
115 28 ATHENS
GREECE

TEL: 30.1.721.1140 or 721.3154
FAX: 30.1.724.1374

AVANTEC
TVETENVEIEN 6
0661 OSLO NORWAY

TEL: 472.63.05.20
FAX: 472.65.84.14

ABB NERA A/S
KOKSTADVEGEN 23
KOKSTAD BERGEN NORWAY

TEL: 351.2.815.680
FAX: 351.2.815.630

MEASUREMENT SYSTEMS SCANDINAVIA AB
P.O. BOX 393 FORETAGSALLEN 12, HUS 5 BV
184 24 AKERSBERGA SWEDEN

TEL: 46.8.540.68100
FAX: 46.8.540.66536

Eastern Europe

ELSINCO GMBH
ROTENMUHLGASSE 11
1120 VIENNA
AUSTRIA

TEL: 43.222.812.1751
FAX: 43.222.812.2329

Mideast

AMMO
9, HARUGEI MALKHUT
RAMAT HACHAYAL. P.O BOX 13132,
61131 TEL AVIV ISRAEL

TEL: 972.3.6478740
FAX: 972.3.6478771

Asia

LECROY JAPAN CORPORATION
ESAKA SANSHO BLDG - 3RD FLOOR
16-3, 3-CHOME
TARUMICHO, SUITA CITY
OSAKA 564 JAPAN

TEL: 816.330.0961
FAX: 816.330.8096

LECROY JAPAN CORPORATION
ZAIKEN BLDG 6TH FLOOR
19-3, 2-CHOME
SASAZUKA, SHIBUYA-KU
TOKYO 151 JAPAN

TEL: 813.3376-9400
FAX: 813.3376.9587

SCIENTIFIC DEVICES AUSTRALIA
2 JACKS ROAD
SOUTH OAKLEIGH, VICTORIA
AUSTRALIA

TEL: 61.3579.3622
FAX: 61.3579.0971

TATA-HONEYWELL
55-A/8 & 9 HADAPSPAR
INDUSTRIAL ESTATE
PUNE 411 013 INDIA

TEL: 91.212.670445
FAX: 91.212.672205

E.C. GOUGH, LTD
245 ST.ASAPH STREET
P.O. BOX 22073
CHRISTCHURCH NEW ZEALAND

TEL: 64.3.3798.740
FAX: 64.3.3796.776

ELECTRO TECH CORPORATION
1ST FLOOR, 16 KAZI CHAMBERS
BAHADURSHAH ZAFAR ROAD
KARACHI-74800 PAKISTAN

TEL: 92.21.493-8087
FAX: 92.21.493-7749

Section 1 General Information

SINGAPORE ELECTRONICS
AND ENGINEERING, LTD
24 ANG MO KIO STREET, 65
SINGAPORE 2056

TEL: 65.480.7783
FAX: 65.481.4272

LECOLN TECHNOLOGY CO.,LTD.
4F-1, NO. 214, SEC.1
HO PING E ROAD
TAIPEI TAIWAN R.O.C.

TEL: 886.2.365.0612
FAX: 886.2.367.1792

SCHMIDT ELECTRONICS LTD
18 F, GREAT EAGLE CENTRE
23 HARBOUR ROAD WANCHAI
HONG KONG

TEL: 852.2507.0222
FAX: 852.2827.5656

P.T. DWI TUNGGAL JAYA SAKTI
WISMA RAJAWALI, 14TH FLOOR
JL JENDRAL SUDIRMAN
34 JAKARTA 10220INDONESIA

TEL: 62.21.570.4563
FAX: 62.21.583.218

North America

ALLAN CRAWFORD LTD
5835 COOPERS AV, MISSISSAUGA
ONTARIO L4Z 1Y2, CANADA

TEL: 416 890.2010
FAX: 416 890.1959

South America

SEARCH SA
VIAMONTE 1716 - PISO 7
1055 CAPITAL FEDERAL
ARGENTINA

TEL: 54.1.46.6156
FAX: 54.1.394.8374

ABEX ENGINEERING PTE. LTD.
37 KALLANG PUDDING ROAD 08-08
TONG LEE BUILDING BLOCK B
SINGAPORE 1334

TEL: 8412818
FAX: 8415988

MEASURETRONIX
2102/31 RAMKAMHANG ROAD
BANGKOK 10240
THAILAND

TEL: 66.2.375.2733-4
FAX: 66.2.374.9965

WOOJOO HI-TECH CORP.
DONGHYUN BLDG.
102-4 MOONJUNG-DONG,
SONGPA-KU SEOUL 138-200 KOREA

TEL: 82.2.449.5472
FAX: 82.2.449.5475

ATP-HI-TEK
ALAMEDA AMAZONAS
422 ALPHAVILLE 06454-030
BARUEI, SP BRAZIL

TEL: 55.11.421.5477
FAX: 55.11.421.5032

Central America

NUCLEOELECTRONICA, SA
CALZ. LAS AGUILAS 101
DELEGACION ALVARO OBREGON
01710 MEXICO, 20, d.f.
MEXICO

TEL: 52.5593.604
FAX: 52.5593.6021

South Africa

WESTPLEX LTD
TUSCANY HOUSE
376 OAK AVENUE
RANDBURG 2194
REPUBLIC OF SOUTH AFRICA

TEL: 27.11.787.0473
FAX: 27.11.787.0237

1.5 Maintenance Agreements

LeCroy offers a selection of customer support services. Maintenance agreements provide extended warranty and allow the customer to budget maintenance costs after the initial three years warranty has expired. Other services such as installation, training, enhancements and on-site repair are available through specific Supplemental Support Agreements.

1.6 Documentation Discrepancies

LeCroy is committed to providing state-of-the-art instrumentation and is continually refining and improving the performance of its products. While physical modifications can be implemented quite rapidly, the corrected documentation frequently requires more time to produce. Consequently, this manual may not agree in every detail with the accompanying product. There may be small discrepancies in the values of components for the purposes of pulse shape, timing, offset, etc., and, occasionally, minor logic changes. Where any such inconsistencies exist, please be assured that the unit is correct and incorporates the most up-to-date circuitry. In a similar way the firmware may undergo revision when the instrument is serviced. Should this be the case, manual updates will be made available as necessary.

1.7 Service Procedure

Products requiring maintenance should be returned to the Customer Service Department or authorized service facility. LeCroy will repair or replace any product under warranty at no charge. The purchaser is only responsible for one way transportation charges. For all LeCroy products in need of repair after the warranty period, the customer must provide a Purchase Order Number before repairs can be initiated. The customer will be billed for parts and labor for the repair, as well as for shipping.

1.8 Return Procedure

To determine your nearest authorized service facility, contact the Customer Service Department or your field office. All products returned for repair should be identified by the model and serial numbers and include a description of the defect or failure, name and phone number of the user, and, in the case of products returned to the factory, a Return Authorization Number (RAN). The RAN may be obtained by contacting the customer service department in New York, tel: (914)578-6060, or 6061 ; in Geneva, tel: (41)22/719.21.11, or your nearest sales office.

Section 1 General Information

Return shipment should be made prepaid. LeCroy will not accept C.O.D. or Collect Return Shipments. Air-freight is generally recommended. Wherever possible, the original shipping carton should be used. If a substitute carton is used, it should be rigid and be packed such that the product is surrounded with a minimum of four inches of excelsior or similar shock-absorbing material. In addressing the shipment, it is important that the Return Authorization Number be displayed on the outside of the container to ensure its prompt routing to the proper department within LeCroy.

1.9 Safety Precautions

The following servicing instructions are for use by qualified personnel only. Do not perform any servicing other than contained in service instructions. Refer to procedures prior to performing any service.

Exercise extreme safety when testing high energy power circuits. Always turn the power OFF, disconnect the power cord, discharge the cathode ray tube and all capacitors before disassembling the instrument.

The **W A R N I N G** symbol used in this manual indicates dangers that could result in personal injury.

The **C A U T I O N** symbol used in this manual identify conditions or practices that could damage the instrument.

1.10 Antistatic Precautions**C A U T I O N**

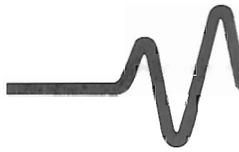
Any static charge that builds on your person or clothing may be sufficient to destroy CMOS components, integrated circuits.

In order to avoid possible damage, the usual precautions against static electricity are required.

- Handle the boards in antistatic boxes or containers with foam specially designed to prevent static build-up.
- Ground yourself with a suitable wrist strap.
- Disassembly the instrument at a properly grounded work station equipped with antistatic mat.
- When handling the boards, do not touch the pins.
- Stock the boards in antistatic bags.

SECTION 2 SPECIFICATIONS

9354A/M/L & 9354T/M Digital Oscilloscope



LeCroy

The Digital Scope Specialists

9350A Family Digital Oscilloscopes 500 MHz Bandwidth, 2 GS/s

Main Features

- Two and Four Channel versions
- Up to 8M Point record length
- 2.5 ns Peak Detect
- Glitch, Pattern, Qualified, Interval, Dropout and TV Triggers
- 8-bit vertical resolution, 11 with ERES option
- Fully programmable via GPIB and RS-232-C
- Automatic PASS/FAIL testing
- Advanced Signal Processing
- DOS Compatible Floppy Disk and Memory Card options
- Internal Printer Option



High speed and long memory make this family the ideal general-purpose Digital Storage Oscilloscopes. Two and Four Channel simultaneous sampling at 500 MS/s meets demanding high-speed design applications. Even faster sampling may be achieved by combining channels, up to a maximum of 2 GS/s.

Acquisition memories may also be combined, providing up to 8 M Points of continuous or segmented waveform recording. Repetitive signals are digitized at up to 10 GS/s. These combined capabilities make the 9350A family the state-of-the-art in current DSO technology.

A unique peak detect scheme captures 2.5 ns glitches - even at slow time bases - *without destroying the underlying data*. This provides circuit designers with the benefits of peak detection without any loss of precision.

Live waveforms may be viewed simultaneously with up to 3 expansions, showing all of the signal detail. Expansions are shown as highlights on the main trace.

SMART Trigger modes like Glitch, Pattern, Dropout and TV allow you to capture precisely the events of interest. Pre- and Post-Trigger delay, and Time and Events Holdoff are also standard.

The 9350A family features the proven user-interface of LeCroy's portable scopes. A bright, high-resolution 9" CRT allows optimum waveform viewing under any conditions. Menus and text are arranged around the graticules - they never overwrite the waveforms. Dedicated control knobs keep the scope's performance at your fingertips.

A comprehensive range of signal processing functions including FFT and Math on live or stored waveforms, allows extensive waveform manipulation. DOS compatible floppy disk and memory card options store waveforms and test setups, and simplify data transfer to any PC.

Features and Benefits

PRECISION ACQUISITION

The 9350A family combines all the technologies required for accurate waveform digitizing. Low-noise high-sensitivity amplifiers drive 500 MS/s 8-bit ADC's which are clocked simultaneously by a high-precision timebase. 500 MHz system bandwidth allows accurate risetime measurements below 1 nanosecond. Vertical resolution can be enhanced to 11 bits using ERES.

MEMORY FOR ALL APPLICATIONS

The 9350A family offers three different memory lengths:

50k points per channel (std. versions),
250k points per channel ("M" versions),
2M points per channel ("L" versions).
Memory length may be extended by combining the acquisition memories of multiple channels (see table below).

Long memories provide higher horizontal resolution. LeCroy's unique memory management system, combined with an advanced peak detection system, maximizes the benefits of longer memory. Showing the entire waveform onscreen allows immediate location of glitches or other disturbances, and guarantees the highest possible sample rate on all timebases.

THE MOST ADVANCED PEAK DETECT

9350A family members offer 2.5 ns peak detect, available whenever the digitizer system runs at below 200MS/s. This captures fast glitches or signal details that might have been missed due to undersampling.

One unwanted effect of other peak detection systems is a severe loss of horizontal (time) precision. This occurs because detected peaks are known to have occurred *during* a particular interval, but not at any specific time. This means that signals acquired with other manufacturers peak detection techniques cannot be successfully used for further processing or analysis.

LeCroy solves this problem by maintaining both peak detected *and* normally sampled waveforms for each signal. Thus the user gets all the benefits of peak detection without any loss of time precision.

EXTENSIVE TRIGGER SYSTEM

To capture rare or complex conditions, SMART trigger functions are available. These include Glitch with 2.5 ns resolution to trigger down to 1 ns and a unique Dropout mode, which triggers when the signal disappears for a selectable period of time. Other trigger modes include Pattern, Interval, State or Edge-Qualified and TV. TV trigger allows individual lines or fields in PAL, SECAM, NTSC and non-standard video to be selected. Pre- and Post-trigger delay are fully variable.

ProBus™ PROBE INTERFACE

The ProBus system provides a complete measurement solution from probe tip to oscilloscope display. ProBus is an intelligent interconnection between LeCroy oscilloscopes and a growing range of innovative probes, including high-bandwidth low-loading FET probes.

AUTOMATIC MEASUREMENTS

The following Parametric measurements are available, together with their Average, Highest, Lowest values and Standard Deviation:

amplitude	falltime	peak to peak
area	f 80-20%	period
base	f@level (abs)	risetime
cycles	f@level (%)	r 20-80%
delay	frequency	r@level (abs)
Δdelay	maximum	r@level (%)
Δt at level (abs)	mean	RMS
Δt at level (%)	median	std dev
Δt at level (t=0,abs)	minimum	top
Δt at level (t=0,%)	overshoot +	width
duty Cycle	overshoot -	

Pass/Fail testing allows up to 5 parameters to be tested against selectable thresholds. Waveform Limit Testing is performed using Masks which may be defined inside the instrument. Any failure will cause preprogrammed actions such as Hardcopy, Save, GPIB SRQ or Pulse Out.

DOS COMPATIBLE MASS STORAGE

All LeCroy 9300-series scopes offer an optional 3.5" 1.44 MB floppy disk drive which stores traces, setups, screen graphics and Pass/Fail templates. Data are stored as DOS files, which may be read directly by a PC. A high-speed DOS compatible PCMCIA memory card option is also available.

BUILT-IN PRINTER

As well as driving most printers and plotters via GPIB, RS-232-C and (optional) Centronics interface, the 9300 series offers an optional internal printer. This thermal printer produces full resolution screendumps, 126 x 90 mm, in under 10 seconds.

FLEXIBLE INTERFACING

GPIB and RS-232-C interfaces may be used for full remote control of the instrument. All front-panel and internal processing functions can be controlled via either interface. For applications where throughput is essential, the GPIB interface transfers hundreds of waveforms per second. A Front-Panel BNC connector may be setup to provide Pass/Fail test output pulses.

MULTIPLE DISPLAY MODES

The high-resolution raster display shows from one to four independent waveform grids. Waveforms are represented as dots joined by vectors which may be turned on or off. Four Zoom/Math traces may be used for zooming waveforms or for signal processing. The area to be zoomed is selected by moving an intensified portion of the main waveform. Persistence display mode allows easy viewing of signal changes over time, and XY mode plots any two sources against one another. Cursors are usable in all display modes.

EXTENSIVE WAVEFORM MATH

Standard built-in waveform processing includes mathematics (Add, Subtract, Multiply and Divide, Negation and Identity) and Summation Averaging (up to 1000 sweeps). Option WP01 provides Summed and Continuous Averaging, Waveform Math Functions, Extrema and Enhanced Resolution Modes. More information is available in the 9300 WP01 datasheet.

OPTIONAL FFT PACKAGE

Option WP02 provides comprehensive Spectral Analysis capabilities, permitting the system designer to identify characteristics which may not be apparent in the time domain. WP02 provides a wide selection of displayed projections and windowing functions, as well as averaging in the frequency domain. For more information, see the 9300 WP02 datasheet.

9350A Family Specifications

ACQUISITION SYSTEM

Bandwidth (-3 dB):

@ 50 Ω: DC to 500 MHz
 100 mV/div: 400 MHz
 50 mV/div and below: 350 MHz

@ 1 MΩ DC: DC to 250 MHz typ. at probe tip.

No. of Channels: 4 (9354A) or 2 (9350A)

No. of Digitizers: 4 (9354A) or 2 (9350A)

Maximum Sample Rate and Acquisition

Memories: See table below.

Sensitivity: 2 mV/div to 5 V/div, fully variable.

Scale factors: A vast choice of probe attenuation factors are selectable.

Offset Range: 2.0 - 9.9 mV/div: ±120 mV
 10.0 - 199 mV/div: ±1.2 V
 0.2 - 5.0 V/div: ±24 V

DC Accuracy: ≤±2% full scale (8 divisions) at 0 V offset.

Vertical Resolution: 8 bits.

Bandwidth Limiter: 30 MHz

Input Coupling: AC, DC, GND.

Input Impedance: 1 MΩ//15 pF or 50 Ω ±1%.

Max Input:

1 MΩ: 250 V (DC+peak AC ≤10 kHz)
 50 Ω: ±5 V DC (500 mW) or 5 V RMS

TIME BASE SYSTEM

Timebases: Main and up to 4 Zoom Traces.

Time/Div Range: 1 ns/div to 1,000 s/div.

Clock Accuracy: ≤10 ppm

Interpolator resolution: 10 ps

Roll Mode: ranges 500 ms to 1,000 s/div.

For > 50k points: 10 s to 1,000 s/div.

External Clock: ≤100 MHz on EXT input with ECL, TTL or zero crossing levels. Optional up to 500 MHz rear panel clock input.

External Reference: Optional 10 MHz rear-panel input.

TRIGGERING SYSTEM

Trigger Modes: Normal, Auto, Single, Stop.

Trigger Sources: CH1, CH2, Line, Ext, Ext/10 (9354A: CH3, CH4). Slope, Level and Coupling for each can be set independently.

Slope: Positive, Negative.

Coupling: AC, DC, HF (up to 500 MHz), LFREJ, HFREJ.

Pre-trigger recording: 0 to 100% of full scale (adjustable in 1% div increments).

Post-trigger delay: 0 to 10,000 divisions (adjustable in 0.1 div increments).

Holdoff by time: 10 ns to 20 s.

Holdoff by events: 0 to 99,999,999 events.

Internal Trigger Sensitivity Range: ±5 div.

EXT Trigger Max Input:

1 MΩ//15 pF: 250 V (DC+peak AC ≤10 kHz)
 50 Ω ±1%: ±5 V DC (500 mW) or 5 V RMS

EXT Trigger Range: ±0.5 V (±5 V with Ext/10)

Trigger Timing: Trigger Date and Time are listed in the Memory Status Menu.

Trigger Comparator: Optional ECL rear panel output.

SMART TRIGGER TYPES

Pattern: Trigger on the logic AND of 5 inputs - CH1, CH2, CH3, CH4, and EXT Trigger, (9350A: 3 inputs - CH1, CH2, EXT) where each source can be defined as High, Low or Don't Care. The Trigger can be defined as the beginning or end of the specified pattern.

Signal or Pattern Width: Trigger on width between two limits selectable from 2.5ns to 20s.

Signal or Pattern Interval: Trigger on interval between two limits selectable from 10ns to 20s

Dropout: Trigger if the input signal drops out for longer than a time-out from 25ns to 20s.

State/Edge Qualified: Trigger on any source only if a given state (or transition) has occurred on another source. The delay between these events can be defined as a number of events on the trigger channel or as a time interval.

TV: Allows selection of both line (up to 1500) and field number (up to 8) for PAL, SECAM, NTSC or non-standard video.

ACQUISITION MODES

Random Interleaved Sampling (RIS): for repetitive signals from 1 ns/div to 2 μs/div (M,L: from 1 ns/div to 5 μs/div).

Single shot: for transient and repetitive signals from 10 ns/div (all channels active).

Peak detect: captures and displays 2.5 ns glitches or other high-speed events.

Sequence: Stores multiple events in segmented acquisition memories.

Number of segments available:

9350A-54A	2-200
9350AM-9354AM	2-500
9350AL-9354AL	2-2,000

Min. Dead Time between segments: 60 μs

DISPLAY

Waveform style: Vectors connect the individual sample points, which are highlighted as dots. Vectors may be switched off.

CRT: 12.5x17.5 cm (9" diagonal) raster.

Resolution: 810 x 696 points.

Modes: Normal, X-Y, Variable or Infinite Persistence.

Real-time Clock: Date, hours, minutes, seconds.

Graticules: Internally generated; separate intensity control for grids and waveforms.

Grids: 1, 2 or 4 grids.

Formats: YT, XY, and both together.

Channels Used	Maximum Sample Rate	Memory per Channel			Notes
		9350A 9354A	9350AM 9354AM	9350AL 9354AL	
All Peak Detect OFF	500 MS/s	50k	250k	2M	All channels active
All Peak Detect ON	100 MS/s data 400 MS/s peak	25k data + 25k peaks	100k data + 100k peaks	1M data + 1M peaks	All channels active 2.5 ns peak detect
Paired Peak Detect OFF	1 GS/s	100k	500k	4M	9350A: CH1 9354A: CH2 + CH3
Paired + PP 092 Peak Detect OFF	2 GS/s	200k	1M	8M	9354A models only

Vertical Zoom: Up to 5x Vertical Expansion (50x with averaging, up to 40 μ V sensitivity).

Maximum Horizontal Zoom Factors:

9350A-9354A	1000x
9350AM-9354AM	5,000x
9350AL-9354AL	40,000x

Waveforms can be expanded to give 4-5 points/division. This implies zoom factors up to 200,000x for the 9354AL when channels are combined.

INTERNAL MEMORY

Waveform Memory: Up to four 16-bit Memories (M1, M2, M3, M4).

Processing Memory: Up to four 16-bit Waveform Processing Memories (A, B, C, D).

Setup Memory: Four non-volatile memories. Optional Cards or Disks may also be used for high-capacity waveform and setup storage.

CURSOR MEASUREMENTS

Relative Time: Two cursors provide time measurements with resolution of $\pm 0.05\%$ full-scale for unexpanded traces; up to 10% of the sampling interval for expanded traces. The corresponding frequency value is displayed.

Relative Voltage: Two horizontal bars measure voltage differences up to $\pm 0.2\%$ of full-scale in single-grid mode.

Absolute Time: A cross-hair marker measures time relative to the trigger and voltage with respect to ground.

Absolute Voltage: A reference bar measures voltage with respect to ground.

WAVEFORM PROCESSING

Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity and Summation Averaging.

Average: Summed averaging of up to 1,000 waveforms in the basic instrument. Up to 10⁶ averages are possible with Option WP01.

Envelope*: Max, Min, or Max and Min values of from 1 to 10⁶ waveforms.

ERES*: Low-Pass digital filter provides up to 11 bits vertical resolution.

Sampled data is always available, even when a trace is turned off. Any of the above modes can be invoked without destroying the data.

FFT*: Spectral Analysis with four windowing functions and FFT averaging.

*Envelope and ERES modes are provided in Math Package WP01. FFT is in WP02.

AUTOSETUP

Pressing Autsetup sets timebase, trigger and sensitivity to display a wide range of repetitive signals. (Amplitude 2mV to 40V; frequency above 50Hz; Duty cycle greater than 0.1%).

Autosetup Time: Approximately 2 seconds.

Vertical Find: Automatically sets sensitivity and offset.

PROBES

Model: One PP002 (10:1, 10 M Ω // 15 pF) probe supplied per channel.

The 9350A family is fully compatible with LeCroy's range of FET Probes, which may be purchased separately.

Probe calibration: Max 1 V into 1 M Ω , 500 mV into 50 Ω , frequency and amplitude programmable, pulse or square wave selectable, rise and fall time 1 ns typical.

Alternatively, the Calibrator output can provide a trigger output or a PASS/FAIL test output.

INTERFACING

Remote Control: Of all front-panel controls, as well as all internal functions is possible by GPIB and RS-232-C.

RS-232-C Port: Asynchronous up to 19200 baud for computer/terminal control or printer/plotter connection.

GPIB Port: (IEEE-488.1) Configurable as talker/listener for computer control and fast data transfer. Command Language complies with requirements of IEEE-488.2.

Centronics Port: Optional hardcopy parallel interface.

Hardcopy: Screen dumps are activated by a front-panel button or via remote control. TIFF and BMP formats are available for importing to Desktop Publishing programs. The following printers and plotters can be used to make hardcopies: HP DeskJet (color or BW), HP ThinkJet, QuietJet, LaserJet, PaintJet and EPSON printers. HP 7400 and 7500 series, or HPGL compatible plotters. An optional internal high resolution graphics printer is also available.

GENERAL

Auto-calibration ensures specified DC and timing accuracy.

Temperature: 5° to 40° C (41° to 104° F) rated 0° to 50° C (32° to 122° F) operating.

Humidity: <80%.

Shock & Vibration: Meets MIL-STD-810C modified to LeCroy design specifications and MIL-T-28800C.

Power: 90-250 V AC, 45-66 Hz, 230 W.

Battery Backup: Front-panel settings maintained for two years.

Dimensions: (HWD)8.5"x14.5"x16.25", 210mm x 370mm x 410mm.

Weight: 13 kg (28.6 lbs) net, 18.5 kg (40.7 lbs) shipping.

Warranty: Two years.

Ordering Information

Oscilloscope and Options

9354A/AM/AL	4-Ch Digital Oscilloscope
9350A/AM/AL	2-Ch Digital Oscilloscope
9XXX-WP01	Waveform Math
9XXX-WP02	FFT Processing
9XXX-MC01/04	Memory Card Reader w/512KB Memory Card
93XX-FD	Internal 3.5" Floppy Drive
93XX-GP	Internal Graphics Printer
935XA-CKTRIG	10MHz External Clock Reference Input
	500MHz External Clock input
	Trigger Comparator Output

Oscilloscope Accessories

Supplied with Instrument:

935X-OM	Operator's Manual
93XX-RCM	Remote Control Manual
93XX-FC	Front Cover
PP002	350MHz, 10M Ω Passive Probe (1 per channel)
PP092	ProBus Channel Multiplexer (9354A only)

Ordered separately:

93XX-W5	5 years extended warranty
93XX-CC	Calibration Certificate
935XA-SM	Service Manual
9XXX-MC02	128K Memory Card
9XXX-MC04	512K Memory Card
DC/GPIB	2 Meter GPIB Cable
SG9001	High Voltage Protector
OC9001	Oscilloscope Cart
AP020	1 GHz 10:1 FET Probe
AP021	800 MHz 5:1 FET Probe
AP030	15 MHz Differential Probe
PP062	1 GHz, 10:1, 500 Ω Passive Probe
PP090	ProBus 75 to 50 Ω adapter
93XX-RM01	Rackmount
93XX-TC1	Transit Case
93XX-TC2	Carrying Bag

USA Direct Sales: 1 (800) 5LE-CROY

LeCroy Worldwide Sales Offices

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	04902.8.9285
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy GmbH	06221 83.10.01
ITALY	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND Geneva		022.719.21.11
SWITZERLAND Lenzburg		064.51.91.81
United Kingdom	LeCroy Ltd	(01235) 533114



The Digital Scope Specialists

Copyright October 1994. LeCroy is a registered trademark of LeCroy Corporation. All rights reserved. Information in this publication supersedes all earlier versions. Specifications subject to change without notice.



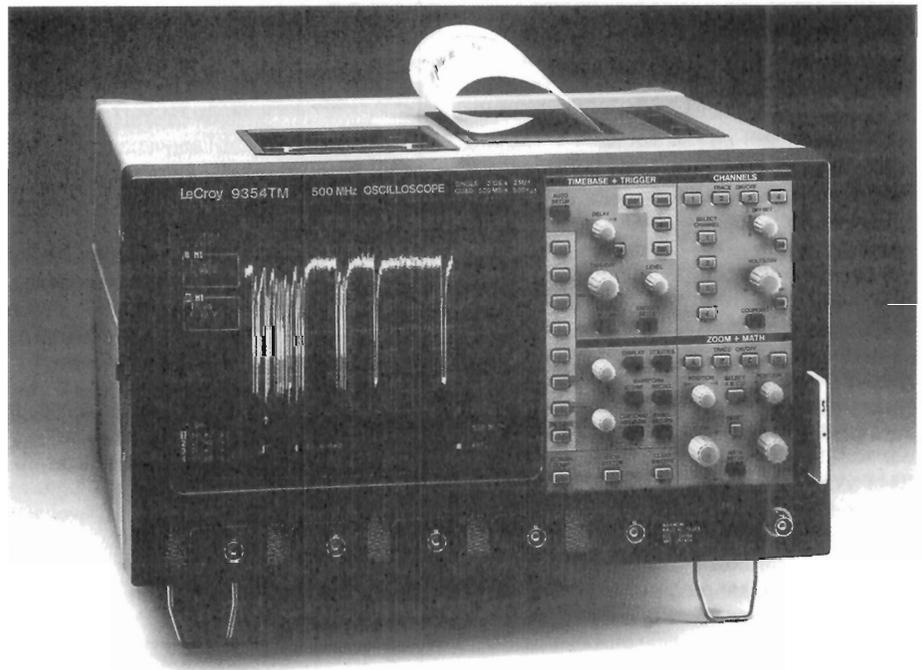
LeCroy

The Digital Scope Specialists

9354T/9354TM Digital Oscilloscopes 500 MHz Bandwidth, 2 GS/s

Main Features

- Four Channels
- Up to 2 M Point record length
- Advanced Peak Detect
- Glitch, Pattern, Qualified, Interval, Dropout and TV Triggers
- 8-bit vertical resolution, 11 with ERES option
- Fully programmable via GPIB and RS-232-C
- Automatic PASS/FAIL testing
- Advanced Signal Processing
- DOS Compatible Floppy Disk
- Internal Printer, PCMCIA Hard Disk and memory card available.



The 9354T and 9354TM are Total Performance products that provide high sampling speed, long memory, excellent analysis capability and superior I/O features. Four channel simultaneous sampling at 500 MS/s meets demanding high-speed design applications. Even faster sampling may be achieved by combining channels, up to a maximum of 2 GS/s. Acquisition memories may also be combined, providing up to 2 M Points of continuous or segmented waveform recording. Repetitive signals are digitized at up to 10 GS/s.

A unique peak detect scheme captures 2.5 ns glitches, even at slow time bases, *without destroying the underlying data.*

This provides circuit designers with the benefits of peak detection without any loss of precision.

Live waveforms may be viewed simultaneously with up to 3 expansions on a total of 4 different display timebases, showing all of the signal detail. Expansions are shown as highlights on the main trace.

SMART Trigger modes like Glitch, Pattern, Dropout and TV allow the precise capture of events of interest. Pre- and Post-Trigger delay, and Time and Events Holdoff are also standard. The 9354T and 9354TM feature the proven user-interface of LeCroy's

portable scopes. A bright, high-resolution 9" CRT allows optimum waveform viewing under any conditions. Menus and text are arranged around the graticules - they never overwrite the waveforms.

A comprehensive range of signal processing functions including FFT and Math on live or stored waveforms, allows extensive waveform manipulation. GPIB, RS-232-C and Centronics ports are standard as is a floppy disk drive. The 9354TM also includes an internal high resolution printer.

Features and Benefits

PRECISION ACQUISITION

The 9354T and 9354TM combine all the technologies required for accurate waveform digitizing. Low-noise high-sensitivity amplifiers drive 500 MS/s 8-bit ADC's which are clocked simultaneously by a high-precision timebase. 500 MHz system bandwidth allows accurate risetime measurements below 1 nanosecond. Vertical resolution can be enhanced to 11 bits using ERES.

MEMORY FOR ALL APPLICATIONS

The 9354T offers 100k points per channel, while the 9354TM has 500k points per channel. Memory length may be extended by combining the acquisition memories of multiple channels (see table below).

Long memories provide higher horizontal resolution. LeCroy's unique memory management system, combined with an advanced peak detection system, maximizes the benefits of longer memory. Showing the entire waveform onscreen allows immediate location of glitches or other disturbances, and guarantees the highest possible sample rate on all timebases.

THE MOST ADVANCED PEAK DETECT

The 9354T and 9354TM offer 2.5 ns peak detect, available whenever the digitizer system runs at below 200MS/s. This captures fast glitches or signal details that might have been missed due to undersampling.

One unwanted effect of other peak detection systems is a severe loss of horizontal (time) precision. This occurs because detected peaks are known to have occurred *during* a particular interval, but not at any specific time. This means that signals acquired with other manufacturers peak detection techniques cannot be successfully used for further processing or analysis.

LeCroy solves this problem by maintaining both peak detected *and* normally sampled waveforms for each signal. Thus the user gets all the benefits of peak detection without any loss of time precision.

EXTENSIVE TRIGGER SYSTEM

To capture rare or complex conditions, SMART trigger functions are available. These include Glitch with 2.5 ns resolution to trigger down to 1 ns and a unique Dropout mode, which triggers when the signal disappears for a selectable period of time. Other trigger modes include Pattern, Interval, State- or Edge-Qualified and TV. TV trigger allows individual lines or fields in PAL, SECAM, NTSC and non-standard video to be selected. Pre- and Post-trigger delay are fully variable.

ProBus™ PROBE INTERFACE

The ProBus system provides a complete measurement solution from probe tip to oscilloscope display. ProBus is an intelligent interconnection between LeCroy oscilloscopes and a growing range of innovative probes, including high-bandwidth low-loading FET probes.

AUTOMATIC MEASUREMENTS

The following Parametric measurements are available, together with their Average, Highest, Lowest values and Standard Deviation:

amplitude	falltime	peak to peak
area	f 80-20%	period
base	f@level (abs)	risetime
cycles	f@level (%)	r 20-80%
delay	frequency	r@level (abs)
Δdelay	maximum	r@level (%)
Δt at level (abs)	mean	RMS
Δt at level (%)	median	std dev
Δt at level (t=0,abs)	minimum	top
Δt at level (t=0,%)	overshoot +	width
duty Cycle	overshoot -	

Pass/Fail testing allows up to 5 parameters to be tested against selectable thresholds. Waveform Limit Testing is performed using Masks which may be defined inside the instrument. Any failure will cause preprogrammed actions such as Hardcopy, Save, GPIB SRQ or Pulse Out.

DOS COMPATIBLE MASS STORAGE

The 9354T and 9354TM scopes offer a 3.5" 1.44 MB floppy disk drive which stores traces, setups, screen graphics and Pass/Fail templates. Data are stored as DOS files, which may be read directly by a PC. High-speed DOS compatible PCMCIA memory card and hard disk options are also available.

BUILT-IN PRINTER

As well as driving most printers and plotters via GPIB, RS-232-C and Centronics interface, the 9354TM offers an internal high resolution graphics printer. This thermal printer produces full resolution screendumps, 126 x 90 mm, in under 10 seconds. The printer is optional for model 9354T.

FLEXIBLE INTERFACING

GPIB and RS-232-C interfaces may be used for full remote control of the instrument. All front-panel and internal processing functions can be controlled via either interface. For applications where throughput is essential, the GPIB interface transfers hundreds of waveforms per second. A Front-Panel BNC connector may be setup to provide Pass/Fail test output pulses.

MULTIPLE DISPLAY MODES

The high-resolution raster display shows from one to four independent waveform grids. Waveforms are represented as dots joined by vectors which may be turned on or off. Four Zoom/Math traces may be used for zooming waveforms or for signal processing. The area to be zoomed is selected by moving an intensified portion of the main waveform. Persistence display mode allows easy viewing of signal changes over time, and XY mode plots any two sources against one another. Cursors are usable in all display modes.

EXTENSIVE WAVEFORM MATH

Standard built-in waveform processing includes mathematics (Add, Subtract, Multiply and Divide, Negation and Identity) and Summation Averaging (up to 1000 sweeps). It also provides Summed and Continuous Averaging, Waveform Math Functions, Extrema and Enhanced Resolution Modes. More information is available in the 9300 WP01 datasheet.

FFT PACKAGE

The WP02 package provides comprehensive Spectral Analysis capabilities, permitting the system designer to identify characteristics which may not be apparent in the time domain. WP02 provides a wide selection of displayed projections and windowing functions, as well as averaging in the frequency domain. For more information, see the 9300 WP02 datasheet.

9354T and 9354TM Specifications

ACQUISITION SYSTEM

Bandwidth (-3 dB):

@ 50 Ω : DC to 500 MHz
 100 mV/div: 400 MHz
 50 mV/div and below: 350 MHz
 @ 1 M Ω DC: DC to 250 MHz typ. at probe tip.

No. of Channels: 4

No. of Digitizers: 4

Maximum Sample Rate and Acquisition

Memories: See table below.

Sensitivity: 2 mV/div to 5 V/div, fully variable.

Scale factors: A vast choice of probe attenuation factors are selectable.

Offset Range: 2.0 - 9.9 mV/div: ± 120 mV
 10.0 - 199 mV/div: ± 1.2 V
 0.2 - 5.0 V/div: ± 24 V

DC Accuracy: $\leq \pm 2\%$ full scale (8 divisions) at 0 V offset.

Vertical Resolution: 8 bits.

Bandwidth Limiter: 30 MHz

Input Coupling: AC, DC, GND.

Input Impedance: 1 M Ω /15 pF or 50 Ω $\pm 1\%$.

Max Input:

1 M Ω : 250 V (DC+ peak AC ≤ 10 kHz)
 50 Ω : ± 5 V DC (500 mW) or 5 V RMS

TIME BASE SYSTEM

Timebases: Main and up to 4 Zoom Traces.

Time/Div Range: 1 ns/div to 1,000 s/div.

Clock Accuracy: ≤ 10 ppm

Interpolator resolution: 10 ps

Roll Mode: ranges 500 ms to 1,000 s/div.

For > 50k points: 10 s to 1,000 s/div.

External Clock: ≤ 100 MHz on EXT input with ECL, TTL or zero crossing levels. Optional up to 500 MHz rear panel clock input.

External Reference: Optional 10 MHz rear-panel input.

TRIGGERING SYSTEM

Trigger Modes: Normal, Auto, Single, Stop.

Trigger Sources: CH1, CH2, CH3, CH4, Line, Ext, Ext/10. Slope, Level and Coupling for each can be set independently.

Slope: Positive, Negative.

Coupling: AC, DC, HF (up to 500 MHz), LFREJ, HFREJ.

Pre-trigger recording: 0 to 100% of full scale (adjustable in 1% div increments).

Post-trigger delay: 0 to 10,000 divisions (adjustable in 0.1 div increments).

Holdoff by time: 10 ns to 20 s.

Holdoff by events: 0 to 99,999,999 events.

Internal Trigger Sensitivity Range: ± 5 div.

EXT Trigger Max Input:

1 M Ω /15 pF: 250 V (DC+ peak AC ≤ 10 kHz)

50 Ω $\pm 1\%$: ± 5 V DC (500 mW) or 5 V RMS

EXT Trigger Range: ± 0.5 V (± 5 V with Ext/10)

Trigger Timing: Trigger Date and Time are listed in the Memory Status Menu.

Trigger Comparator: Optional ECL rear panel output.

SMART TRIGGER TYPES

Pattern: Trigger on the logic AND of 5 inputs - CH1, CH2, CH3, CH4, and EXT Trigger, where each source can be defined as High, Low or Don't Care. The Trigger can be defined as the beginning or end of the specified pattern.

Signal or Pattern Width: Trigger on width between two limits selectable from 2.5ns to 20s.

Signal or Pattern Interval: Trigger on interval between two limits selectable from 10ns to 20s

Dropout: Trigger if the input signal drops out for longer than a time-out from 25ns to 20s.

State/Edge Qualified: Trigger on any source only if a given state (or transition) has occurred on another source. The delay between these events can be defined as a number of events on the trigger channel or as a time interval.

TV: Allows selection of both line (up to 1500) and field number (up to 8) for PAL, SECAM, NTSC or nonstandard video.

ACQUISITION MODES

Random Interleaved Sampling (RIS): for repetitive signals from 1 ns/div to 5 μ s/div.

Single shot: for transient and repetitive signals from 10 ns/div (all channels active).

Peak detect: captures and displays 2.5 ns glitches or other high-speed events.

Sequence: Stores multiple events in segmented acquisition memories.

Number of segments available:

9354T 2-500

9354TM 2-2000

Min. Dead Time between segments: 60 μ s

DISPLAY

Waveform style: Vectors connect the individual sample points, which are highlighted as dots. Vectors may be switched off.

CRT: 12.5x17.5 cm (9" diagonal) raster.

Resolution: 810 x 696 points.

Modes: Normal, X-Y, Variable or Infinite Persistence.

Real-time Clock: Date, hours, minutes, seconds.

Graticules: Internally generated; separate intensity control for grids and waveforms.

Grids: 1, 2 or 4 grids.

Formats: YT, XY, and both together.

Vertical Zoom: Up to 5x Vertical Expansion (50x with averaging, up to 40 μ V sensitivity).

Maximum Horizontal Zoom Factors:

9354T 4000x

9354TM 20000x

Waveforms can be expanded to give 2 points/division. This implies zoom factors up to 100,000x for the 9354TM when channels are combined.

INTERNAL MEMORY

Waveform Memory: Up to four 16-bit Memories (M1, M2, M3, M4).

Processing Memory: Up to four 16-bit Waveform Processing Memories (A, B, C, D).

Setup Memory: Four nonvolatile memories. Optional Cards or Disks may also be used for high-capacity waveform and setup storage.

Channels Used	Maximum Sample Rate	Memory per Channel		Notes
		9354T	9354TM	
All Peak Detect OFF	500 MS/s	100k	500k	All channels active
All Peak Detect ON	100 MS/s data 400 MS/s peak	50k data + 50k peaks	250k data + 250k peaks	All channels active 2.5 ns peak detect
Paired Peak Detect OFF	1 GS/s	250k	1M	CH2 + CH3
Paired + PP 092 Peak Detect OFF	2 GS/s	500k	2M	

CURSOR MEASUREMENTS

Relative Time: Two cursors provide time measurements with resolution of $\pm 0.05\%$ full-scale for unexpanded traces; up to 10% of the sampling interval for expanded traces. The corresponding frequency value is displayed.

Relative Voltage: Two horizontal bars measure voltage differences up to $\pm 0.2\%$ of full-scale in single-grid mode.

Absolute Time: A cross-hair marker measures time relative to the trigger and voltage with respect to ground.

Absolute Voltage: A reference bar measures voltage with respect to ground.

WAVEFORM PROCESSING

Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity and Summation Averaging.

Average: Summed averaging of up to 1,000 waveforms in the basic instrument. Up to 10^6 averages are possible with Option WP01.

Envelope*: Max, Min, or Max and Min values of from 1 to 10^6 waveforms.

ERES*: Low-Pass digital filter provides up to 11 bits vertical resolution.

Sampled data is always available, even when a trace is turned off. Any of the above modes can be invoked without destroying the data.

FFT*: Spectral Analysis with four windowing functions and FFT averaging.

*Envelope and ERES modes are provided in Math Package WP01. FFT is in WP02.

AUTOSETUP

Pressing Autsetup sets timebase, trigger and sensitivity to display a wide range of repetitive signals. (Amplitude 2mV to 40V; frequency above 50Hz; Duty cycle greater than 0.1%).

Autosetup Time: Approximately 2 seconds.

Vertical Find: Automatically sets sensitivity and offset.

PROBES

Model: One PP002 (10:1, 10 M Ω // 15 pF) probe supplied per channel.

The 9354T and 9354TM are fully compatible with LeCroy's range of FET Probes, which may be purchased separately.

Probe calibration: Max 1 V into 1 M Ω , 500 mV into 50 Ω , frequency and amplitude programmable, pulse or square wave selectable, rise and fall time 1 ns typical. Alternatively, the Calibrator output can provide a trigger output or a PASS/FAIL test output.

INTERFACING

Remote Control: Of all front-panel controls, as well as all internal functions is possible by GPIB and RS-232-C.

RS-232-C Port: Asynchronous up to 19200 baud for computer/terminal control or printer/plotter connection.

GPIB Port: (IEEE-488.1) Configurable as talker/listener for computer control and fast data transfer. Command Language complies with requirements of IEEE-488.2.

Centronics Port: Optional hardcopy parallel interface (included with 9354TM).

Hardcopy: Screen dumps are activated by a front-panel button or via remote control. TIFF and BMP formats are available for importing to Desktop Publishing programs. The following printers and plotters can be used to make hardcopies: HP DeskJet (color or BW), HP ThinkJet, QuietJet, LaserJet, PaintJet and EPSON printers. HP 7400 and 7500 series, or HPGL compatible plotters. An optional internal high resolution graphics printer is also available (included with 9354TM).

GENERAL

Auto-calibration ensures specified DC and timing accuracy.

Temperature: 5° to 40° C (41° to 104° F) rated 0° to 50° C (32° to 122° F) operating.

Humidity: <80%.

Shock & Vibration: Meets MIL-STD-810C modified to LeCroy design specifications and MIL-T-28800C.

Power: 90-250 V AC, 45-66 Hz, 230 W.

Battery Backup: Front-panel settings maintained for two years.

Dimensions: (HWD) 8.5"x14.5"x16.25", 210mm x 370mm x 410mm.

Weight: 13 kg (28.6 lbs) net, 18.5 kg (40.7 lbs) shipping.

Warranty: Two years.

USA Direct Sales: 1 (800) 5LE-CROY**LeCroy Worldwide Sales Offices**

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	04902.8.9285
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy GmbH	06221.83.10.01
ITALY	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND	Geneva	022.719.21.11
SWITZERLAND	Lenzburg	064.51.91.81
United Kingdom	LeCroy Ltd	(01235) 533114

Ordering Information**Oscilloscope and Options**

9354T/TM	4-Ch Digital Oscilloscope
9XXX-MC01/04	Memory Card Reader w/512KB Memory Card
93XX-HD01	Hard Disk Adapter
93XX-HD02	PCMCIA Hard Disk
93XX-DA01-110	PCMCIA type III external desktop adaptor for PC (110v)
93XX-DA01-220	PCMCIA type III external desktop adaptor for PC (220v)
93XX-HDD	HD01/HD02 combination
93XX-DDM	Disk Drive Measurements
93XX-PRML	Supplementary Disk Drive Measurements
935XA-CKTRIG	10MHz External Clock Reference Input
	500MHz External Clock input
	Trigger Comparator Output
93XX-W5	5 Year Warranty
93XX-C5	5 Year Calibration Contract
93XX-T5	5 Year Warranty and Calibration

Oscilloscope Accessories**Supplied with Instrument:**

935X-OM	Operator's Manual
93XX-RCM	Remote Control Manual
93XX-FC	Front Cover
PP002	350MHz, 10M Ω Passive Probe (1 per channel)
PP092	ProBus Channel Multiplexer
9XXX-WP01	Waveform Math
9XXX-WP02	FFT Processing
93XX-FD01	Floppy Drive
93XX-GP01	Internal Graphics Printer (Included with 9354TM only)

Ordered separately:

93XX-CC	Calibration Certificate
935XT-SM	Service Manual
9XXX-MC02	128K Memory Card
9XXX-MC04	512K Memory Card
DC/GPIB	2 Meter GPIB Cable
SG9001	High Voltage Protector
OC9002	Oscilloscope Cart
AP020	1 GHz 10:1 FET Probe
AP021	800 MHz 5:1 FET Probe
AP030	15 MHz Differential Probe
PP062	1 GHz, 10:1, 500 Ω Passive Probe
PP090	ProBus 75 to 50 Ω adapter
93XX-RM01	Rackmount
93XX-TC1	Transit Case
93XX-TC2	Carrying Bag

Various option bundling schemes available. Contact your nearest LeCroy subsidiary or representative for more information.



LeCroy

The Digital Scope Specialists

9300 Series PCMCIA Hard Disk Adapter, Internal Printer, 3.5" Floppy Disk Drive and Ram Card

Main Features

- PCMCIA Type III compatible Hard Disk Adapter, DOS Compatible
- High-resolution Printer, ideal for fast, on-the-spot documentation
- 3.5" Floppy disk drive, DOS format - affordable and convenient
- Ultra-fast RAM card, DOS format, ideal for PASS/FAIL testing
- Convenient Hardcopy storage to card/disk



3.5" Floppy

The floppy drive is a convenient storage medium, not only for saving and retrieving waveforms or instrument settings, but also for storing hardcopies that can be printed from a PC when desired. The floppy supports both 720k and 1.44M DOS formats so that it can be read back on any PC with a 3.5" drive, avoiding the need to interface the oscilloscope to your PC. As with the RAM-card option, the floppy system capabilities include automatic storage of data under pre-programmed conditions.

PCMCIA Storage

PCMCIA Interfaces for RAM card and Hard Disk allow the use of fast, removable and compact storage media for saving and retrieving waveforms and instrument settings. They comply fully with the PC industry's PCMCIA and JEIDA standards. With the special Autostore feature, waveforms can be automatically stored after every acquisition and "played back" when desired. When used in combination with the PASS/FAIL feature, failure data can be saved automatically for later analysis.

Printer

The internal printer is an invaluable tool for instant, on-the-spot documentation. It generates a clear, crisp hardcopy of the screen in just a few seconds. The large size of the printout, combined with its high resolution, provide you with an excellent document that matches the screen's superior quality to its finest details. And because it frees you from the trouble of carrying and interfacing a bulky printer, it is the ideal solution for field measurements.

Mass Storage Features and Benefits

LeCroy's mass storage capabilities provide a range of benefits:

- Easy data transfers to PCs
- Waveform logging
- Waveform archiving for future use
- Faster troubleshooting
- Faster, more reproducible testing
- Shared oscilloscope resources

EASY DATA TRANSFER TO PC

Because the 9300 series oscilloscope uses DOS-formatted floppy disks, hard disks and memory cards, transferring waveform data to a PC is simple. The removable storage allows transfers without cables, programming, or any knowledge of GPIB, RS-232, or other interfaces.

In addition, LeCroy provides free of charge, a binary-to-ASCII format conversion program for the PC, accommodating those PC-based analysis packages (such as spreadsheets) that require ASCII format.

WAVEFORM LOGGING

By using Glitch or Dropout triggering in combination with the powerful AUTO-STORE mode, LeCroy oscilloscopes can monitor and log intermittent problems automatically. To store a waveform, the oscilloscope opens and names a DOS-compatible file and then stores the waveform data in the file. This logging feature requires no operator intervention and maintains data and the operational setup through power line failures. Logged waveforms can be selectively played back by trigger time/date or by sequence number, or can be scrolled through sequentially.

WAVEFORM ARCHIVING FOR FUTURE USE

- Recallable proof of performance
- Additional data analysis as needed
- Accurate trend or drift monitoring
- Calibration procedure verification

When storing waveforms, LeCroy DSOs also archive a header of setup information and the acquisition time/date. After recalling an archived waveform, the several hundred byte header ensures correct time and voltage scaling. When recalled into the oscilloscope, the waveform can be zoom expanded,

compared, or analyzed just like a live waveform. The time/date offers proof of measurement authenticity and trend sequence.

All LeCroy DSOs store raw waveform data using one byte per sample point. Signal averaged, Enhanced Resolution (ERES) filtered, and other processed data use two bytes per point, to take advantage of the added resolution.

HARDCOPY ARCHIVING

Hardcopies of the screen can also be stored for future use. For instance, a screen saved in TIFF format can be imported into a Word Processor to illustrate a report. Additionally, field-measurement screens can be saved in LaserJet format on the memory card or floppy disk, and then printed from a PC back in the lab.

FASTER FIELD MEASUREMENTS

Recallable reference waveforms and oscilloscope setups for each test point on a Device Under Test (DUT) can make fault troubleshooting faster and more accurate. A dedicated memory card or floppy disk will hold all of the correct test point waveforms and associated DSO setups for a particular DUT. The technician can recall stored setups quickly and consistently, thereby avoiding incorrect measurement conditions. He can then compare actual waveforms to recalled reference waveforms taken from a known working system. He will therefore spend less time probing a large number of test points and verifying that the correct waveforms exist.

If a problem is found, the aberrant waveform may be saved. It can later be shown to laboratory-based engineers, for example, for problem-solving guidance or for improvement of DUT design.

Memory cards - rugged and pocket-sized - are ideal for this application.

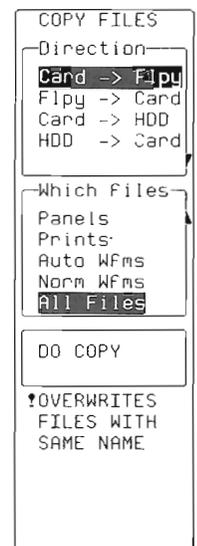
FASTER, MORE REPRODUCIBLE TESTING

LeCroy oscilloscopes will compare measured waveforms against upper and lower waveshape tolerances or against parameter limits, such as risetime, overshoot, or peak voltage, and make PASS/FAIL decisions. This PASS/FAIL

testing decreases test times in GPIB-based ATE systems by reducing data transfers. It increases reproducibility and accuracy in manual tests by eliminating human errors. Once defined, these tests may be saved by storing instrument setups which include the specified tolerances and/or reference waveforms. Different test personnel can easily share a common test library via a PC network. Waveshape test limits can be generated by capturing a "golden" waveform and by then selecting amplitude and timing limits (in fractions of screen graticule divisions). Or a user can create standard waveform limit templates on a computer (e.g. ANSI/CCITT telecommunication templates). With the LeCroy 9300 series DSOs, specific parameter tolerance test procedures are created by selecting limits for any five out of twenty pulse parameters with Boolean AND / OR conditions between them. During testing, FAIL responses can include an audible beep, GPIB SRQ, hardcopy output, or store to memory card.

SHARED OSCILLOSCOPE RESOURCES

By plugging-in your *personal* floppy disk, RAM card or PCMCIA Hard Disk you can restore your setup in seconds. Individual users can keep preferred setups on separate disks or cards or within separate directories.



A selection of files can be copied between the available mass storage devices.

Hardcopy Features and Benefits

The internal printer adds a whole range of benefits to the LeCroy 9300 series:

- Ultra-fast printouts
- High resolution printing
- Easy transportation
- Trouble-free interfacing
- Auto Print on Trigger

ULTRA-FAST PRINTOUTS

Measurement documentation is made easier and faster since the internal printer produces a hardcopy in less than 10 seconds. In addition the document is date- and time-stamped: a real bonus for archiving test results.

HIGH RESOLUTION PRINTING

With a resolution of 190 dots-per-inch, the internal printer matches the screen's superior quality. And for even higher resolution, the printout can be stretched to a full 70 meter length so you can see those traces down to their finest details.

EASY TRANSPORTATION

A printer that is totally integrated in the instrument makes life much easier for field-measurement applications. Imagine carrying a scope, a printer (and perhaps a floppy drive) in one hand!

TROUBLE-FREE INTERFACING

The internal printer frees your mind from the struggle with cable schematics, baud rates, gender-changers and dip switches, for more productive tasks. Select the internal printer in the scope's utilities menu, hit the SCREEN DUMP button, and you're in business!

AUTO PRINT ON TRIGGER

The Auto Print feature is used to print a screen image on each acquisition.

The 9300 series oscilloscope supports a whole range of popular printers and plotters. Hardcopies can be either sent directly to the peripheral device or to the floppy disk, Ram Card or Hard disk for future use.

HARDCOPY

output to

Card
Floppy
GPIB
RS232
Centronics

page Feed

Off On

plotter

LaserJet
ThinkJet
TIFF
HP 7470
HP 7550

plot size

A5 (8.5"/5.5")
A4 (11"/8.5")

pen number

2

OTHER HARDCOPY SOLUTIONS

High quality project reports, presentation materials, technical manuals, and troubleshooting instructions often require integration of text and graphics on the same page.

Advanced PC desktop publishing and word processors such as Word-for-Windows, WordPerfect, or AMI Pro can directly import graphic files, size them, and position them anywhere on the page. Written text can then wrap around or be positioned within the graphics.

LeCroy 9300 oscilloscopes will save screens in TIFF (Tagged Image Format File), or BMP. After transferring the file to a PC, the DTP software can import and manipulate the document like any other graphic object.

The LeCroy 9300 series also offers a wide range of interfacing capabilities with external hardcopy devices:

- Plotters. HPGL, HP 7400 and 7500 compatible
- Printers. HP LaserJet, ThinkJet, Paintjet (including color), DeskJet (including color) and Epson
- Interfacing. RS-232, GPIB, or even Centronics (optional)

Specifications

MASS STORAGE

	Floppy Disk	Ram Card	Hard Disk
Compatibility	3.5" Floppy Drive	PCMCIA I, II JEIDA 3.0, 4.0	PCMCIA III
Supported Formats	DOS Format	Read/Write: SRAM Read: OTP, ROM, Flash DOS Format	DOS Format
Size	720k byte, 1.44M byte	Up to 8M byte	Up to 512M byte * Note 1
Max Transfer Rate	18k byte/sec	500k byte/sec	150k byte/sec
Typical waveform: Transfer Speed (Store/Recall)			
1000 point	1.1s / 0.4s	40ms / 30ms	140ms / 120ms
10000 point	1.8s / 1.0s	70ms / 60ms	240ms / 220ms
100000 point	7.5s / 6.5s	300ms / 300ms	1.0s / 0.9s
1M point	57s / 55s	2s / 2s	7.0s / 6.5s

Waveform File size: A channel-trace will use 1 byte per sample plus approximately 360 bytes of waveform descriptor. A processed trace will use 2 bytes per sample.

Template Size: Approximately 21k bytes.

Panel Setup Size: Approximately 3k bytes.

*Note 1: When available

PRINTER

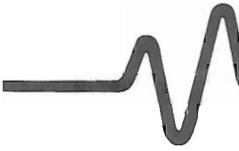
Type: Raster printer, thermal.

Resolution: 190 DPI.

Printout Size: 126 mm x 90 mm

Paper: Thermal printer paper, 30 meter roll, 110 mm width, type Seiko or similar.

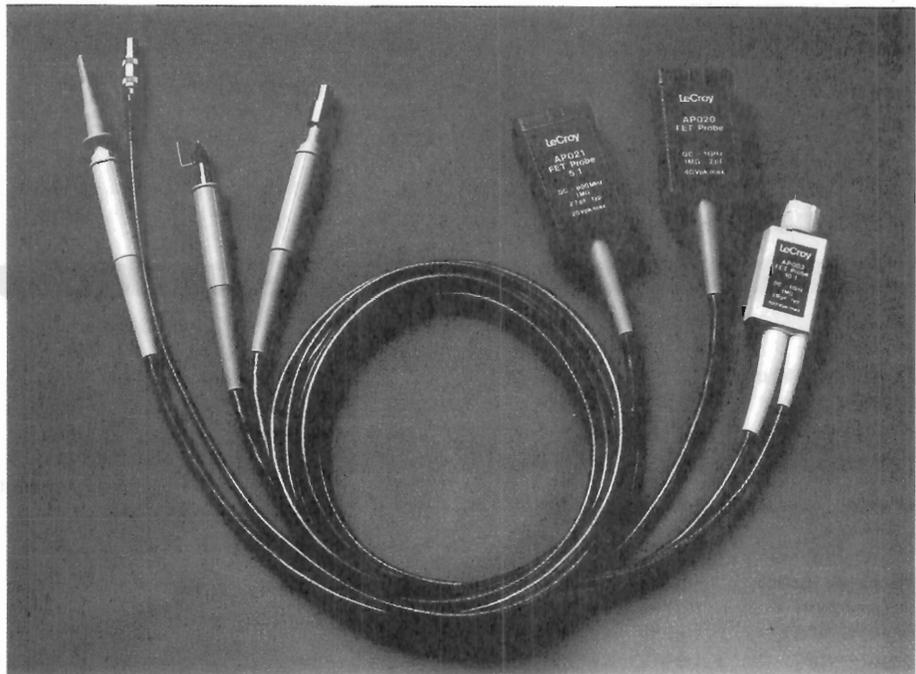
Printing speed: 6 seconds approx. for one screen.



AP003, AP020 and AP021 Active FET Probes

Main Features

- Bandwidths to 1 GHz
- LeCroy ProBus™ interface for the AP020 and the AP021
- 1 MΩ input Impedance
- Low capacitance at probe tip
- Rugged mechanical construction
- Automatic sensing and control on scopes equipped with ProBus™



FET Probes provide the oscilloscope user with a higher level of measurement capability. Compared with passive probes, they offer low circuit loading, low capacitance and high bandwidth. This combination makes them the ideal tools for working on sensitive or high-speed electronics.

This performance is achieved by the integration of a high-impedance Field Effect Transistor (FET) amplifier into the probe tip. The circuit under test sees only the amplifier's input impedance - it is effectively buffered from the scope's input impedance and the probe cable.

LeCroy's AP series of FET probes are mechanically rugged in design, while their miniature construction allows them to be used in hand-held PCB probing applications. Their detachable tips are designed for simple replacement, and they are supplied with a full set of accessories.

Models AP020 and AP021 offer 1 GHz and 800 MHz Bandwidth respectively. AP020 features X10 signal attenuation and is especially recommended for LeCroy's 9320 and 9324 1 GHz oscilloscopes. The AP021 offers X5 attenuation when used with the new 9360.

As an active device, the FET probe requires a stabilized power supply. LeCroy provides an elegant solution to this with the ProBus™ probe interface.

ProBus™ provides probe power and signal connection in one integrated package. It also allows the scope to control other probe functions, such as input coupling and DC offset. The ProBus™ interface is now available on a growing range of LeCroy oscilloscopes and probes. AP003 has an external power connector for use with scopes which are not ProBus™ compatible. All other models use the ProBus™ interface.

Features and Benefits

Connecting a probe to a circuit can significantly distort its signals by adding undesired loading - mostly capacitive and resistive. FET probes offer high resistance and low capacitance therefore they present minimal loading to the circuit under test, and protect from making erroneous measurements.

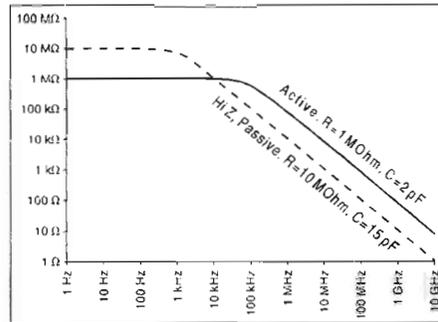
HIGH RESISTANCE

Low resistance probes have significant DC effects when used in high impedance circuits. They can greatly affect the behaviour of the device under test by changing the swing and the DC offset of the probed signal. A 1 MΩ impedance FET probe will not affect gain or offset in virtually all the cases.

LOW CAPACITANCE

Although not important in DC measurements, capacitive loading is very

disruptive at high signal frequencies. The capacitive loading effects can be drastic. When probed with a 10 MΩ, 15



Probe Impedance versus Frequency

pF passive probe, a 100 MHz signal "sees" a 100 Ω load as illustrated on the picture below.

With only 2 pF of capacitance at the probe tip, LeCroy's FET probes reduce

circuit loading at high frequencies by a factor of 10. Minimizing tip capacitance can also push the probe's resonant frequency beyond the system bandwidth. Sensitivity to ground lead inductance is also minimized.

PROBUS

The ProBus™ system is a complete measurement solution from probe tip to oscilloscope display. It supplies power to active probes, while automatically sensing probe attenuation. ProBus™ enables direct control of the probe offset and input coupling from the scope's front panel, extending the instrument's accuracy up to the probe tip. In addition, ProBus™ automatically optimizes scope and probe offset adjustments, calibrates the gain at the probe tip and compensates for non-linearities, providing most accurate measurements.

Specifications

MODEL	AP003	AP020	AP021	MODEL	AP003	AP020	AP021
Bandwidth (MHz)	DC-1000	DC-1000	DC-800	Dynamic Range	±7 V	±5 V	±2.5 V
Risetime (psec)	< 350	< 350	< 437	DC Offset Range	N/A	±20 V	±10 V
Attenuation	10:1 ±2%	10:1 ±2%	5:1 ±2%	Input Coupling	DC	DC/AC	DC/AC
Input R (MΩ)	1 ±5%	1 ±2%	1 ±2%	Total length (m)	1.5	1.5	1.5
Input C (pF)	1.9 ±0.3	1.8 ±0.2	2.7 ±0.2	Power requirement	±12 V	±12 V	±12 V
Max Input Voltage	±100 V	±40 V	±20 V	Interface	N/A	ProBus™	ProBus™

Recommended Matching

LeCroy Model	AP-003	AP-020	AP-021
9304-10-14	XX		
9360-61			X
9320-24		X	
94XX	X		
7200	XX		
7200A	X		
ScopeStation	X		

X: External Power Supply not required
 XX: External Power Supply required

Ordering Information

AP003	1 GHz active FET probe
AP020	1 GHz active FET probe
AP021	800 MHz active FET probe with ProBus™ interface. All probes are shipped with the following accessories: 1x Retractable hook 1x Ground Lead 1x BNC Adaptor 1x IC Tip
AP501	3x Ground Bayonets 1x Mini pincher with Lead Adaptor Power Supply for the AP003

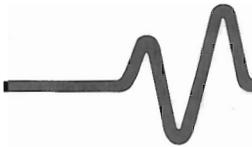
USA Direct Sales: 1 (800) 5LE-CROY

LeCroy Worldwide Sales Offices

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	04902.8.9285
CANADA	LeCroy Cnd	514.928.4707
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy GmbH	06221 83.10.01
ITALY Milano	LeCroy SRL	02.204.70.82
ITALY Rome	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND Geneva		022.719.21.11
SWITZERLAND Lenzburg		064.51.91.81
United Kingdom	LeCroy Ltd	0235-533114

Other sales and service representatives throughout the world.

Copyright © May, 1993. LeCroy is a registered trademark of LeCroy Corporation. All rights reserved. Information in this publication supersedes all earlier versions. Specifications subject to change without notice.



LeCroy

The Digital Scope Specialists

AP030, SI 9000 and SI 9000A Active Differential Probes

Main Features

- Bandwidths to 15 MHz
- Multiple:
 - Attenuations
 - Differential Voltage Ranges
 - Common Mode Voltages
- High Input Impedance
- Rugged and Lightweight
Mechanical Construction



The Models AP030, SI 9000 and SI 9000A are fully differential active probes designed for applications where electric signals must be measured relative to a floating voltage, other than ground potential.

These probes are designed specifically for situations where:

- the reference voltage may be several hundreds volts above or below ground;

- measurements require the rejection of common-mode signals, (e.g. to evaluate small amplitude pulses riding on big common-mode signals);
- ground loops and currents produce so much interference that small signals cannot be detected.

With these differential probes the oscilloscope user avoids both the dangerous practice of floating the

scope, and the technique of using two scope channels in "Invert and Add" mode, which is limited both in common mode rejection and in dynamic range.

Models AP030, SI 9000 and SI 9000A are lightweight and easy to use. They have the rugged mechanical construction required for laboratory, manufacturing and field service environments, and are battery powered for greater safety and convenience.

Features and Benefits

FULLY DIFFERENTIAL INPUTS

The probes are fully differential active devices. The differential technique allows measurements to be made between two points in a circuit without reference to ground. The two input signals are processed inside the probe (as illustrated in figure) and the resulting single-ended signal may be measured by any grounded oscilloscope.

HIGH COMMON MODE VOLTAGE

The three probes offer a range of Common Mode Voltages from 40 V to 1000 V.

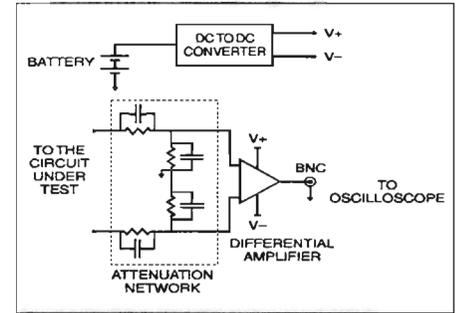
RUGGED CONSTRUCTION

The probes are designed to be compact and lightweight with power provided by four AA size 1.5 V batteries. A rubber casing enhances the probes' resistance to shocks.

SAFETY

Use of differential probes is safe within the specified voltages. Their

use avoids less reliable alternatives, or possible dangerous practices.



Specifications

MODEL	AP030	SI 9000	SI9000A
Bandwidth (MHz)	15 MHz	15 MHz	15 MHz
Risetime	24 ns	24 ns	24 ns
Attenuation	1:10/1:100	1:20/1:200	1:50/1:500
Atten. Accuracy	2%	2%	2%
Input Resistance	2 M Ω	2 M Ω	2 M Ω
Input Capacitance	12 pF each side to ground		
Input Configuration	Differential		
Input Voltage			
Differential Max	± 400 VDC or 280 Vrms for 1:100 ± 40 VDC or 28 Vrms for 1:10	± 700 VDC or 500 Vrms for 1:200 ± 70 VDC or 50 Vrms for 1:20	± 1000 VDC or 700 Vrms for 1:500 100 VDC or 70 Vrms for 1:50
Common Mode Max	± 420 VDC or 300 Vrms	± 700 VDC or 500 Vrms	± 1000 VDC or 700 Vrms
Absolute Max	± 1000 VDC or 700 Vrms		
CMRR			
50Hz	-90db	-80db	-80db
1KHz	-80db	-70db	-70db
1MHz	-53 db	-45db	-45db
Output Voltage			
Amplitude Max	± 4 V	± 3.5 V	± 2 V
Offset	$\leq \pm 5$ mV	$\leq \pm 10$ mV	$\leq \pm 10$ mV
Noise	typical -10° C to $+40^{\circ}$ C 1.5 to 2mV typical		
Source Impedance	1 Ω at 1 KHz, 8 Ω at 1 MHz typical		
Ambient Temperature			
Operating	-10° C to $+40^{\circ}$ C		
Storage	-30° C to $+70^{\circ}$ C		
Power requirement:	Four internal 1.5 V AA size batteries or external AC to 6 Vdc adaptor Typical consumption 50 mA		
Dimensions	6.6" (168mm) x 2.4" (62mm) x 0.79" (20mm) excluding casing		
Weight	9.35 oz (265 gr) excluding batteries and casing		

Ordering Information

AP030	15 MHz differential probe 1:10 / 1:100
SI9000	15 MHz differential probe 1:20 / 1:200
SI9000A	15 MHz 1:50 / 1:500

All models are delivered with rubber casing.
Batteries not included

USA Direct Sales: 1 (800) 5LE-CROY

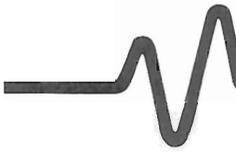
LeCroy Worldwide Sales Offices

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	04902.8.9285
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy GmbH	06221.83.10.01
ITALY	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND Geneva		022.719.21.11
SWITZERLAND Lenzburg		064.51.91.81
United Kingdom	LeCroy Ltd	(01235) 533114

Other sales and service representatives
throughout the world.

Copyright December, 1994. LeCroy is a registered trademark of LeCroy Corporation. All rights reserved. Information in this publication supersedes all earlier versions.

Specifications subject to change without notice.



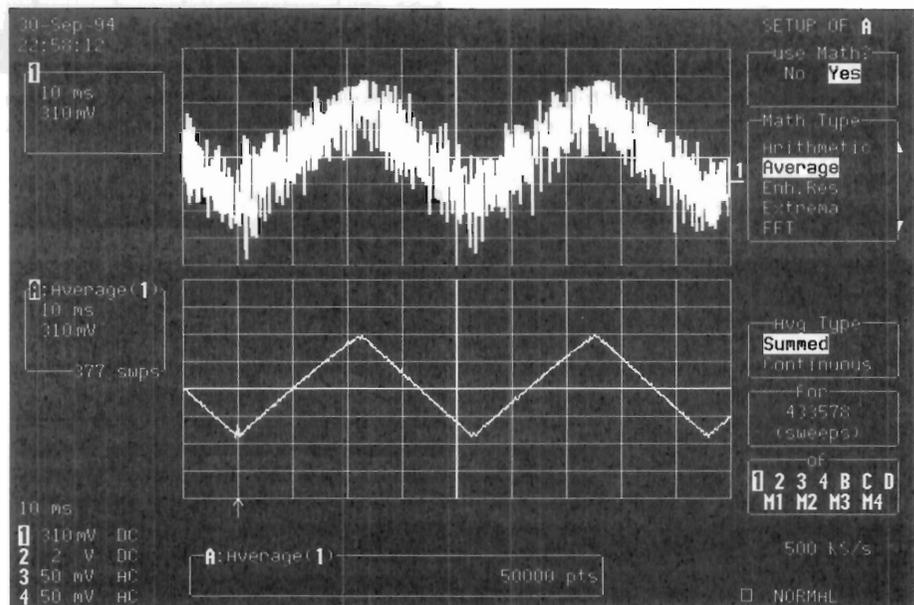
LeCroy

The Digital Scope Specialists

WP01 Waveform Processing Firmware for the 9300 Family of Digital Oscilloscopes

Main Features

- High-precision averaging up to 1 million sweeps
- Extended digital filtering capabilities
- Rescale function, with $(ax + b)$ correction factor
- Envelope mode
- Integration
- Differentiation
- $\text{Log}(e)$ and $\text{Log}(10)$
- $\text{Exp}(e)$ and $\text{Exp}(10)$
- Absolute, Reciprocal
- Square, Square root
- Powerful function chaining feature



Summed Averaging is applied to the signal in Channel 1, to remove random noise. Trace A shows the result after 377 sweeps: the noise has practically disappeared.

The LeCroy WP01 Waveform Processing package features a powerful toolset that extends the processing power inside the 9300 oscilloscope, well beyond the capabilities of a traditional instrument.

In fact, all the processing is built-in to eliminate the need for external computers and controllers. High-speed microprocessors are used to ensure real-time updates of computed waveforms on the screen.

The package is fully programmable over GPIB or RS-232-C interfaces, and hard copies can be made directly on to a wide range of printers (including the optional internal printer), plotters or graphic formats.

Features and Benefits

EXTENSIVE SIGNAL AVERAGING

WP01 offers two powerful, high-speed averaging modes that can be used to reduce noise and improve the signal-to-noise ratio. Vertical resolution can be extended by several bits to improve dynamic range and increase the overall input sensitivity to as much as 50 $\mu\text{V}/\text{div}$.

Summed averaging, where up to 1,000,000 sweeps are repeatedly summed, with equal weight, in a 32-bit accumulation buffer for improved accuracy. The accumulated result is then divided by the number of sweeps.

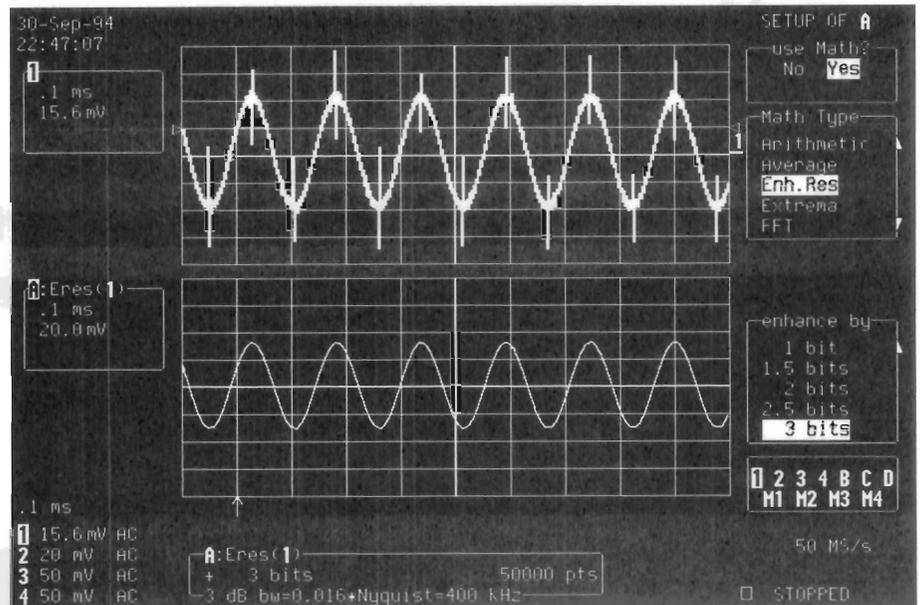
Continuous/exponential averaging where a weighted addition of successive waveforms can be performed with weighting factors from 1:1 to 1:1023. The averaging goes on indefinitely with the contribution of "older" sweeps gradually decreasing. The method is particularly appropriate to reduce noise on signals drifting very slowly in time or amplitude.

ENHANCED RESOLUTION BY DIGITAL FILTERING

Allows low-pass F.I.R. filtering of the digitized signals, with 6 different cut-off frequencies per sampling rate setting. As a result, the vertical resolution of the captured signals – single-shot or repetitive – increases from 8 bits to 11 bits in 0.5-bit steps. This feature is ideal to strip off unwanted high-frequency noise on transient events.

RESCALING

Allows an input signal to be rescaled using a $(ax + b)$ correction factor to compensate for gain and offset. This is very useful when dealing with various types of transducers, to read the correct temperature or pressure value directly from the scope's cursor.



High-frequency glitches in Channel 1 have been dramatically reduced in Trace A by using the low-pass filtering properties of the Enhanced Resolution Function.

ENVELOPE MODE

Shows the signal envelope by retaining only the highest and lowest amplitudes for every sampling interval, over a user-definable number of sweeps. Ideal to visualize the time or amplitude jitter in a signal.

POWERFUL MATH TOOLSET

In addition to the basic arithmetic functions found in the standard models (+, -, \times , \div), WP01 adds an impressive set of functions such as integration, differentiation, logarithms and exponential – in both bases 10 and e – square, square root, reciprocal, absolute, and a $\sin(x)/x$ interpolation function.

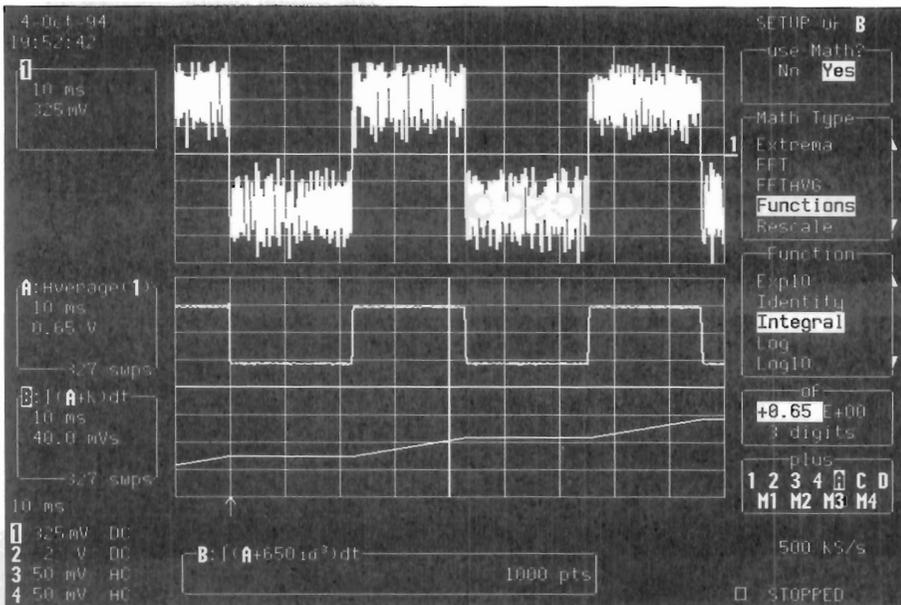
All these functions are updated automatically each time a new waveform is acquired, showing a "live" representation of a computed trace. This would be impossible to achieve on a separate computer.

FUNCTION CHAINING

When more than one math function is needed in the equation, WP01 supports function chaining, and allows the user to multiply, for instance, the "Voltage" and the "Current" channel and to integrate the result to get an instantaneous energy curve.

REMOTE CONTROL

All of the waveform processing can be controlled via GPIB or RS-232-C remote control. And the function traces do not even need to be called up on screen to be updated, an important feature that speeds up the computation.



To illustrate WP01's function chaining ability, the noisy signal in Channel 1 has been averaged in Trace A to remove undesired noise, and the result integrated in trace B.

WP01 Specifications

GENERAL

Max. number data points: only limited by the available amount of system memory (indicated in the "memory used" status menu).

Min. number data points: Data points can be reduced down to 50 in the processing function to improve update rate.

Vertical Zoom: supported, 50x maximum.

Horizontal Zoom: supported, maximum zooming to a point where 50 samples of the source trace occupy the full screen.

Maximum Sensitivity: 50 $\mu\text{V}/\text{div}$ after vertical expansion.

SUMMATION AVERAGING

Number of Sweeps: 1 to 1,000,000.

Speed: up to 200,000 points/s.

CONTINUOUS AVERAGING

Possible Weighting Factors: 1:1, 1:3, 1:7, 1:15, 1:31, 1:63, 1:127, 1:255, 1:511 and 1:1023.

ENHANCED RESOLUTION

Choice of six low-pass filters to improve vertical resolution improvement from 8 to 11 bits in 0.5-bit steps.

Resulting bandwidth:

0.5 bit	$0.5 \times \text{Nyquist BW}$
1 bit	$0.241 \times \text{Nyquist BW}$
1.5 bit	$0.058 \times \text{Nyquist BW}$
2 bit	$0.029 \times \text{Nyquist BW}$
2.5 bit	$0.016 \times \text{Nyquist BW}$

Nyquist BW = $1/2 \times \text{sample frequency}$.

RESCALE

$ax + b$ rescaling with a and b ranging from $\pm 0.00001 \text{ E-15}$ to $\pm 9.99999 \text{ E+15}$

ARITHMETIC

Addition, subtraction, multiplication and ratio on any two waveforms.

FUNCTIONS

Identity, negation, integration (including additive constant), differentiation, square, square root, logarithm and exponential (base e and 10), $\sin x/x$, reciprocal and absolute value of any waveform.

EXTREMA

Shows the signal envelope by retaining only the highest and lowest amplitudes for every sampling interval. Logs all extreme values of a waveform over a programmable number of sweeps. Maxima and minima can be displayed together, or separately by choosing *roof* or *floor* traces.

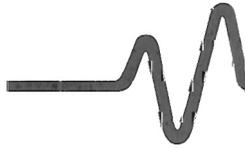
Number of Sweeps: 1 to 1,000,000.

FUNCTION CHAINING

Up to four functions can be automatically chained using traces A, B, C and D. Using memories M1 to M4 for intermediate results, any number of operations can be chained manually or via remote control.

REMOTE CONTROL

All controls and waveform processing functions are fully programmable using simple commands over the oscilloscope's GPIB or RS-232-C interfaces.



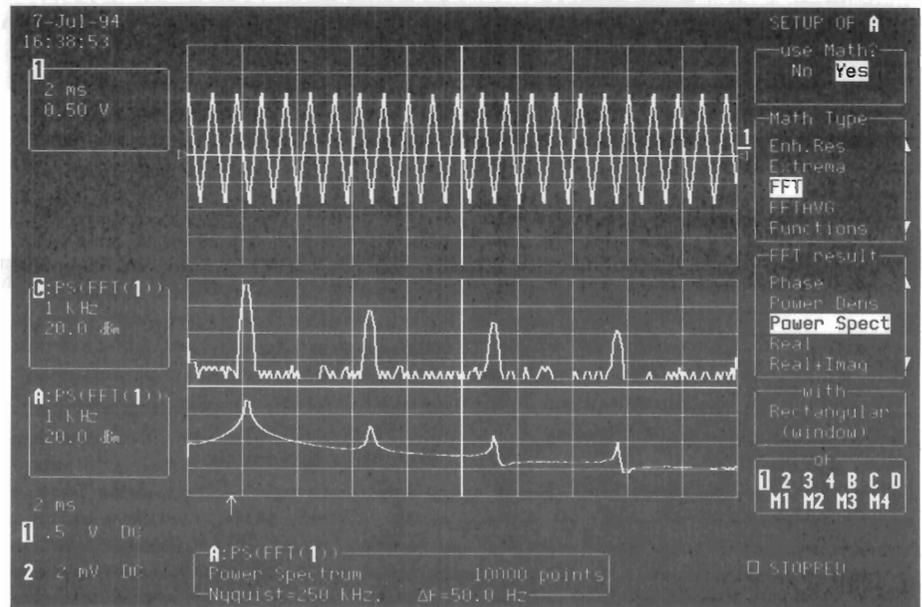
LeCroy

The Digital Scope Specialists

WP02 Spectrum Analysis Firmware for the 9300 Family of Digital Oscilloscopes

Main Features

- Frequency range from DC up to the instrument's full bandwidth
- Simultaneous FFTs on up to 4 channels
- Frequency resolution down to 100 μ Hz
- Frequency domain averaging
- Wide selection of scaling formats
- 5 window functions
- Up to 5 1000-point FFTs per second
- Full support of cursors and automatic waveform parameters
- Full PASS/FAIL testing support



Adding the WP02 Spectrum Analysis Package to the 9300 family of digital oscilloscopes provides a fast and economical solution to frequency domain applications.

The WP02 Spectrum Analysis package provides the 9300 oscilloscope with a powerful frequency-domain toolset that extends its processing capabilities, well beyond the realm of a standard instrument. In fact, all the processing is built-in to eliminate the need for external computers and controllers.

High-speed microprocessors are used to ensure real-time update of computed waveforms on the screen. Fast Fourier Transforms (FFTs) rapidly convert time domain waveforms into frequency domain records to reveal valuable spectral information such as phase, magnitude and power.

The package is fully programmable over GPIB and RS-232-C interfaces, and hardcopies can be made directly on to a wide range of printers (including the optional internal printer), plotters or graphic formats.

Features and Benefits

WHY FFT IN A SCOPE?

The FFT package on a LeCroy 9300 has at least four clear advantages over common swept spectrum analyzers:

- It can show the spectrum of a **transient signal**.
- Both **time and frequency** information can be monitored **simultaneously**.
- Phase information is **available**.
- The price is **attractive**.

It has two definite advantages over FFT analyzers:

- It can show higher-frequency components.
- Both **time and frequency** information can be monitored **simultaneously**.
- The price is **attractive**.

BROAD SPECTRUM COVERAGE

The frequency spectrum ranges from DC to the full bandwidth of the oscilloscope for repetitive signals, and to one half of the maximum sampling frequency for transients.

MULTI-CHANNEL ANALYSIS

All input channels can be analyzed simultaneously to look for common frequency-domain characteristics in independent signals.

VERSATILE SCALING FORMATS

Frequency-domain data may be presented as magnitude, phase, real, imaginary, complex, log-power and log-PSD (Power Spectral Density).

STANDARD WINDOW FUNCTIONS

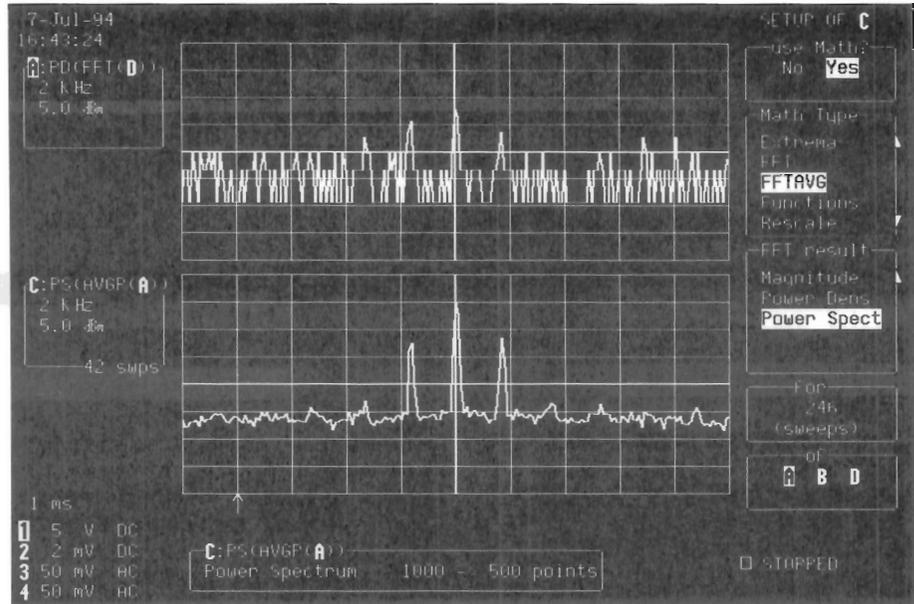
Use rectangular for transient signals; von Hann (Hanning) and Hamming for continuous waveform data; Flattop for accurate amplitude measurements; Blackman-Harris for maximum frequency resolution.

FREQUENCY DOMAIN AVERAGING

Up to 50,000 FFT sweeps may be averaged to reduce base-line noise, enable analysis of phase-incoherent signals or signals which cannot be triggered on.

FREQUENCY CURSORS AND WAVEFORM PARAMETERS

Cursors can be set on the FFT trace to show up to 0.004% frequency resolution (up to 0.002% for 10,000 point memory) and measure power or voltage differences to 0.2% of full scale. Automatic waveform param-



An FFT (top trace) with spectral components buried in noise. By applying the power averaging function (lower trace), all the baseline noise is removed, and the spectral components of an AM signal are clearly visible..

eters can also be applied to FFT traces.

PASS/FAIL TESTING ON FFT TRACES

PASS/FAIL testing is fully supported on FFT traces. The instrument can be setup to test incoming spectra against tolerance masks. In case the signal "fails", the instrument can be programmed to perform a choice of actions (screen dump, waveform storage, pulse out, etc.)

RESCALING

Allows an input signal to be rescaled using a $(ax + b)$ correction factor to compensate for gain and offset. This is very useful when dealing with various types of transducers, to read the correct temperature or pressure value directly from the scope's cursor.

FUNCTION CHAINING

When more than one math function is needed in the equation, WP02 supports function chaining, and allows the user to multiply, for instance, the "Voltage" and the "Cur-

rent" channel and to integrate the result to get an instantaneous energy curve.

REMOTE CONTROL

All of the waveform processing can be controlled via GPIB or RS-232-C remote control. And the function traces do not even need to be called up on screen to be updated, an important feature that speeds up the computation.

FOURIER PROCESSING

Fourier processing is a mathematical technique which enables a time-domain waveform to be described in terms of frequency-domain magnitude and phase, or real and imaginary spectra. It is used, for example, in spectral analysis where a waveform is sampled and digitized, then transformed by a Discrete Fourier Transform (DFT). Fast Fourier Transforms (FFT) are a set of algorithms used to reduce the computation time (by better than a factor of 100 for a 1000 point FFT) needed to evaluate a DFT.

WP02 Specifications

GENERAL

Max. number data points: only limited by the available amount of system memory (indicated in the "memory used" status menu).

Min. number data points: Data points can be reduced down to 50 in the processing function to improve update rate.

Vertical Zoom: supported, 50× maximum.

Horizontal Zoom: supported, maximum zooming to a point where 50 samples of the source trace occupy the full screen.

Maximum Sensitivity: 50 $\mu\text{V}/\text{div}$ after vertical expansion.

Frequency Range:

Repetitive signals: DC to instrument bandwidth.

Transient signals: DC to 1/2 maximum single-shot sampling frequency

Frequency Scale Factors: 0.05 Hz/div to 0.2 GHz/div in a 1-2-5 sequence.

Frequency Accuracy: 0.01%.

AMPLITUDE AND PHASE

Amplitude Accuracy: Better than 2%. Amplitude accuracy may be modified by the window function (see the window functions table).

Signal Overflow: A warning is provided at the top of the display when the input signal exceeds the ADC range.

Number of Traces: Time domain and frequency domain data can be displayed simultaneously (up to 4 waveforms).

Phase Range: -180° to $+180^\circ$.

Phase Accuracy: $\pm 5^\circ$ (for amplitudes > 1.4 div).

Phase Scale Factor: $50^\circ/\text{division}$.

SPECTRUM SCALING FORMATS

Horizontal Scale: *Linear, in Hz*

Vertical Scales:

Power Spectrum in dBm (1 mW into 50 Ω).

Power Spectral Density (PSD) in dBm.

Magnitude, Real, Imaginary: *Linear, in V/div*

Phase Display: *Linear, in degrees.*

WINDOW FUNCTIONS

Rectangular, von Hann (Hanning), Hamming, Flattop and Blackman-Harris (see table below).

FFT EXECUTION TIMES*

100 points in less than 0.03 s.

1000 points in less than 0.3 s.

10000 points in less than 3 s.

* Only valid for 9350, 9360, and 9304/10 with MWP option. Other models, add 50%

FREQUENCY DOMAIN POWER AVERAGING

Summation averaging of power, PSD or magnitude for up to 50,000 sweeps.

FUNCTION CHAINING

Up to four functions can be automatically chained using traces A, B, C and D. Using memories M1 to M4 for intermediate results, any number of operations can be chained manually or via remote control.

REMOTE CONTROL

All controls and waveform processing functions are fully programmable using simple commands over the oscilloscope's GPIB or RS-232-C interfaces.

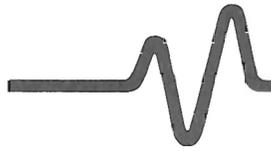
FILTER PASS BAND AND RESOLUTION

Window type	Filter bandwidth at -6 dB [freq. bins]	Highest side lobe [dB]	Scallop loss [dB]	Noise bandwidth [freq. bins]
Rectangular	1.21	-13	3.92	1.0
von Hann	2.00	-32	1.42	1.5
Hamming	1.81	-43	1.78	1.36
Flattop	1.78	-44	0.01	2.96
Blackman-Harris	1.81	-67	1.13	1.71

Filter Bandwidth at -6 dB characterizes the frequency resolution of the filter.

Highest Side Lobe indicates the reduction in leakage of signal components into neighboring frequency bins.

Scallop Loss is the loss associated with the picket fence effect.



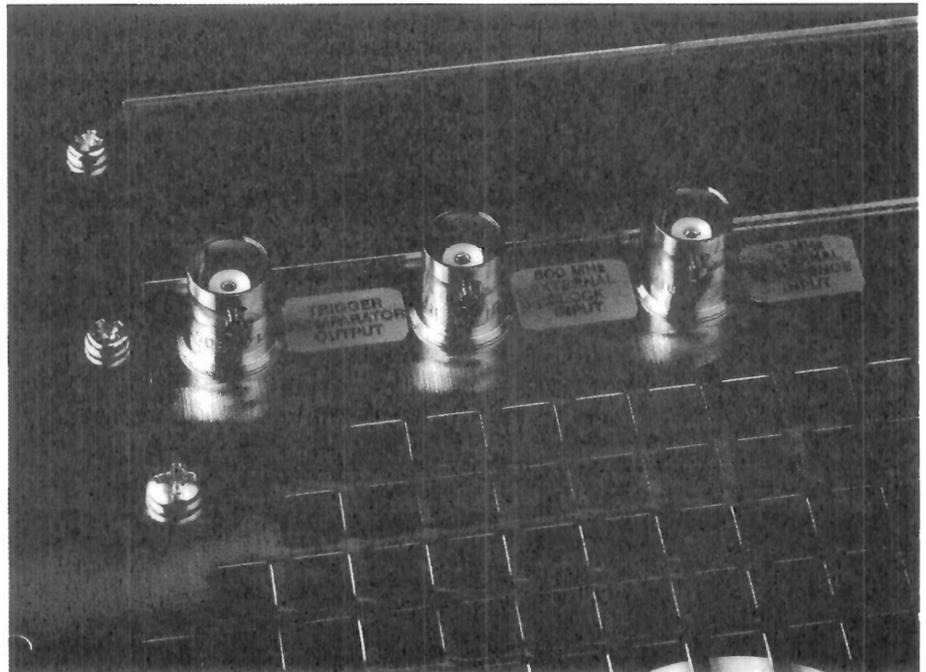
LeCroy

The Digital Scope Specialists

CKTRIG hardware option for the 9350A family

Main Features

- High speed 500 MHz external clock input.
- 10 MHz external clock reference input.
- Edge trigger comparator output.
- BNC, rear-panel mounted connectors.



External clock

This feature allows the 9350A family oscilloscopes to be externally clocked up to 500 MS/s, enabling full phase control over the acquired signal. In addition, the sample rate can be fine-tuned to the exact speed required by the application.

External reference

The external reference allows the scope to be phase-synchronized to an external 10 MHz reference, either to match the stability of the external source or to phase lock the acquired signal.

Trigger comparator

The trigger comparator signal outputs a pulse for each valid edge-trigger condition on the trigger signal. An invaluable feature for event-counting applications.

Specifications

EXTERNAL CLOCK INPUT

Input signal requirements:

Amplitude: 800 mV p-p
Frequency range: DC to 500 MHz
Offset: 0 V

Input impedance: 50Ω.

The negative pulse width must imperatively be less than 5ns.

EXTERNAL CLOCK REFERENCE INPUT

Input signal requirements:

Amplitude: 800 mV p-p
Frequency range: 10 MHz ±5%
Offset: 0 V

Input impedance 50Ω.

TRIGGER COMPARATOR OUTPUT

The comparator operates in a 'time-over-threshold' mode and generates a pulse edge of the same polarity as the polarity of the selected triggering edge each time a valid EDGE TRIGGER condition is met on the trigger signal. The duration of the pulse will be equal to the time the trigger signal is above/below the trigger level.

Note: This does not operate in SMART TRIGGER mode.

Output signal characteristics: ECL, 50Ω, series-terminated.

Ordering Information

935XA-CKTRIG	CKTRIG option for the 9350A oscilloscope family.
935XA-RKCKTRIG	Retrofit kit for the the 9350A oscilloscope family.

USA Direct Sales: 1 (800) 5LE-CROY

LeCroy Worldwide Sales Offices

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	04902.8.9285
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy GmbH	06221.83.10.01
ITALY	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND Geneva		022.719.21.11
SWITZERLAND Lenzburg		064.51.91.81
United Kingdom	LeCroy Ltd	(01235) 533114

Other sales and service representatives throughout the world.

Copyright October, 1994. LeCroy is a registered trademark of LeCroy Corporation. All rights reserved. Information in this publication supersedes all earlier versions.

Specifications subject to change without notice.

LeCroy
The Digital Scope Specialists

**LeCroy**

Innovators in Instrumentation

LeCalsoft—Calibration Software for LeCroy Digital Oscilloscopes

Main Features

- Traceability to reference standards
- Computer check of key specifications
- Computer-aided readjustment
- Fully automated configurations available
- Supports all 93XX and 94XX models
- IBM[®] PC-AT compatible



The LeCalsoft package enables a fast and thorough verification of all key specifications.

General

The LeCroy LeCalsoft (94XXCS05) test and calibration package provides a convenient, unambiguous check of LeCroy oscilloscopes. Designed for users who require traceability to reference standards (NIST, etc.), this package is ideally suited for use in calibration laboratories where the oscilloscopes are checked at fixed intervals.

Results of the calibration check are fully documented on hard copy, or they can be archived on hard disk or diskette.

LeCalsoft works on any PC compatible with the IBM[®]-AT standard. It controls the oscilloscope and the calibration sources through a National Instruments[®] GPIB interface.

Features

Calibration Check

All the essential specifications of the Digital Oscilloscope, such as bandwidth, linearity, noise, trigger, timebase and effective-bit count are tested. Deviations from nominal values are calculated and displayed on the screen, printed, or archived on hard disk or diskette.

Comprehensive Documentation of the Test Results

At the end of each calibration check, two types of documentation are available: a long form printout which gives details of the results of all the tests executed, and states whether or not the results are within the specifications, and a short form printout which gives a summary of the test results.

Calibration Traceable to National Standards (NIST, etc.)

By using signal sources traceable to a standard, the calibration will be traceable to the same standard, provided the relevant documentation is maintained.

Manual and Automated Calibration Check

Both manual operation with computer assistance, and automated operation are possible. Automated operation requires programmable multiplexer and signal sources. See the list of supported devices below.

Assisted Adjustment of the Oscilloscope

A computer-aided adjustment procedure is also provided. By following instructions on the screen, the trained technician is guided through the adjustments required to correct the settings of the oscilloscope so that it is within the specifications.

Calibration Certificate

On request, LeCroy will perform calibration traceable to National Standard Organizations. Calibration certificates are provided as part of this service.

Functional Description

Calibration Practice

LeCroy oscilloscopes are auto-calibrating digital oscilloscopes and therefore do not require regular calibration like analog oscilloscopes. However, for users who require traceability to reference standards (such as those provided by the National Institutes of Standards and Technology), and for calibration laboratories which must inspect incoming instruments and perform recalibration at prescribed intervals, the LeCalsoft computer-aided test and calibration packages provide an easy solution.

Under guidance of the LeCalsoft program, some adjustments to the oscilloscope can be made by an electronics technician. However major deviations from specifications usually require repair by a trained service engineer. LeCroy regularly schedules training classes. If no in-house trained person is available, the nearest LeCroy service center can carry out repairs and calibration, and provide traceability to reference standards.

Using the LeCroy LeCalsoft Packages

For calibration checking, digital oscilloscopes have a great advantage over analog oscilloscopes because waveforms can be transferred to a host computer. This simplifies the calibration procedure enormously, makes it potentially faster and allows an extensive range of tests with unambiguous interpretation of the results.

LeCalsoft performs an extensive series of tests which verify the specifications of the oscilloscope. It includes many tests relevant to analog scopes such as Noise and Linearity tests. Although these tests are difficult and time consuming on an analog oscilloscope, they can be computer controlled and are quickly and easily performed on a digital oscilloscope. Tests which are specific to digital oscilloscopes, such as Sinefit tests are also included.

The various test options in LeCalsoft are presented to the operator in the form of a simple menu system. The user has the choice of performing an automated calibration check of the oscilloscope, or individually testing any of the specifications. Some of the tests require the use of high-quality external signal generators. The user receives instructions on

the screen when it is necessary to change the cable connections, but apart from this minor intervention, the tests are fully computer controlled when supported GPIB-programmable instruments are used.

Supported Instrumentation

LeCalsoft software works on any AT-compatible equipped with a math coprocessor and a National Instruments GPIB interface. Automated calibration checking is possible using a set of instruments from the following list. (For an automated calibration check, either the LeCroy or Keithley programmable multiplexer is required to feed the calibration signals to the oscilloscope input.)

RF sinewave generators:
Marconi 2019A, 2022C, 2030, 2031
Fluke 6060B, 6061A
Hewlett-Packard 8642A, 8642B
Rohde & Schwarz SMX

AF sinewave generators:
Marconi 2019A, 2022C, 2030, 2031
Hewlett-Packard 8642A, 8642B
Rohde & Schwarz SMX
Tektronix FG5010
LeCroy AFG 9100

DC Precision Power Supply:
Tektronix PS5004
Datron 4708 Autocal Multifunction Standard

Fast Pulse Generator:
Tektronix CG5001/CG551AP

Power Meters:
Hewlett-Packard HP436A, HP437B

Multiplexers:
Keithley 199 SYSTEM DMM/
SCANNER with LeCroy interface board.
LeCroy 4951, 4973-1, 4973-2
Multiplexers.

Frequency standard:
WWV or HBG1500

Recommended Accessories

A full kit of calibration connectors and interfaces is available from LeCroy. It includes all the necessary cables, adapters, splitters and filters, as well as the Programmable Multiplexer. Also available is a repair package including special tools, board extenders, etc., for computer-aided adjustment.

Use of Other Instruments

It is possible to perform the calibration check with some other unsupported signal sources. However, the user is then required to set up these instruments manually and to perform one measurement at a time. The LeCalsoft package

guides the user step by step, and controls the oscilloscope data acquisition and the computation of the results.

LeCalsoft compares the signal measured by the oscilloscope with the signal it would expect to receive from the generator. Warning messages are displayed

whenever tolerances are exceeded. Some of the adjustments may be carried out by the user when the test sequence is finished. In this case, the software will guide the user through the correct adjustment procedure. At the end of the calibration check, a printout can be generated to list the results.

Specifications

Computer Required: Any PC compatible with the IBM-AT standard, and equipped with a mathematical coprocessor and a National Instrument Inc. GPIB interface.

Operating System: DOS 3.0 upward

Medium: 3¹/₂" 1.44 Mb
5¹/₄" 1.2 Mb diskette

Major Tests Supported by LeCalsoft

Internal

To ensure proper calibration of the oscilloscope, internal auto-calibration tests are automatically executed during normal operation. This standard sequence of internal auto calibration tests is initiated by the software and the results are transferred to the PC for analysis.

The tests are:

- Calibration of the resolution of the time-to-digital converter with respect to the system clock
- Determination of the gain constants of the input amplifiers
- Offset compensation versus gain variation
- Global internal non-linearity
- General functionality check

Bandwidth

To calculate the bandwidth, the amplitudes of sine waves of increasing frequencies are measured. The sine wave generator is first set to 500 kHz with an amplitude 75% of full screen, i.e. ± 3 vertical divisions. The frequency is then swept up to the point where an amplitude drop of 3 dB is observed. This indicates the bandwidth.

This test is executed on all channels for 1 M Ω and 50 Ω input impedance and for all vertical sensitivities. It requires a sine wave generator with good flatness.

Generators supported under program

control are listed on page 2.

Linearity

15 different known voltages, varying from 5% to 95% of full screen, are applied by the external voltage reference source. For each voltage value, a full waveform is acquired, and the mean value is compared to the known input voltage. The linearity is determined through a linear regression fit to the 15 measurements. The slope, the offset and the chi-square of the fit are computed.

With the linearity test, many other related tests are performed: response time of the overload protection of the 50 Ω input, linearity of the variable gain calibration, range and linearity of the offset setting, and quality of the input coupling.

This procedure is executed on all channels for both 1 M Ω and 50 Ω input impedance. The test requires a DC source with a precision and time stability of 0.1%, a voltage range of 0 V to 20 V adjustable in steps of 5 mV, and an output current capability of 300 mA.

Power supplies supported under program control are listed on page 2.

Noise

The noise tests are executed on all channels for both 1 M Ω and 50 Ω input impedance, with AC and DC coupling, five different time-base settings, and open inputs. Full waveforms are acquired with different offset values. The peak-to-peak as well as the RMS values of each measurement are computed, and the maximum values are recorded. The program also indicates the occurrence of any "flyers", i.e. short noise peaks generated by the ADC's.

The noise tests also include:

- checking the linearity of the variable offsets of all channels between 2.5% and 97.5% of full screen.

- checking the stability of the ground line when switching the inputs between GROUND and DC coupling modes.

Rise time/Overshoot

Executed on all channels for both 1 M Ω and 50 Ω input impedance, these tests measure the rise time of the oscilloscope response to the input voltage step, as well as the amount of pre-shoot and overshoot. They require a voltage step generator with calibrated fast-rise-time amplitude.

The Voltage Step Generator supported under program control is the Tektronix CG5001.

Sinefit

The performance of the analog-to-digital converter is evaluated in terms of the number of effective bits (a measure of the signal-to-noise ratio). It is measured on all channels, at a sensitivity of 50 mV/div., by applying a pure sine wave at varying frequencies and timebase settings

This test is a measurement of dynamic linearity. It shows the effect of such errors as noise, non-linearities and aperture jitter.

Timebase

The timebase test compares the internal clock with a very precise and stable external timebase reference (clock generator) such as the WWV standard or HBG 1500.

Trigger

The trigger capabilities are tested for all possible configurations. These include:

- Internal and external trigger sources
- DC, AC, HF-reject, and LF-reject couplings
- Trigger level settings in all slope modes.

ORDERING INFORMATION**LeCalsoft and Options**

94XXCS05 Complete LeCalsoft for 93XX and 94XX (software and hardware), incl. cables, switch card, adapters, etc.
 94XXCS01 LeCalsoft software for 93XX and 94XX
 9400CS01 Calsoft software for 9400A

LeCalsoft Accessories

93XXKCS02 Calibration kit for 93XX and 94XX
 9400KCS02 Calibration kit for 9400A
 Individual system components available on request

**U.S. REGIONAL SALES
 OFFICES 1 800-5-LeCroy
 (1-800-553-2769):**

automatically connects you to your local sales office.

LeCroy has sales engineers in most major metropolitan areas, coordinated through a system of five Regional Sales and Service Offices:

NORTHEAST: 700 Chestnut Ridge Rd,
 Chestnut Ridge, NY 10977

SOUTHEAST: 410 Ware Blvd Ste 716,
 Tampa, FL 33619

FARWEST: 5912 Stoneridge Mall Rd
 Ste 150, Pleasanton,
 CA 94588

CENTRAL:

Midwest: 4811 S 76th St Ste 415,
 Greenfield, WI 53220

Southwest: 14800 Central Ave SE
 Albuquerque, NM 87123

WORLDWIDE

Argentina: Search SA, (01) 394-5882

Australia: Scientific Devices Pty Ltd,
 (03) 579-3622

Austria: Dewetron GmbH, (0316) 391804

Benelux: LeCroy BV (0031) 4902-89285

Brazil: ATP-Hi-Tek, (011) 421-5477

Canada: LeCroy Canada Inc,
 (514) 928-4707

Denmark: Lutronic, (42) 459 764

Eastern Europe: Elsinco GmbH, Vienna,
 222 812 1751

Finland: Labtronic OY, (80) 847 144

France: LeCroy Sarl (1) 69 073 897

Germany: LeCroy GmbH, (06221) 831001

Greece: Hellenic S/R Ltd., (01) 721 1140

Hong Kong: Euro Tech (Far East) Ltd,
 (052) 814-0311

India: Electronic Ent, (022) 4137096

Israel: Ammo, (03) 453157

Italy: LeCroy Srl, Roma (06) 300.97.00
 or 331 31 46; Milano (02) 2940 5634

Japan: LeCroy Japan,
 Tokyo (0081) 33 376 9400;
 Osaka (0081) 6 330 0961

Korea: WOOJOO Hi-Tech Corp,
 (02) 449-5472

Mexico: Nucleoelectronica SA,
 (05) 5593 6043

New Zealand: E.C. Gough Ltd,
 (03) 798-740

Norway: Avantec AS (02) 630520

Pakistan: Electronuclear Corp, (021) 418087

Portugal: M.T. Brandao, Lta, (02) 815680

Singapore: Sing. Electr. and Eng. Ltd
 (65) 481-8888

S. Africa: Westplex Test & Meas.
 (011) 787 0473

Sweden: MSS AB, (0764) 68100

Switzerland: LeCroy SA (064) 51 91 81

Taiwan: Topward El.Inst., Ltd, (02) 601 8801

Thailand: Measuretronix Ltd, (02) 374 2516

United Kingdom: LeCroy Ltd, (0235) 533 14

LeCroy

Innovators in Instrumentation

LeCROY CORPORATE HEADQUARTERS

700 Chestnut Ridge Road
 Chestnut Ridge, NY 10977-6499
 Phone: (914) 425-2000
 TWX: (710) 577-2832
 Fax: (914) 425-8967

LeCROY EUROPEAN HEADQUARTERS

2, rue du Pré-de-la-Fontaine
 P.O.Box 341
 1217 Meyrin 1 - Geneva, Switzerland
 Telephone: (022) 719-21-11
 Fax: (022) 782-39-15

SECTION 3	Block Diagram and Sub-Assemblies
------------------	---

3.1 9354A, 9354AM & 9354AL Sub-Assemblies

F9302-1-4	Processor, 4 Mbyte RAM for 9354A
F9302-1-8	Processor, 8 Mbyte RAM for 9354AM
F9302-1-16	Processor, 16 Mbyte RAM for 9354AL
F9350-21	Acquisition Memory, 2 X 50 K for 9354A
F9350M-21	Acquisition Memory, 2 X 250 K for 9354AM
F9350L-2	Acquisition Memory, 2 X 2 MB for 9354AL
F9354-31	Main card, Quad 500 MHz, 500 MS/s, Front end, ADC, Time base
F9300-4	GPIB + RS232 interface
F9354-5	Quad channel front panel
PS9351	Power supply +/- 5V, +/- 15V.
93XX-Display	Video, deflection, CRT, yoke
M935X	Mechanical for 9354A/M/L series

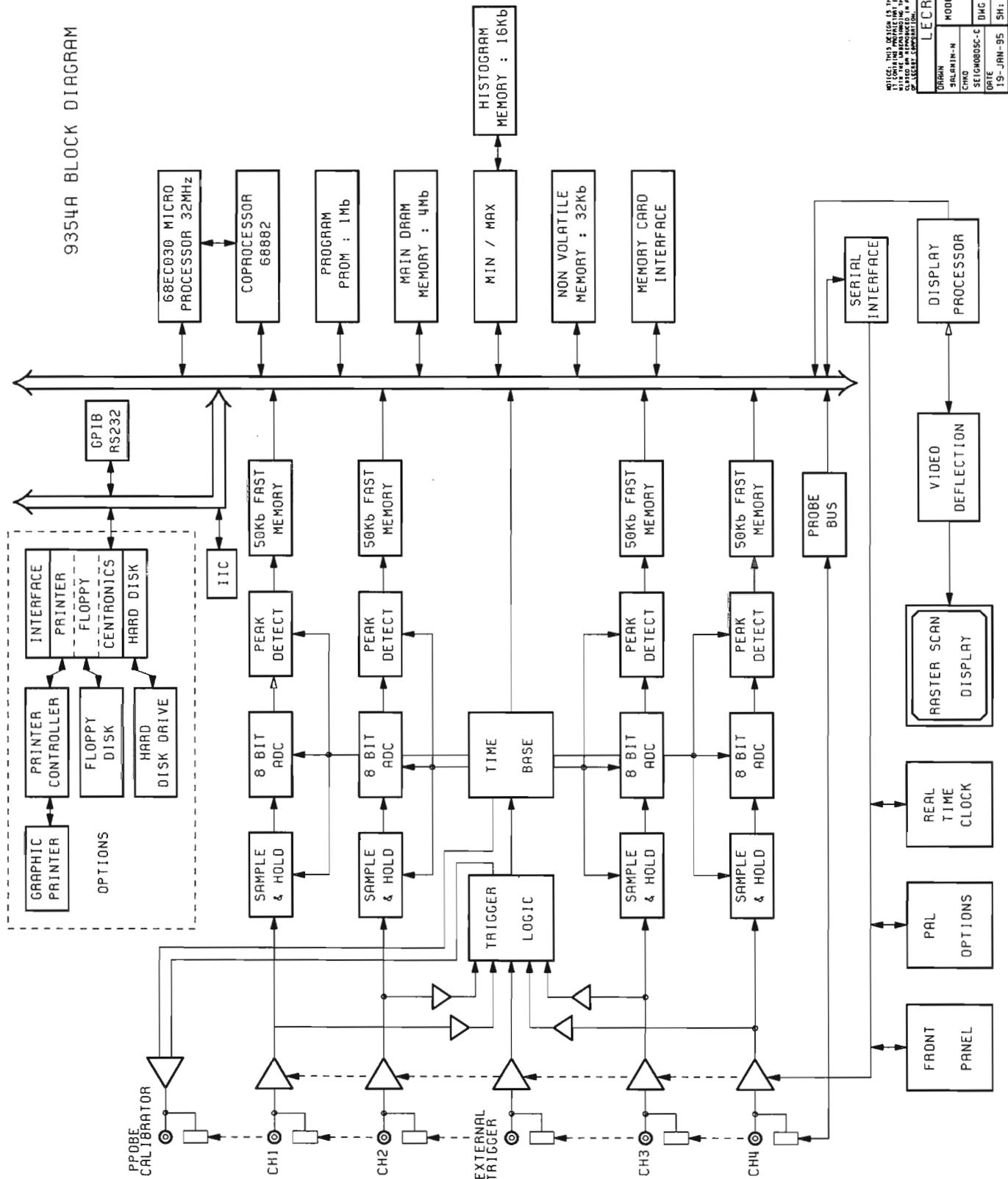
3.2 9354T & 9354TM Sub-Assemblies

F9302-1-4	Processor, 4 Mbyte RAM for 9354T
F9302-1-8	Processor, 8 Mbyte RAM for 9354TM
F9350T-21	Acquisition Memory, 2 X 100 K for 9354T
F9350TM-21	Acquisition Memory, 2 X 500 K for 9354TM
F9354-31	Main card, Quad 500 MHz, 500 MS/s, Front end, ADC, Time base
F9300-4	GPIB + RS232 interface
F9354-5	Quad channel front panel
PS9351	Power supply +/- 5V, +/- 15V.
93XX-Display	Video, deflection, CRT, yoke
M935X	Mechanical for 9354T series

3.3 9354A, 9354AM, 9354AL, 9354T & 9354TM Hardware Options

9354A-FDGP	Graphic Printer & Floppy Disk F9300-6 : Centronics, Floppy, Printer interface F9300-7 : Printer controller
9354A-GP01	Graphic Printer F9300-6 : Centronics, Floppy, Printer interface F9300-7 : Printer controller
9354A-FD01	Floppy Disk F9300-6 : Centronics, Floppy, Printer interface
9354A-HDD	Hard Disk Drive, 130 MB F9300-8 : PCMCIA III, Hard Disk Controller

9354A BLOCK DIAGRAM

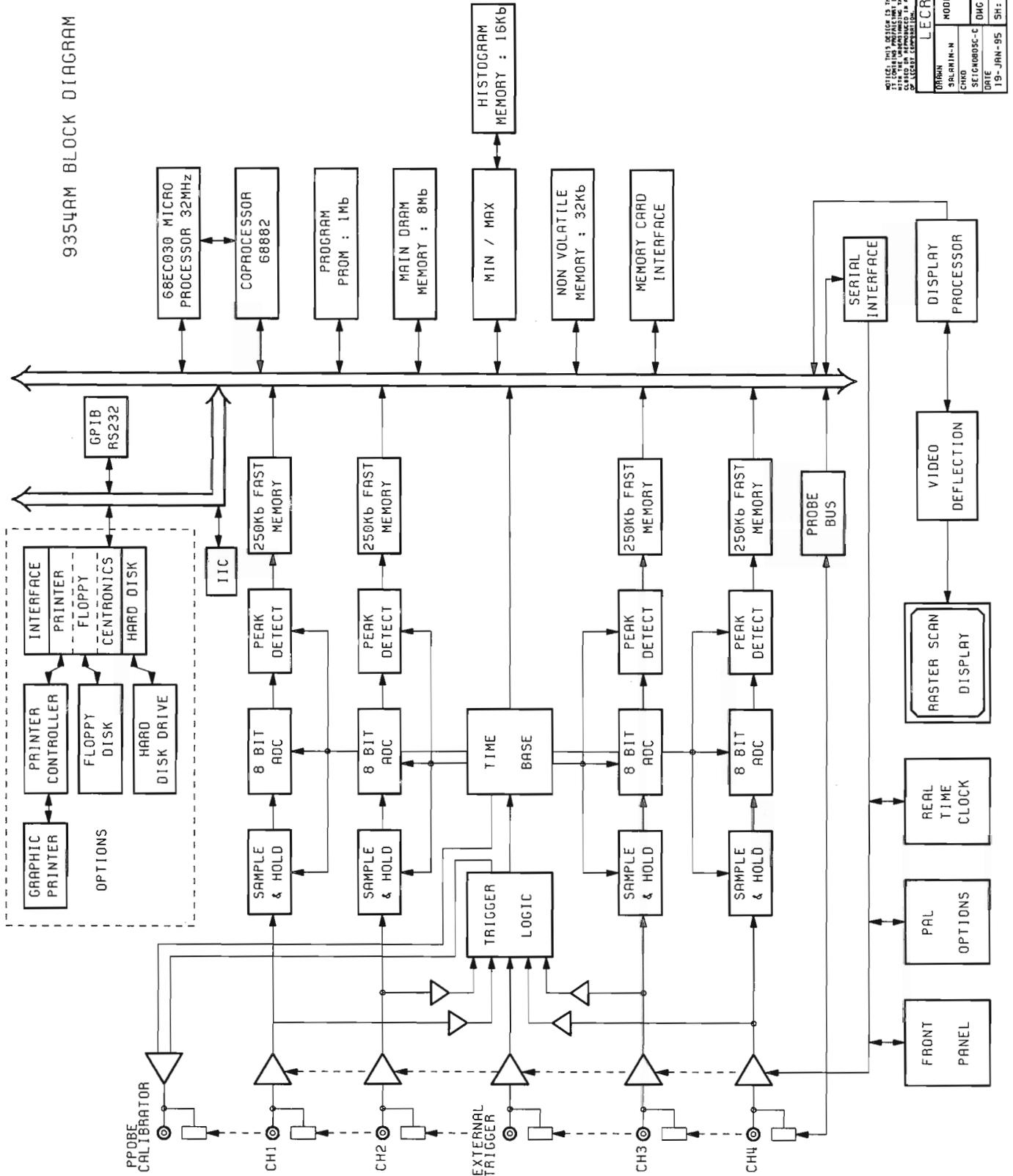


LECROY S.A

DRSHN	MODEL : 9354A
SALAHIN-N	BLOCK DIAGRAM
CHD	SEICH0005C-C
DATE	DWG NO: DIAGRAM-9354A
19-JAN-95	SH: 1 OF 1 REV. : A

NOTE: THIS DRAWING IS THE SOLE PROPERTY OF LECROY S.A. IT IS FOR THE USE OF THE CUSTOMER AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM. WITHOUT THE WRITTEN PERMISSION OF LECROY S.A.

9354AM BLOCK DIAGRAM

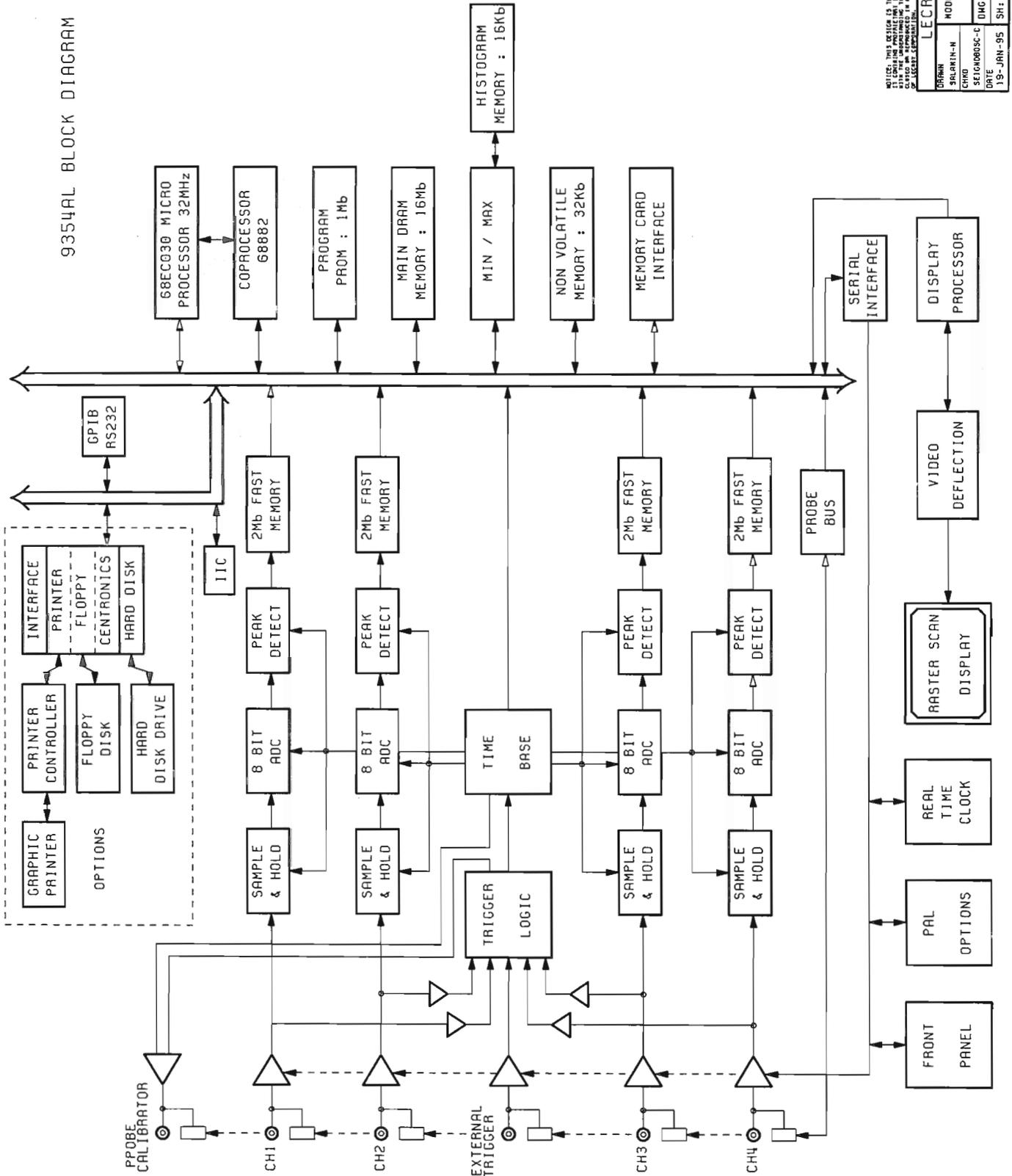


NOTICE: THIS DEVICE IS THE SOLE PROPERTY OF LECROY CORP. IT CONTAINS PROPRIETARY INFORMATION AND IS MANUFACTURED BY LECROY CORP. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF LECROY CORP.

LECROY S.A

DRAM	MODEL : 9354AM
9354AM-N	BLOCK DIAGRAM
CHD	SETICR0005C-C
DATE	DMG NO: DIAGRAM-9354AM
19-JAN-95	SH: 1 OF 1 REV. : R

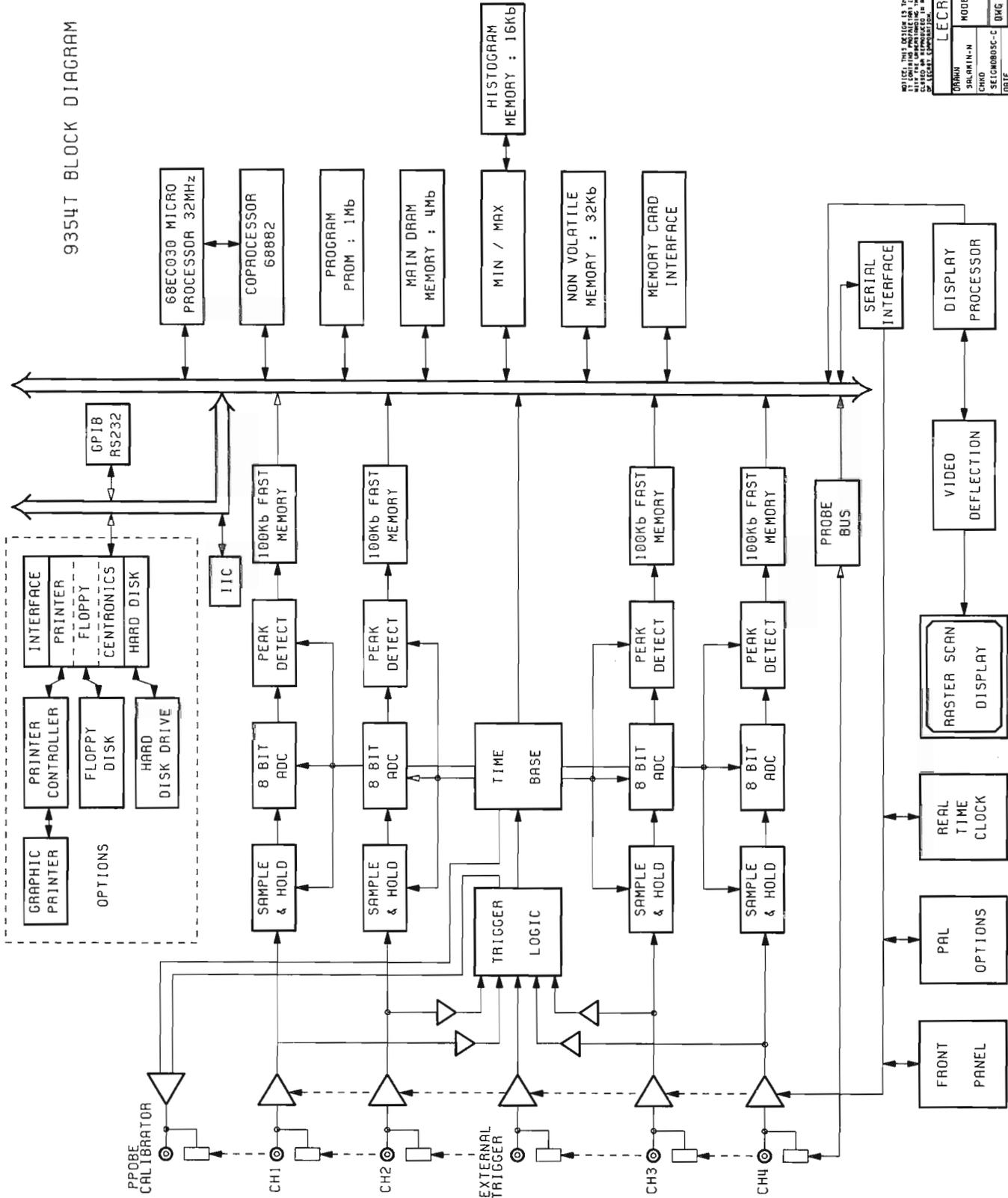
9354AL BLOCK DIAGRAM



PLEASE CONTACT THE LOCAL SALES OFFICE OF LEICROY CORP. FOR THE NAME AND ADDRESS OF THE SALES OFFICE IN YOUR AREA. THE SALES OFFICE WILL BE GLAD TO ASSIST YOU IN THE SELECTION OF THE APPROPRIATE MODEL FOR YOUR APPLICATION. THE SALES OFFICE WILL BE GLAD TO ASSIST YOU IN THE SELECTION OF THE APPROPRIATE MODEL FOR YOUR APPLICATION.

DRIVER	LEICROY S.A.
MODEL	9354AL
CHNO	BLOCK DIAGRAM
SEICROSC-C	DWG NO. DIAGRAM-9354AL
DATE	19-JAN-95
SH	1 OF 1
REV.	A

9354T BLOCK DIAGRAM



NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF LECROY CORP. ALL RIGHTS ARE RESERVED. THIS DESIGN IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

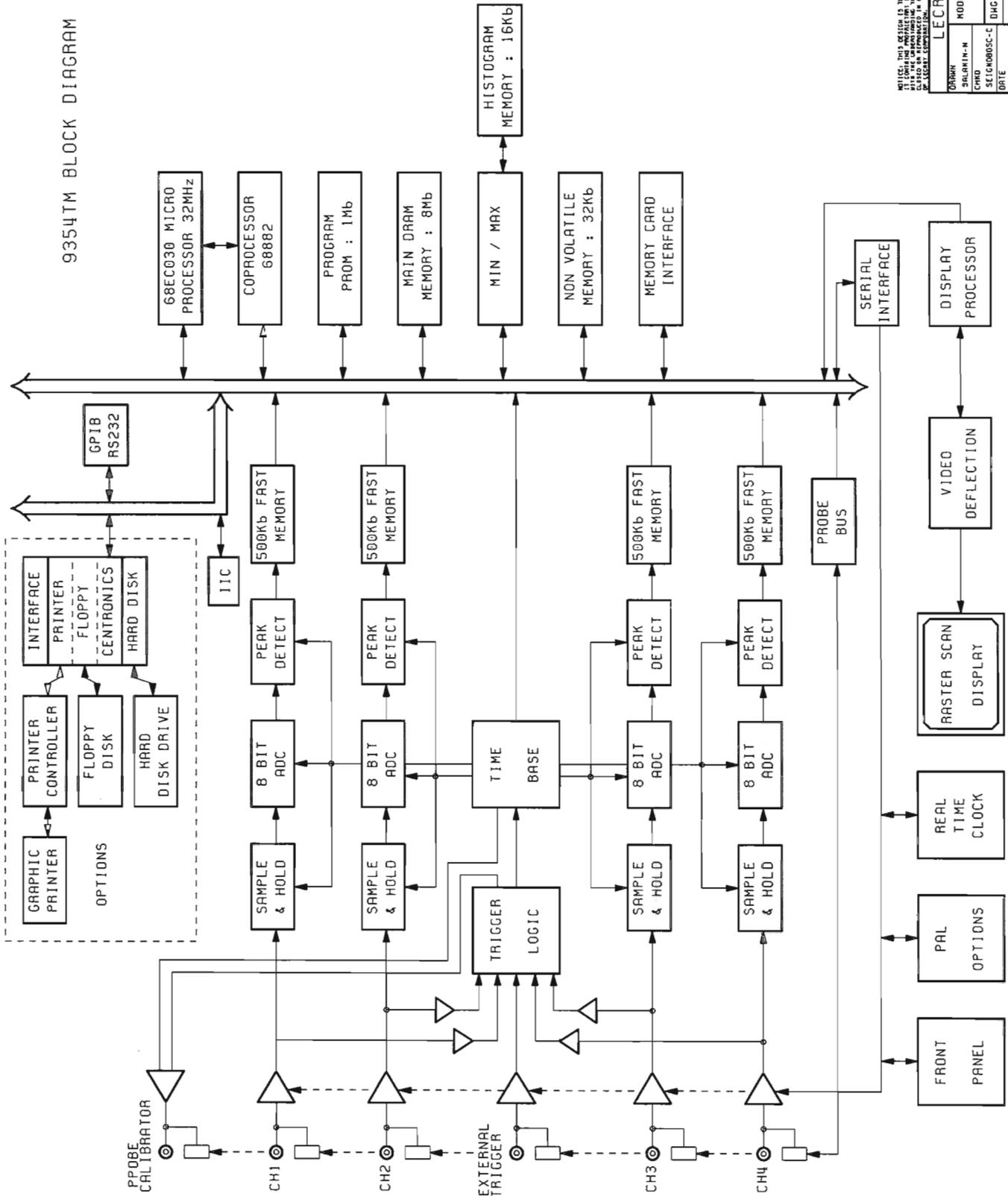
LECRY S.A	
DRIVER	MODEL : 9354T
SILICIN-N	BLOCK DIAGRAM
CRD	DMG NO. DT RRRN-9354T
SEICH0805C-C	DATE 19-JAN-95 SH: 1 OF 1 REV. : A

Section 3 Block Diagram and Sub-Assemblies

NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF LECROY CORP. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LECROY CORP.

LECROY S.A	
DRIVER	MODEL : 9354TM
SR/PH/IN	BLOCK DIAGRAM
CHD	SEC/CH0805C-L
DATE	DWG NO: 01ACRAN-9354TM
19-JAN-95	SH: 1 OF 1 REV: 1 R

9354TM BLOCK DIAGRAM

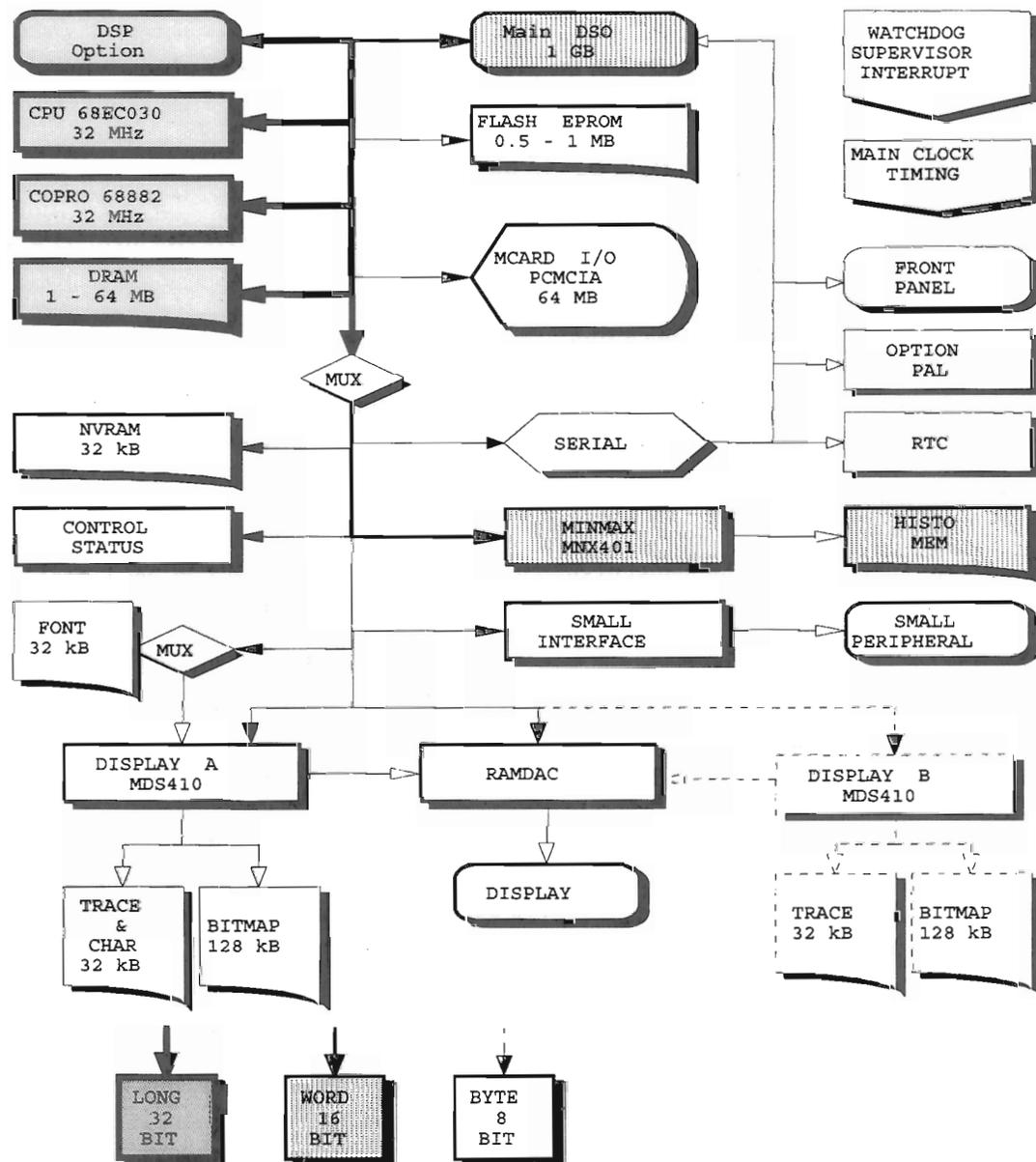


SECTION 4 THEORY of OPERATION

4.1 Processor Board : F9302-1-4 for 9354A & 9354T, F9302-1-8 for 9354AM & 9354TM, or F9302-1-16 for 9354AL

This processor board is based on to the 68EC030 and 68882 coprocessor, with an internal clock frequency of 32 MHz, and 4 Mbytes or 8 Mbytes or 16 Mbytes memory. The internal Data Bus is 32 bits wide (DRAM, DSP), the peripheral Data Bus set 8 or 16 bits, and the Address Bus has 32 bits (A0-A30 and A31 for the Min/Max.).

4.1.1 Processor Block Diagram



4.1.2 Parallel Peripherals

DRAM memory : Data bus 32 bits

The DRAM memory of 4 Mbytes or 8 Mbytes or 16 Mbytes (up to 64 Mbytes) is used as the program memory and working memory.

The compacted program of 1MByte stored within the Flash EPROM, IC of 8 Mbit is de-compacted, loaded and executed in the DRAM.

DSP interface : Data bus 32 bits.

An optional Digital Signal Processor is connected to the processor board via a 32 bits address bus.

F9354-31 main board interface : Data bus 16 bits.

The main board is connected to the processor via a 32 bits address bus.
See section 4.3.

Min/Max calculation : Data bus 16 bits.

A gate array MNX401 makes a histogram in its associated 16 Kbytes memory and remembers the minimum and maximum data values it sees.

Flash memory : Data bus 8 bits.

Segmented Flash EPROM of 1 Mbyte (IC of 8 Mbits) contains 16 Kbytes program, executable at power on, and other compacted programs executable in the DRAM.

Memory card : Data bus 8 bits.

An interface is implemented to support an external memory card, PCMCIA / JEIDA 4, type 68 pins, whose size can range from 16 Kbytes to 64 Mbytes, with the extension to support flash memory and I/O cards.

Graphic processor : Data bus 8 bits.

The graphic processor of the raster scan display is a gate array designated MDS410.

Clock frequency	:	48 MHz.
Trace and characters memory	:	32 Kbytes (SRAM).
Bitmap memory	:	128 Kbytes (BMRAM).
Character font	:	32 Kbytes (SRAM).

Non volatile memory : Data bus 8 bits.

A static RAM of 32 Kbytes (IC of 256 Kbits) contains the parameters used at power on to initialize the scope and the stored panels parameters. This memory is battery backed up

DAC command of the display intensity : Data bus 8 bits.

The control of the display intensity is done by a RAMDAC, up to 8 traces.

Status and command registers : Data bus 8 bits.

Status (read) and command (write) registers of 12 bits address, control the memory card and front panel interface during the boot process or after a RESET.

4.1.3 Serial Peripherals

The processor controls the digital and analog section with a dual serial controller.

DAC's registers (read/write)
Front panel registers (68HC05C4)
RTC registers (68HC68T1)
Probe detection
Software options (GAL)
Front end control
Trigger control (MTR408)

Real time clock

Integrated circuit 68HC68T1 (Motorola or RCA).
Resolution : 1 sec to 99 years.
Clock frequency : 32.768 KHz.
Non volatile memory : 32 Kbytes.
Data & Address bus : 8 bits.
Interrupt level : 5.

4.1.4 External Interfaces

Serial RS232 interface and Parallel GPIB interface.
See F9300-4 description, section 4.4.

4.1.5 Optional Interfaces

Graphic Printer : F9300-6 interface and F9300-7 printer controller.
Internal graphic printer

Floppy Disk Drive : F9300-6 interface
1.44 Mbytes floppy

Centronics Printer : F9300-6 interface

Hard Disk Drive : F9300-8 PCMCIA III controller,
130 Mbytes hard disk

Section 4 Theory of Operation**4.2 F9354-31 Main Board****4.2.1 Introduction**

The board is divided into five sections :

- Microprocessor control.
- Front-end
- Trigger
- Analog to Digital Converter
- Time base

4.2.2 Microprocessor Control

See block diagram, page 4.6

4.2.3 Front End

The front end system provides the signal conditioning for the ADC system.

The main functions are :

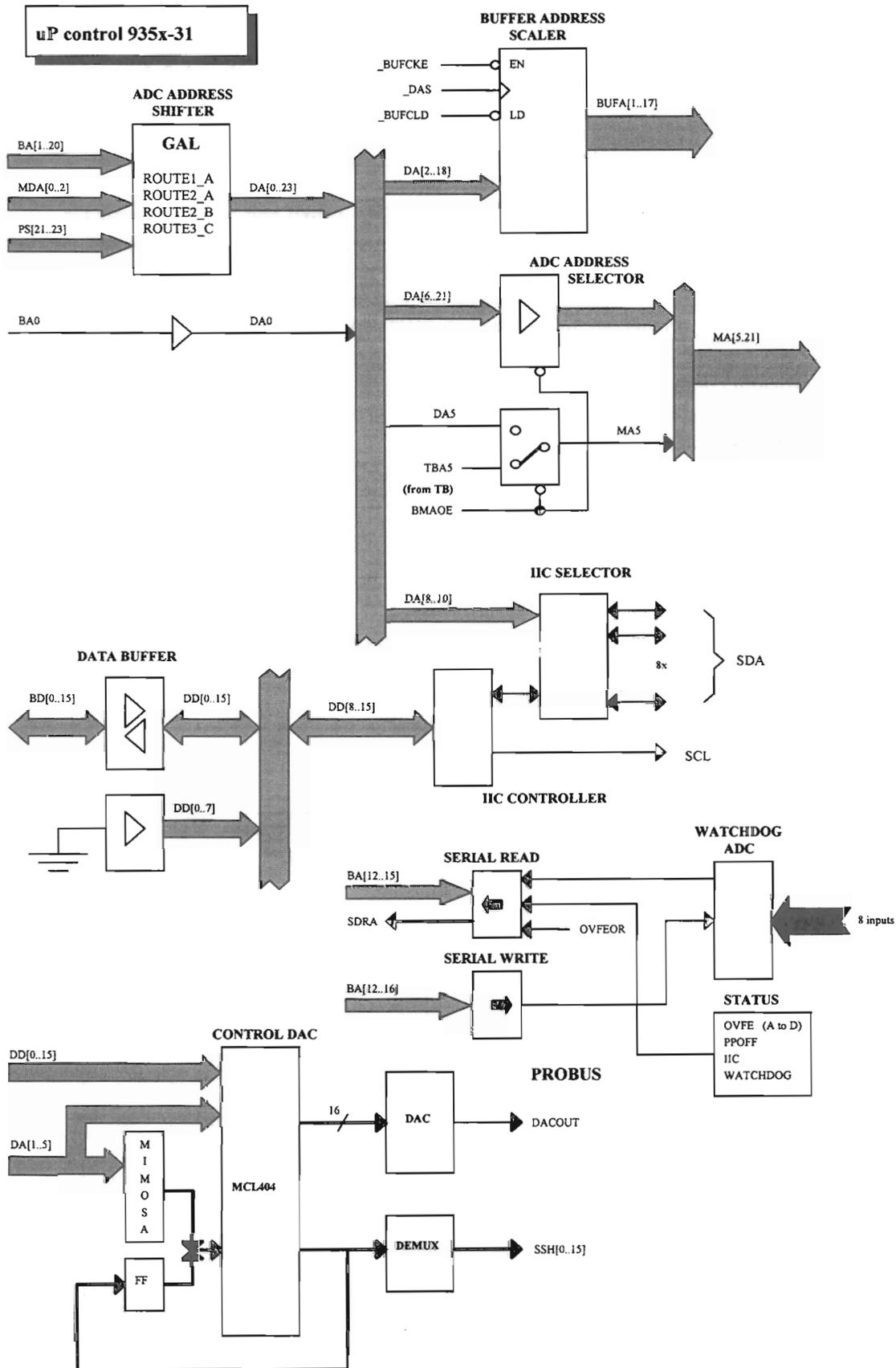
- four channels operation, calibration with Software control
- input protection and coupling : AC, DC, 1 M Ω , 50 Ω
- amplitude normalisation for the ADC system : 320 mV full scale
- fine gain control
- offset control
- bandwidth limit filter : BWL 30 MHz
- triggering with standard coupling and TV trigger on four channels and External

4.2.3.1 Channel Description

The four channels are identical, thus only one channel will be described for brevity.

▪ Input coupling and protection : Relay RL1 (`_CAL`) connects the front-end input to the calibration source and disconnects the BNC which is then terminated on a 1 M Ω high impedance. Switch SW1 (`VCAL/10`) selects between a divide by 4 or a divide by 40 for the DC calibration signal. Relay RL2 (`_HZ`) sets the 1 M Ω /50 Ω coupling. A diode circuit senses the temperature of the 50 Ω termination resistor and sets the `_OVL` status bit low if overheating is detected. The BNC input is then disconnected by the hardware, the DC calibration signal being connected to the front-end input (automatic activation of RL1). Relay RL3 (`_IN/20`) selects between a divide-by-20 or a direct path for the signal. Relay RL4 (DC) sets the AC/DC coupling, which is preceded by a divide by 10 amplifier.

▪ High impedance buffer : A0 is a high impedance buffer with a gain of 10. The same buffer is used for the offset control. Switch SW2 (`of/10`) selects a direct or a divide by 10 amplifier.



Section 4 Theory of Operation

- The MFE409 is a monolithic circuit with the following main features :
 - Differential input with 6 fixed sensitivities (2 mV/div. to 100 mV/div. in a 1-2-5 sequence).
 - Continuously variable gain amplifier with gain ratio of almost 3.5.
 - A2 is a second variable gain amplifier used to reach the gain needed for the 2 mV/div. setting.
 - A3 delivers two complementary outputs, one for the ADC system and one for the trigger circuit (MTR408). A3 can be trimmed for gain and linearity. Typically, A1 will be set with 20 mV/div. and a gain of 3.0, A2 with a gain of 2.0 and A3 will be trimmed to have 320 mV FS into the ADC system input with the lowest non-linearity.
 - The bandwidth control, connected through switch SW3 (BWL), is implemented with a one pole RC filter with a -3 dB cut-off frequency of almost 30 MHz.
 - Another bandwidth control, connected through switch SW4 (BWLD), is here to correct the shape of the signal when the divide-by-20 attenuation is selected (gain > 100 mV) in 1 M Ω high impedance coupling.
 - The output to the ADC system is separated in two 75 Ω lines, going through the relay RL5 (RSH) which selects the source for one of each ADC system couple (B for AB or C for CD), this is to implement the 1 GS/s mode.

4.2.3.2 Digital controls

0141 0z00 - 0141 0zff write channel A control register
 0141 1z00 - 0141 1zff write channel B control register
 0141 2z00 - 0141 2zff write channel C control register
 0141 3z00 - 0141 3zff write channel D control register

15	8						
_VCAL	_IN/20	2mV	5mV	10mV	20mV	50mV	100mV
7	0						
---	---	BWL	RSH	BWLD	OF/10	DC	_HZ

range mV	BWLD	OF/10	_IN/20	2mV	5mV	10mV	20mV	50mV	100mV	gain to ADC
2	0	1	1	1	0	0	0	0	0	+20
5	0	1	1	0	1	0	0	0	0	+8
10	0	1	1	0	0	1	0	0	0	+4
20	0	0	1	0	0	0	1	0	0	-2
50	0	0	1	0	0	0	0	1	0	-0.8
100	0	0	1	0	0	0	0	0	1	-0.4
200	_HZ	1	0	0	0	1	0	0	0	+0.2
500	_HZ	0	0	0	0	0	1	0	0	-0.08
1000	_HZ	0	0	0	0	0	0	1	0	-0.04
2000	_HZ	0	0	0	0	0	0	0	1	-0.02

_VCAL 0 = DC calibration (external BNC is disconnected),
 1 = input coupling.
 IN/20 0 = attenuation is ON, 1 = attenuation is OFF.
 BWL 0 = bandwidth limit is OFF, 1 = bandwidth limit is ON.
 RSH 0 = channel only on one ADC, 1 = channel on two ADC.
 BWLD 0 = high impedance bandwidth compensation is OFF, 1 = ON.
 OF/10 0 = offset control attenuation is OFF, 1 = ON.
 DC 0 = AC coupling, 1 = DC coupling.
 _HZ 0 = 1 MΩ high impedance coupling, 1 = 50 Ω coupling.

0140 4z00 - 0140 4zff read channels overload (and option package availability)

7	_INTWD	_INTIIC	_OVL_T	_PPOFF	_OVL_D	_OVL_C	_OVL_B	_OVL_A	0
									LSB-1
									OPT

_INTWD watchdog ADC interrupt,
 _INTIIC I²C protocol interrupt,
 _PPOFF probe power overload interrupt,
 _OVL_n overload indicator (Ch A, B, C, D, EXT).
 OPT 935XA-CKTRIG option package (9th bit of serial read).

A low state indicate that overload or interrupt is detected. Bit OPT is high when the options are available.

0140 5z00 - 0140 5zff read overload sum

OVLSUM bit 7, Sum of the eight above bits.
 0 = OK, 1 = problem occurred (read channels overload)

4.2.3.3 Analog controls

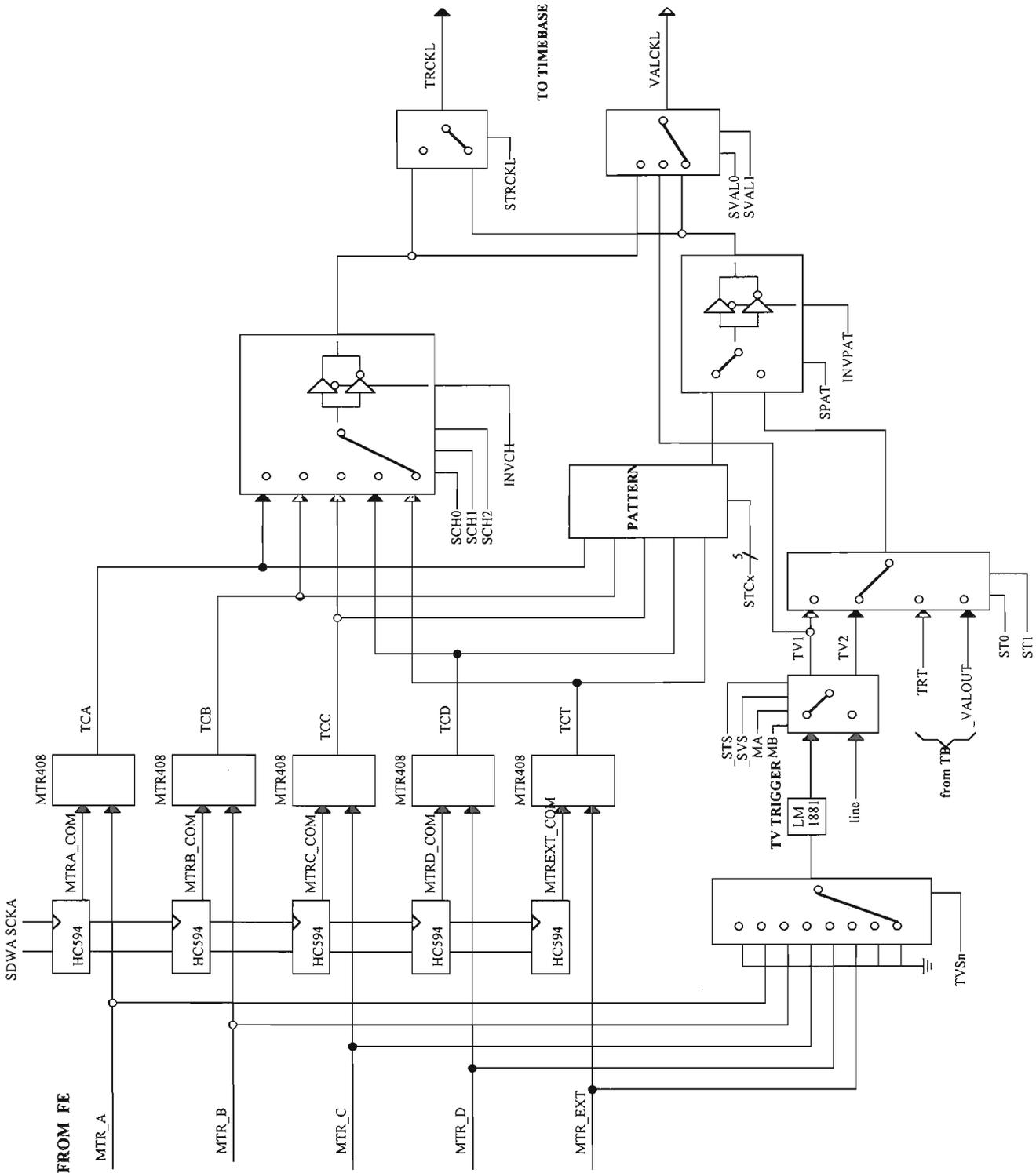
- One precision DAC with associate circular memory (μP system) drives and refreshes a multiple sample-and-hold system. The DC calibration control is common to all four channels. Each channel has two analog controls.
- VCAL and VOFFSET are voltage controls. The DAC dynamic range (± 10V) is scaled to the proper range by means of resistor dividers and thus the conversion can be said to be linear. The gain controlled amplifiers inside the MFE409 needs current mode controls. A voltage to current converter follows the sample-and-hold IVGAIN signal and provides the appropriate range. The addresses are :

0300 0014 write DC calibration level control (VCAL)
 0300 0000 write channel A gain control
 0300 0002 write channel A offset control
 0300 0004 write channel B gain control
 0300 0006 write channel B offset control
 0300 0008 write channel C gain control
 0300 000a write channel C offset control
 0300 000c write channel D gain control
 0300 000e write channel D offset control

Section 4 Theory of Operation

4.2.4 Trigger

4.2.4.1 Block Diagram



The different trigger couplings are :

- DC
- AC : cut off frequency is almost 10 Hz.
- LF REJ : set a single pole high pass filter with a cut off frequency at 50 kHz.
- HF REJ : set a single pole low pass filter with a cut off frequency at 50 kHz.
- TBWL : single pole low pass filter at 30 MHz.

The amplitude at the input of the MTR408 is 320 mV FS (identical to the ADC system),

4.2.4.2 Digital Controls

The 40 bit shift register, is allocated as follows :

0141 4z00 - 0141 4zff write trigger control register

39	---	TBWL_A	HFR_A	AC_A	DC_A	---	SNEG_A	SPOS_A	32
31	TEXT50	TBWL_B	HFR_B	AC_B	DC_B	---	SNEG_B	SPOS_B	24
23	---	TBWL_C	HFR_C	AC_C	DC_C	---	SNEG_C	SPOS_C	16
15	---	TBWL_D	HFR_D	AC_D	DC_D	---	SNEG_D	SPOS_D	8
7	EXT/10	TBWL_EXT	HFR_EXT	AC_EXT	DC_EXT	---	SNEG_EXT	SPOS_EXT	0

TEXT50 0 = 1 MΩ external input coupling, 1 = 50 Ω external input coupling.
 _EXT/10 0 = attenuation is ON, 1 = OFF.

4.2.4.3 Analog Controls

A sample and hold fed by the precision DAC provides the threshold level.

The addresses are :

- 0300 0010 write EXT threshold control
- 0300 0018 write channel A threshold control
- 0300 001a write channel B threshold control
- 0300 001c write channel C threshold control
- 0300 001e write channel D threshold control

4.2.4.4 TV Trigger

Each channel has a pick-off after the MFE409 or after the high impedance buffer for external trigger. The TV trigger source is selected via bit TVS and drives a times 10 amplifier with complementary outputs. These outputs are selected (_TVINV) depending on the state of the selected MFE409 gain.

The TV trigger uses a commercial chip (LM1881) and provides two outputs,TV1 & TV2. This circuit is able to trigger on different TV line number standards.

Section 4 Theory of Operation

▪ Digital Controls

The 16 bit shift register, written using the serial protocol, is allocated as follows :

0141 5z00 - 0141 5zff write trigger TV and MST412 oscillator control register

15							8
_TVINV	TVS2	TVS1	TVS0	HDTV	875	MB	MA
7							0
_STI	_STW	_SVS	_STS	--	--	--	--

- _TVINV 0 = inverting TV trigger (to compensate for inversion in MFE409).
- _SVS 0 = enable TV1 source.
- _STS 0 = enable TV2 source.
- _STI 0 = enable interval width mode for MST412 oscillator control.
- _STW 0 = enable pulse width mode for MST412 oscillator control.

TVS2	TVS1	TVS0	TV trigger source	HDTV	875	line setting
0	0	1	channel A	0	0	525-625 TVLO
0	1	0	channel B	0	1	875 (MED)
0	1	1	channel C	1	0	1225 (HIGH)
1	0	0	channel D	1	1	2500 (HDTV)
1	0	1	external trigger			

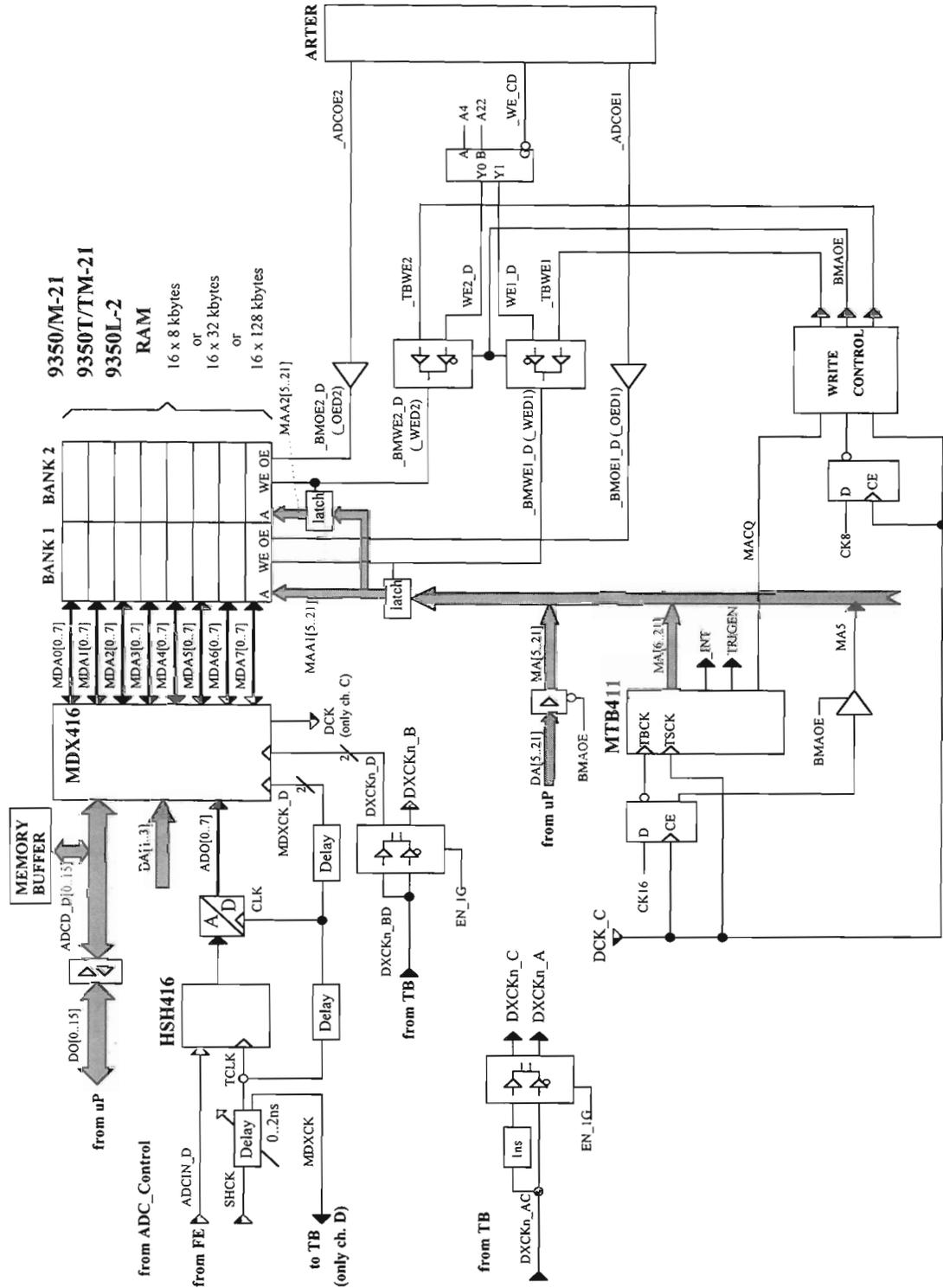
4.2.5 Analog to Digital Converter

4.2.5.1 Introduction

The analog to digital converter system does the signal conversion to 8 bits.

- Sample and Hold : the HSH416 Hybrid with Analog bandwidth of 1GHz, performs the track and hold before the ADC. It is clocked at three different frequencies : 500 MHz, 400 MHz, and 200 MHz. The offset is calibrated by use of a current mirror controlled by a 8 bit DAC.
- Flash ADC : the TDA8718 is a folding ADC working at a maximum clock speed of 500 Ms/s. The gain is calibrated by adjusting the internal resistor ladder using a 8 bit DAC. The ADC input level is 240 mV peak to peak on 75 Ω, from the nominal 320 mV front-end output.
- Demultiplexer : the MDX416 monolithic is used to demultiplex the ADC output, and catch the glitch (min/max).
- Buffer Memory : 128K bytes
- ADC Memory : 50K points for 9354A, 100 K for 9354T, 250K for 9354AM, 500 K for 9354TM, 2M points for 9354AL. Memory length may be extended by combining the acquisition memories of multiple channels.

4.2.5.2 ADC Block Diagram



4.2.6 Time Base

4.2.6.1 Introduction

The main clock (SHCK) comes from a PLL oscillator with a 10 MHz reference, there is a control bit (SEXTREF) to select an optional external reference with ECL level.

The PLL output frequency is controlled by three bits (SF500, SF400 and _SF200). The main clock is directly used by the sample-and-hold, the analog-to-digital converter and the time-to-digital converter for real time measurement. It is also used for synchronization inside the MDX416 demultiplexer.

The main clock is then feedback to the time base, from the ADC system (MDXCK), to drive a pre-divider controlled by four bits (DIVn). The output of the pre-divider then drives the MTB411 frequency divider (FD). At fastest speed, when the MTB411 frequency divider is not used, the clock to FD (FDCK) can be disabled (DISFD).

The main clock can also be driven from the external trigger BNC, this path is selected by a control bit (SEXTCK). The external clock threshold can be modified by two bits from the time base mode control (EXTCTH1 and EXTCTH2). This external clock frequency range is 0 to 100 MHz.

The PLL oscillator has in fact only two values, 500 and 400 MHz, the 200 MHz is a secondary path coming from a divider by two.

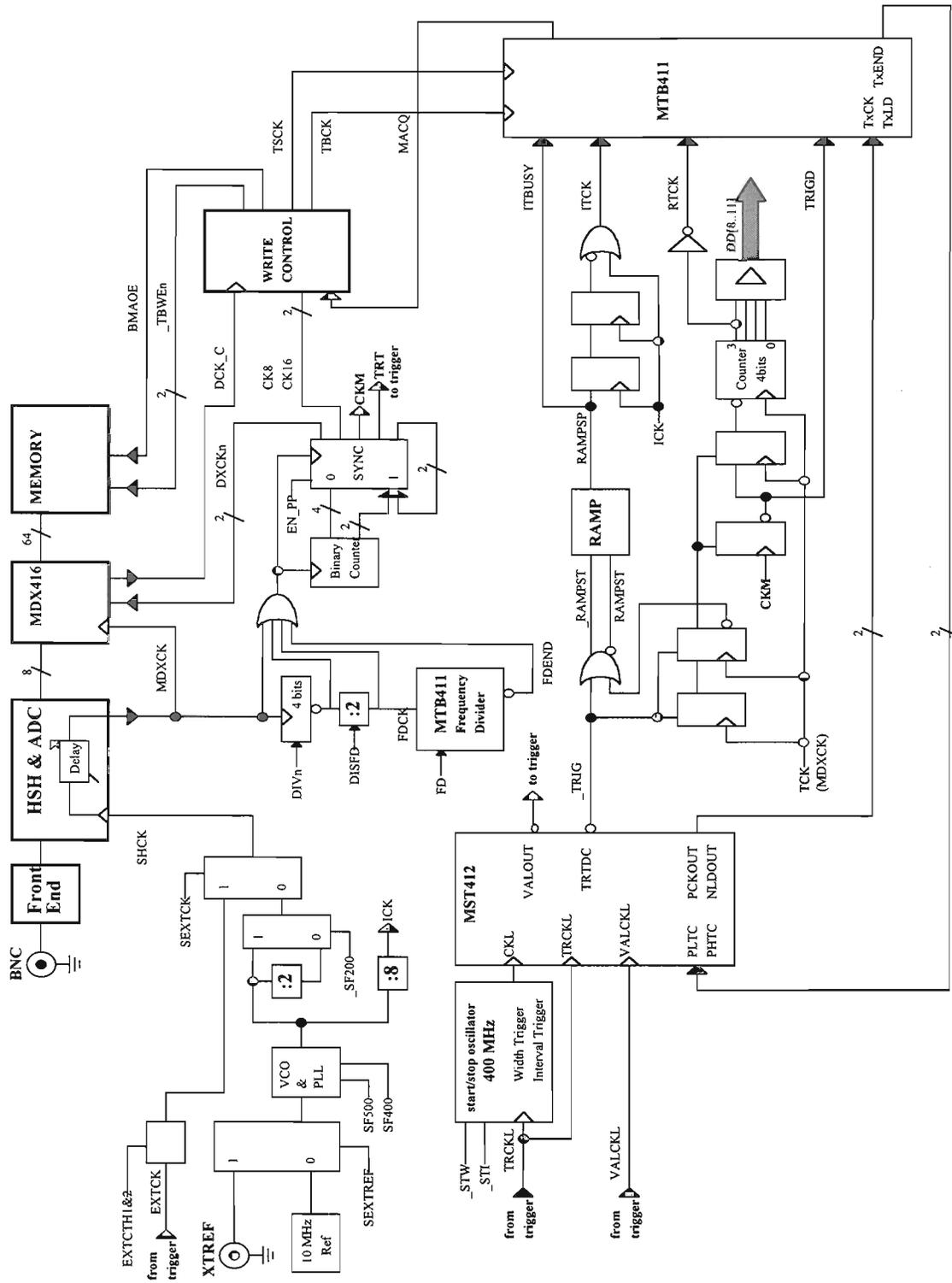
- 500 MHz is used for fast timebase settings, 1 GS/s, 2 GS/s and RIS mode.
- 400 MHz is used as soon as possible when starting to skip samples (skip > 1) in order to be able to do a peak detection (min-max) with the MDX416.
- 200 MHz is used for Roll mode.

There is also another reference clock for the interpolated TDC (ICK) which comes from a divider by eight. Its frequency is then 62.5 or 50 MHz, to be able to directly use the MTB411 counter (general time base control, start/stop, counters, memory address).

The output of the fast frequency divider is combined with the output of the MTB411's FD to drive a synchronous clock generator. The main functions are :

- reference to the MDX416 (DXCKn) and to the memory address generator (CK8 and CK16),
- synchronize the trigger (CKM for TRIGD),
- calibrate the MST412 use for smart trigger (TRT).

4.2.6.2 Time Base Block Diagram



4.2.6.3 Digital Control

0141 8z00 - 0141 8zfffwrite Time Base divider register

15					8		
---	---	---	---	---	SECK500	EN_1G	SEXTREF
7					0		
DISFD	_SF200	SF500	SF400	DIV3	DIV2	DIV1	DIV0

where :

- SECK500 select optional external clock (100 MHz to 500 MHz).
- EN_1G enable 1 GS/s acquisition (1 ns delay on MDX416 clock).
- SEXTREF select optional external PLL clock reference (10 MHz ± 5 %).
- DISFD disable FD clock to MTB411.
- _SF200 select oscillator frequency 200 MHz.
- SF500 select oscillator frequency 500 MHz.
- SF400 select oscillator frequency 400 MHz.
- DIVn frequency pre-divider (4 bits).

4.2.6.4 Trigger Selection

Each differential outputs of the five MTR408 from the Front-End (TCx) are selected (bit SCHn) and then inverted (bit INVCH) to drive the TRCKL signal and the VALCKL signal (bit SVAL1).

A logical function of the TCx signals can be selected (bit STCx) for the pattern generator. A few single ended signals can also be selected one at a time (bit STn). These signals are TV1 and TV2 for television trigger, TRT for test and calibration of MST412, _VALOUT for drop-out trigger.

Then there is a selection between the pattern and the single ended sources (bit SPAT). The signal obtained is inverted (bit INVPAT) and used to drive TRCKL (bit STRCKL). There is also a choice between this signal and TV1 to drive VALCKL (bit SVAL0). The pattern trigger logic function is any "AND" combination of TCx input signals, inverted or not. All the control are done through a 16 bit serial register.

4.2.6.5 Smart Trigger

The VALCKL source drives the MST412. The TRCKL source goes through a buffer to drive the MST412 and control the smart trigger 400 MHz start/stop oscillator.

The MST412 oscillator is usually free running, but when using glitch trigger mode the oscillator is enable only during the pulse duration (bit _STW), and when using interval width trigger mode the oscillator is restarted at each edge (bit _STI). There is also a time base mode control register with roll mode interrupt enable (RMIE), external clock control (SEXTCK, EXTCTH1 and EXTCTH2), buzzer (BUZZ) and calibration front panel output signal selection (PCSn).

Section 4 Theory of Operation

4.3 F9300-4 GPIB and RS 232 Interface

This board is connected to the processor through a flat cable.
Data bus is 8 bits, address bus: 12 bits.
Address 0180 000 to 0180 00FF.

4.3.1 RS 232 Serial Interface

Based on the 2661A IC from Signetics or Philips.

- Clock frequency 4.9152 MHz.
- 4 internal registers of 8 bits.
- Interrupt level 2.
- Connector type DB9 with 9 male pins.

4.3.2 GPIB Interface

Based on the circuit 7210 IC from NEC.

- Clock frequency 5 MHz.
- 8 internal registers of 8 bits.
- Tri-state external GPIB drivers. - Low level output.
- Interrupt level 3.

The GPIB address is set by software and stored in non-volatile memory.

4.4 F9354-5 Front Panel

The front panel is connected to the processor board with a flat cable. Power supply and control signals are supplied from the processor. The front panel is divided in two sections:

- One board with Motorola 68HC05C4 processor, coders, and serial data interface.
- One matrix Keyboard with push buttons.

4.5 F9300-6 Centronics, Floppy, Printer interface option**4.5.1 Centronics interface option**

This Centronics interface makes direct connection possible to external parallel printer.

- Address 0130 0180 to 0130 01A0
- Interrupt level 2

4.5.2 Floppy Disk drive interface option

Based on the circuit MCS3201 from Motorola.

- Address 0130 01C0 to 0130 01C7
- Interrupt level 4

Address	Read	Write
0130 01C0	Input register	----
0130 01C2	----	Digital output register
0130 01C4	Main status register	----
0130 01C5	Data register	Data register
0130 01C7	Data input register	Disk control register

4.5.3 Printer Interface option

Internal graphic printer : Seiko LPT5446

- Address 0130 0140 to 0130 0160
- Interrupt level 2

4.6 F9300-7 Printer Controller option

Based on the LPT5000 series control chip set from Seiko instrument Inc

- PT501P01 CPU
- PT500GA1 Gate array
- Technical reference 39019-2234-01
- Address 0130 0100

4.7 F9300-8 Hard Disk option, PCMCIA III Controller

- Address 0130 0800 to 0130 0bff
- Interrupt level 5

4.8 93XX-Display

4.8.1 General Description

The raster scan display module is divided into five sections:

- Graphic processor
- Deflection
- Video
- Yoke
- Cathode ray tube

4.8.2 Basic Characteristics

- Nine inches diagonal monochrome, yellowish, orange.
- CRT anti-glare treated
- Non interlaced resolution of (X)810 x (Y)696 pixels at 60 Hz or 50 Hz frequency.

Section 4 Theory of Operation

- Landscape vertical raster
- Electromagnetic deflection.
- Intensity control rise and fall time > 12 ns.
- Analog intensity input
- TTL synchronization input.
- Horizontal nominal size: 165 mm for X-on = 15.39 Ms.
- Horizontal size adjustment: > +/- 5 mm.
- Horizontal offset adjustment: +/- 5 mm.
- Vertical nominal size: 120 mm for Y-on = 14.5 μ s.
- Vertical size adjustment: > +/- 5 mm.
- Vertical offset adjustment: +/- 5 mm.
- X and Y differential non linearity: 10%.

The line deflection is vertical, from bottom to top. The field deflection is horizontal, from left to right and is resynchronized to the power line frequency.

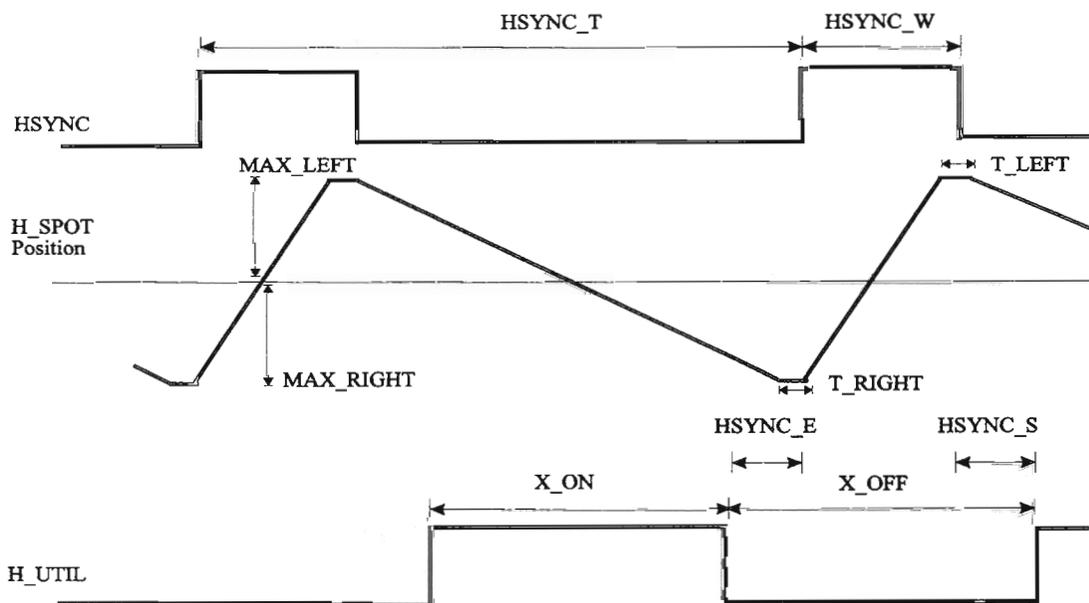
4.8.3 Horizontal Deflection

The horizontal deflection is synchronized to the 50 or 60 Hertz power line frequency. The on time display is the same for both frequencies, therefore the deflection is calculated for 60 Hz. The horizontal deflection is controlled by the HSYNC signal.

The trailing edge of HSYNC resets the horizontal spot position to a hardware predefined position at the left side of the screen: MAX_left. When ever HSYNC is high, the spot stays at this position.

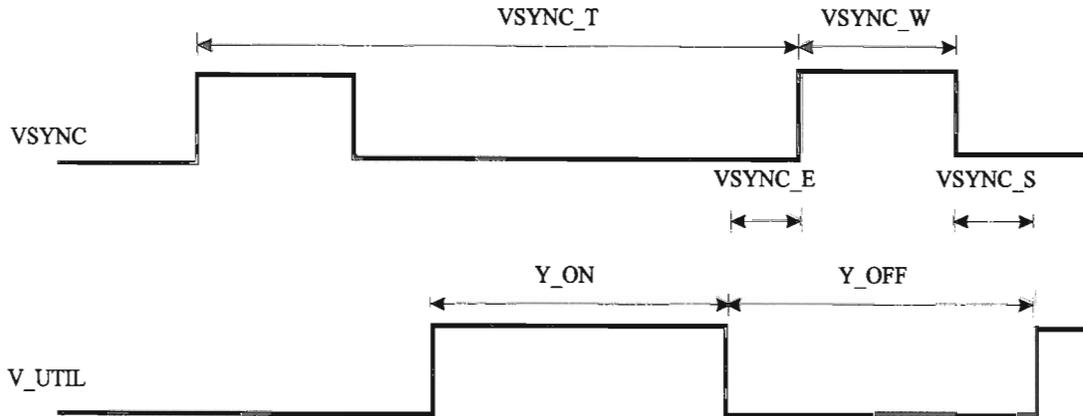
The falling edge of HSYNC starts the horizontal deflection ramp. The ramp has the same rate for either 50 or 60 Hertz frequency.

When ever HSYNC is low, the horizontal deflection will rise left to right, until HSYNC becomes high, or the system has reached the maximum right position (MAX_RIGHT).



4.8.4 Vertical Synchronization

The timing of both VSYNC and HSYNC is synchronized to the pixel clock (PCLK).



The pixel rate is 48 MHz.

4.8.5 Horizontal Resolution

	# of vertical line	Time in ms
HSYNC_T	842	15.998
HSYNC_W	22	0.418
HSYNC_E	4	0.076
HSYNC_S	6	0.114
X-ON	810	15.390
X-OFF	32	0.608

Values of the horizontal timing for the maximum field refresh frequency.

4.8.6 Vertical Resolution

	# of Pixels	Time in μ s
VSYNC_T	912	19.000
VSYNC_W	136	2.833
VSYNC_E	0	0.000
VSYNC_S	80	1.666
Y-ON	696	14.500
Y-OFF	216	4.500

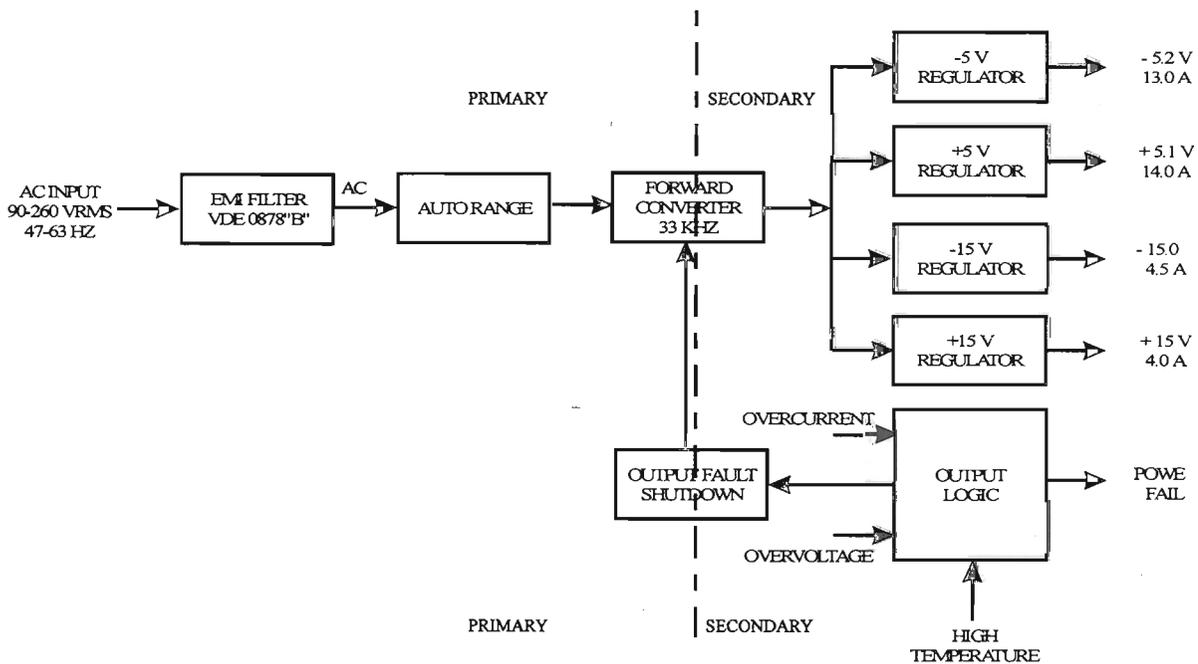
Section 4 Theory of Operation

4.9 PS9351 Power Supply

4.9.1 Power Supply Specifications

Input voltage	: 90 to 130 V or 180 to 260 V. Auto ranging line voltage.
Input frequency	: 47 Hz to 63 Hz.
Input rush current	: Max. 40 A peak at start up.
Environmental	: Operating temperature range 0 °C to + 50 °C Storage temperature range - 55 °C to + 80 °C Relative humidity from 5% to 95%.
Output voltages	: - 5.2 VDC, 13 amp Max. + 5.2 VDC, 14 amp Max. - 15.1 VDC, 4.5 amp Max. + 15.1 VDC, 4 amp Max.
Output adjustment	: +/- 5%.
Regulation	: +/- 1%.
Transient response	: recover to 1% of its final value within 500 µsec.
Ripple and noise	: Peak to peak value < 50 mV
Hold up time	: 16 msec at full load
Output short circuit protection	: Yes.
Output over voltage protection	: Yes.
Input protection	: 6 amp fuses.
Thermal protection	: Yes.
Safety	: VDE 0806, IEC 380, 435, 950 & UL1012, 478, CSAC22.2#1402C
EMI	: VDE 0871 class A, FCC 20780 class A.

4.9.2 Power Supply Block Diagram



SECTION 5 Performance Verification

5.1 Introduction

This procedure can be used to verify the main operating specifications of the LeCroy 9354A/T digital storage oscilloscope, it is useful as an incoming inspection checkout. It is time consuming and requires extensive test equipment. If you are not familiar with operating the 9354A/T oscilloscope, read the operator's manual.

5.2 Test Equipment Required

Instrument	Specifications	Recommended	Where used
Signal Generator (sine wave)	Frequency : .5 MHz to 1 GHz Frequency Accuracy : 1 ppm Amplitude : 1 V peak to peak	Marconi 2030 or equivalent	5.9.1.a 5.11 5.12
Leveled Sine wave generator	Frequency : .5 MHz -250 MHz Amplitude : 5 V peak to peak	Tektronix SG503 or equivalent	5.9.1.b
Fast pulse Generator	Rise time < 500 psec	LeCroy 4969 or equivalent	5.13
Sine Wave Generator	Frequency : 5 KHz Amplitude : 6 V peak to peak	LeCroy LW420 or equivalent	5.10
DC precision Power Supply	Amplitude : 10 V, DC Accuracy : < 0.1 %	Tektronix PS5004	5.7, 5.8 5.15
Digital Multimeter	4 digits	Keithley 199 or equivalent	5.4 5.5
Cable	BNC, 50 Ω, length 20 cm, 1ns (7.87 inches)	LeCroy 4802432001	5.10.3 5.10.4
Cable	BNC, 50 Ω, length 100 cm, 5 ns (39.37 inches)	LeCroy 480020101	5.XX
Attenuator	50 Ω, 20 dB 1% accuracy	Suhner	5.7
Attenuator	1 MΩ, 20 dB 1% accuracy	Suhner	5.7
Attenuator	50 Ω, 3 dB 1% accuracy	Suhner	5.10
Terminator	50 Ω Feed through	Suhner	5.13
BNC T adapter	BNC, 50 Ω, T adapter	LeCroy 402222002	5.10.3 5.10.4

Table 5-1 : Test Equipment

5.3 Turn On

- Switch on the power using the power switch on the rear panel and verify :
- The display turns on after about 10 seconds and is stable
- The range of intensity and grid intensity is reasonable

- Wait for about 10 minutes for the scope to reach a stable operating temperature.

Section 5 Performance Verification

5.4 Input Impedance

Specifications

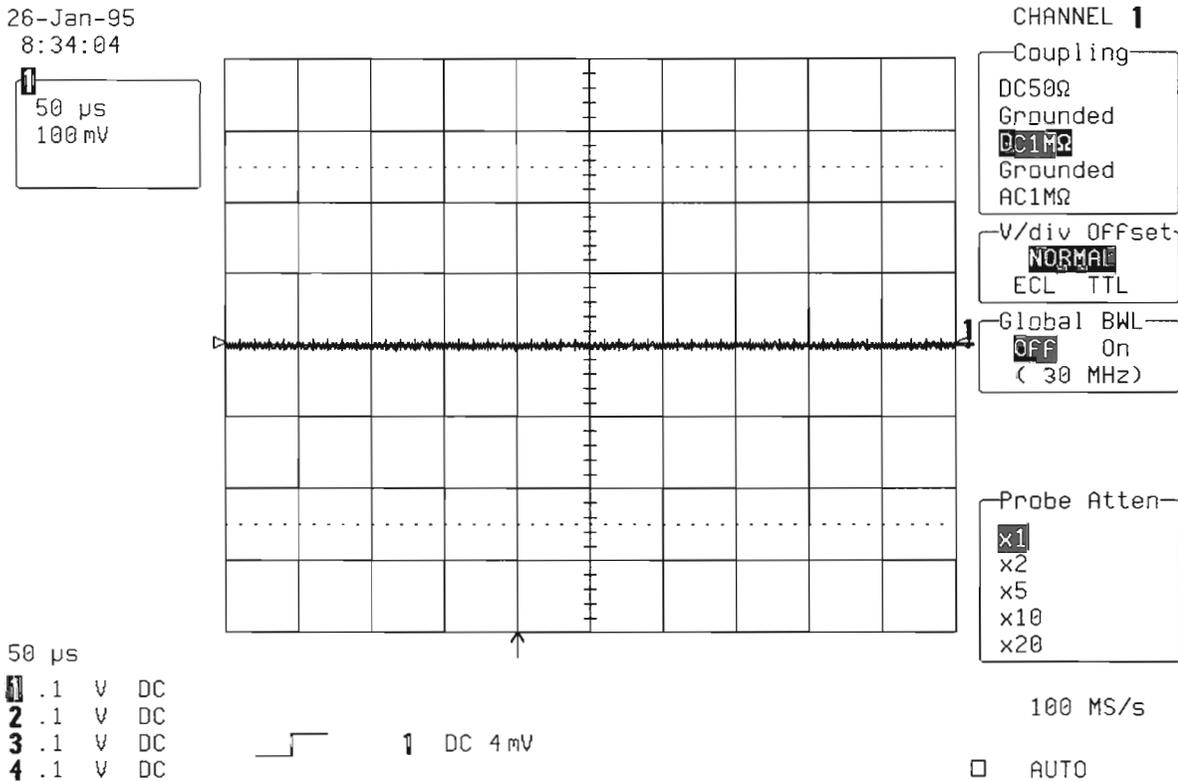
DC $1\text{M}\Omega \pm 1\%$
 DC $50\ \Omega \pm 1\%$

5.4.1 Procedure

The input impedance is tested in working conditions, with a high precision digital multimeter.

5.4.1.a DC $1\text{M}\Omega$

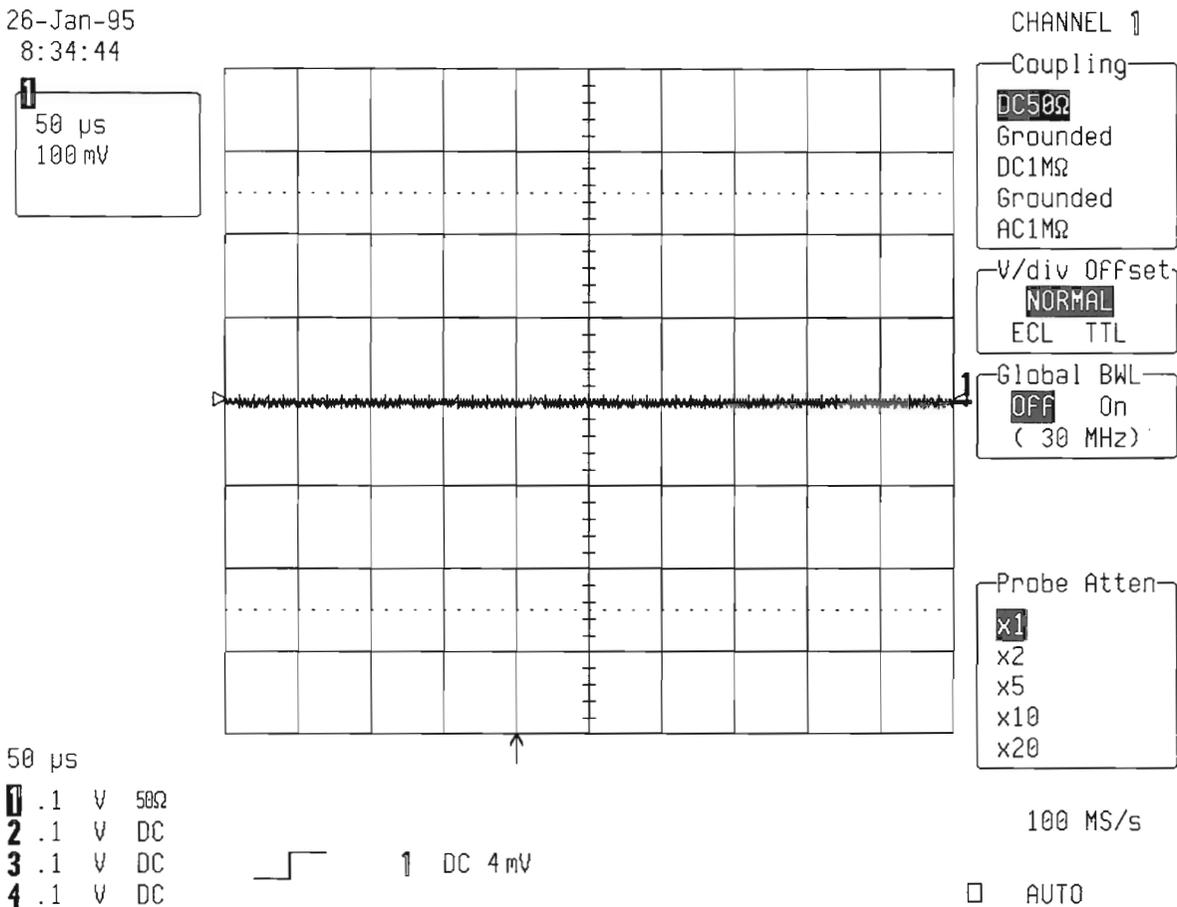
- Set DSO Channel 1 : **On**
- Input Coupling : **DC $1\text{M}\Omega$**
- Input gain : **100 mV/div.**
- Trigger on : **Channel 1**
- Trigger mode : **Auto**
- Time base : **50 $\mu\text{sec/div.}$**



- Measure the impedance using a high precision DMM with sense : must be $1\text{M}\Omega \pm 1\%$.
- Repeat the above test for input volt/div. of **200 mV**.

5.4.1.b DC 50Ω

- Set DSO Channel 1 : **On**
- Input Coupling : **DC 50Ω**
- Input gain : **100 mV/div.**
- Trigger on : **Channel 1**
- Trigger mode : **Auto**
- Time base : **50 μsec/div.**



- Measure the impedance using a high precision DMM with sense : must be **50 Ω ± 1%**
- Repeat steps 5.4.1.a, and 5.4.1.b for Channel 2, Channel 3 and Channel 4.

5.4.2 External Trigger Input Impedance

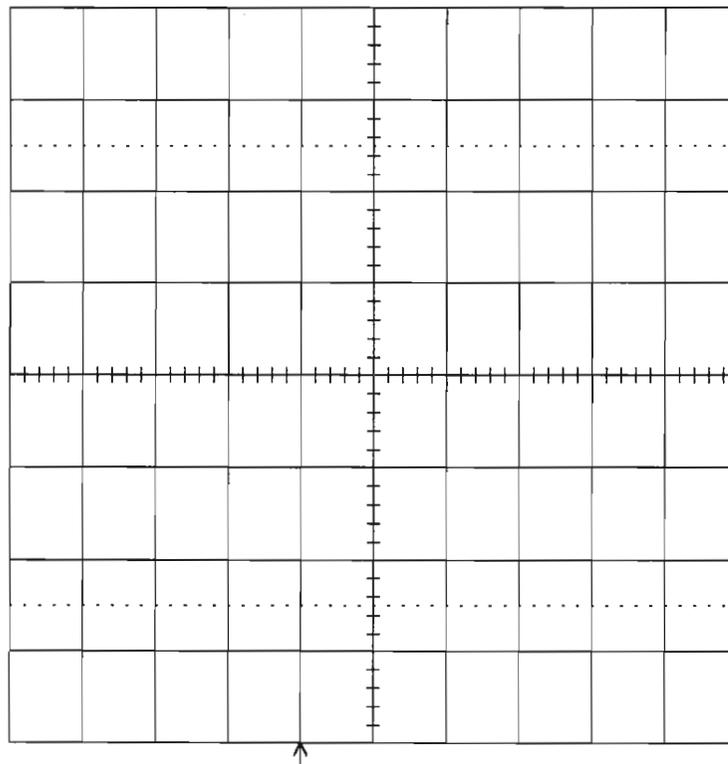
5.4.2.a DC 1MΩ

The External Trigger input impedance is tested with any time base and gain.

- Set Trigger on : **EXT**
- Trigger mode : **Auto**
- Coupling Ext : **DC**
- External : **DC 1MΩ**

26-Jan-95
8:35:22

TRIGGER SETUP



Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50Ω DC1MΩ

holdoff
- - -
OFF Time Evt

50 μs

- 1 .1 V 50Ω
- 2 .1 V DC
- 3 .1 V DC
- 4 .1 V DC

Ext DC 0mV 1MΩ

100 MS/s

AUTO

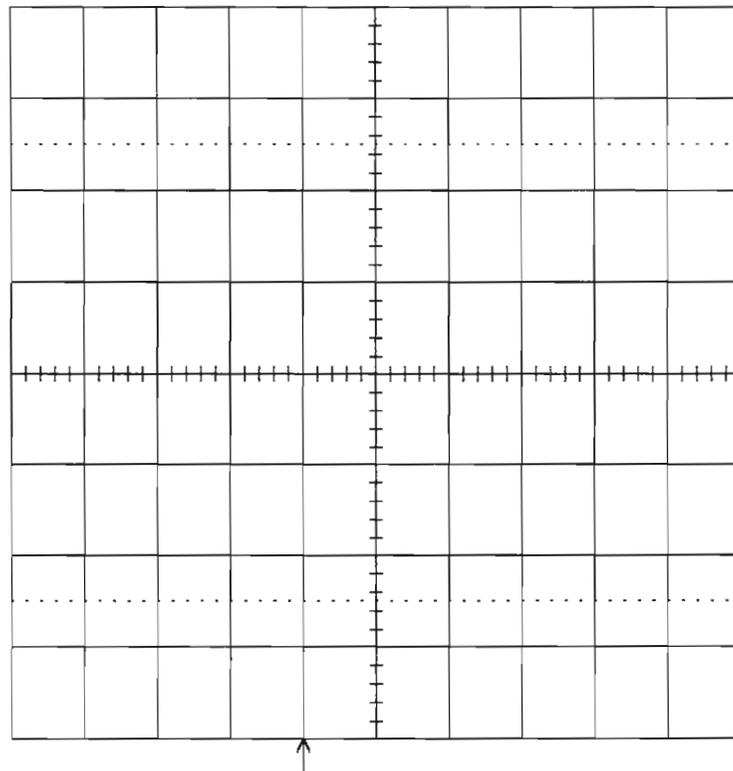
- Measure the impedance using a high precision DMM with sense : must be **1MΩ ±1%**.

5.4.2.b DC 50Ω

With any time base and gain.

- Set Trigger on : **EXT**
- Trigger mode : **Auto**
- Coupling Ext : **DC**
- External : **DC 50Ω**

26-Jan-95
8:35:50



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50Ω DC1MΩ

holdoff
Off Time Evts

100 MS/s

AUTO

50 μs

- 1 .1 V 50Ω
- 2 .1 V DC
- 3 .1 V DC
- 4 .1 V DC

Ext DC 0mV 50Ω

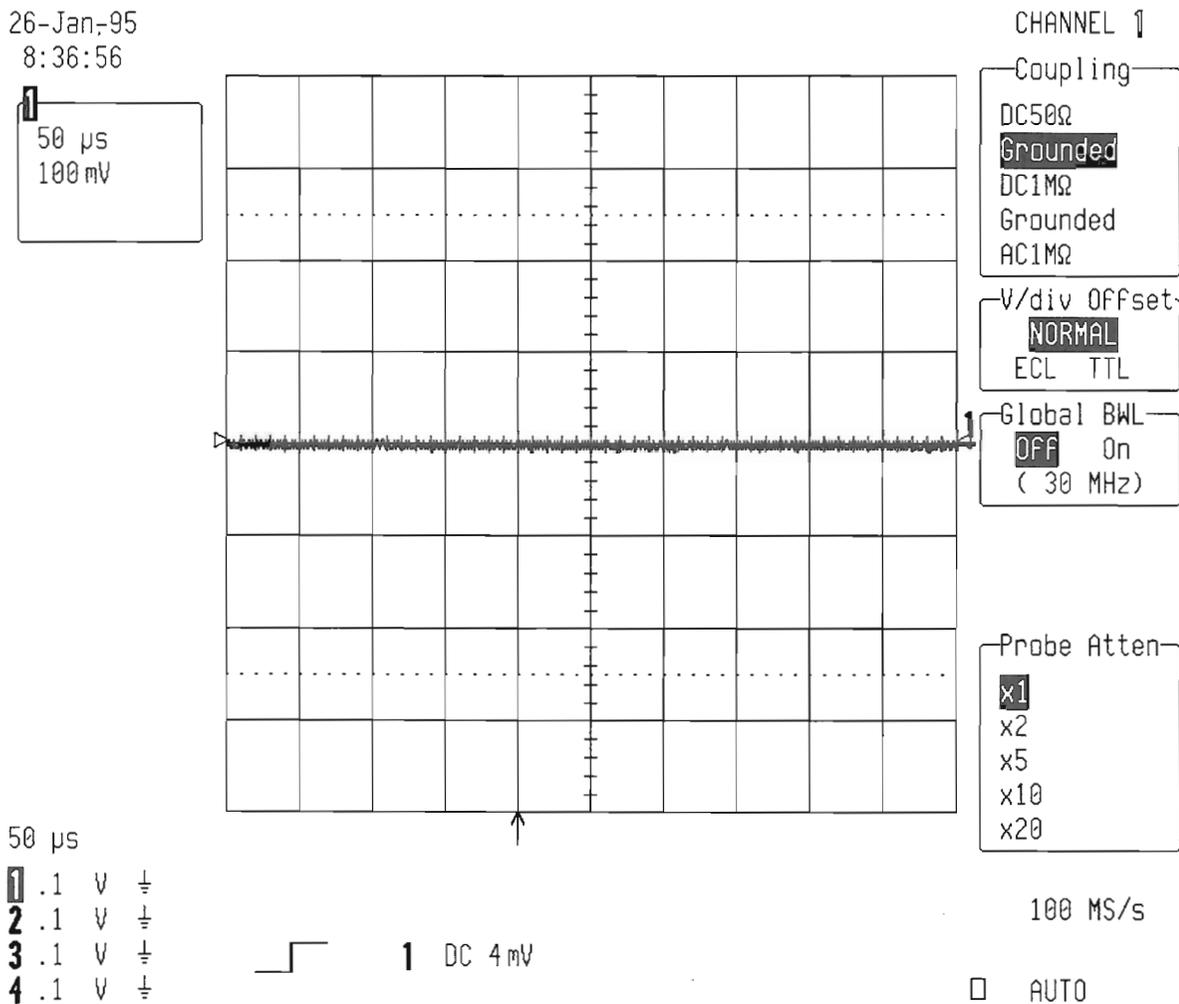
- Measure the impedance using a high precision DMM with sense : must be **50 Ω ± 1%**.
- Repeat steps 5.4.2.a, 5.4.2.b for **Ext/10**, and check as above.

Section 5 Performance Verification

5.4.3 Internal Protective Resistor Verification

With any time base and gain, set DSO as follows :

- Input Coupling : **Grounded**
- Check with a high precision DMM : input impedance must be **1 MΩ ± 2%**.
- In case of problem check SM 1MΩ resistor R1003 or troubleshoot relay RL1000 .
- Repeat the above test for Channel 2, Channel 3, Channel 4.
- In case of problem check SM 1MΩ resistors R2003, R3003, R4003 or troubleshoot relays RL2000, RL3000, RL4000.



5.5 Leakage Current

Specifications

DC 1 M Ω , AC 1 M Ω , DC 50 Ω : ± 1 mV

5.5.1 Procedure

- Set DSO Ch1 : **On**
- Input Coupling : **DC 50 Ω**
- Input gain : **100 mV/div.**
- Trigger on : **Channel 1**
- Trigger mode : **Auto**
- Time base : **10 μ sec**

- Connect a high precision DMM to Channel 1, and verify that the reading is not larger than ± 1 mV.

- Repeat the procedure for **1M Ω DC** and **1M Ω AC**.

- Repeat step 5.5.1 for Channel 2, Channel 3, Channel 4 and check as above.

5.6 Average Noise Level

Description

The 9354A/T inputs average noise level is tested at 5 mV/div., with 0 mV offset. This is to verify the proper operation of the main board, front-end and ADC's. The scope parameters functions are used to measure the RMS and Peak amplitude of the noise.

5.6.1 Peak to Peak Noise

Specifications

< ± 3.6 mV Peak to Peak at 5 mV/div.

5.6.1.a DC 1M Ω

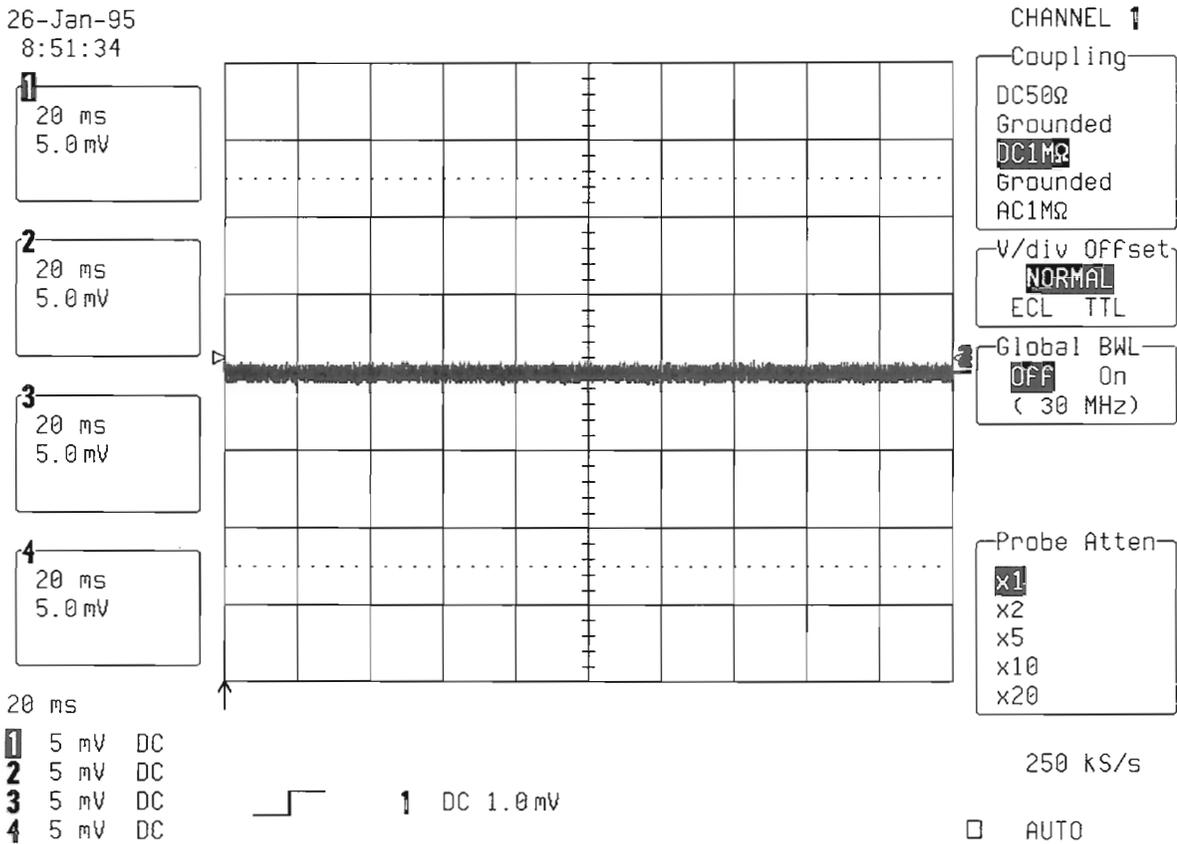
Procedure

- With no signal connected to the inputs, set 9354A/T DSO settings as follows :

- Turn on traces : **Ch1, Ch2, Ch3, Ch4**
- Display setup : **Standard, Dot Join on, Persistence off, Single grid**
- Input Coupling : **DC 1M Ω**
- V/div. offset : **Normal**
- Probe atten : **X1**
- Global BWL : **Off**

Section 5 Performance Verification

- Input gain : **5 mV/div.**
- Trigger setup : **Edge**
- Trigger on : **1**
- Coupling 1 : **DC**
- Slope 1 : **Pos**
- Holdoff : **Off**
- Trigger Mode : **Auto**
- Timebase : **20 msec/div.**
- Channel use : **4**
- Record up : **50 K**



- Press : **Cursors/Measure**
- Measure : **Parameters**
- Mode : **Custom**
- Statistics : **On**
- Change parameters
- On line 1 : **Measure pkpk of Ch1**
- On line 2 : **Measure pkpk of Ch2**
- On line 3 : **Measure pkpk of Ch3**
- On line 4 : **Measure pkpk of Ch4**

26-Jan-95
8:53:34

1
20 ms
5.0 mV

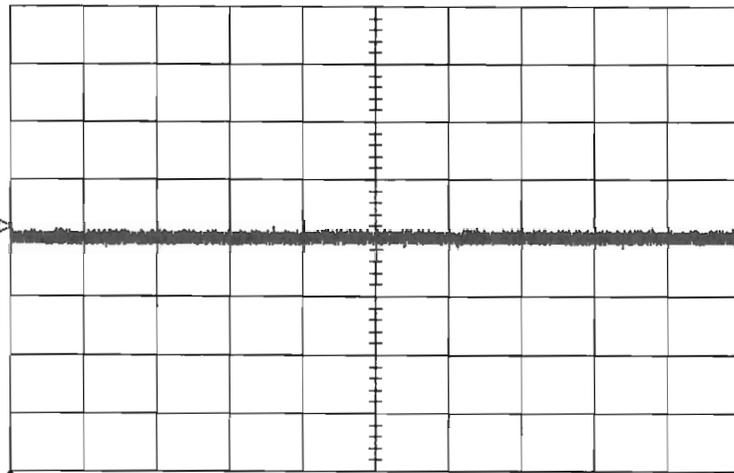
2
20 ms
5.0 mV

3
20 ms
5.0 mV

4
20 ms
5.0 mV

20 ms

- 1 5 mV DC
- 2 5 mV DC
- 3 5 mV DC
- 4 5 mV DC



40 sweeps:

	average	low	high	sigma
pkpk (1)	1.35 mV	1.09	1.56	0.10
pkpk (2)	1.51 mV	1.41	1.72	0.10
pkpk (3)	1.50 mV	1.41	1.72	0.09
pkpk (4)	1.32 mV	1.25	1.56	0.09

1 DC 1.0 mV

MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF

CHANGE
PARAMETERS

From
0.00 div
Track OFF On

to
10.00 div

250 KS/s

AUTO

26-Jan-95
8:53:53

1
20 ms
5.0 mV

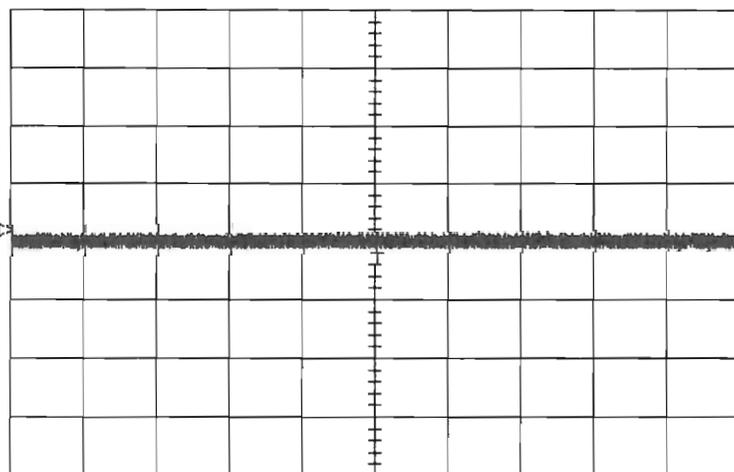
2
20 ms
5.0 mV

3
20 ms
5.0 mV

4
20 ms
5.0 mV

20 ms

- 1 5 mV DC
- 2 5 mV DC
- 3 5 mV DC
- 4 5 mV DC



96 sweeps:

	average	low	high	sigma
pkpk (1)	1.36 mV	1.09	1.56	0.09
pkpk (2)	1.50 mV	1.41	1.72	0.09
pkpk (3)	1.49 mV	1.41	1.72	0.08
pkpk (4)	1.32 mV	1.25	1.56	0.09

1 DC 1.0 mV

CHANGE PARAM

On line
 2 3 4 5

DELETE ALL
PARAMETERS

measure
over-
period
pkpk
points
rise

of
1 2 3 4
A B C D

250 KS/s

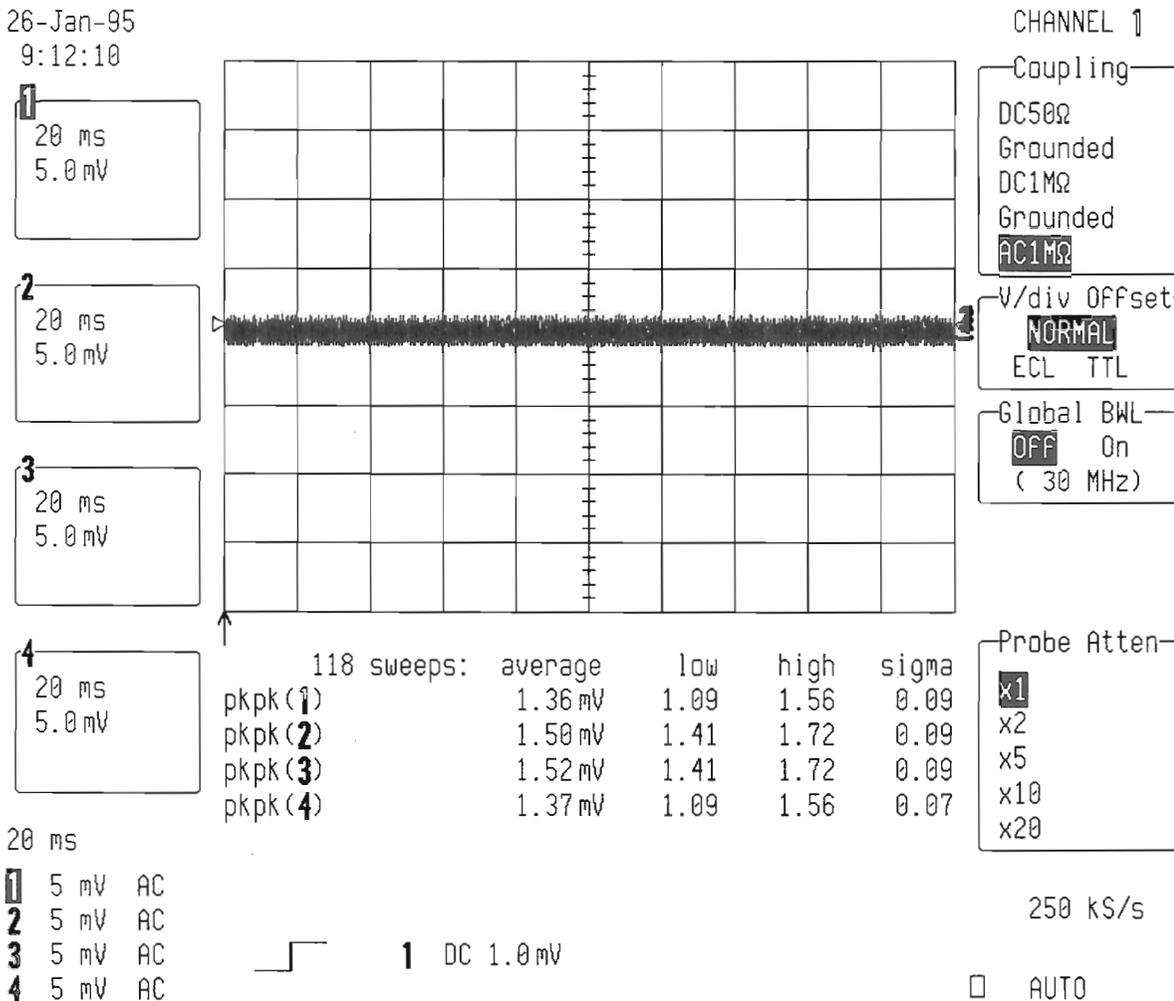
AUTO

Section 5 Performance Verification

- Check after at least 100 sweeps that : high pkpk readout is less than ± 3.6 mV, corresponding to **9% of full scale**.
- Repeat the test for Timebase : **2 msec/div, .2 msec/div, 20 μ sec/div, and 10 μ sec/div** and check as above.

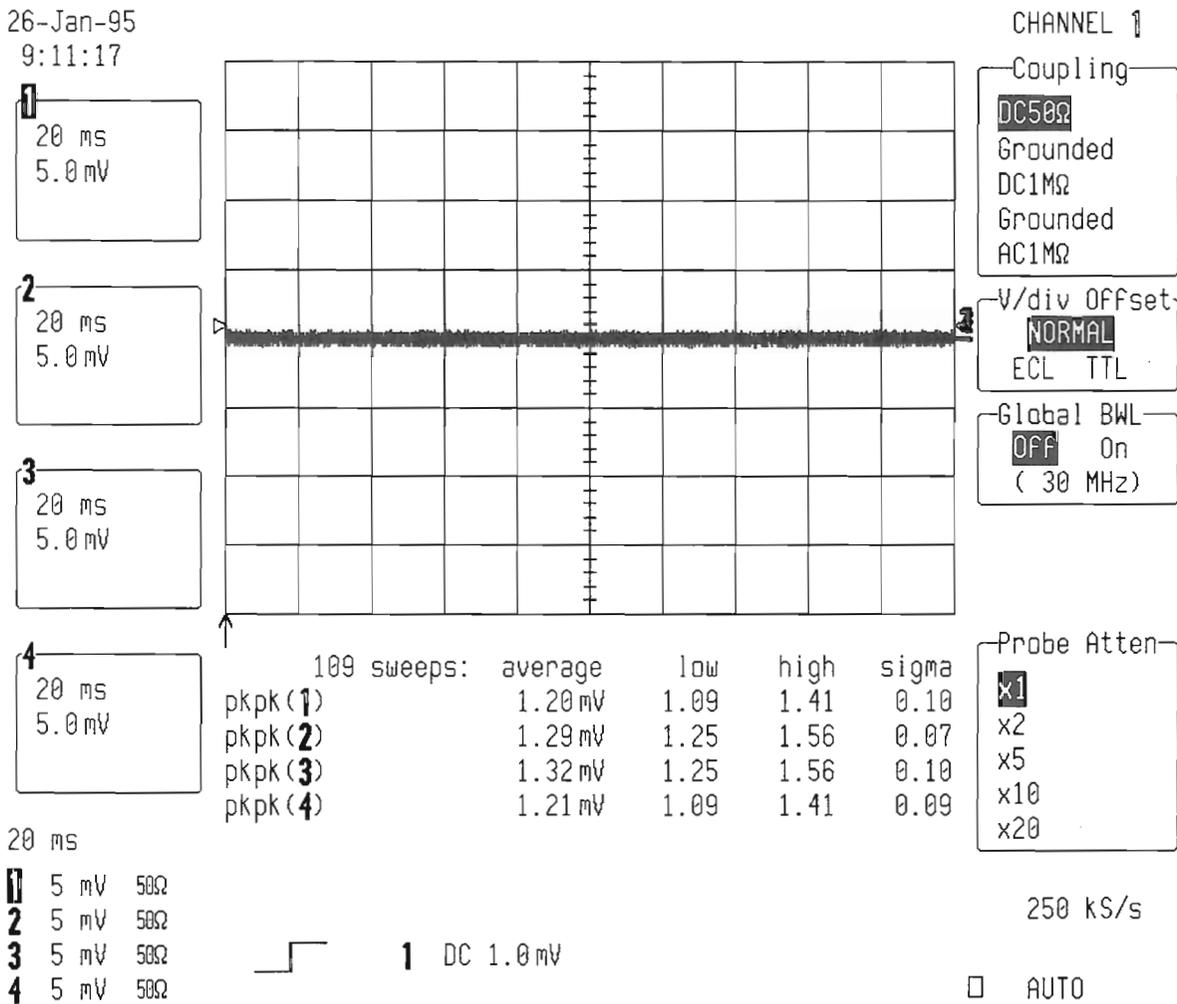
5.6.1.b AC 1M Ω

- Select Coupling Ch1, Ch2, Ch3, Ch4 : **AC 1M Ω**
- Check after at least 100 sweeps that the high pkpk readout is less than ± 3.6 mV, corresponding to **9% of full scale**.
- Repeat the test for Timebase : **2 msec/div, .2 msec/div, 20 μ sec/div, and 10 μ sec/div** and check as above.



5.6.1.c DC 50Ω

- Select Coupling Ch1, Ch2, Ch3, Ch4 : **DC 50Ω**
- Check after at least 100 sweeps that the high pkpk readout is less than **± 3.6 mV**, corresponding to **9% of full scale**.
- Repeat the tests for Timebase : **2 msec/div, .2 msec/div, 20 μsec/div, and 10 μsec/div** and check as above.



5.6.2 Rms Noise

Specifications

< $\pm 360 \mu\text{V}$ at 5 mV/div.

5.6.2.a DC 1M Ω

Procedure

- With no signal connected to the inputs, set 9354A/T DSO settings as follows :
 - Turn on traces : **Ch1, Ch2, Ch3, Ch4**
 - Display setup : **Standard, Dot Join on, Persistence off, Single grid**
 - Input Coupling : **DC 1M Ω**
 - V/div. offset : **Normal**
 - Probe atten : **X1**
 - Global BWL : **Off**
 - Input gain : **5 mV/div.**
 - Trigger setup : **Edge**
 - Trigger on : **1**
 - Coupling 1 : **DC**
 - Slope 1 : **Pos**
 - Holdoff : **Off**
 - Trigger Mode : **Auto**
 - Timebase : **20 msec/div.**
 - Channel use : **4**
 - Record up : **50 K**
- Press : **Cursors/Measure**
- Measure : **Parameters**
- Mode : **Custom**
- Statistics : **On**
- Change parameters
 - On line 1 : **Measure sdev of Ch1**
 - On line 2 : **Measure sdev of Ch2**
 - On line 3 : **Measure sdev of Ch3**
 - On line 4 : **Measure sdev of Ch4**
- Check after at least 100 sweeps that : high sdev readout is less than $\pm 360 \mu\text{V}$, corresponding to **0.9% of full scale**.
- Repeat the test for Timebase : **2 msec/div, .2 msec/div, 20 $\mu\text{sec/div}$, and 10 $\mu\text{sec/div}$.** and check as above.

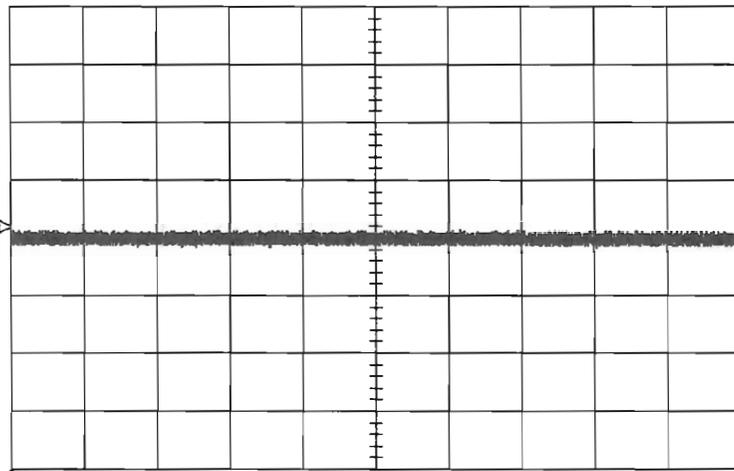
26-Jan-95
9:15:34

1
20 ms
5.0 mV

2
20 ms
5.0 mV

3
20 ms
5.0 mV

4
20 ms
5.0 mV



104 sweeps:

	average	low	high	sigma
sdev(1)	179.4 μ V	177.1	182.1	0.8
sdev(2)	190.6 μ V	188.0	193.9	1.3
sdev(3)	187.1 μ V	184.5	188.6	0.7
sdev(4)	169.7 μ V	166.3	171.3	0.7

20 ms

- 1 5 mV DC
- 2 5 mV DC
- 3 5 mV DC
- 4 5 mV DC

1 DC 1.0 mV

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL
PARAMETERS

measure
r@level
rms
sdev
top
width

of
1 2 3 4
A B C D

250 KS/s

AUTO

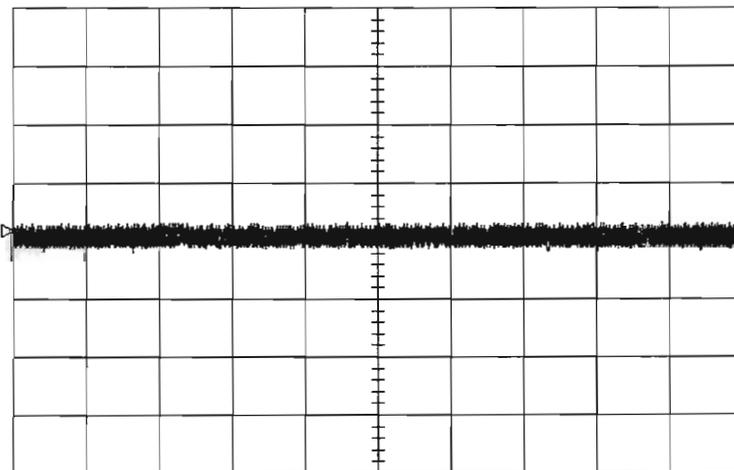
26-Jan-95
9:18:04

1
20 ms
5.0 mV

2
20 ms
5.0 mV

3
20 ms
5.0 mV

4
20 ms
5.0 mV



102 sweeps:

	average	low	high	sigma
sdev(1)	153.5 μ V	150.7	155.8	1.0
sdev(2)	167.8 μ V	165.9	169.4	0.8
sdev(3)	170.7 μ V	167.5	172.8	0.9
sdev(4)	171.8 μ V	168.8	174.0	0.9

20 ms

- 1 5 mV AC
- 2 5 mV AC
- 3 5 mV AC
- 4 5 mV AC

1 DC 1.0 mV

CHANNEL 1

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

250 KS/s

AUTO

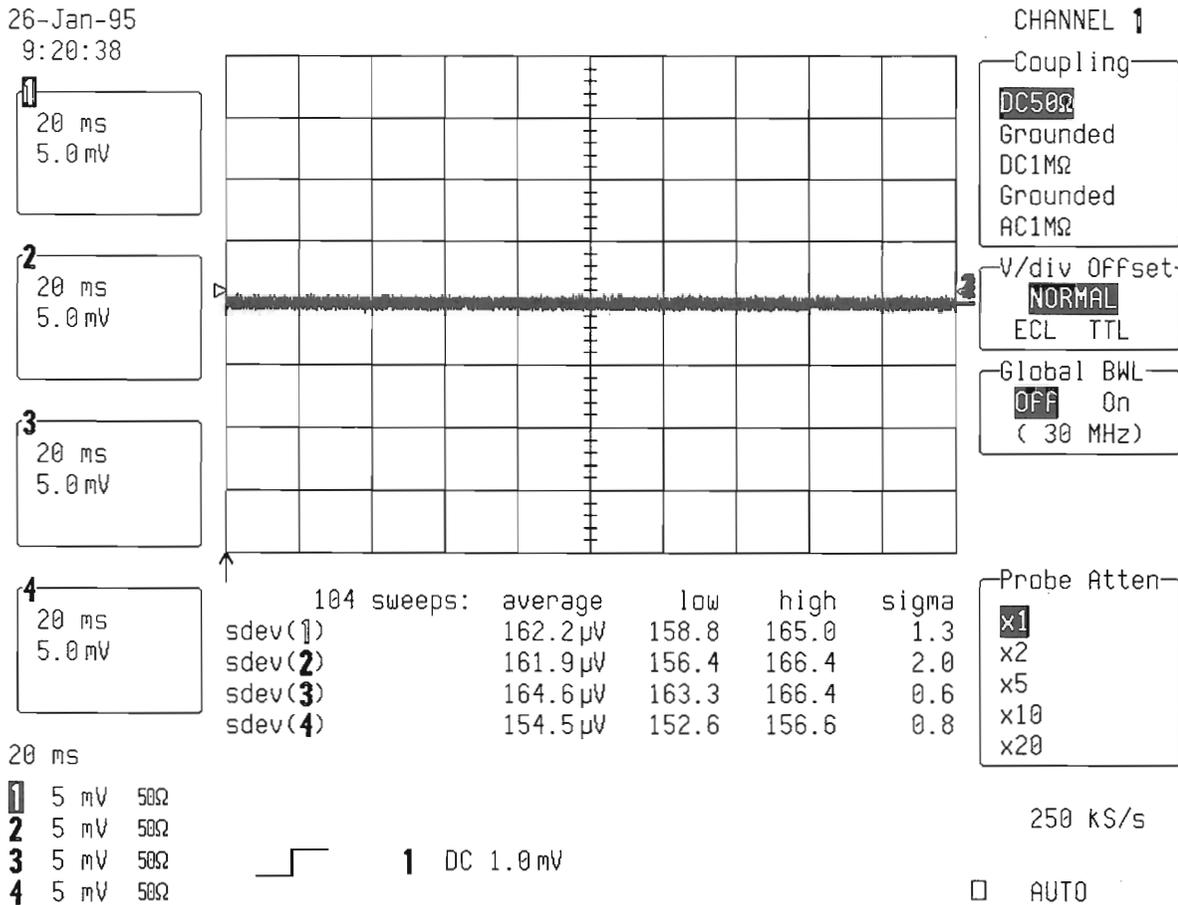
Section 5 Performance Verification

5.6.2.b AC 1MΩ

- Select Coupling Ch1, Ch2, Ch3, Ch4 : **AC 1MΩ**
- Check after at least 100 sweeps that the high pkpk readout is less than $\pm 360 \mu\text{V}$, corresponding to **0.9% of full scale**.
- Repeat the test for Timebase : **2 msec/div, .2 msec/div, 20 μsec/div, and 10 μsec/div.** and check as above.

5.6.2.c DC 50Ω

- Select Coupling Ch1, Ch2, Ch3, Ch4 : **DC 50Ω**
- Check after at least 100 sweeps that the high pkpk readout is less than $\pm 360 \mu\text{V}$, corresponding to **0.9% of full scale**.
- Repeat the tests for Timebase : **2 msec/div, .2 msec/div, 20 μsec/div, and 10 μsec/div.** and check as above.



5.6.3 Inputs Grounded

With no cable plugged into scope, set the DSO as follows :

- Turn on trace : **Channel 1, Channel 2, Channel 3, Channel 4**
- Input Coupling : **DC 50Ω**
- Input gain : **10 mV/div.**
- Offset : **Zero**
- Trigger on : **Channel 1, DC**
- Trigger mode : **Auto**
- Timebase : **50 μsec/div.**
- Channel use : **4**
- Record up : **50 K**
- Turn off trace : **Channel 1, Channel 2, Channel 3, Channel 4**

- Turn on trace : **A, B, C, D**
- Select Math Setup
- For Math : **Use at most 5000 points**
- Redefine A, B, C, D : **Channel 1, Channel 2, Channel 3, Channel 4**
- Use Math ? : **Yes**
- Math Type : **Average**
- Avg Type : **Summed**
- For : **1000 sweeps**

- Cursors/Measure : **Parameters**
- Mode : **Custom**
- Statistics : **off**
- Change parameters
- On line 1 : **Measure mean of A**
- On line 2 : **Measure mean of B**
- On line 3 : **Measure mean of C**
- On line 4 : **Measure mean of D**

- Check after at least 100 sweeps that the **mean** value of **A, B, C, D** is less than **±1.6 mV**, corresponding to **± 2%** of full scale.

- Switch Channel 1, Channel 2, Channel 3 and Channel 4, between coupling **DC 50Ω** and **Grounded**.
- Check after at least 100 sweeps that the **mean** value of **A, B, C, D** is less than **±1.6 mV**, corresponding to **± 2%** of full scale.

- Set coupling all Channel : **DC 1MΩ**
- Check after at least 100 sweeps that the **mean** value of **A, B, C, D** is less than **±1.6 mV**, corresponding to **± 2%** of full scale.

- Switch all Channel between coupling **DC 1MΩ** and **Grounded**.
- Check after at least 100 sweeps that the **mean** value of **A, B, C, D** is less than **±1.6 mV**, corresponding to **± 2%** of full scale.

Section 5 Performance Verification

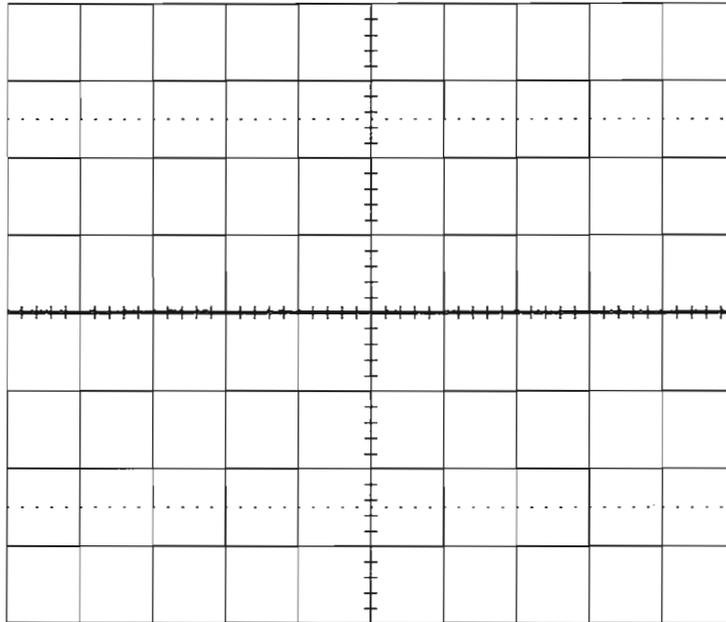
26-Jan-95
9:28:26

A: Average(1)
50 μ s
10.0 mV
624 swps

B: Average(2)
50 μ s
10.0 mV
614 swps

C: Average(3)
50 μ s
10.0 mV
604 swps

D: Average(4)
50 μ s
10.0 mV
589 swps



50 μ s

1 10 mV 50 Ω
2 10 mV 50 Ω
3 10 mV 50 Ω
4 10 mV 50 Ω

1 DC 1.0 mV

ZOOM + MATH

REDEFINE **A**
A=Average(1)

REDEFINE **B**
B=Average(2)

REDEFINE **C**
C=Average(3)

REDEFINE **D**
D=Average(4)

Multi-Zoom
Off On

for Math use
max points
5000

100 MS/s

AUTO

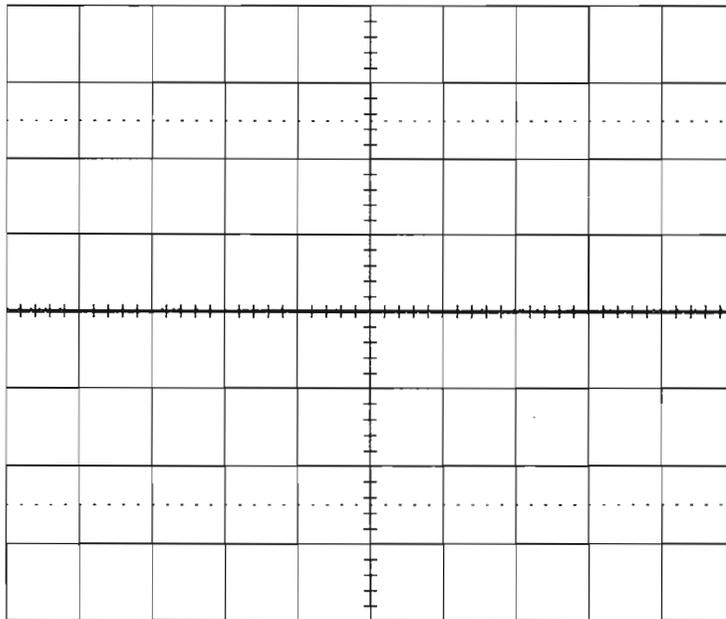
26-Jan-95
9:28:45

A: Average(1)
50 μ s
10.0 mV
698 swps

B: Average(2)
50 μ s
10.0 mV
688 swps

C: Average(3)
50 μ s
10.0 mV
678 swps

D: Average(4)
50 μ s
10.0 mV
663 swps



50 μ s

1 10 mV 50 Ω
2 10 mV 50 Ω
3 10 mV 50 Ω
4 10 mV 50 Ω

A: Average(1) 50000 -> 5000 pts

SETUP OF **A**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh. Res
Extrema
FFT

Avg Type
Summed
Continuous

for
1000
(sweeps)

of
1 2 3 4 **B** C D
M1 M2 M3 M4

100 MS/s

AUTO

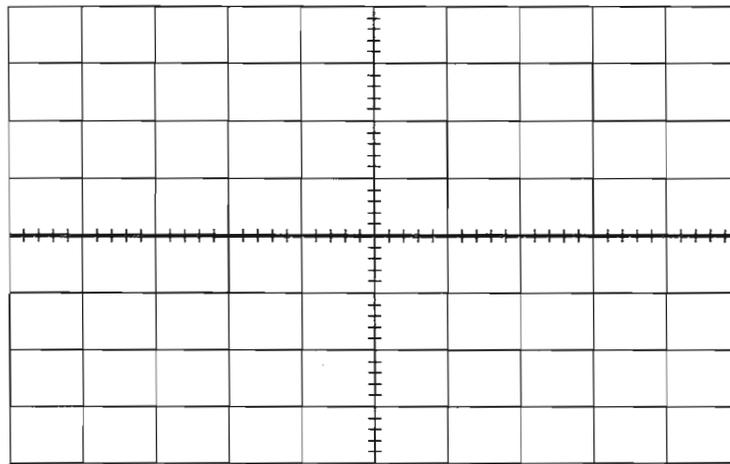
26-Jan-95
9:29:07

A: Average(1)
50 μ s
10.0 mV
757 swps

B: Average(2)
50 μ s
10.0 mV
747 swps

C: Average(3)
50 μ s
10.0 mV
737 swps

D: Average(4)
50 μ s
10.0 mV
722 swps



mean(A) 181.88 μ V
mean(B) 73.24 μ V
mean(C) 37.84 μ V
mean(D) 163.57 μ V

50 μ s

- 1 10 mV 50 Ω
- 2 10 mV 50 Ω
- 3 10 mV 50 Ω
- 4 10 mV 50 Ω

1 DC 1.0 mV

MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

CHANGE PARAMETERS

from
0.00 div
Track OFF On

to
10.00 div

100 MS/s

AUTO

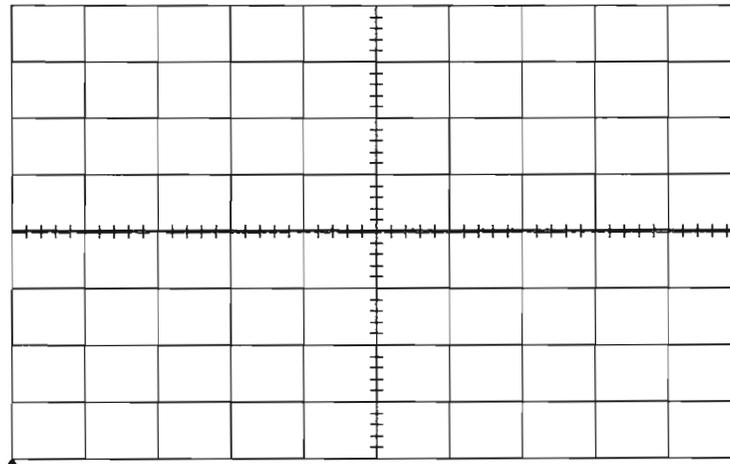
26-Jan-95
9:30:26

A: Average(1)
50 μ s
10.0 mV
105 swps

B: Average(2)
50 μ s
10.0 mV
105 swps

C: Average(3)
50 μ s
10.0 mV
105 swps

D: Average(4)
50 μ s
10.0 mV
105 swps



mean(A) 198.97 μ V
mean(B) 91.55 μ V
mean(C) 50.05 μ V
mean(D) 172.12 μ V

50 μ s

- 1 10 mV 50 Ω
- 2 10 mV 50 Ω
- 3 10 mV 50 Ω
- 4 10 mV 50 Ω

1 DC 1.0 mV

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL PARAMETERS

measure
last
maximum
mean
median
minimum

of
1 2 3 4
A B C D

100 MS/s

AUTO

Section 5 Performance Verification

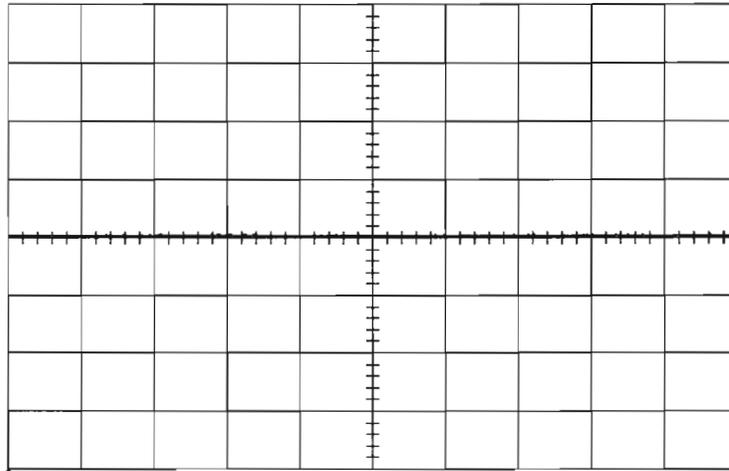
26-Jan-95
9:31:22

A: Average(1)
50 μ s
10.0 mV
105 swps

B: Average(2)
50 μ s
10.0 mV
101 swps

C: Average(3)
50 μ s
10.0 mV
96 swps

D: Average(4)
50 μ s
10.0 mV
93 swps



mean(A)	\neq	388.18 μ V
mean(B)	\neq	275.88 μ V
mean(C)	\neq	283.20 μ V
mean(D)	\neq	433.35 μ V

CHANNEL 1

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

- 50 μ s
- 1 10 mV $\frac{1}{2}$
 - 2 10 mV $\frac{1}{2}$
 - 3 10 mV $\frac{1}{2}$
 - 4 10 mV $\frac{1}{2}$

1 DC 1.0 mV

100 MS/s

AUTO

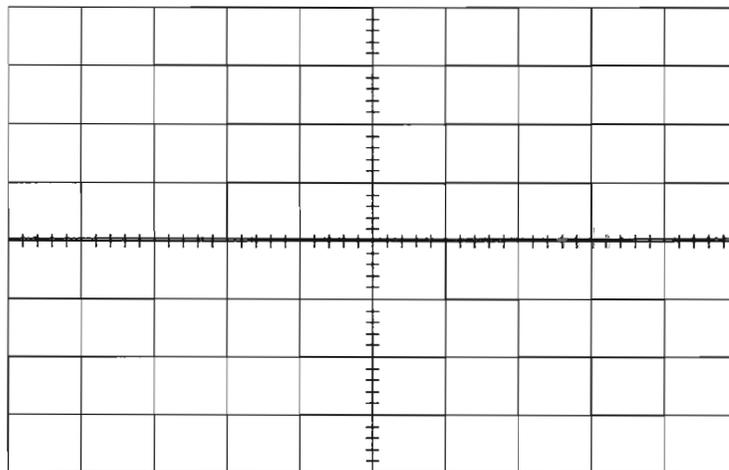
26-Jan-95
9:32:24

A: Average(1)
50 μ s
10.0 mV
105 swps

B: Average(2)
50 μ s
10.0 mV
105 swps

C: Average(3)
50 μ s
10.0 mV
105 swps

D: Average(4)
50 μ s
10.0 mV
105 swps



mean(A)		430.91 μ V
mean(B)	\neq	318.60 μ V
mean(C)	\neq	222.17 μ V
mean(D)	\neq	385.74 μ V

CHANNEL 1

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

- 50 μ s
- 1 10 mV $\frac{1}{2}$
 - 2 10 mV $\frac{1}{2}$
 - 3 10 mV $\frac{1}{2}$
 - 4 10 mV $\frac{1}{2}$

1 DC 1.0 mV

100 MS/s

AUTO

5.7 DC Linearity

Specification

$\leq \pm 2\%$ of full scale at 0 mV offset

5.7.1 Description

This test measures the DC Accuracy within the gain range specified.
The parameters Std voltage are used to measure the amplitude of the DC input signal.

In the absence of the computer automated calibration system based on LeCroy Calibration Software (LeCalsoft) for the 9354A/T model oscilloscope, the manual performance test procedure can be followed to establish a traceable calibration, provided that the measurement instruments used are themselves traceable.
For such calibration, follow the manual linearity test procedure using a calibrated and certified high precision (better than 0.1 %) voltage source, for example TEK PS5004 or equivalent, or use a certified DMM to measure the applied voltage.

5.7.1.a DC 50 Ω

Procedure

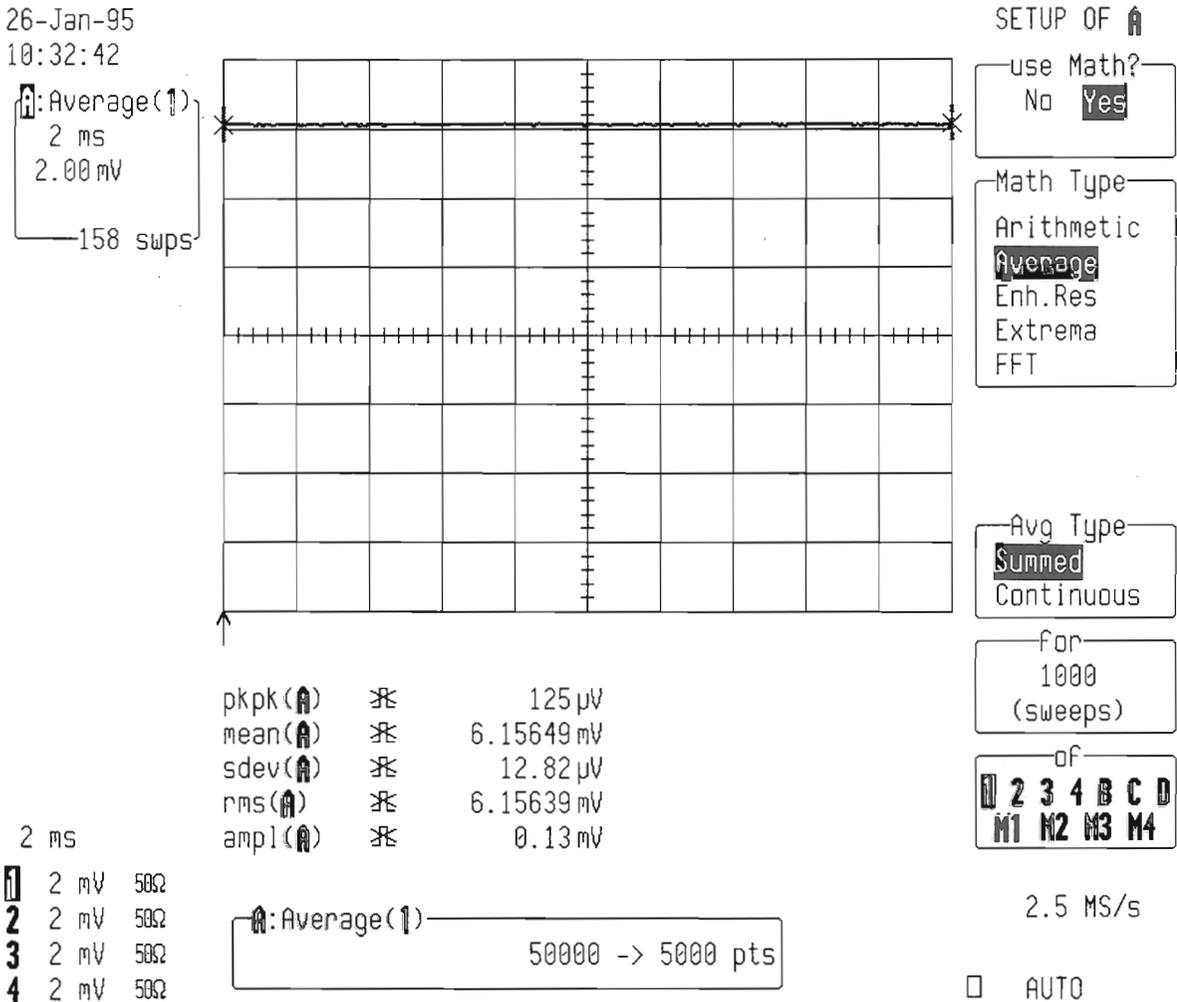
- Turn on trace : **Ch1**
- Display setup : **Standard, Persistence off, Dot join on, Single grid**
- Input Coupling : **DC 50 Ω**
- V/div. offset : **Normal**
- Global BWL : **Off**
- Probe atten : **X1**
- Input offset : **0.0 mV**
- Input gain : **from 2mV/div to 5 V/div. (see table 5-2 and 5-3)**
- Trigger setup : **Edge**
- Trigger on : **1**
- Coupling 1 : **DC**
- Slope 1 : **Pos**
- Mode : **Auto**
- Holdoff : **Off**
- Timebase : **2 msec/div.**
- Channel use : **4**
- Record up : **50 K**
- Turn on trace : **A**
- Select Math Setup
- For Math : **Use at most 5000 points**
- Redefine A
- Use Math ? : **Yes**
- Math Type : **Average**
- Avg Type : **Summed**
- For : **1000 sweeps**
- Of : **Channel 1**

Section 5 Performance Verification

- Turn off trace : **Channel 1**
- Cursors/Measure : **Parameters**
- Mode : **Std Voltage**
- Statistics : **off**
- on displayed trace : **A**

5.7.1.a.1 Positive DC Linearity

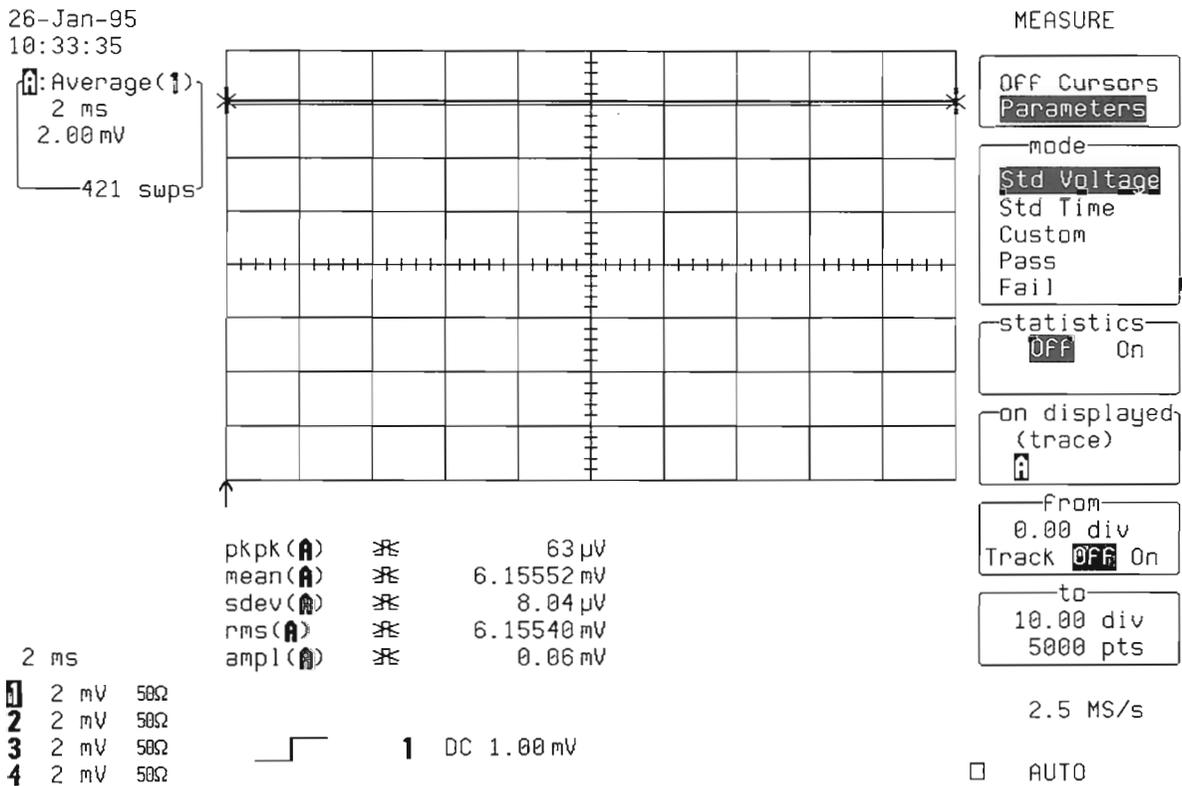
- For the ranges **2 mV/div. to 1 V/div.**, from the high precision voltage source, apply to Channel 1 : **+ 3 major screen divisions.**
- For the low sensitivities : **2 mV, 5 mV, 10 mV, 20 mV and 50 mV/div.**, use a **50 Ohm 20 dB** attenuator.
- For the range **2V/div. and 5V/div.**, the maximum input voltage is **+ 5 V.**



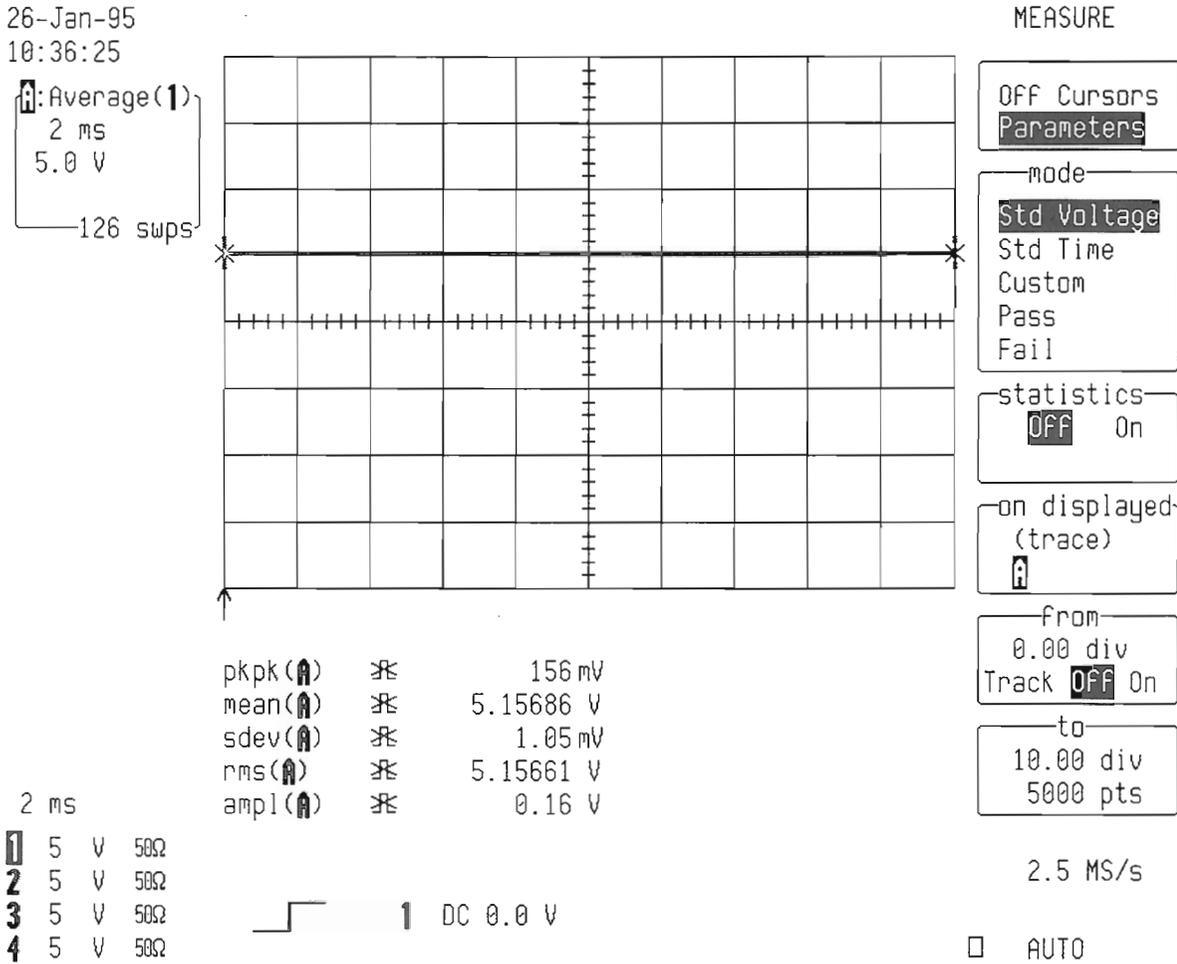
Range	Attenuator	Conditions of Test			Average Mean Parameter Reading		
		PS Output	9354A/T Input	9354A/T Full scale	Min Value -X % of FS	Max Value +X% of FS	X%
2 mV	Yes	+ 60 mV	+ 6 mV	16 mV	+ 5.2 mV	+ 6.8 mV	5%
5 mV	Yes	+ 150 mV	+ 15 mV	40 mV	+ 13.8 mV	+ 16.2 mV	3%
10 mV	Yes	+ 300 mV	+ 30 mV	80 mV	+ 28.4 mV	+ 31.6 mV	2%
20 mV	Yes	+ 600 mV	+ 60 mV	160 mV	+ 56.8 mV	+ 63.2 mV	2%
50 mV	Yes	+ 1.5 V	+150 mV	400 mV	+ 142 mV	+ 158 mV	2%
.1 V	No	+ 300 mV	+ 300 mV	800 mV	+ 284 mV	+ 316 mV	2%
.2 V	No	+ 600 mV	+ 600 mV	1.6 v	+ 568 mV	+ 632 mV	2%
.5 V	No	+ 1.5 V	+ 1.5 V	4 V	+ 1.42 V	+ 1.58 V	2%
1 V	No	+ 3 V	+ 3 V	8 V	+ 2.84 V	+ 3.16 V	2%
2 V	No	Max +5 V	Max +5 V	16 V	+ 4.68 V	+ 5.32 V	2%
5 V	No	Max +5 V	Max +5 V	40 V	+ 4.20 V	+ 5.80 V	2%

Table 5-2 : Positive DC Linearity Readout Accuracy

- For each point, read off the **Mean** parameter voltage, and compare it to the digital readout of the voltage reference
- The **Mean** parameter reading should be within the limits shown in table 5-2.



Section 5 Performance Verification



5.7.1.a.2 Negative DC Linearity

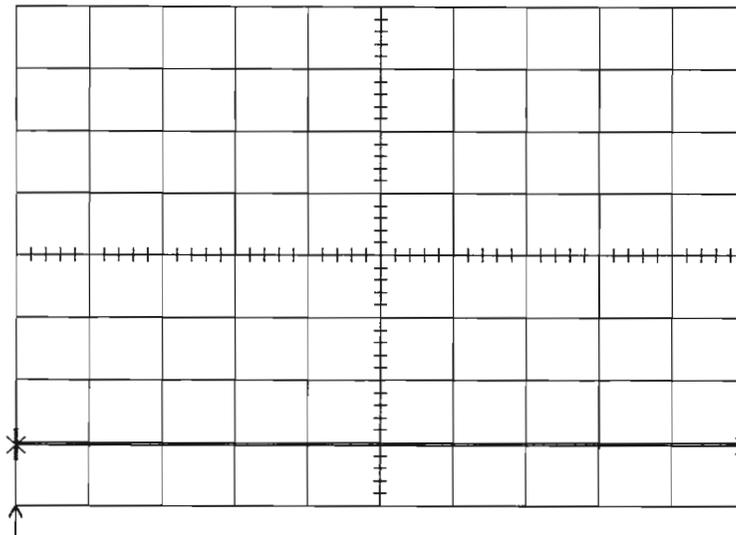
- For the ranges **2 mV/div. to 1 V/div.**, from the high precision voltage source, apply to Channel 1 : - **3 major screen divisions**.
- For the low sensitivities : **2 mV, 5 mV, 10 mV, 20 mV** and **50 mV/div.**, use a **50Ω 20 dB** attenuate.
- For the range **2V/div. and 5V/div.**, the minimum input voltage is - **5 V**.
- For each point, read off the **Mean** parameter voltage, and compare it to the digital readout of the voltage reference.
- The **mean** parameter reading should be within the limits shown in table 5-3.

Range	Attenuator	Conditions of Test			Average Mean Parameter Reading		
		PS Output	9354A/T Input	9354A/T Full scale	Min Value -X % of FS	Max Value +X% of FS	X%
2 mV	Yes	- 60 mV	- 6 mV	16 mV	- 5.2 mV	- 6.8 mV	5%
5 mV	Yes	- 150 mV	- 15 mV	40 mV	- 13.8 mV	- 16.2 mV	3%
10 mV	Yes	- 300 mV	- 30 mV	80 mV	- 28.4 mV	- 31.6 mV	2%
20 mV	Yes	- 600 mV	- 60 mV	160 mV	- 56.8 mV	- 63.2 mV	2%
50 mV	Yes	- 1.5 V	-150 mV	400 mV	- 142 mV	- 158 mV	2%
.1 V	No	- 300 mV	- 300 mV	800 mV	- 284 mV	- 316 mV	2%
.2 V	No	- 600 mV	- 600 mV	1.6 v	- 568 mV	- 632 mV	2%
.5 V	No	- 1.5 V	- 1.5 V	4 V	- 1.42 V	- 1.58 V	2%
1 V	No	- 3 V	- 3 V	8 V	- 2.84 V	- 3.16 V	2%
2 V	No	Max -5 V	Max -5 V	16 V	- 4.68 V	- 5.32 V	2%
5 V	No	Max -5 V	Max -5 V	40 V	- 4.20 V	- 5.80 V	2%

Table 5-3 : Negative DC Linearity Readout Accuracy

26-Jan-95
10:39:08

Average(1)
2 ms
200 mV
216 samps



pkpk (A) ✖ 6.3 mV
mean (A) ✖ -606.128 mV
sdev (A) ✖ 376 µV
rms (A) ✖ 606.135 mV
ampl (A) ✖ 6 mV

- 1 .2 V 50Ω
- 2 .2 V 50Ω
- 3 .2 V 50Ω
- 4 .2 V 50Ω

1 DC 0.000 V

MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

on displayed
(trace)
A

from
0.00 div
Track OFF On

to
10.00 div
5000 pts

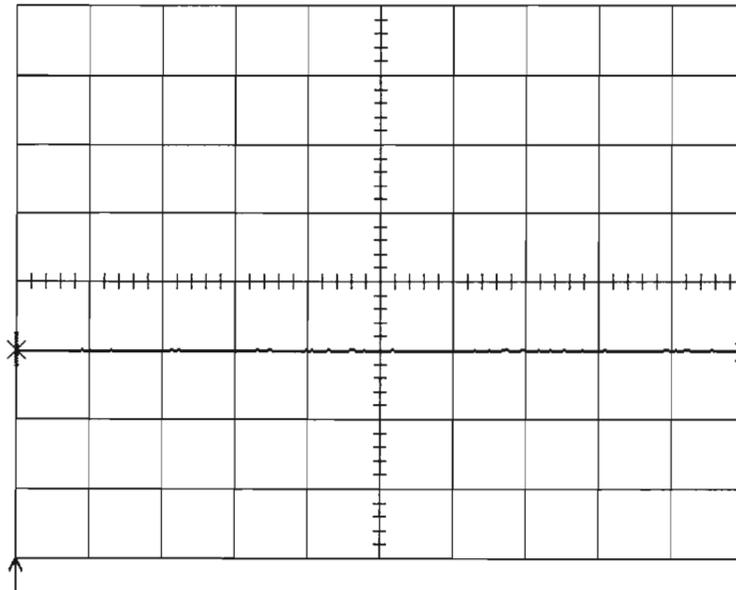
2.5 MS/s

AUTO

Section 5 Performance Verification

26-Jan-95
10:37:07

1: Average(1)
2 ms
5.0 V
128 swps



pkpk(A)	⊗	156 mV
mean(A)	⊗	-5.00183 V
sdev(A)	⊗	3.13 mV
rms(A)	⊗	5.00182 V
ampl(A)	⊗	0.16 V

2 ms

1	5 V	50Ω
2	5 V	50Ω
3	5 V	50Ω
4	5 V	50Ω

1 DC 0.0 V

MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

on displayed
(trace)
A

from
0.00 div
Track OFF On

to
10.00 div
5000 pts

2.5 MS/s

AUTO

5.7.1.b DC 1MΩ

Set the DSO as follows :

- Input Coupling : DC 1MΩ
- Input offset : 0.0 mV
- Input gain : from 2mV/div. to 5 V/div.

- For the ranges 2 mV/div. to 5 V/div., from the high precision voltage source, apply to Channel 1 the following 2 voltages values, one after another : + 3 major screen divisions, - 3 major screen divisions.

- For the low sensitivities : 2, 5, 10, 20 and 50 mV/div., use a 1MΩ 20 dB attenuator (1/10), see table 5-4.

Range	Attenuator	Conditions of Test			Average Mean Parameter Reading		
		PS Output	9354A/T Input	9354A/T Full scale	Min Value ±X% of FS	Max Value ±X% of FS	± X%
Volts/div Control	20 dB						
2 mV	Yes	± 60 mV	± 6 mV	16 mV	± 5.2 mV	± 6.8 mV	5%
5 mV	Yes	± 150 mV	± 15 mV	40 mV	± 13.8 mV	± 16.2 mV	3%
10 mV	Yes	± 300 mV	± 30 mV	80 mV	± 28.4 mV	± 31.6 mV	2%
20 mV	Yes	± 600 mV	± 60 mV	160 mV	± 56.8 mV	± 63.2 mV	2%
50 mV	Yes	± 1.5 V	±150 mV	400 mV	± 142 mV	± 158 mV	2%
.1 V	No	± 300 mV	± 300 mV	800 mV	± 284 mV	± 316 mV	2%
.2 V	No	± 600 mV	± 600 mV	1.6 v	± 568 mV	± 632 mV	2%
.5 V	No	± 1.5 V	± 1.5 V	4 V	± 1.42 V	± 1.58 V	2%
1 V	No	± 3 V	± 3 V	8 V	± 2.84 V	± 3.16 V	2%
2 V	No	± 6 V	± 6 V	16 V	± 5.68 V	± 6.32 V	2%
5 V	No	± 15 V	± 15 V	40 V	± 14.2 V	± 15.8 V	2%

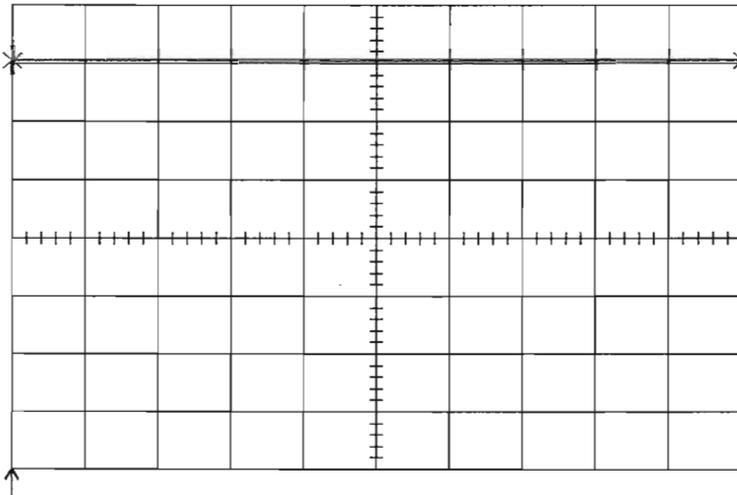
Table 5-4 : 1MΩ DC Linearity Readout Accuracy

- For each point, read off the **Mean** parameter voltage, and compare it to the digital readout of the voltage reference.
- The **mean** parameter reading should be within the limits shown in table 5-4.
- Repeat steps 5.7.1.a and 5.7.1.b for Channel 2, Channel 3, and Channel 4 substituting channel controls and input connector.

Section 5 Performance Verification

26-Jan-95
10:51:22

Average(1)
2 ms
1.00 V
278 swps



pkpk() 0.0 mV
mean() 3.05933 V
sdev() 1.504 mV
rms() 3.05927 V
ampl() 0 mV

CHANNEL 1
Coupling
DC50Ω
Grounded
DC1MΩ
Grounded
AC1MΩ
V/div Offset
NORMAL
ECL TTL
Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

2.5 MS/s

AUTO

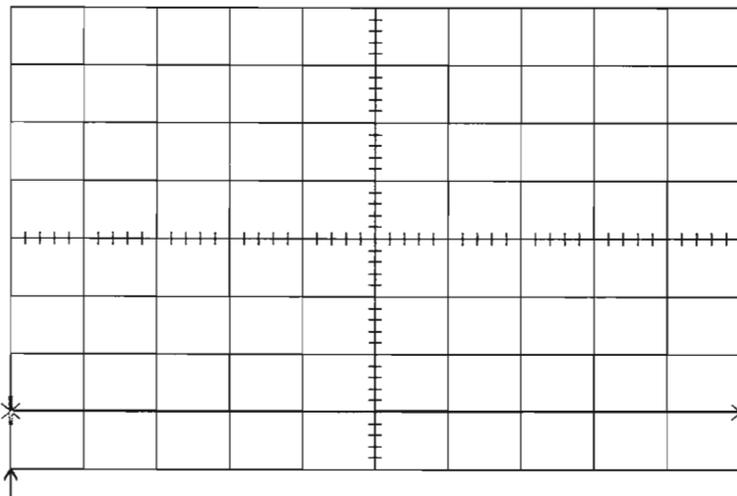
2 ms

- 1 1 V DC
- 2 1 V DC
- 3 1 V DC
- 4 1 V DC

1 DC 0.00 V

26-Jan-95
10:53:12

Average(1)
2 ms
5.0 V
107 swps



pkpk() 0 mV
mean() -14.9872 V
sdev() 5.08 mV
rms() 14.9871 V
ampl() 0.00 V

CHANNEL 1
Coupling
DC50Ω
Grounded
DC1MΩ
Grounded
AC1MΩ
V/div Offset
NORMAL
ECL TTL
Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

2.5 MS/s

AUTO

2 ms

- 1 5 V DC
- 2 5 V DC
- 3 5 V DC
- 4 5 V DC

1 DC 0.0 V

5.8 Offset

5.8.1 Description

The maximum allowed offsets depend on the sensitivity as shown in table 5-5 and 5-6, and is tested at DC 1 M Ω , over the full 2 mV to 5 V range.

Specifications

- $\pm 120\text{mV}$: for the ranges 2mV/div., 5 mV/div.
- $\pm 1.2\text{ V}$: for 10 mV/div., 20 mV/div., 50 mV/div., 100 mV/div.
- $\pm 24\text{ V}$: for 200 mV/div., 500 mV/div., 1 V/div., 2 V/div., 5 V/div.

5.8.1.a Negative Offset Control Procedure

Set the DSO as follows :

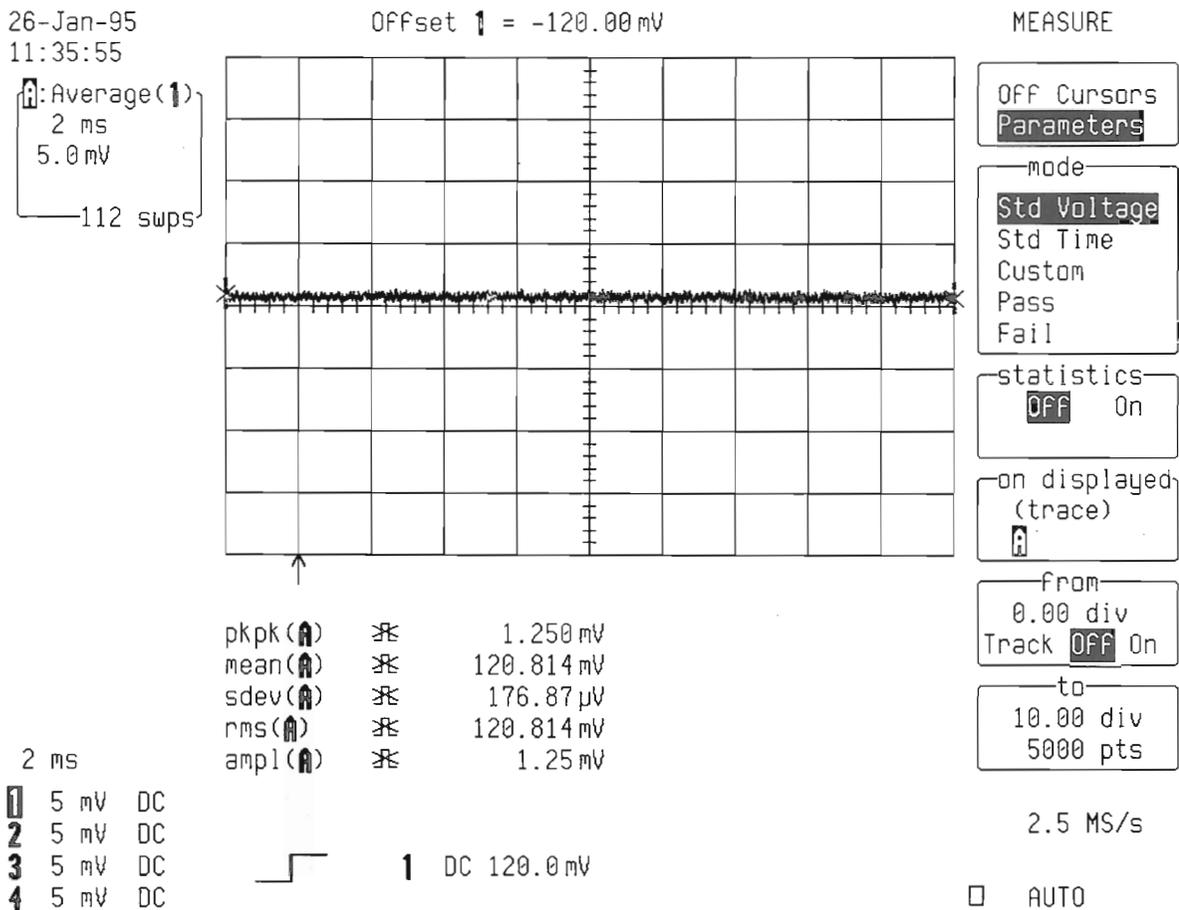
- Turn on trace : **Channel 1**
- Display setup : **Standard, Persistence off, Dot join on, Single grid**
- Input Coupling : **DC 1M Ω**
- V/div. offset : **Normal**
- Global BWL : **Off**
- Probe atten : **X1**
- Input gain : **5 mV**
- Trigger setup : **Edge**
- Trigger on : **1**
- Coupling 1 : **DC**
- Slope 1 : **Pos**
- Mode : **Auto**
- Holdoff : **Off**
- Timebase : **2 msec/div.**
- Channel use : **4**
- Record up : **50 K**
- Turn on trace : **A**
- Select Math Setup
- For Math : **Use at most 5000 points**
- Redefine A
- Use Math ? : **Yes**
- Math Type : **Average**
- Avg Type : **Summed**
- For : **1000 sweeps**
- Of : **Channel 1**
- Turn off trace : **Channel 1**
- Cursors/Measure : **Parameters**
- Mode : **Std Voltage**
- Statistics : **off**
- On displayed trace : **A**

Section 5 Performance Verification

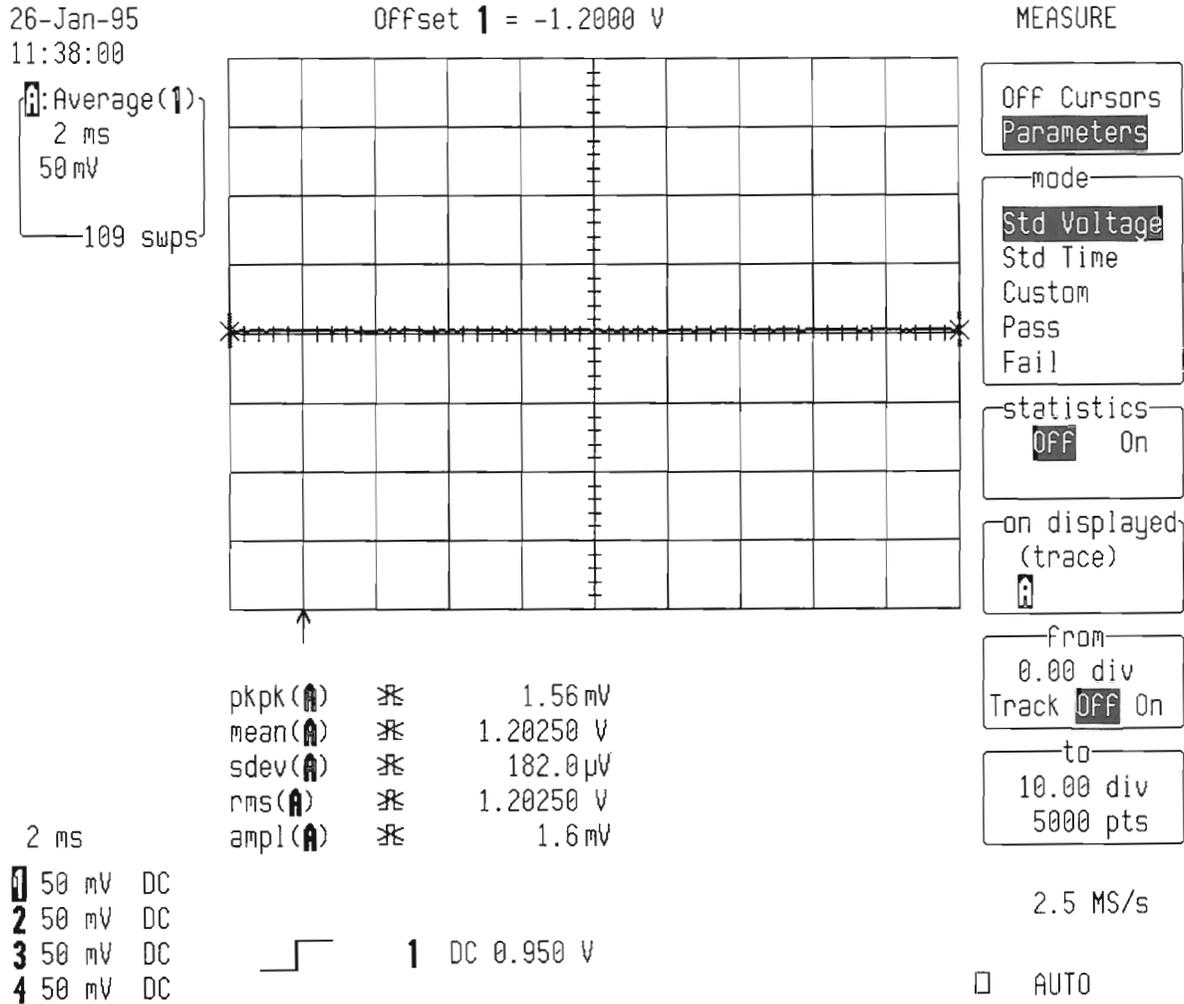
- From the high precision voltage source PS5004, apply to Channel 1 + 120 mV .
- Using the offset control, move Channel 1 trace through the entire range until the maximum offset value is reached : - 120 mV.
- Verify that the displayed trace A : Average (1) is in the screen, near to the center horizontal graticule line.
- Press clear sweeps.
- Check after at least 100 sweeps that the mean (A) parameter readout is : + 120 mV ± 3 %.

Range	Conditions of Test		Offset Control	Mean Parameter Reading		
	PS Output	9354A/T Input		9354A/T Offset	Minimum value, -X %	Maximum Value, +X %
5 mV	+ 120 m V	+ 120 mV	- 120 mV	+ 116.4 mV	+ 123.6 mV	3%
50 mV	+ 1.2 V	+ 1.2 V	- 1.2 V	+ 1.164 V	+ 1.236 V	3%
5 V	+ 20 V	+ 20 V	- 24 V	+ 18.6 V	+ 21.4V	7%

Table 5-5 : Negative offset control



- Set input gain to **50 mV/div.**, from the high precision voltage source, apply to Channel 1 the following voltage value : **+ 1.2 V**.
- Using the offset control, move the Ch1 trace through the entire range until the following offset value is reached : **- 1.2 V**.
- Verify that the displayed trace A : Average (1) is in the screen (near to the center horizontal graticule line).
- Press clear sweeps
- Check after at least 100 sweeps that the mean (A) parameter readout is : **+ 1.2 V ± 3 %** (see table 5-5).



Section 5 Performance Verification

- Set input gain to **5 V/div.**, from the high precision voltage source, apply to Channel 1 : **+ 20 V** (maximum from PS5004).
- Using the offset control, move the Ch1 trace through the entire range until the maximum offset value is reached : **- 24 V**.
- Verify that the displayed trace A : Average (1) is in the screen
- Press clear sweeps
- Check after at least 100 sweeps that the mean (A) parameter readout is : **+ 20 V \pm 7 %** (see table 5-5).
- Repeat step 5.8.1.a for Channel 2, Channel 3 and Channel 4 substituting channel control and input connector.

5.8.1.b Positive Offset Control Procedure

Set the DSO as in 5.8.1.a:

- Channel 1 input gain : **5 mV**
- From the high precision voltage source PS5004, apply to Channel 1 : **- 120 mV** .
- Using the offset control, move Channel 1 trace through the entire range until the maximum offset value is reached : **+ 120 mV**.
- Verify that the displayed trace A : Average (1) is in the screen, near to the center horizontal graticule line.
- Press clear sweeps.
- Check after at least 100 sweeps that the mean (A) parameter readout is : **- 120 mV \pm 3 %**.

Range	Conditions of Test		Offset Control	Mean Parameter Reading		
	PS Output	9354A/T Input		9354A/T Offset	Minimum value, -X %	Maximum Value, +X %
5 mV	- 120 mV	- 120 mV	+ 120 mV	- 116.4 mV	- 123.6 mV	3%
50 mV	- 1.2 V	- 1.2 V	+ 1.2 V	- 1.164 V	- 1.236 V	3%
5 V	- 20 V	- 20 V	+ 24 V	- 18.6 V	- 21.4V	7%

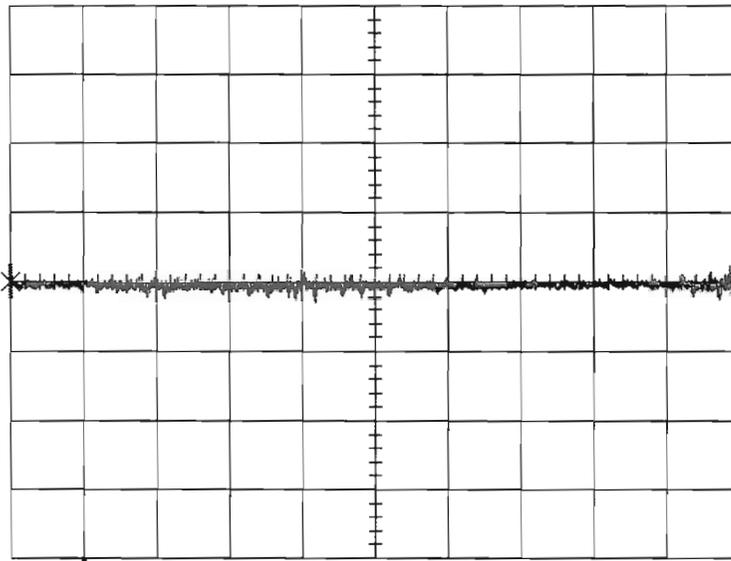
Table 5-6 : Positive offset control

26-Jan-95
11:43:54

Offset 1 = 120.00 mV

MEASURE

Average(1)
2 ms
5.0 mV
124 swps



OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

on displayed
(trace)
A

From
0.00 div
Track OFF On

to
10.00 div
5000 pts

pkpk(A)	✖	2.656 mV
mean(A)	✖	-120.151 mV
sdev(A)	✖	155.81 μ V
rms(A)	✖	120.151 mV
ampl(A)	✖	2.66 mV

2 ms
1 5 mV DC
2 5 mV DC
3 5 mV DC
4 5 mV DC

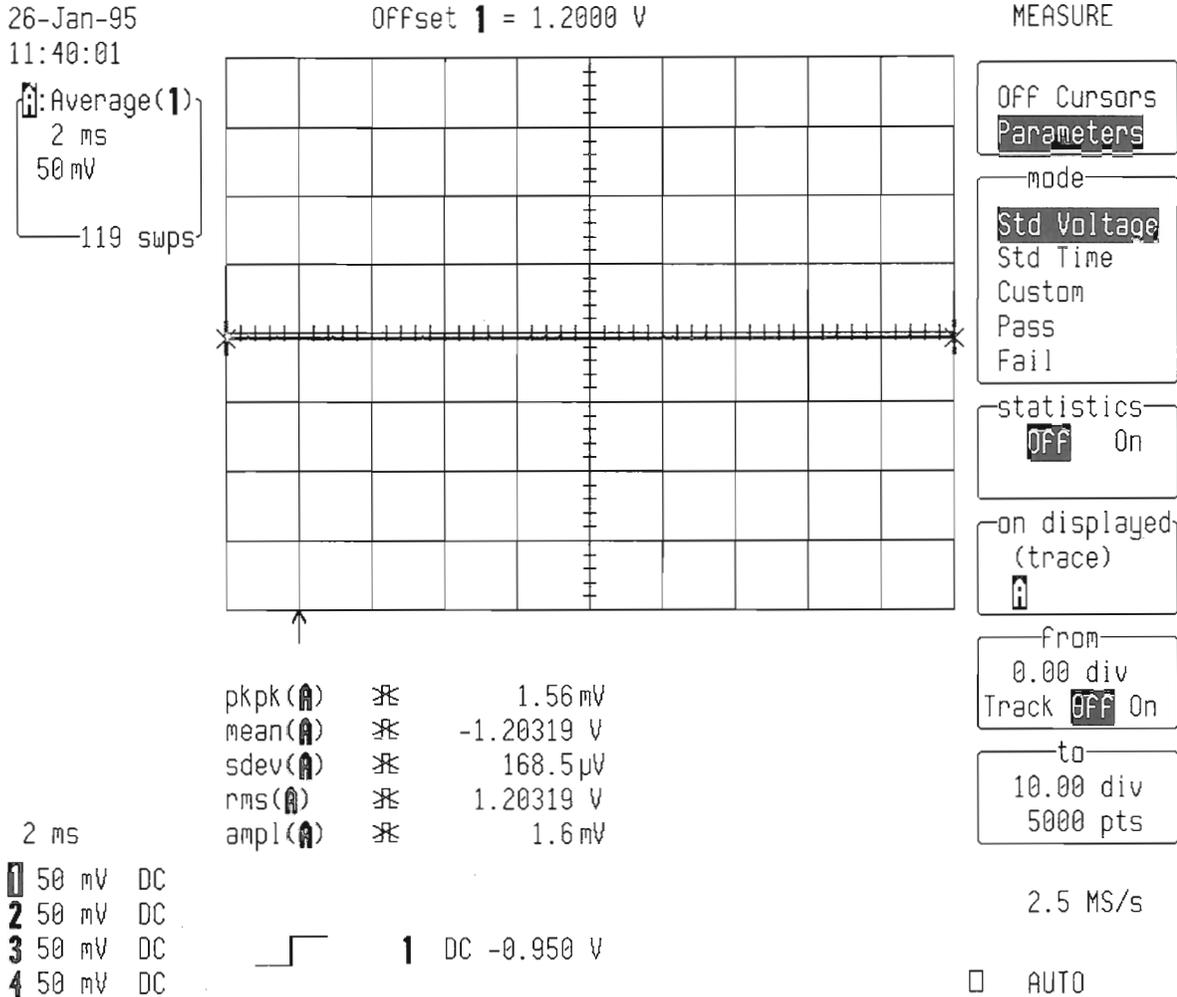
1 DC -95.0 mV

2.5 MS/s

AUTO

- Set input gain to **50 mV/div.**, from the high precision voltage source, apply to Channel 1 the following voltage value : **+ 1.2 V**.
- Using the offset control, move the Ch1 trace through the entire range until the following offset value is reached : **- 1.2 V**.
- Verify that the displayed trace A : Average (1) is in the screen (near to the center horizontal graticule line).
- Press clear sweeps
- Check after at least 100 sweeps that the mean (A) parameter readout is : **+ 1.2 V \pm 3 %** (see table 5-6).

Section 5 Performance Verification



- Set input gain to **5 V/div.**, from the high precision voltage source, apply to Channel 1 - **20 V** (maximum from PS5004).
- Using the offset control, move the Ch1 trace through the entire range until the maximum offset value is reached : **+ 24 V**.
- Verify that the displayed trace A : Average (1) is in the screen.
- Press clear sweeps
- Check after at least 100 sweeps that the mean (A) parameter readout is : **- 20 V ± 7 %** (see table 5-6).
- Repeat step 5.8.1.b for Channel 2, Channel 3 and Channel 4 substituting channel control and input connector.

5.9 Bandwidth

5.9.1 Description

The purpose of this test is to ensure that the entire system has a bandwidth of at least 500 MHz at 200 mV/div. An external source is used as the reference to provide a signal where amplitude and frequency are well controlled. A serious measurement of the bandwidth requires the use of a source whose amplitude does not change with frequency. The LeCroy calibration software corrects for the measured amplitude variation of the generator used. Generators can have errors of - 2 dB above 500 MHz. The non flatness of the generator should be taken into consideration.

Specifications

DC to at least 500 MHz (- 3 dB) at 200 mV/div. and above.

DC to at least 400 MHz at 100 mV/div.

DC to at least 350 MHz below 100 mV/div.

5.9.1.a DC 50 Ω

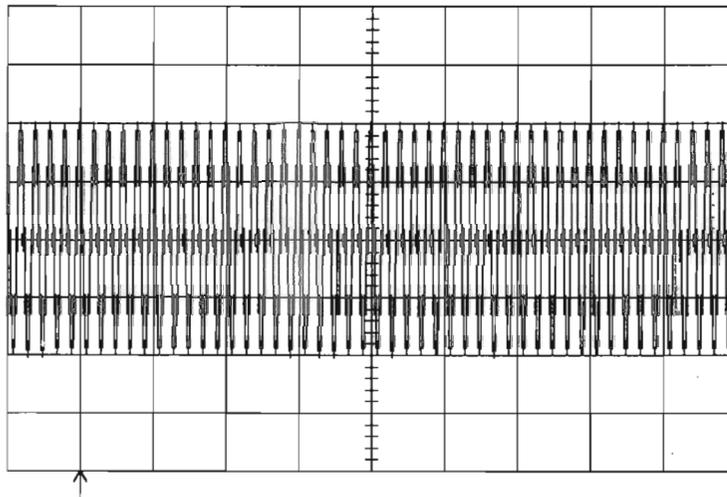
Procedure

- Turn on trace : **Ch1**
 - Display setup : **Standard, Persistence off, Dot join on, Single grid**
 - Input Coupling : **DC 50 Ω**
 - V/div. offset : **Normal**
 - Global BWL : **Off**
 - Probe atten : **X1**
 - Input gain : **100 mV/div.**
 - Offset : **0 mV**
 - Trigger setup : **Edge**
 - Trigger on : **Line**
 - Slope Line : **Pos**
 - Mode : **Norm or Auto**
 - Timebase : **10 μ sec/div.**
 - Channel use : **4**
 - Record up : **50 K**
 - Press Cursors/Measure: **Parameters**
 - Mode : **Custom**
 - Statistics : **off**
 - Change parameters : **Measure**
 - On line 1 : **sdev of 1**
 - On line 2 : **freq of 1**
- Connect a leveled sine wave generator to Channel 1 (i.e. Marconi 2030), set the frequency to **500 KHz**, adjust the generator output amplitude to get on DSO : **sdev(1) = 140 mV.**

Section 5 Performance Verification

26-Jan-95
14:27:00

10 μ s
100 mV



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

slope Line
Positive
Negative

sdev(1) $\sqrt{\quad}$ 140.742 mV
freq(1) Ω 500.02 kHz

10 μ s

- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .1 V 50 Ω
- 4 .1 V 50 Ω

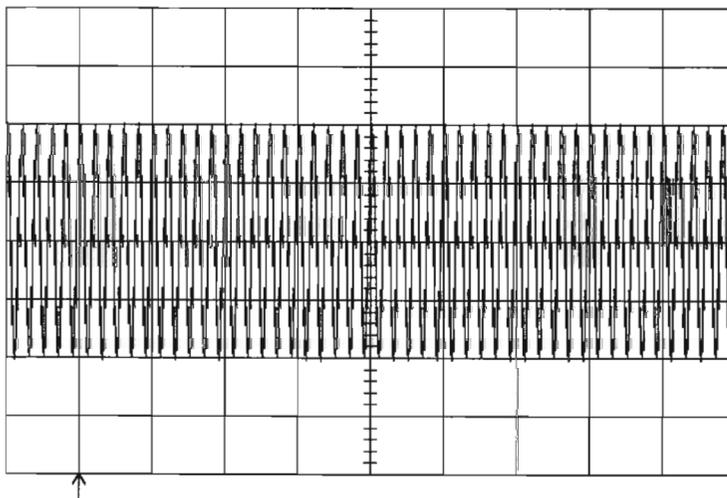
Line

500 MS/s

AUTO

26-Jan-95
14:27:25

10 μ s
100 mV



MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

CHANGE
PARAMETERS

from
0.00 div
Track OFF On

to
10.00 div

sdev(1) $\sqrt{\quad}$ 140.751 mV
freq(1) Ω 500.01 kHz

10 μ s

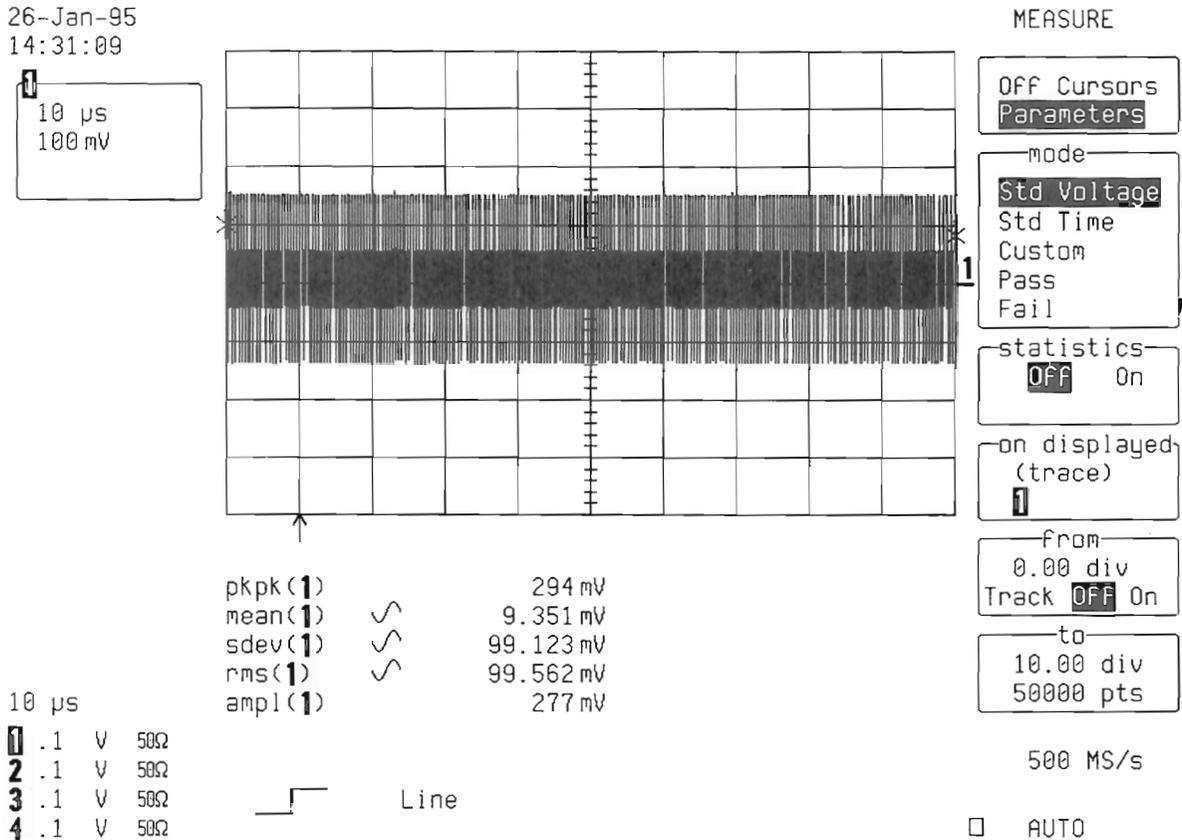
- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .1 V 50 Ω
- 4 .1 V 50 Ω

Line

500 MS/s

AUTO

- Increase the generator frequency in multi **50 MHz** steps until the sine wave amplitude is 70% of the initial amplitude at 500 KHz .
- At each 50 MHz step, check that **sdev(1) > 98 mV**
- When **sdev(1) = 98 mV (3 dB point)** the frequency of the generator must be at least **400 MHz**.

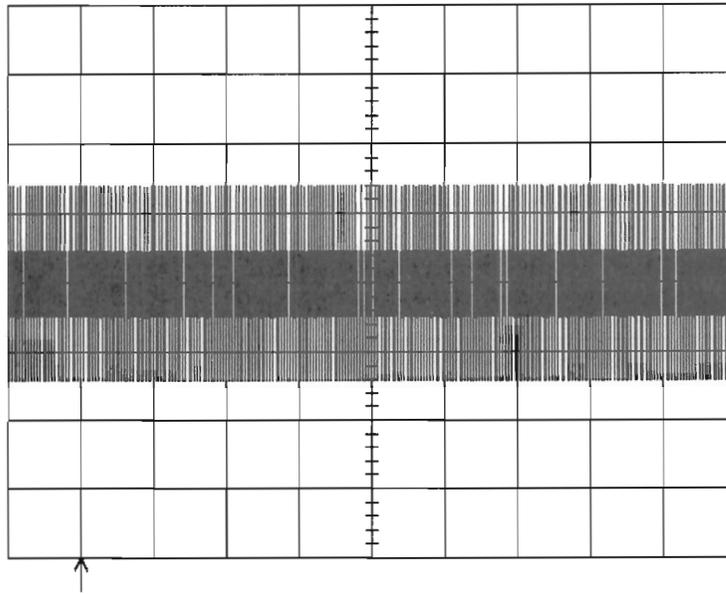


- Select Coupling and **Global BWL : On** (bandwidth limiter on)
- Check that the frequency at the 3 dB point (**sdev(1) = 98 mV**) is typically **30 MHz** .
(between 22 MHz and 43 MHz).

Section 5 Performance Verification

26-Jan-95
14:34:39

1
10 μ s
100 mV



CHANNEL 1
Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω
V/div Offset
NORMAL
ECL TTL
Global BWL
OFF On
(30 MHz)

sdev(1) \checkmark 98.350 mV
Freq(1) Ω 29.0 MHz

Probe Atten
 x1
x2
x5
x10
x20

10 μ s BWL

1 .1 V 50 Ω
2 .1 V 50 Ω
3 .1 V 50 Ω
4 .1 V 50 Ω

 Line

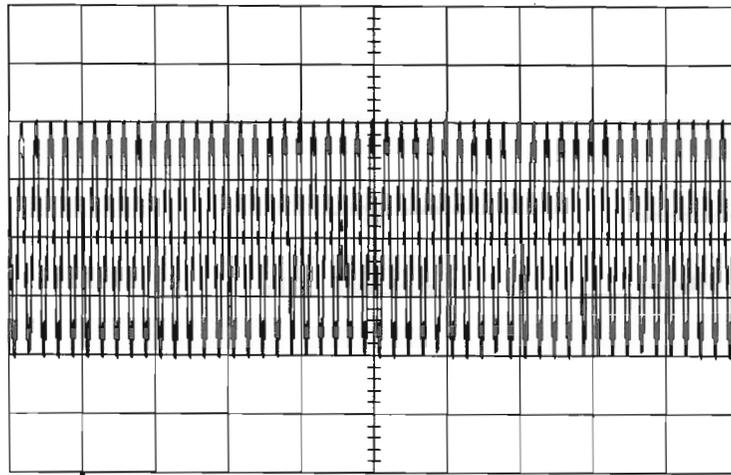
500 MS/s

AUTO

- Set DSO Input gain : **200 mV/div.**
- Select Coupling and **Global BWL : Off** (bandwidth limiter off)
- Set sine wave generator frequency to **500 KHz**, adjust the generator output amplitude to get on DSO : **sdev(1) = 282 mV.**
- Increase the generator frequency in multi **50 MHz** steps until the sine wave amplitude is 70% of the initial amplitude at 500 KHz .
- At each 50 MHz step, check that **sdev(1) > 198 mV**
- When **sdev(1) = 198 mV (3 dB point)** the frequency of the generator must be at least **500 MHz.**

26-Jan-95
14:37:10

10 μ s
200 mV



sdev(1) $\sqrt{\quad}$ 282.045 mV
freq(1) $\Pi\Pi$ 500.0 kHz

10 μ s

- 1 .2 V 50 Ω
- 2 .2 V 50 Ω
- 3 .2 V 50 Ω
- 4 .2 V 50 Ω

Line

MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

CHANGE
PARAMETERS

from
0.00 div
Track OFF On

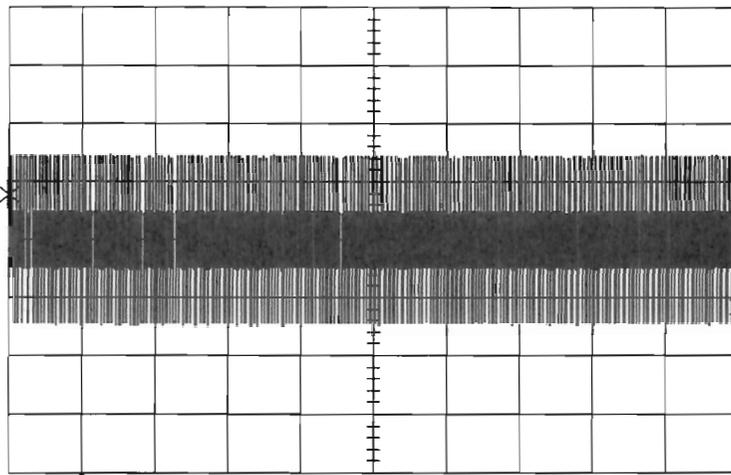
to
10.00 div

500 MS/s

AUTO

26-Jan-95
14:38:39

10 μ s
200 mV



pkpk(1) 588 mV
mean(1) -4.688 mV
sdev(1) 197.439 mV
rms(1) 197.493 mV
ampl(1) 544 mV

10 μ s

- 1 .2 V 50 Ω
- 2 .2 V 50 Ω
- 3 .2 V 50 Ω
- 4 .2 V 50 Ω

Line

MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

on displayed
(trace)

from
0.00 div
Track OFF On

to
10.00 div
50000 pts

500 MS/s

AUTO

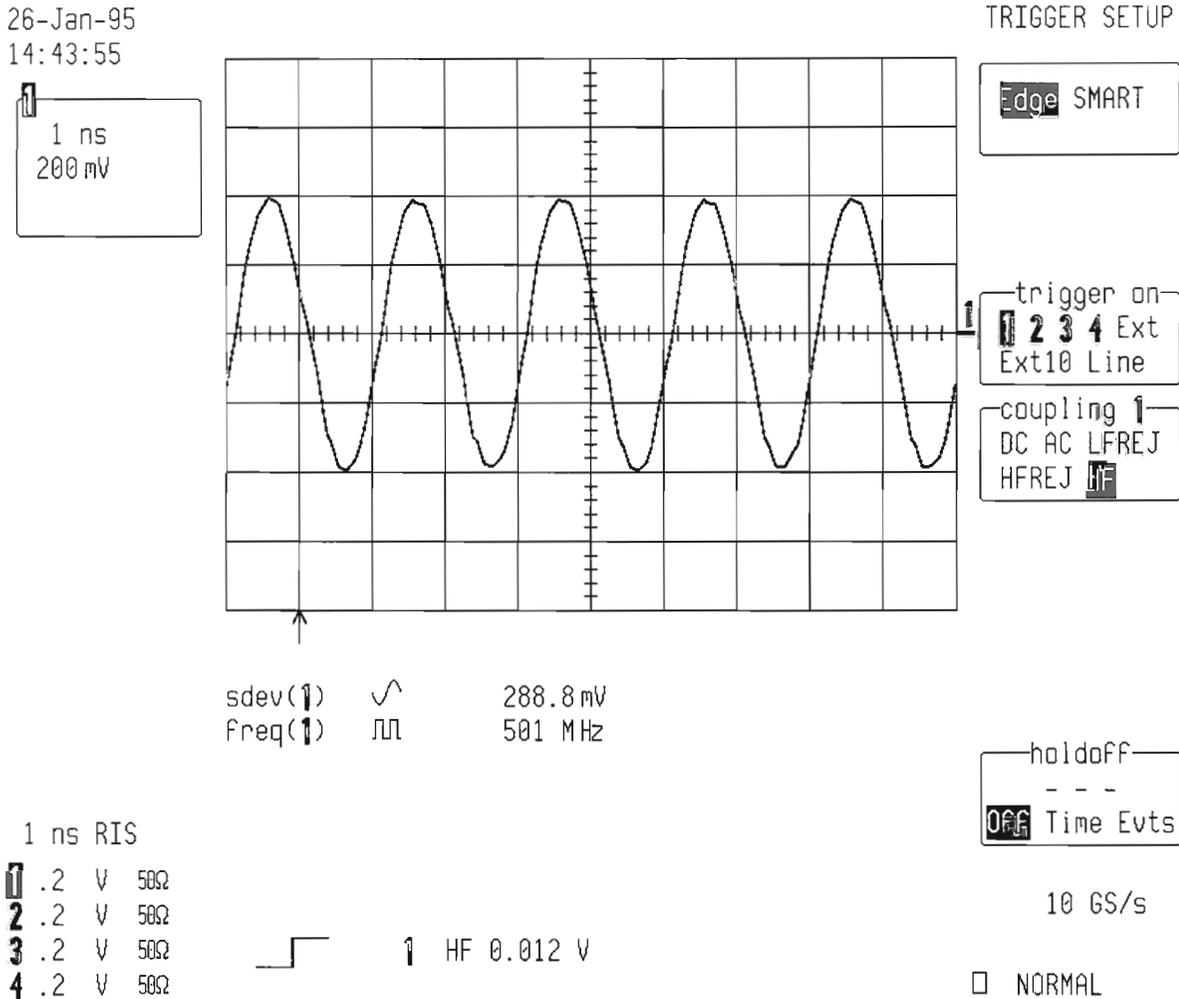
Section 5 Performance Verification

5.9.1.a.1 Trigger Bandwidth

- Set Trigger on : 1
- Coupling 1 : HF
- Mode : Norm
- Timebase : 1 nsec/div.

- Set sine wave generator frequency to 501 MHz

- Change Trigger level, until the scope triggers on Channel 1.



- Check : The scope must keep triggering in a stable way, a smooth 501 MHz sine wave must be visible on the screen.

- Repeat step 5.9.1.a and 5.9.1.a.1 for Channel 2, Channel 3 and Channel 4, substituting channel control and input connector.

5.9.1.b DC 1 M Ω

The purpose of this test is to ensure that the entire 9354A/T system has a bandwidth of at least **250 MHz at probe tip**.

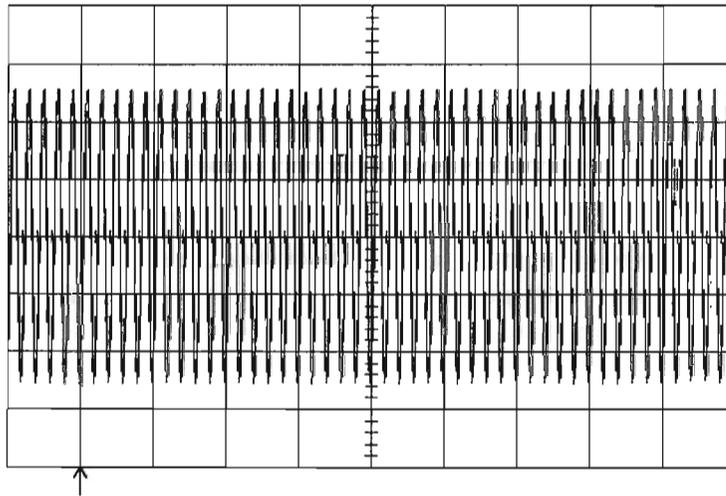
Set up a Tektronix SG503 leveled sine wave generator or equivalent.

- Terminate the output of the SG503 via a **50 Ω feed through** and connect it to the channel 1 input through a **10X-probe** using a probe tip BNC Jack adapter. Make sure the probe compensation is perfectly adjusted at low frequency.
- Turn on trace : **Ch1**
- Display setup : **Standard, Persistence off, Dot join on, Single grid**
- Input Coupling : **AC 1M Ω**
- V/div. offset : **Normal**
- Global BWL : **Off**
- Probe atten : **X10**
- Input gain : **1 V/div.**
- Offset : **0 mV**
- Trigger setup : **Edge**
- Trigger on : **Line**
- Slope Line : **Pos**
- Mode : **Norm**
- Timebase : **10 μ sec/div.**
- Channel use : **4**
- Record up : **50 K**
- Press Cursors/Measure: **Parameters**
- Mode : **Custom**
- Statistics : **off**
- Change parameters : **Measure**
- On line 1 : **sdev of 1**
- On line 2 : **freq of 1**
- Set sine wave generator frequency to **500 KHz**, adjust the generator output amplitude to get on DSO : **sdev(1) = 1.8 V**.
- Increase the generator frequency in multi **MHz** steps until the sine wave amplitude is 70% of the initial amplitude at 500 KHz .
- At each frequency step, check that **sdev(1) > 1.25 V**
- When **sdev(1) = 1.25 V (3 dB point)** the frequency of the generator must be at least **250 MHz**.

Section 5 Performance Verification

26-Jan-95
14:52:03

10 μ s
1.00 V



CHANNEL 1

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe sensed
(x10)

sdev(1) \surd 1.80290 V
Freq(1) $\Omega\Omega$ 499.91 KHz

10 μ s

- 1 .1 V AC $\times 10$
- 2 .2 V 50 Ω
- 3 .2 V 50 Ω
- 4 .2 V 50 Ω

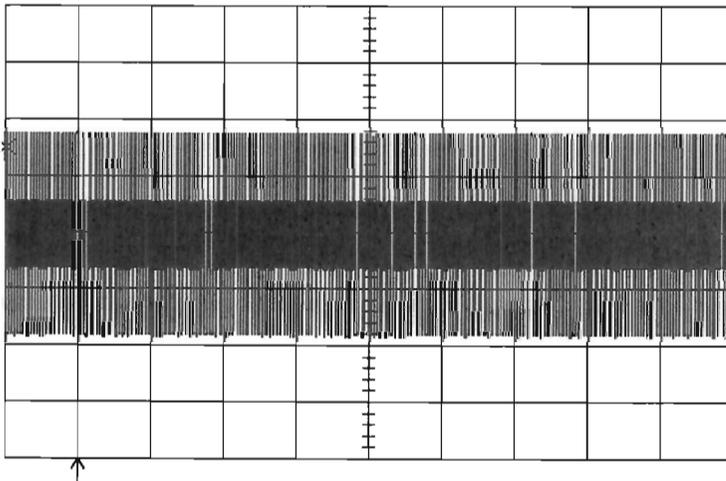
Line

500 MS/s

NORMAL

26-Jan-95
14:55:36

10 μ s
1.00 V



MEASURE

OFF Cursors
Parameters

mode
Std Voltage
Std Time
Custom
Pass
Fail

statistics
OFF On

on displayed
(trace)
1

from
0.00 div
Track **OFF** On

to
10.00 div
50000 pts

500 MS/s

pkpk(1) 3.62 V
mean(1) -32.96 mV
sdev(1) 1.25378 V
rms(1) 1.25420 V
ampl(1) 3.44 V

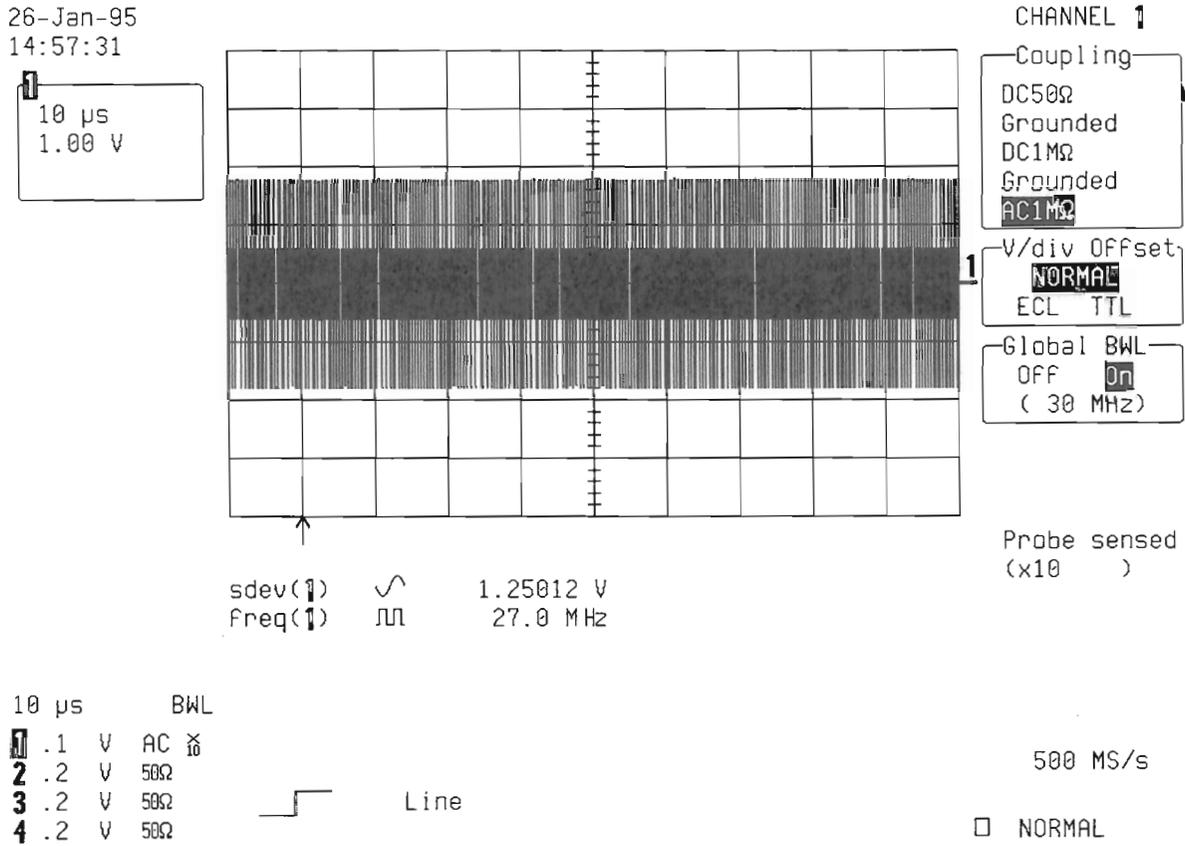
10 μ s

- 1 .1 V AC $\times 10$
- 2 .2 V 50 Ω
- 3 .2 V 50 Ω
- 4 .2 V 50 Ω

Line

NORMAL

- Set the bandwidth limiter on :
- Select Coupling and **Global BWL : On**
- Check that the frequency at the 3 dB point is typically **30 MHz** .
(between 22 MHz and 43 MHz).



- Repeat step 5.9.1.b for Channel 2, Channel 3 and Channel 4 substituting channel control and input connector.

Section 5 Performance Verification

5.10 Trigger Level

5.10.1 Description

The trigger capabilities are tested for several cases of the standard edge trigger :

- Channel (internal), and External Trigger sources
- Three DC levels : - 3, 0, - 3 major screen divisions
- DC coupling
- Positive and negative slopes

5.10.2 Channel (internal)

The horizontal and vertical errors for a trigger at 0 v threshold are determined by comparing the crossing point of the same sine wave at two different amplitudes.

- Setup any sine wave generator capable of generating sine waves of **1 KHz, 4V pkpk**.
- Connect the generator output to Channel 1

- Turn on trace : **Ch1**
- Input Coupling Ch 1 : **DC 50 Ω**
- V/div. offset : **Normal**
- Input gain : **.5 V/div.**
- Input offset : **0 mV**
- Trigger setup : **Edge**
- Trigger on : **1**
- Coupling 1 : **DC**
- Slope 1 : **Pos**
- Set Trigger level : **DC 0.0 mV**
- Mode : **Single**
- Pre-Trigger Delay : **50 %**
- Timebase : **.1 msec/div.**
- Channel Use : **4**
- Record up to : **50 K samples**

- Adjust the sine wave generator's output amplitude to get **8 divisions peak to peak**, corresponding to a **4 V** amplitude.
- It is important that the offset of the input is set to **zero mV**, use show status and acquisition status to verify.

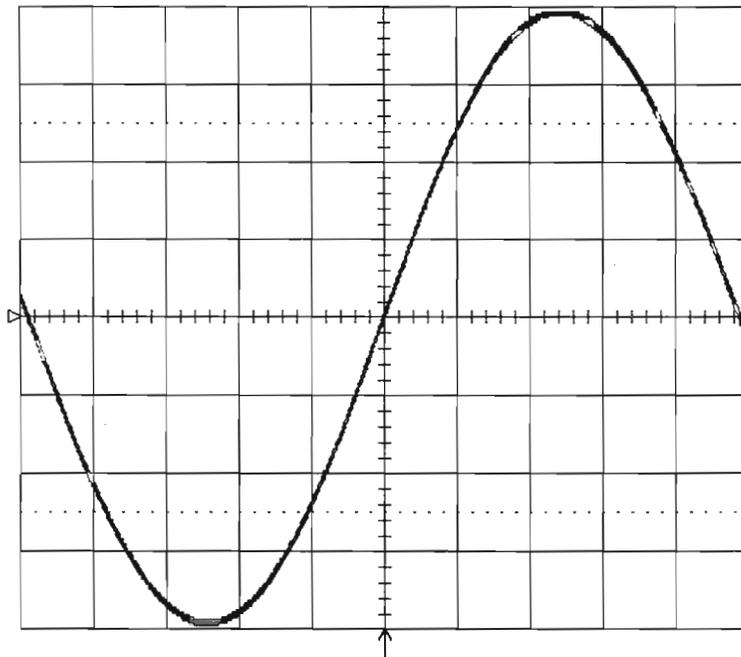
- Display setup : **Dot join Off**
- Set **Persistence On**, and acquire few sweeps in Single Trigger mode.
- Connect a **3 dB attenuator**, and acquire few more sweeps in Single mode.

- Select Cursors/Measure : **Cursors, Time, Absolute**
- Use the " cursor position " knob, to move the marker at the **horizontal crossing point** of the two sine waves.

- Check that the **time** difference obtained between the marker and the trigger is within **$\pm 20 \mu \text{sec}$** . The time readout is below 0.50 V in the icon 1, at top left.

26-Jan-95
15:33:02

1
.1 ms
0.50 V



DISPLAY SETUP

Standard XY

Persistence OFF **On** (Infinite)

Dot Join **OFF** On

Persistence Setup

Grids **Single** Dual Quad

Waveform+Text intensity 90 %

Grid intensity 60 %

.1 ms

- 1** .5 V 50Ω
- 2** .5 V 50Ω
- 3** .5 V 50Ω
- 4** .5 V 50Ω

10 sweeps

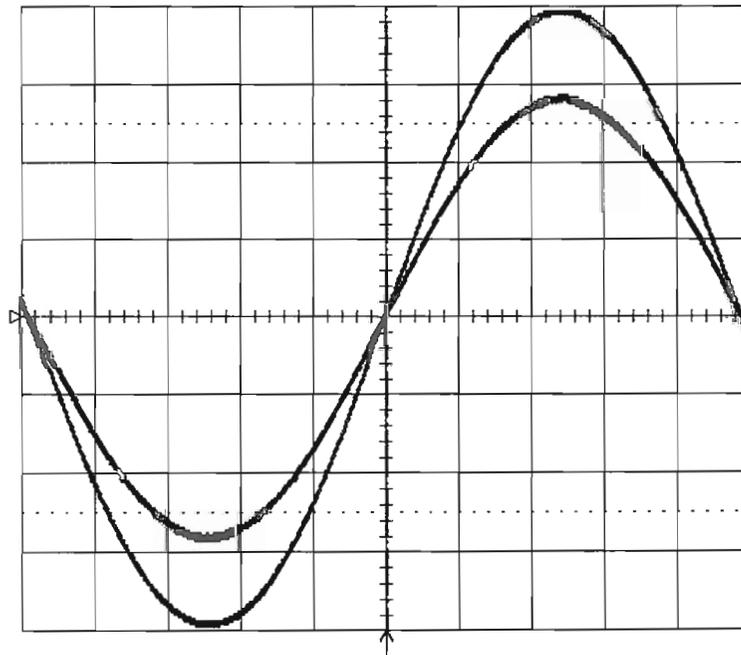
1 DC 0.00 V

50 MS/s

STOPPED

26-Jan-95
15:35:28

1
.1 ms
0.50 V
2 μs



MEASURE

OFF **Cursors** Parameters

mode **Time** Amplitude

type **Relative** Absolute

cursor Position

.1 ms

- 1** .5 V 50Ω
- 2** .5 V 50Ω
- 3** .5 V 50Ω
- 4** .5 V 50Ω

22 sweeps

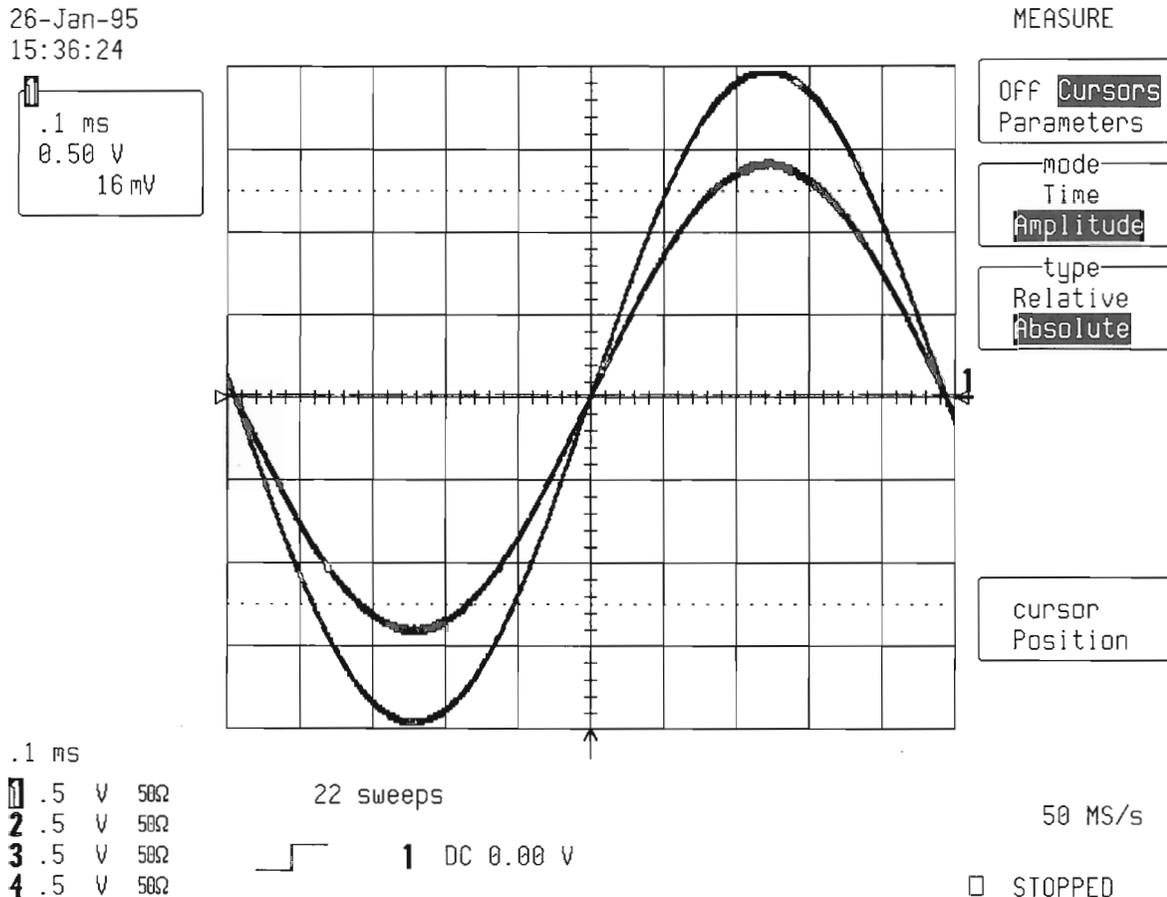
1 DC 0.00 V

50 MS/s

STOPPED

Section 5 Performance Verification

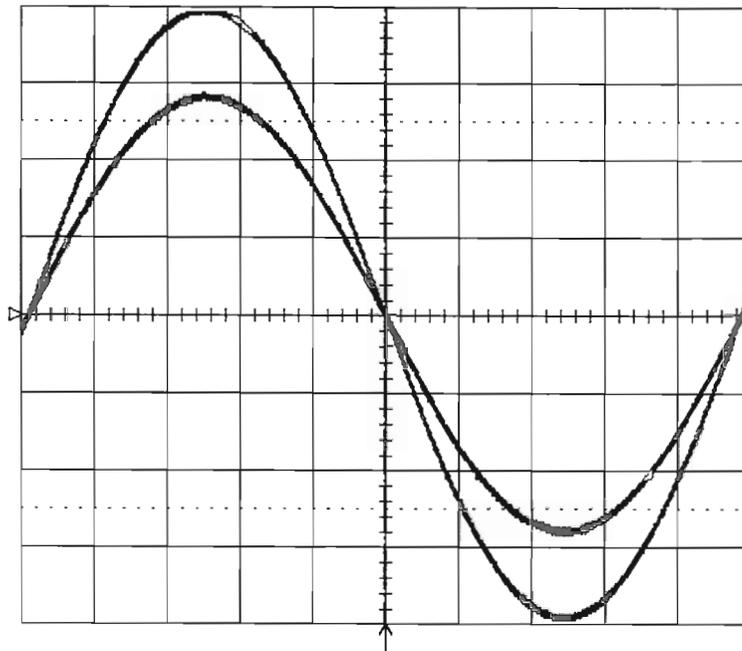
- Select Cursors mode : **Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker at the **vertical crossing point** of the two sine waves.
- Check that the **voltage** difference obtained between the marker and the trigger level is within ± 200 mV. The level readout is below 0.50 V in the icon 1, at top left.



- Set Trigger Slope 1 : **Neg**
- Disconnect the **3 dB attenuator** from the BNC input
- Acquire few sweeps in Single Trigger mode.
- Connect the **3 dB attenuator**, and acquire few more sweeps in Single mode.
- Select Cursors/Measure : **Cursors, Time, Absolute**
- Use the " cursor position " knob, to move the marker at the **horizontal crossing point** of the two sine waves.
- Check that the **time** difference obtained between the marker and the trigger is within ± 20 μ sec. The time readout is below 0.50 V in the icon 1, at top left.
- Select Cursors mode : **Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker at the **vertical crossing point** of the two sine waves.
- Check that the **voltage** difference obtained between the marker and the trigger level is within ± 200 mV. The level readout is below 0.50 V in the icon 1, at top left.

26-Jan-95
15:38:24

1
.1 ms
0.50 V
-2 μ s



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

coupling **1**
DC AC LFREJ
HFREJ HF

slope **1**
Pos Neg

holdoff
- - -
 Off Time Evts

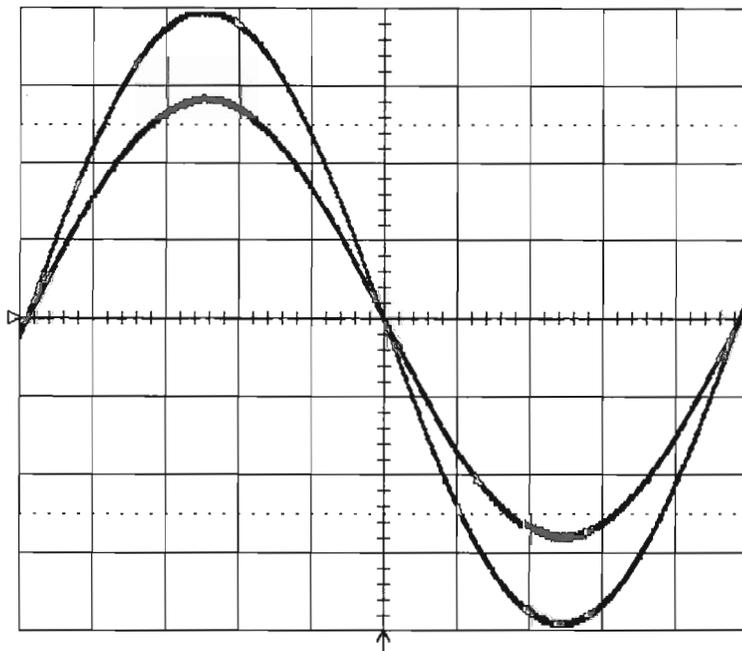
.1 ms
1 .5 V 50 Ω
2 .5 V 50 Ω
3 .5 V 50 Ω
4 .5 V 50 Ω

22 sweeps
 1 DC 0.00 V

50 MS/s
 STOPPED

26-Jan-95
15:39:34

1
.1 ms
0.50 V
-8 mV



MEASURE

OFF Cursors
Parameters

mode
Time
 Amplitude

type
Relative
 Absolute

cursor
Position

.1 ms
1 .5 V 50 Ω
2 .5 V 50 Ω
3 .5 V 50 Ω
4 .5 V 50 Ω

22 sweeps
 1 DC 0.00 V

50 MS/s
 STOPPED

Section 5 Performance Verification

- Set Trigger level : DC + 1.5 V
- Disconnect the 3 dB attenuator from the BNC input
- Set Trigger Slope 1 : Pos

- Acquire few sweeps in Single Trigger mode.

- The sine wave must pass through the **horizontal center** of the screen at the **vertical + 3 divisions**.

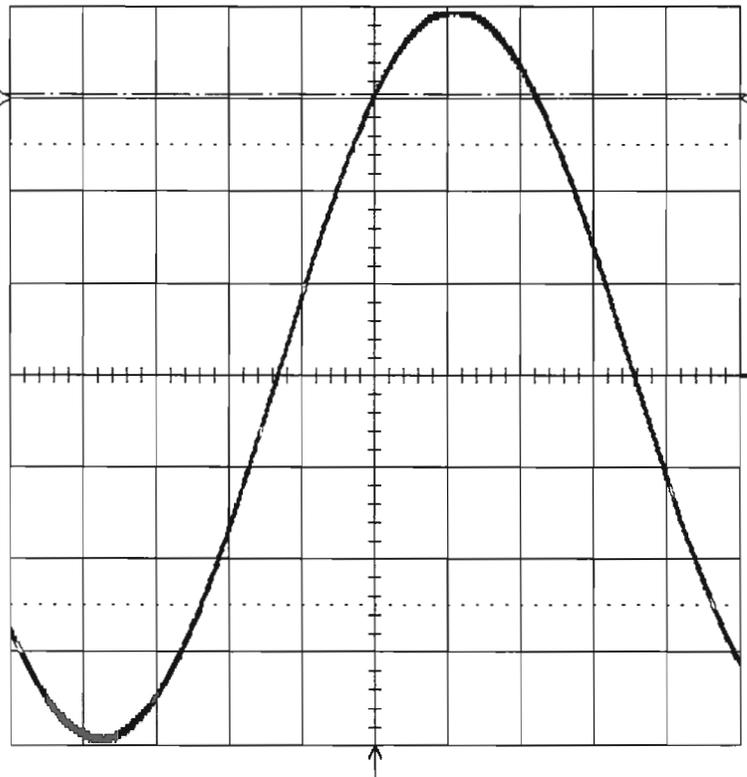
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**

- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).

- Check that the **vertical crossing point level is + 1.5 V ± .2 V**. See icon 1 at top left.

26-Jan-95
15:42:04

1
.1 ms
0.50 V
1.523 V



MEASURE

OFF Cursors
Parameters

mode
Time
Amplitude

type
Relative
Absolute

cursor
Position

.1 ms

- 1 .5 V 50Ω
- 2 .5 V 50Ω
- 3 .5 V 50Ω
- 4 .5 V 50Ω

12 sweeps



1 DC 1.50 V

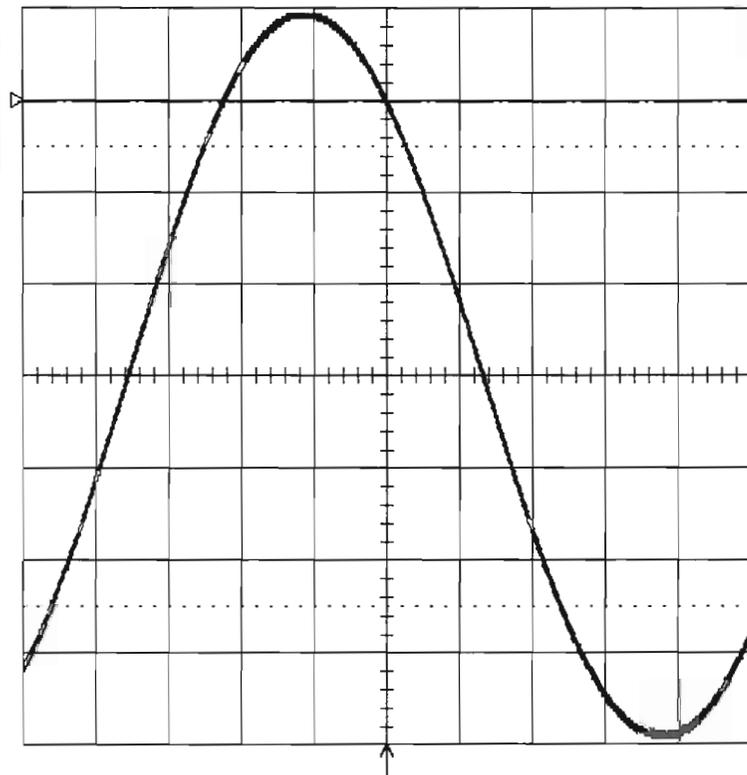
50 MS/s

STOPPED

- Set Trigger Slope 1 : **Neg**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical + 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is + 1.5 V ± .2 V**. See icon at top left.

26-Jan-95
15:43:54

1
.1 ms
0.50 V
1.492 V



TRIGGER SETUP

Edge SMART

trigger on
 2 3 4 Ext
Ext10 Line

coupling 1
 DC AC LFREJ
 HFREJ HF

slope 1
Pos Neg

holdoff
- - -
 OFF Time Evts

.1 ms

1 .5 V 50Ω
 2 .5 V 50Ω
 3 .5 V 50Ω
 4 .5 V 50Ω

11 sweeps

DC 1.50 V

50 MS/s

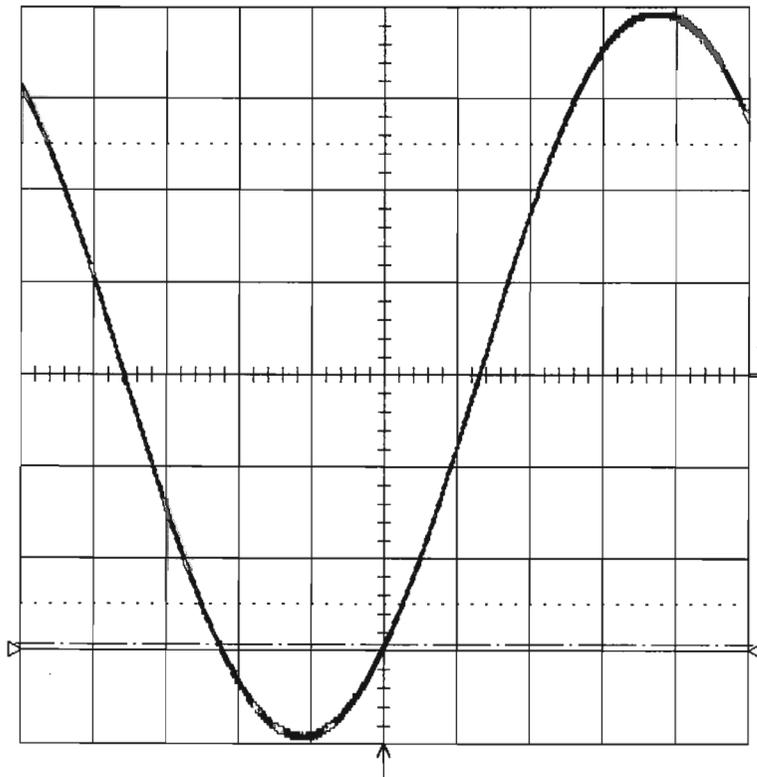
STOPPED

Section 5 Performance Verification

- Set Trigger level : **DC - 1.5 V**
- Set Trigger Slope 1 : **Pos**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical - 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is - 1.5 V ± .2 V**. See icon 1 at top left.

26-Jan-95
15:46:42

1
.1 ms
0.50 V
-1.469 V



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

coupling 1
DC AC LFREJ
HFREJ HF

slope 1
Pos Neg

holdoff
- - -
OFF Time Evts

.1 ms

1 .5 V 50Ω
2 .5 V 50Ω
3 .5 V 50Ω
4 .5 V 50Ω

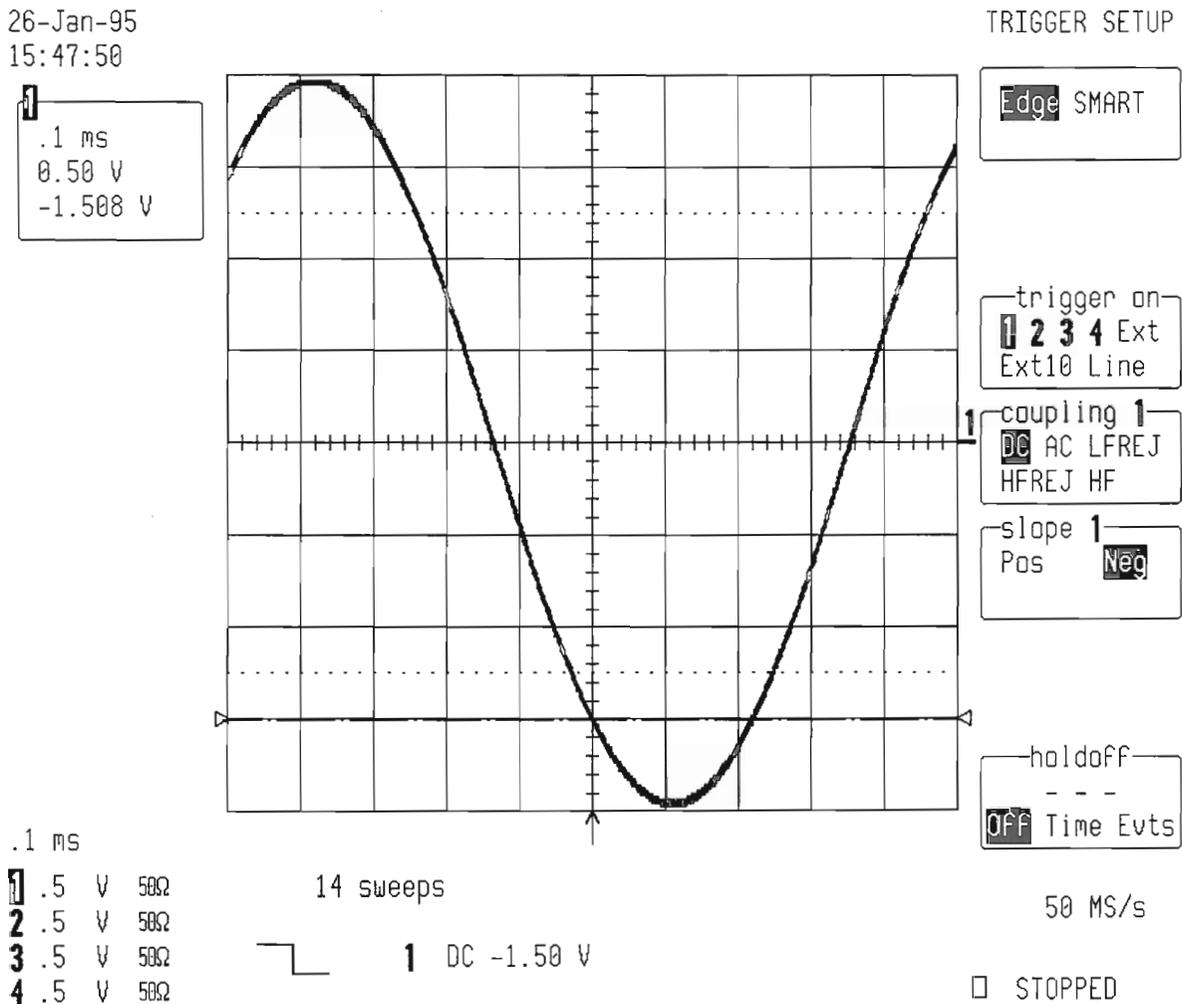
12 sweeps

1 DC -1.50 V

50 MS/s

STOPPED

- Set Trigger Slope 1 : **Neg**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical - 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is - 1.5 V ± .2 V**. See icon 1 at top left.



- Repeat step 5.10.2 for Channel 2, Channel 3 and Channel 4 substituting channel control and input connector.

5.10.3 External Trigger

Specifications

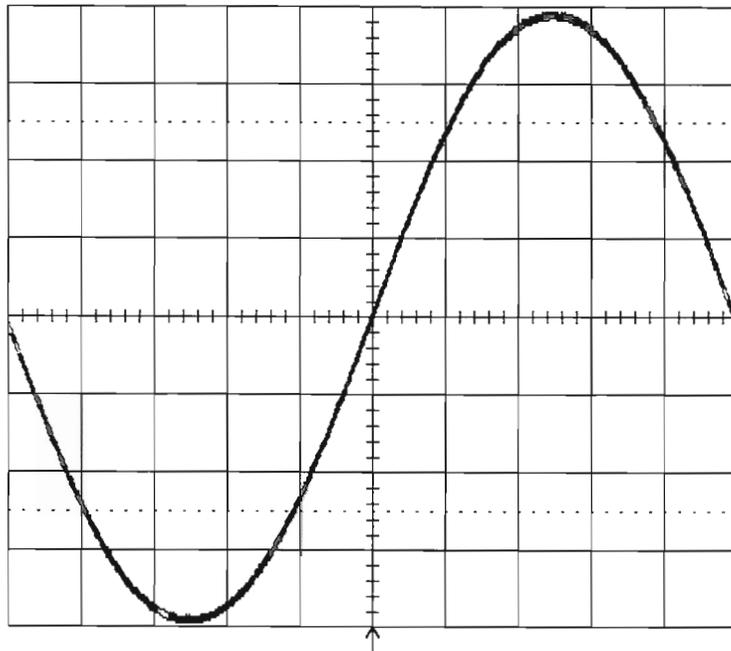
External trigger range : DC \pm .5 V

Procedure

- Connect the output of the generator to External input and to Channel 2 via a coaxial T-connector. The cable length from External to Channel 2 must be short, at most 2 nsec.
- Set frequency : **1 KHz**
- Turn on trace : **Ch2**
- Input Coupling Ch 2 : **DC 50 Ω**
- V/div. offset : **Normal**
- Input gain : **100 mV/div.**
- Input offset : **0 mV**
- Trigger setup : **Edge**
- Trigger on : **Ext**
- Coupling Ext : **DC**
- Slope Ext : **Pos**
- External : **DC 1M Ω**
- Set Ext Trigger level : **DC 0.0 mV**
- Mode : **Single**
- Pre-Trigger Delay : **50 %**
- Timebase : **.1 msec/div.**
- Channel use : **4**
- Record up to : **50 K samples**
- Adjust the sine wave generator's output amplitude to get **8 divisions peak to peak**, corresponding to a **.8 V** amplitude.
- It is important that the offset of the input is set to **zero mV**, use show status and acquisition status to verify.
- Display setup : **Dot join Off**
- Set **Persistence On**, and acquire few sweeps in Single Trigger mode.
- Connect a **3 dB attenuator**, and acquire few more sweeps in Single mode.
- Select Cursors/Measure : **Cursors, Time, Absolute**
- Use the " cursor position " knob, to move the marker at the **horizontal crossing point** of the two sine waves.
- Check that the **time** difference obtained between the marker and the trigger is within **\pm 20 μ sec**. The time readout is below 100 mV in the icon **2**, at top left.

26-Jan-95
16:26:47

2
.1 ms
100 mV



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50Ω **DC1MΩ**

holdoff
OFF Time Evts

- .1 ms
- 1** .1 V 50Ω
 - 2** .1 V 50Ω
 - 3** .1 V 50Ω
 - 4** .1 V 50Ω

12 sweeps

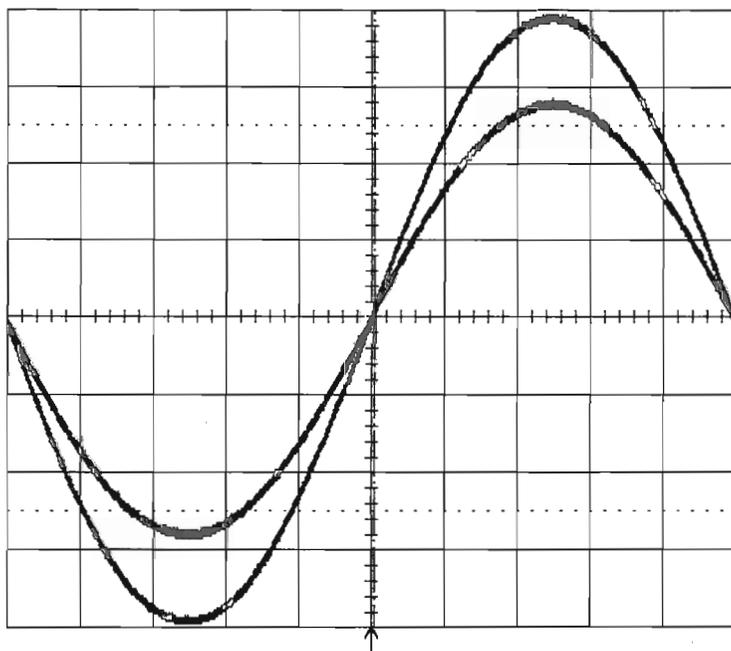
Ext DC 0mV 1MΩ

50 MS/s

STOPPED

26-Jan-95
16:30:20

2
.1 ms
100 mV
4 μs



MEASURE

OFF **Cursors**
Parameters

mode
Time
Amplitude

type
Relative
Absolute

- .1 ms
- 1** .1 V 50Ω
 - 2** .1 V 50Ω
 - 3** .1 V 50Ω
 - 4** .1 V 50Ω

21 sweeps

Ext DC 0mV 1MΩ

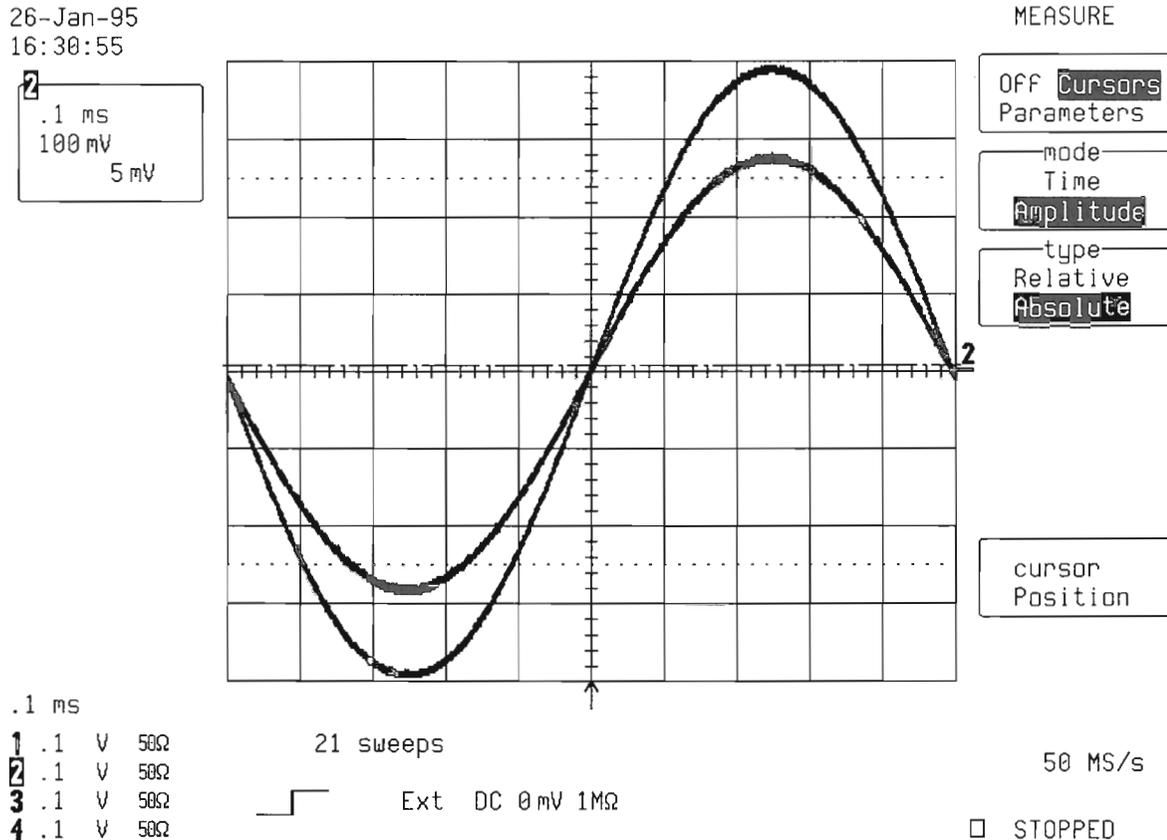
50 MS/s

STOPPED

cursor
Position

Section 5 Performance Verification

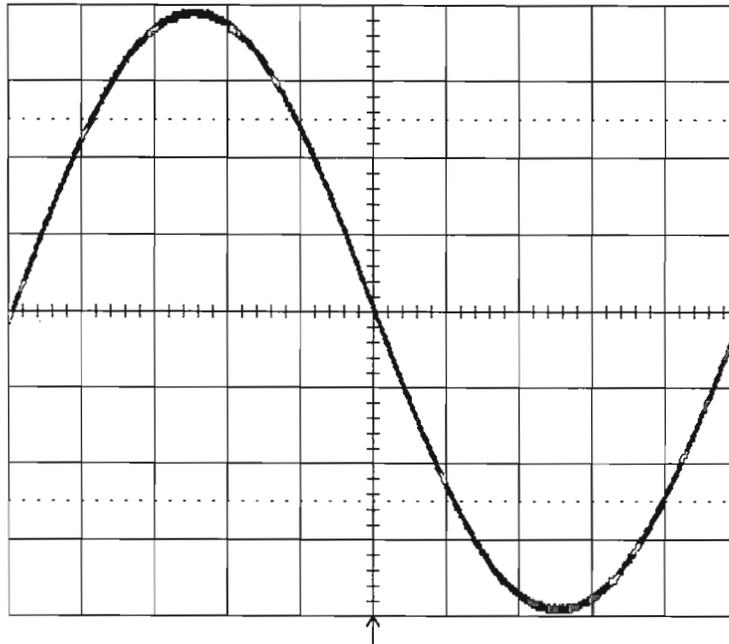
- Select Cursors mode : **Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker at the vertical crossing point of the two sine waves.
- Check that the **vertical crossing point level is within ± 40 mV**. See icon 2 at top left.



- Set Slope Ext : **Neg**
- Disconnect the **3 dB attenuator** from the BNC input
- Acquire few sweeps in Single Trigger mode.
- Connect the **3 dB attenuator**, and acquire few more sweeps in Single mode.
- Select Cursors/Measure : **Cursors, Time, Absolute**
- Use the " cursor position " knob, to move the marker at the **horizontal crossing point** of the two sine waves.
- Check that the **time** difference obtained between the marker and the trigger is within ± 20 μ sec. The time readout is below 100 mV in the icon 2, at top left.

26-Jan-95
16:32:24

2
.1 ms
100 mV



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50Ω DC1MΩ

holdoff
OFF Time Evts

.1 ms

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

11 sweeps

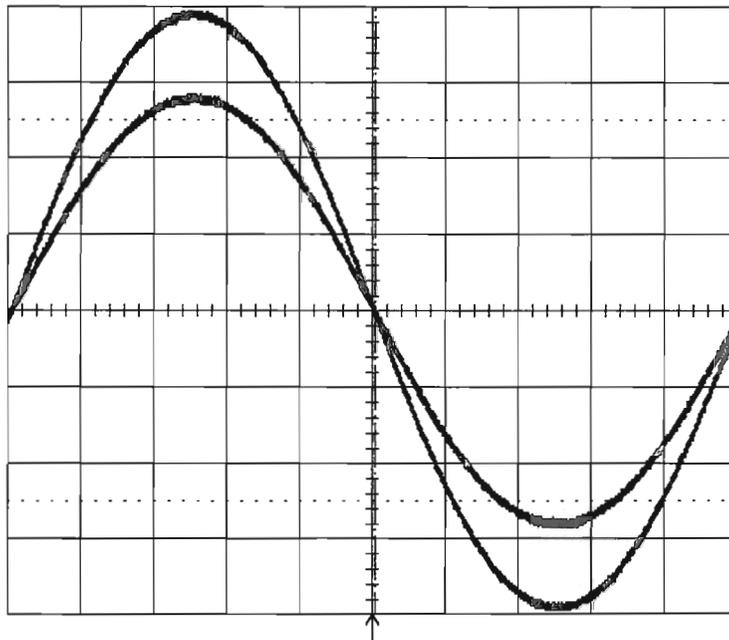
Ext DC 0 mV 1MΩ

50 MS/s

STOPPED

26-Jan-95
16:33:29

2
.1 ms
100 mV
4 μs



MEASURE

OFF Cursors
Parameters

mode
Time
Amplitude

type
Relative
Absolute

cursor
Position

.1 ms

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

22 sweeps

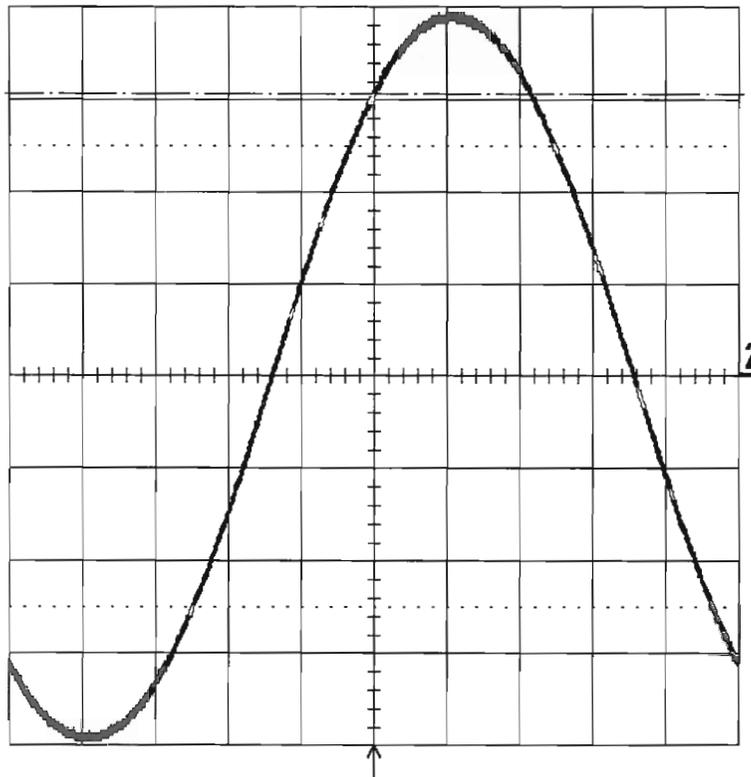
Ext DC 0 mV 1MΩ

50 MS/s

STOPPED

26-Jan-95
16:37:51

2
.1 ms
100 mV
303 mV



MEASURE

OFF **Cursors**
Parameters

mode
Time
Amplitude

type
Relative
Absolute

cursor
Position

.1 ms

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

10 sweeps

Ext DC 300 mV 1MΩ

50 MS/s

□ STOPPED

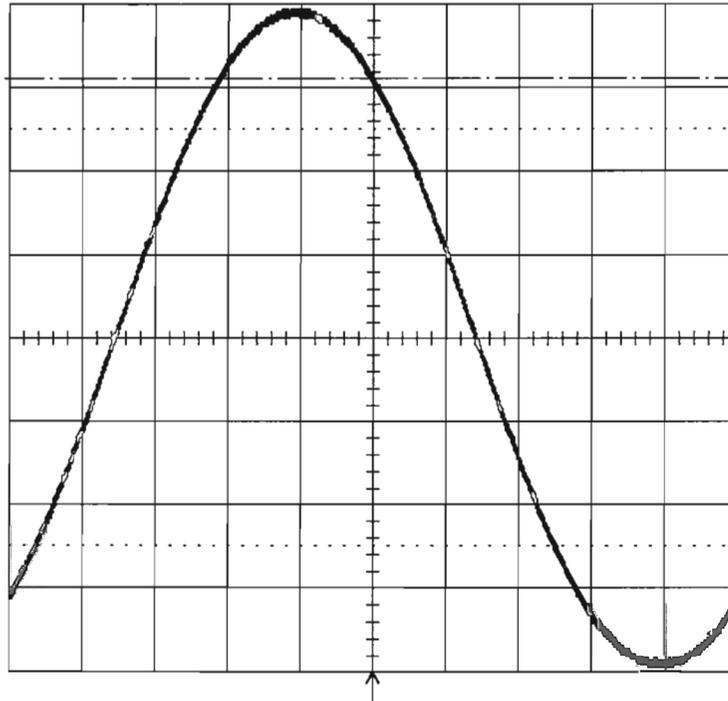
- Set Trigger Slope Ext : **Neg**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical + 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is + 300 mV ± 40 mV**. See icon 2 at top .

Section 5 Performance Verification

26-Jan-95
16:41:59

TRIGGER SETUP

2
.1 ms
100 mV
308 mV



Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

2
cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50Ω DC1MΩ

holdoff
OFF Time Evts

.1 ms

1 .1 V 50Ω
2 .1 V 50Ω
3 .1 V 50Ω
4 .1 V 50Ω

13 sweeps

Ext DC 300 mV 1MΩ

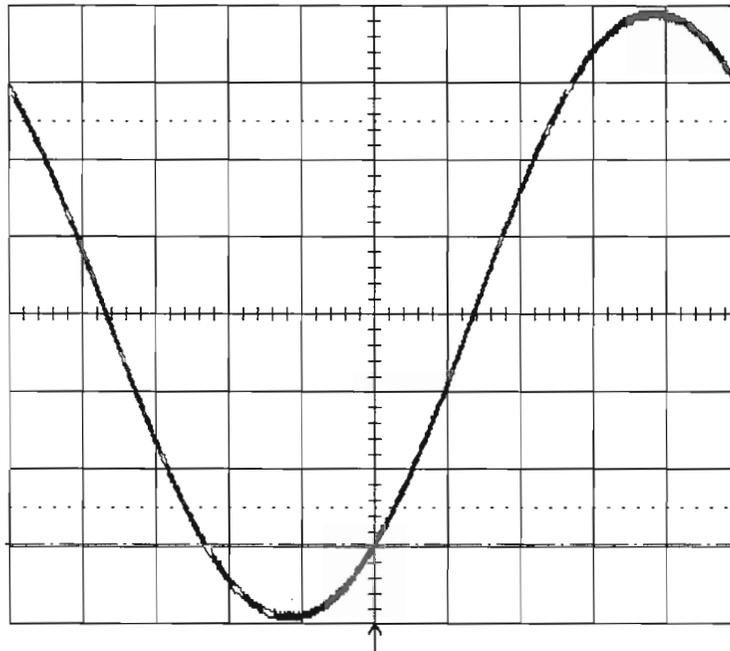
50 MS/s

STOPPED

- Set Trigger level : **DC - 300 mV**
- Set Trigger Slope Ext : **Pos**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical - 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is - 300 mV ± 40 mV**. See icon 2 at top.
- Set Trigger Slope Ext : **Neg**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical - 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is - 300 mV ± 40 mV**. See icon 2 at top.

26-Jan-95
16:43:04

2
.1 ms
100 mV
-300 mV



9 sweeps

Ext DC -300 mV 1M Ω

TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50 Ω DC1M Ω

holdoff
- - -
OFF Time Evts

50 MS/s

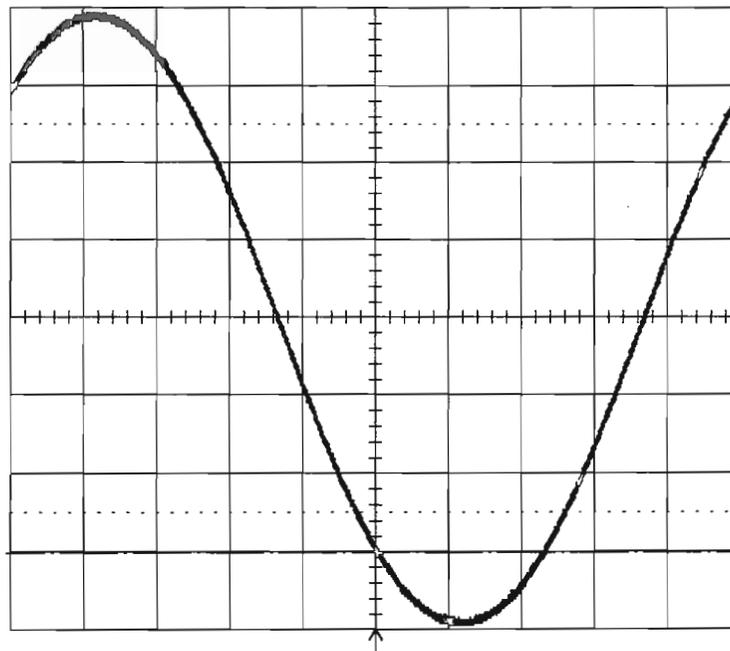
STOPPED

.1 ms

- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .1 V 50 Ω
- 4 .1 V 50 Ω

26-Jan-95
16:43:56

2
.1 ms
100 mV
-305 mV



13 sweeps

Ext DC -300 mV 1M Ω

TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext
DC AC LFREJ
HFREJ HF

slope Ext
Pos Neg

External
DC50 Ω DC1M Ω

holdoff
- - -
OFF Time Evts

50 MS/s

STOPPED

.1 ms

- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .1 V 50 Ω
- 4 .1 V 50 Ω

5.10.4 External /10 Trigger

Specifications

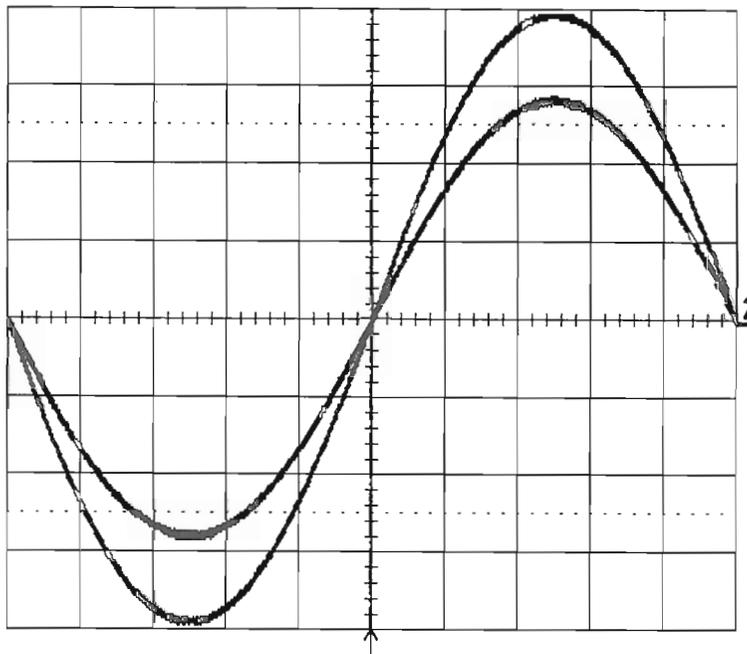
External trigger range : DC \pm 5 V

Procedure

- Connect the output of the generator to External input and to Channel 2 via a coaxial T-connector. The cable length from External to Channel 2 must be short, at most 2 nsec.
- Set frequency : **1 KHz**
- Turn on trace : **Ch2**
- Input Coupling Ch 2 : **DC 50 Ω**
- V/div. offset : **Normal**
- Input gain : **1 V/div.**
- Input offset : **0 mV**
- Trigger setup : **Edge**
- Trigger on : **Ext10**
- Coupling Ext10 : **DC**
- Slope Ext10 : **Pos**
- External : **DC 1M Ω**
- Set Ext Trigger level : **DC 0.0 mV**
- Mode : **Single**
- Pre-Trigger Delay : **50 %**
- Timebase : **.1 msec/div.**
- Channel use : **4**
- Record up to : **50 K samples**
- Adjust the sine wave generator's output amplitude to get **8 divisions peak to peak**, corresponding to a **8 V** amplitude.
- It is important that the offset of the input is set to **zero mV**, use show status and acquisition status to verify.
- Display setup : **Dot join Off**
- Set **Persistence On**, and acquire few sweeps in Single Trigger mode.
- Connect a **3 dB attenuator**, and acquire few more sweeps in Single mode.
- Select Cursors/Measure : **Cursors, Time, Absolute**
- Use the " cursor position " knob, to move the marker at the **horizontal crossing point** of the two sine waves.
- Check that the **time** difference obtained between the marker and the trigger is within \pm **20 μ sec**. The time readout is below 1 V in the icon **2**, at top left.

26-Jan-95
16:52:30

2
.1 ms
1.00 V
-2 μ s



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext10
DC AC LFREJ
HFREJ HF

slope Ext10
Pos Neg

External
DC50 Ω DC1M Ω

holdoff

OFF Time Evt

26 sweeps

Ext10 DC 0.00 V 1M Ω

50 MS/s

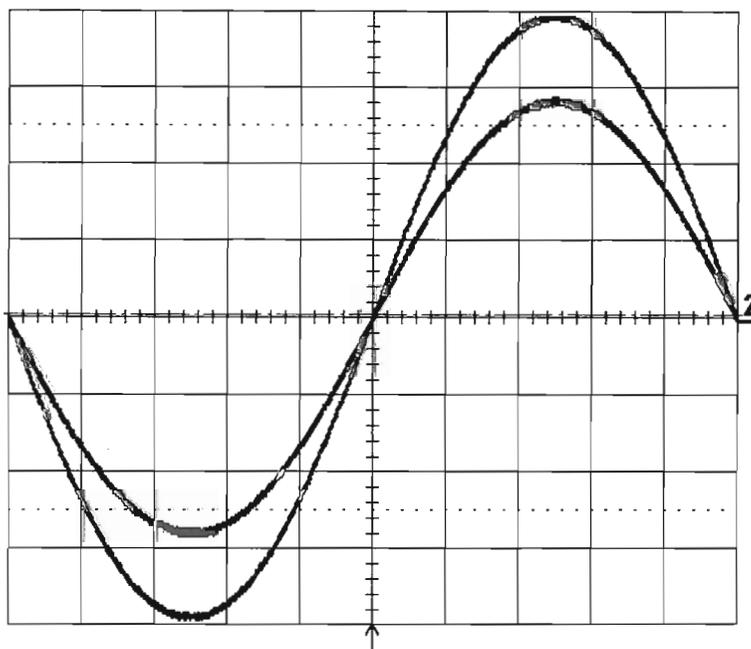
STOPPED

.1 ms

- 1** .1 V 50 Ω
- 2** 1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

26-Jan-95
16:53:40

2
.1 ms
1.00 V
0.07 V



MEASURE

OFF Cursors
Parameters

mode
Time
Amplitude

type
Relative
Absolute

cursor
Position

26 sweeps

Ext10 DC 0.00 V 1M Ω

50 MS/s

STOPPED

.1 ms

- 1** .1 V 50 Ω
- 2** 1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

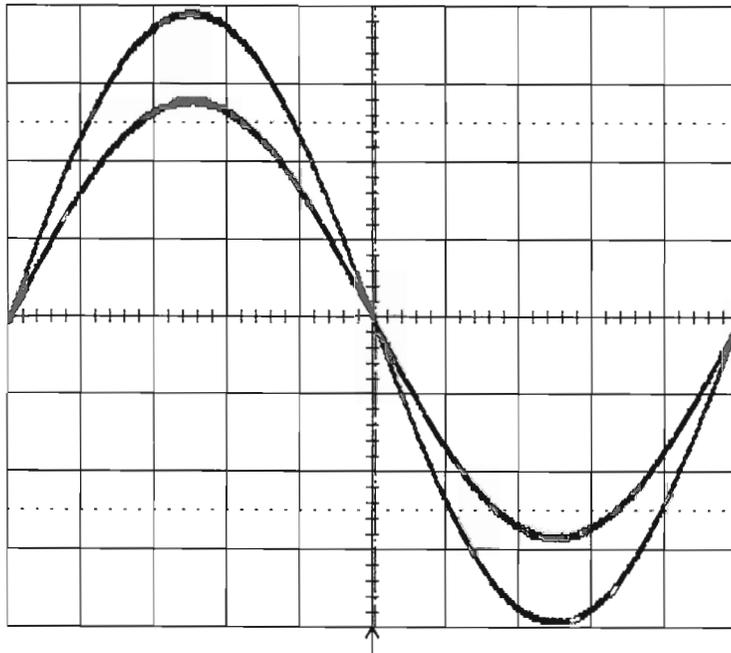
- Select Cursors mode : **Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker at the **vertical crossing point** of the two sine waves.
- Check that the **voltage** difference obtained between the marker and the trigger level is within ± 400 mV. The level readout is below 1 V in the icon **2**, at top left.

- Set Trigger Slope Ext10 : **Neg**
- Disconnect the **3 dB attenuator** from the BNC input
- Acquire few sweeps in Single Trigger mode.
- Connect the **3 dB attenuator**, and acquire few more sweeps in Single mode.
- Select Cursors/Measure : **Cursors, Time, Absolute**
- Use the " cursor position " knob, to move the marker at the **horizontal crossing point** of the two sine waves.
- Check that the **time** difference obtained between the marker and the trigger is within ± 20 μ sec. The time readout is below 1 V in the icon **2**, at top left.

- Select Cursors mode : **Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker at the **vertical crossing point** of the two sine waves.
- Check that the **vertical crossing point level** is within ± 400 mV. See icon **2** at left.

26-Jan-95
16:56:38

2
.1 ms
1.00 V
4 μ s



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cp1g Ext10
DC AC LFREJ
HFREJ HF

slope Ext10
Pos Neg

External
DC50 Ω DC1M Ω

holdoff
Off Time Evts

.1 ms

- 1** .1 V 50 Ω
- 2** 1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

21 sweeps

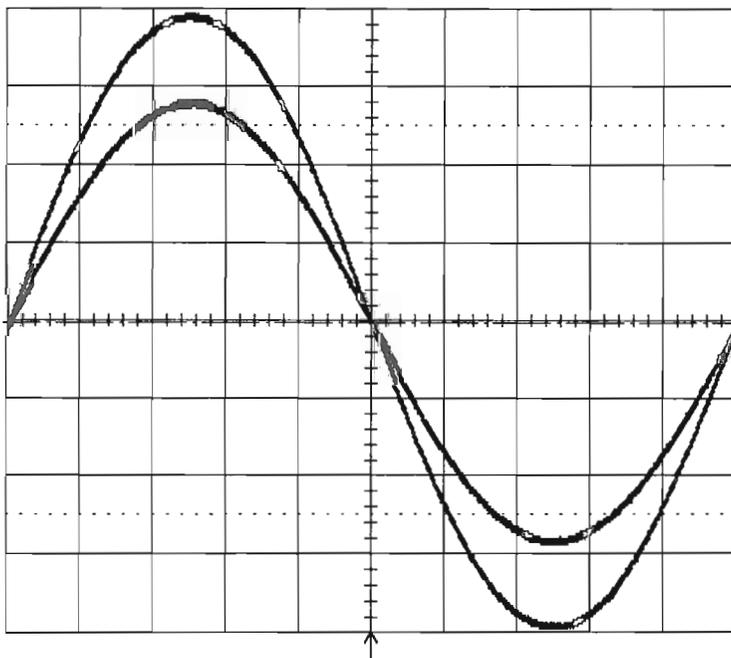
Ext10 DC 0.00 V 1M Ω

50 MS/s

STOPPED

26-Jan-95
16:57:18

2
.1 ms
1.00 V
0.01 V



MEASURE

Off Cursors
Parameters

mode
Time
Amplitude

type
Relative
Absolute

cursor
Position

.1 ms

- 1** .1 V 50 Ω
- 2** 1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

21 sweeps

Ext10 DC 0.00 V 1M Ω

50 MS/s

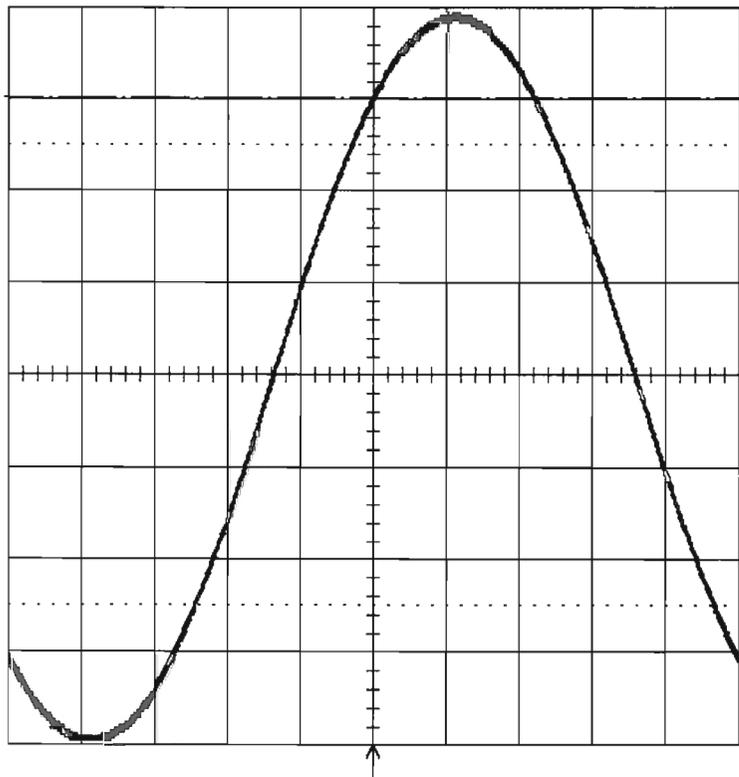
STOPPED

Section 5 Performance Verification

- Set Trigger level : **DC + 3 V**
- Set Trigger Slope Ext10 : **Pos**
- Disconnect the **3 dB attenuator** from the BNC input
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical + 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is + 3 V ± 400 mV**. See icon 2 at top.

26-Jan-95
17:00:54

2
.1 ms
1.00 V
3.06 V



MEASURE

OFF Cursors
Parameters

mode
Time
Amplitude

type
Relative
Absolute

cursor
Position

.1 ms

- 1 .1 V 50Ω
- 2 1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

12 sweeps

Ext10 DC 3.00 V 1MΩ

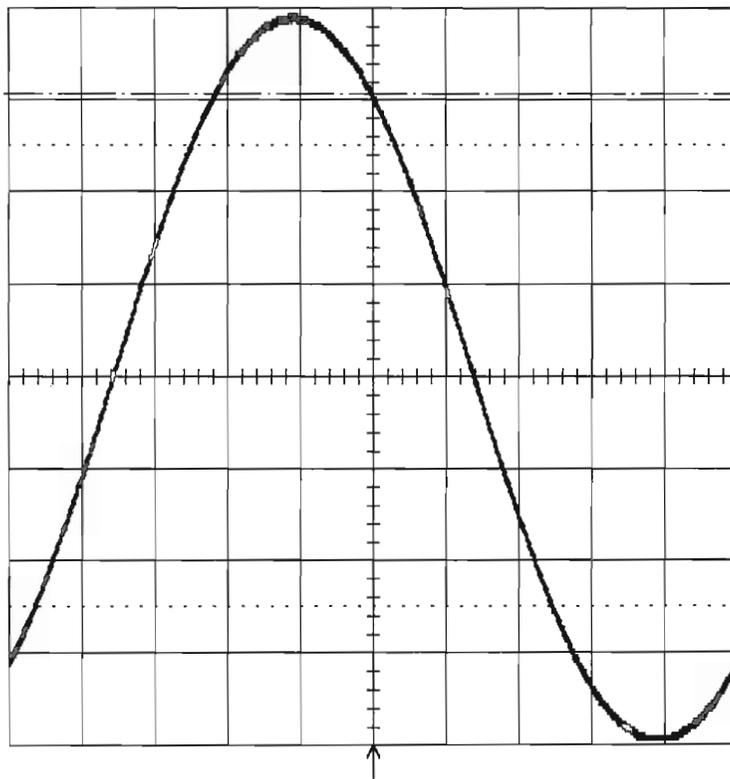
50 MS/s

□ STOPPED

- Set Trigger Slope Ext10 : **Neg**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical + 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is + 3 V ± 400 mV**. See icon 2 at top .

26-Jan-95
17:01:30

2
.1 ms
1.00 V
3.10 V



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext10
DC AC LFREJ
HFREJ HF

slope Ext10
Pos **Neg**

External
DC50Ω **DC1MΩ**

holdoff
- - -
Off Time Evt

.1 ms

- 1** .1 V 50Ω
- 2** 1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

12 sweeps

Ext10 DC 3.00 V 1MΩ

50 MS/s

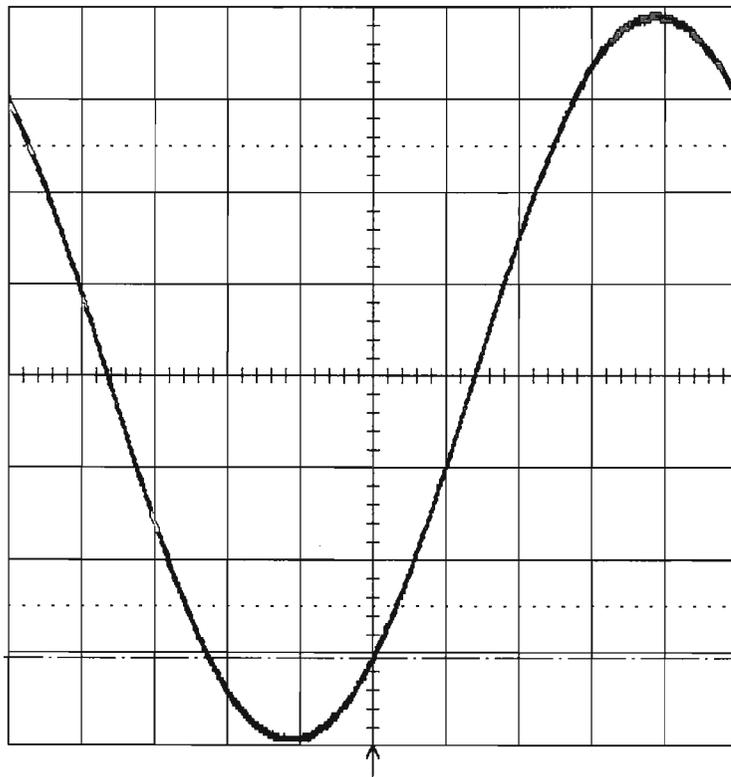
STOPPED

Section 5 Performance Verification

- Set Trigger level : DC - 3 V
- Trigger Slope Ext10 : Pos
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical - 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is - 3 V ± 400 mV**. See icon 2 at top.

26-Jan-95
17:04:41

2
.1 ms
1.00 V
-3.02 V



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cplg Ext10
DC AC LFREJ
HFREJ HF

slope Ext10
Pos Neg

External
DC50Ω **DC1MΩ**

holdoff
- - -
OFF Time Evts

.1 ms

- 1** .1 V 50Ω
- 2** 1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

10 sweeps

Ext10 DC -3.00 V 1MΩ

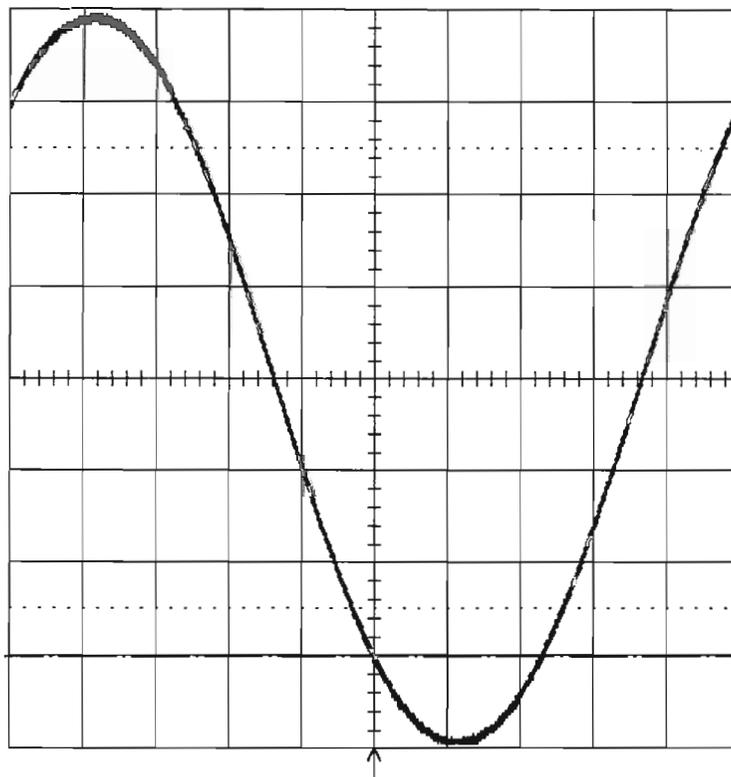
50 MS/s

□ STOPPED

- Trigger Slope Ext10 : **Neg**
- Acquire few sweeps in Single Trigger mode.
- The sine wave must pass through the **horizontal center** of the screen at the **vertical - 3 divisions**.
- Select Cursors/Measure : **Cursors, Amplitude, Absolute**
- Use the " cursor position " knob, to move the marker, at the **crossing point** of the **sine wave** and the **horizontal center of the screen** (50% pre-trigger line).
- Check that the **vertical crossing point level is - 3 V ± 400 mV**. See icon 2 at top.

26-Jan-95
17:05:21

2
.1 ms
1.00 V
-2.98 V



TRIGGER SETUP

Edge SMART

trigger on
1 2 3 4 Ext
Ext10 Line

cp1g Ext10
DC AC LFREJ
HFREJ HF

slope Ext10
Pos **Neg**

External
DC50Ω **DC1MΩ**

holdoff
- - -
Off Time Evts

.1 ms
1 .1 V 50Ω
2 1 V 50Ω
3 .1 V 50Ω
4 .1 V 50Ω

13 sweeps

Ext10 DC -3.00 V 1MΩ

50 MS/s

□ STOPPED

Section 5 Performance Verification

5.11 Smart Trigger

Specifications

Pulse width < or > 2.5 nsec to 20 sec.

5.11.1 Trigger on Pulse Width < 10 nsec

Procedure

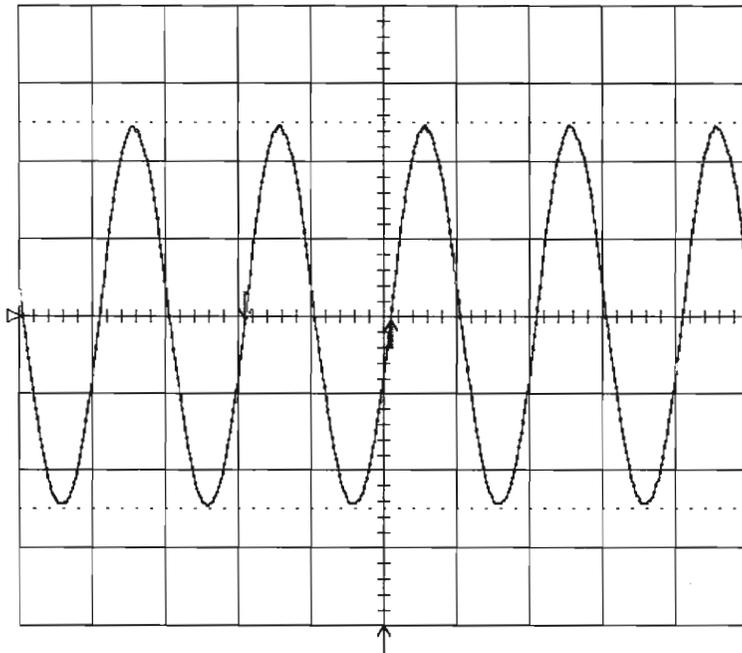
- Connect a leveled sine wave generator to Channel 1
- Frequency : 100 MHz
- Turn on trace : Ch1
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Input Coupling : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input gain : .5 V/div.
- Trigger setup : Smart
- Setup Smart Trigger : Glitch
- Trigger on : 1
- Coupling 1 : DC
- At end of : Neg
- Width : < 10 nsec
- Mode : Norm
- Timebase : 5 nsec/div.
- Adjust the generator output amplitude to get a five division amplitude sine wave.
- Check that the scope triggers
- Switch to Width : > 10 nsec
- Check that the scope **doesn't trigger** : slow trigger and no flashes in box next to normal.

5.11.2 Trigger on Pulse Width > 10 nsec

- Adjust the generator frequency to 40 MHz
- Check that the scope triggers
- Switch to Width : < 10 nsec
- Check that the scope **doesn't trigger** : slow trigger and no flashes in box next to normal.

26-Jan-95
17:14:11

5 ns
0.50 V
0 mV



TRIGGER SETUP

Edge **SMART** (GLITCH)

SETUP SMART TRIGGER

trigger on **1 2 3 4 Ext**
Ext10 Pattern

coupling **1**
DC AC
LFREJ HFREJ

at end of **Neg** Pos pulse

width < 10.0 ns
OFF **On**

width > - - -
OFF On

5 ns RIS

- 1 .5 V 50Ω
- 2 .5 V 50Ω
- 3 .5 V 50Ω
- 4 .5 V 50Ω



Δt 10.000 ns $\frac{1}{\Delta t}$ 100.00 MHz

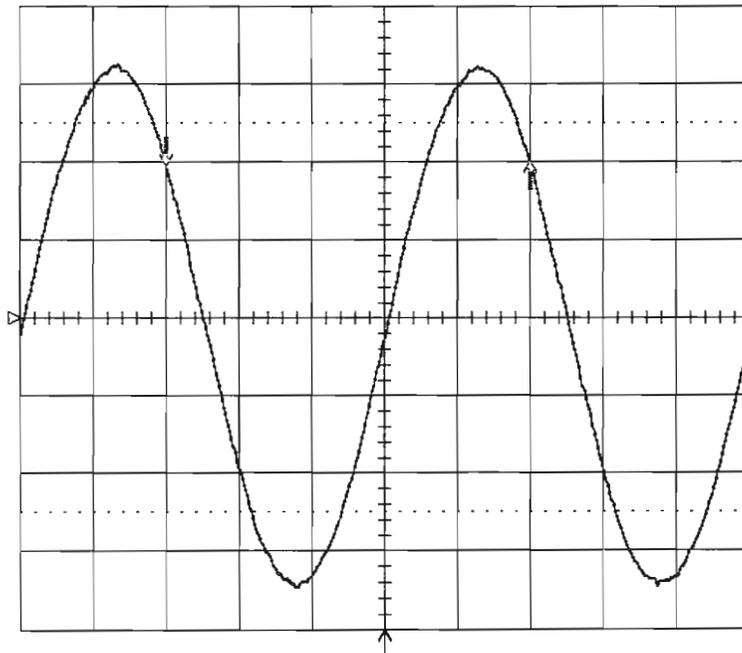
1 DC 0.00 V
pulse < 10.0 ns

10 GS/s

NORMAL

26-Jan-95
17:17:28

5 ns
0.50 V
20 mV



TRIGGER SETUP

Edge **SMART** (GLITCH)

SETUP SMART TRIGGER

trigger on **1 2 3 4 Ext**
Ext10 Pattern

coupling **1**
DC AC
LFREJ HFREJ

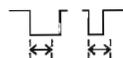
at end of **Neg** Pos pulse

width < - - -
OFF On

width > 10.0 ns
OFF **On**

5 ns RIS

- 1 .5 V 50Ω
- 2 .5 V 50Ω
- 3 .5 V 50Ω
- 4 .5 V 50Ω



Δt 25.000 ns $\frac{1}{\Delta t}$ 40.000 MHz

1 DC 0.00 V
10.0 ns < pulse

10 GS/s

NORMAL

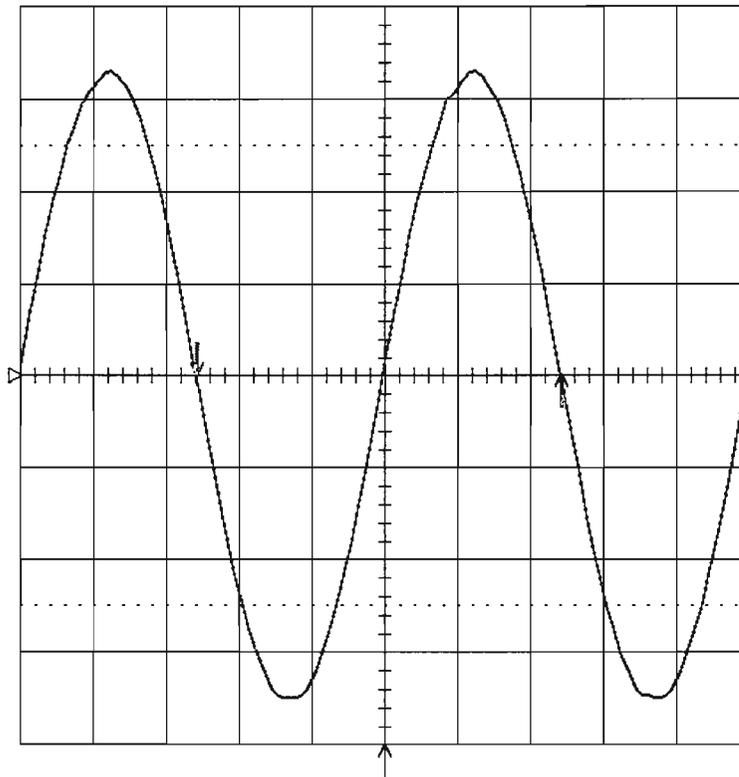
Section 5 Performance Verification

5.11.3 Trigger on Pulse Width < 100 nsec

- Set the generator frequency to **10 MHz**
- Pulse width : **< 100 nsec**
- Timebase : **20 nsec/div.**
- Check that the scope triggers.

26-Jan-95
17:19:37

1
20 ns
0.50 V
6 mV



TRIGGER SETUP

Edge **SMART**
(GLITCH)

SETUP SMART
TRIGGER

trigger on
1 2 3 4 Ext
Ext10 Pattern

coupling **1**
DC AC
LFREJ HFREJ

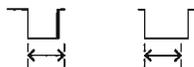
at end of
Neg Pos
pulse

width <
100.0 ns
OFF **On**

width >
- - -
OFF On

20 ns

- 1** .5 V 50Ω
- 2** .5 V 50Ω
- 3** .5 V 50Ω
- 4** .5 V 50Ω



Δt 100.0 ns 1/Δt 10.00 MHz
1 DC 0.00 V
pulse < 100.0 ns

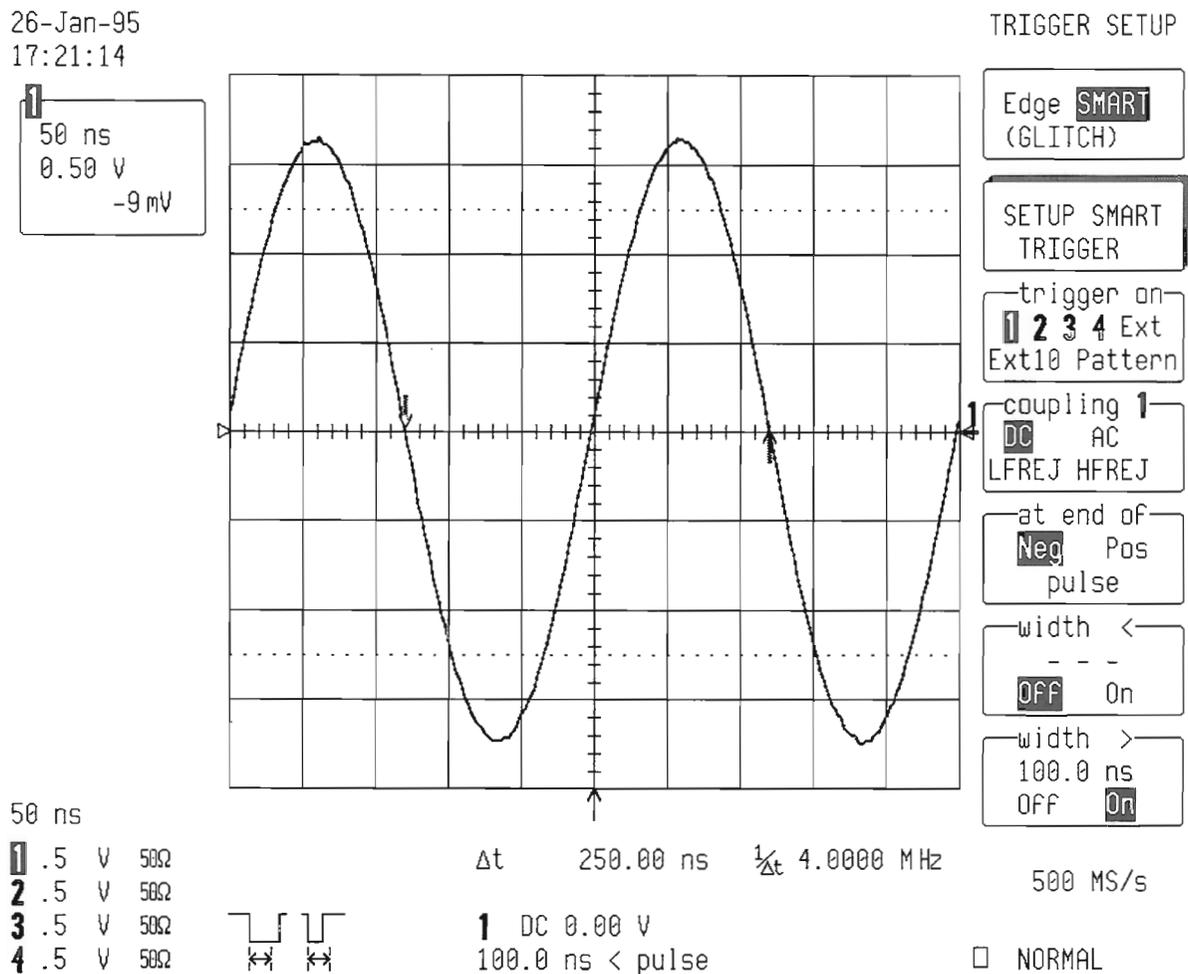
500 MS/s

NORMAL

- Switch to Width : **> 100 nsec**
- Check that the scope **doesn't trigger** : slow trigger and no flashes in box next to normal.

5.11.4 Trigger on Pulse Width > 100 nsec

- Adjust the generator frequency to 4 MHz
- Pulse width : > 100 nsec
- Set Timebase : 50 nsec/div.
- Check that the scope triggers.



- Switch to Width : < 100 nsec
- Check that the scope **doesn't trigger** : slow trigger and no flashes in box next to normal.
- Repeat all the above tests for Channel 2, Channel 3 and Channel 4 substituting channel control and input connector, and check as above.

5.12 Time Base Accuracy**5.12.1 Description**

An external sine wave generator of **1 MHz** with a frequency accuracy better than 1 ppm is used.

Specifications

500 MHz clock : accuracy : $\leq \pm 0.001\%$ or $\leq \pm 10$ ppm

5.12.2 500 MHz Clock Manual Verification Procedure

Setup a leveled sine wave generator.

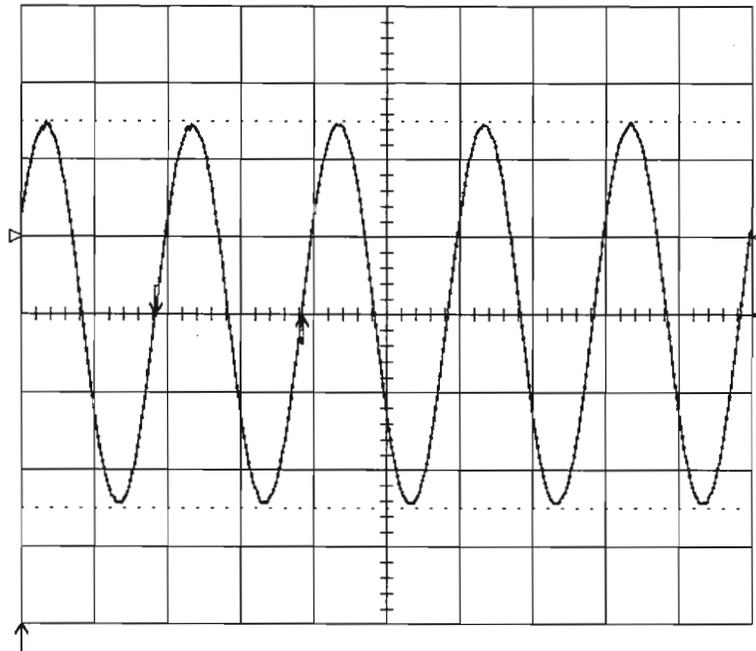
- Frequency : **1 MHz**
- Connect the generator output to Channel 1
- Turn on trace : **Ch1**
- Display setup : **Standard, Persistence off, Dot join on, Single grid**
- Input Coupling : **DC 50 Ω**
- V/div. offset : **Normal**
- Probe atten : **X1**
- Input gain : **.5 V/div.**
- Trigger setup : **Edge**
- Trigger on : **1**
- Coupling 1 : **DC**
- Slope 1 : **Pos**
- Level 1 : **0.5 V**
- Mode : **Norm**
- Holdoff : **Off**
- Delay : **0 %**
- Timebase : **.5 μ sec/div.**
- Channel use : **4**
- Record up to : **50 K**
- Adjust the generator output amplitude and Ch1 offset to get a five divisions peak to peak amplitude sine wave.
- Store Channel 1 in Memory 1
- Set Post-trigger delay to **5.00 msec**

This allows the accuracy of the time base clock to be checked **5000 periods** after the trigger point.

26-Jan-95
17:45:07

STORE W' FORMS

1
.5 μ s
0.50 V
-8 mV



DO STORE
(1->M1)

store

1 **2**
3 **4**
A **B**
C **D**

All displayed

to

M1 **M2** **M3** **M4**
Card

.5 μ s
1 .5 V 50 Ω
2 .5 V 50 Ω
3 .5 V 50 Ω
4 .5 V 50 Ω

Δt 1.0000 μ s $\frac{1}{\Delta t}$ 1.0000 MHz

1 DC 0.50 V

500 MS/s

NORMAL

26-Jan-95
17:40:20

STATUS

ACQUISITION STATUS

	1	2	3	4
Vertical				
V/div	.5 V	.5 V	.5 V	.5 V
Probe	x1	x1	x1	x1
Offset	0 mV	0 mV	0 mV	0 mV
Coupling	DC50 Ω	DC50 Ω	DC50 Ω	DC50 Ω

Acquisition

System

Text & Times

Waveform

Memory Used

Bandwidth Limit OFF

Time base

Time/div .5 μ s Time/pnt 2 ns (500 MS/s)

RIS OFF

Sequence OFF Pts/div 250

Trigger Edge Mode NORMAL

External Attenuation x1

1 DC 0.50 V

Post-trigger Delay 5.00000 ms

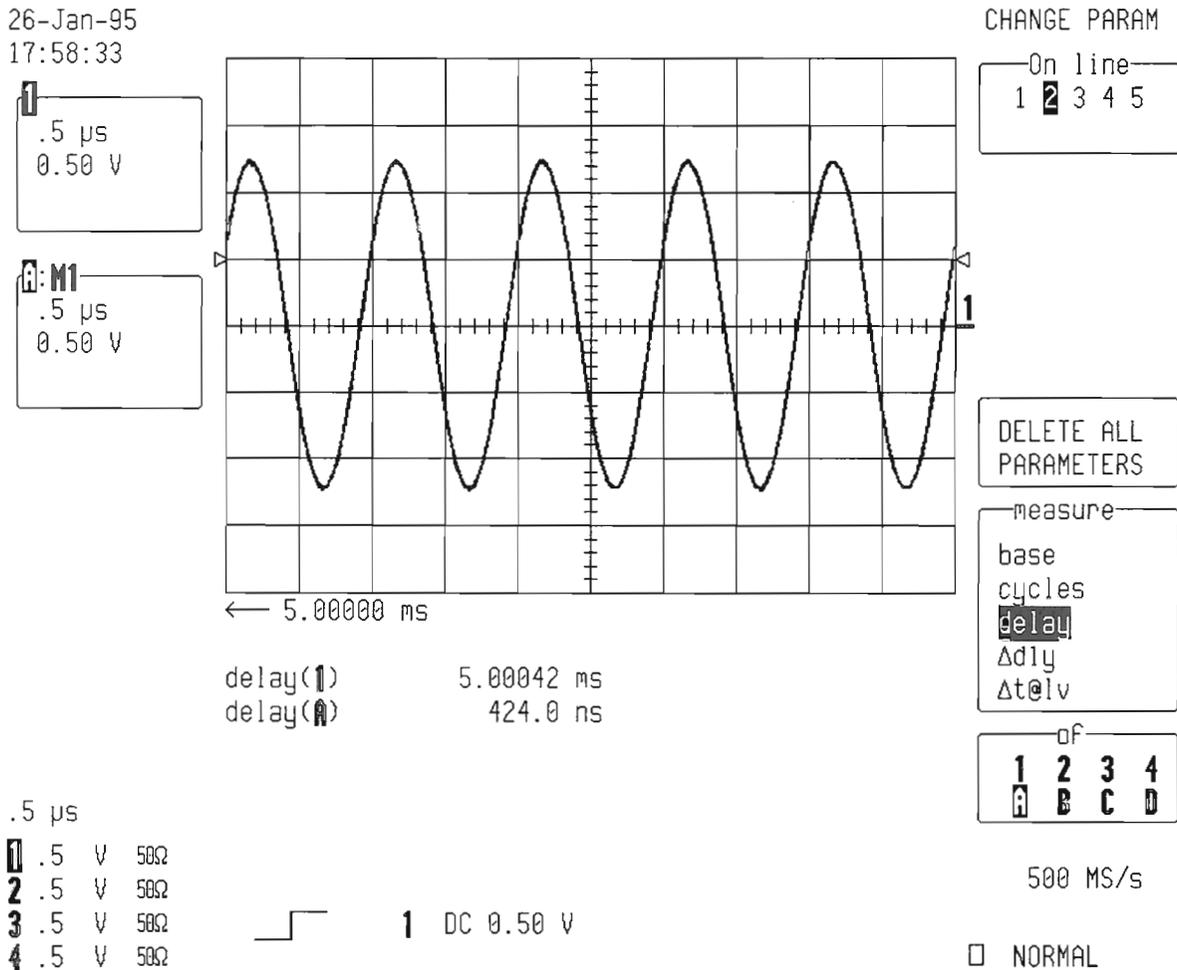
500 MS/s

The currently preselected Smart Trigger type is
GLITCH

NORMAL

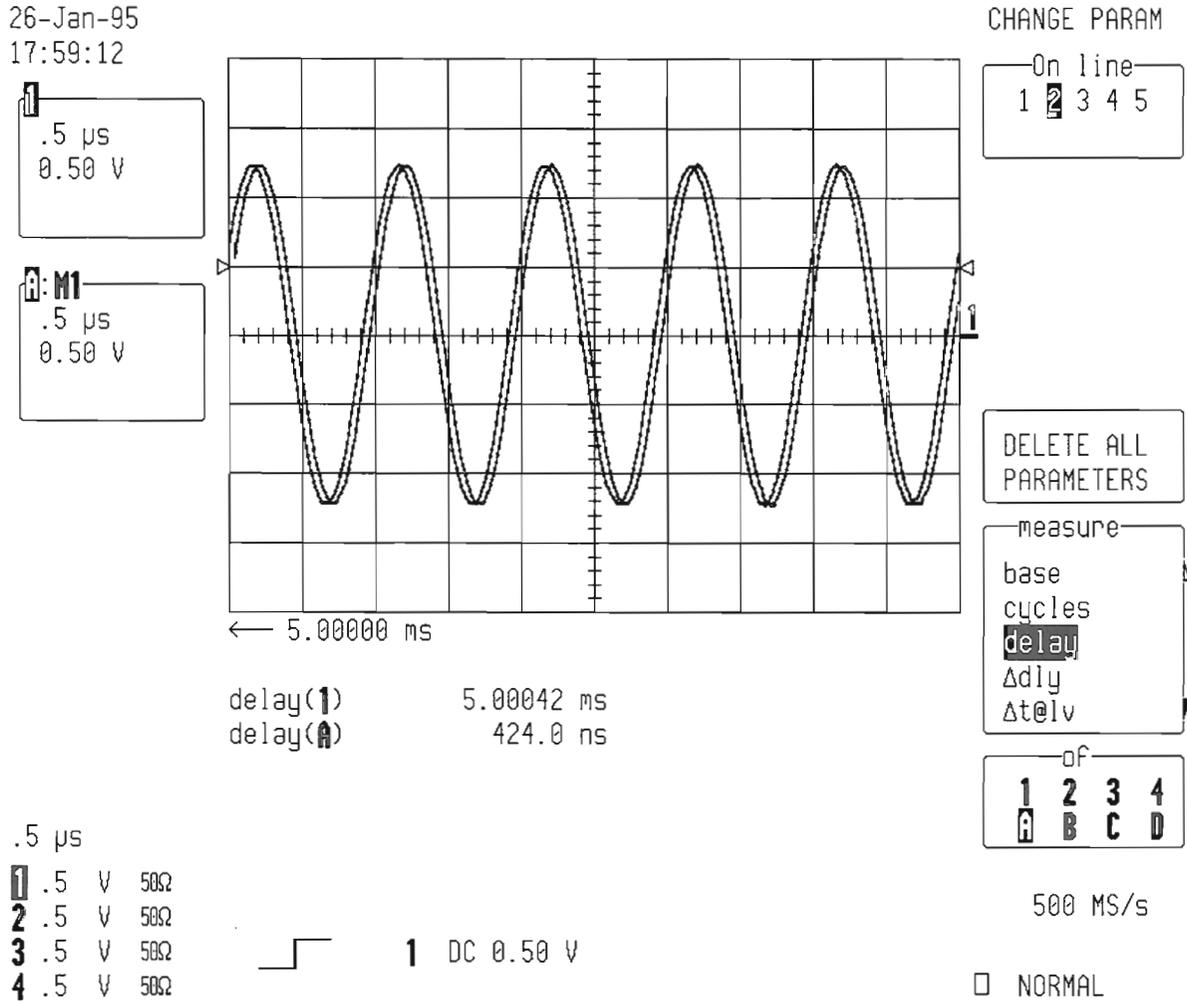
Section 5 Performance Verification

- Recall Memory 1 to A
- Turn on trace A
- Check that the displayed Channel 1 trace is **aligned** with the sine wave from memory 1.
- Press : **Cursors/Measure**
- Measure : **Parameters**
- Mode : **Custom**
- Statistics : **Off**
- Change parameters
- On line 1 : **Delay of 1**
- On line 2 : **Delay of A**
- Check that $(\text{delay}(A) - \text{delay}(1) + 5 \text{ msec}) \leq \pm 0.00005 \text{ msec}$ corresponding to **10ppm**.



A difference of $\pm 0.05 \mu\text{sec}$ corresponds to $\pm 10 \text{ ppm}$.

See screen dump below :



5.13 Overshoot and Rise time (10%-90%)

Specifications

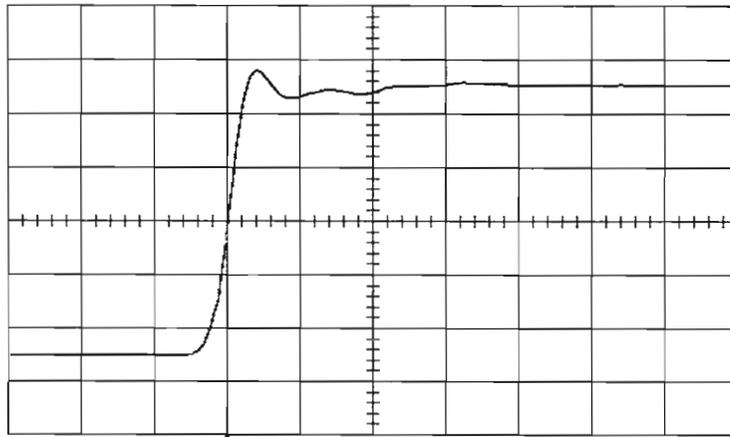
DC 50 Ω , 100 mV/div., : overshoot < 12 %, rise time < 0.9 ns
 DC 1 M Ω , 100 mV/div., : rise time < 1.5 ns

Procedure

- Apply the fast pulse generator LeCroy 4969 (< 500 psec) or equivalent, to Channel 1
- Set the DSO as follows :
 - Turn on trace : **Ch1**
 - Display setup : **Standard, Persistence off, Dot join on, Single grid**
 - Coupling Channel 1 : **DC 50 Ω**
 - V/div. offset : **Normal**
 - Global BWL : **Off**
 - Probe atten : **X1**
 - Input offset : **- 250 mV**
 - Input gain : **100 mV/div**
 - Trigger setup : **Edge**
 - Trigger on : **1**
 - Trigger level : **DC 250 mV**
 - Coupling 1 : **DC**
 - Slope 1 : **Pos**
 - Mode : **Normal**
 - Holdoff : **Off**
 - Timebase : **2 nsec/div**
 - Record up to : **50K samples**
 - Delay : **30 % Pre-Trigger**
 - Turn on trace : **A**
 - Select Math Setup
 - For Math : **Use at most 1000 points**
 - Use Math ? : **Yes**
 - Math Type : **Average**
 - Avg Type : **Summed**
 - Of : **Channel 1**
 - Turn off trace : **Channel 1**
 - Cursors/Measure : **Parameters**
 - Mode : **Custom**
 - Statistics : **On**
 - Change Parameters :
 - on displayed trace : **A**
 - On line 1 :
 - Measure : **Over + of A**
 - On line 2 :
 - Measure : **Rise of A**
- After at least 100 sweeps, check that the average overshoot is < **12 %** and rise time is < **0.9 ns** (measured in scope and not corrected for the effect of the step generator).

30-Jan-95
13:44:19

Average(↑)
2 ns
100 mV
535 swps



169 sweeps:	average	low	high	sigma
over+(↑)	5.4 %	5.2	5.8	0.2
rise(↑)	0.89 ns	0.88	0.90	0.00

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL
PARAMETERS

measure
median
minimum
over+
over-
period

of
1 2 3 4
A B C D

10 GS/s

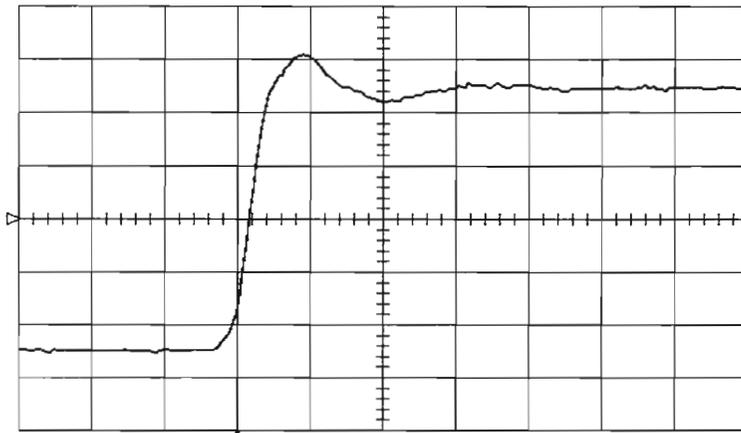
2 ns RIS

1 .1 V 50Ω
2 1 V 50Ω

- Set Input Coupling : **DC 1M Ω**
- Terminate the output of the 4969 pulser with a **50Ω** feed through and connect it to Ch1
- After at least 100 sweeps, check that the Average rise time is **< 1.5 ns** (measured in scope and not corrected for the effect of the step generator).

16-Jun-94
14:36:54

2 ns
100 mV



658 sweeps:	average	low	high	sigma
rise(↑)	0.89 ns	0.85	0.94	0.01

CHANNEL 1

Coupling
DC50Ω
Grounded
DC1MΩ
Grounded
AC1MΩ

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

10 GS/s

2 ns RIS

1 .1 V DC

- Repeat the above tests for Channel 2, Channel 3 and Channel 4 substituting channel control and input connector, and check as above.

5.14 Probe Calibrator Verification

Specifications

Amplitude : 50 mV to 500 mV $\pm 2\%$ into 50 Ω
 : 50 mV to 1 V $\pm 2\%$ into 1 M Ω

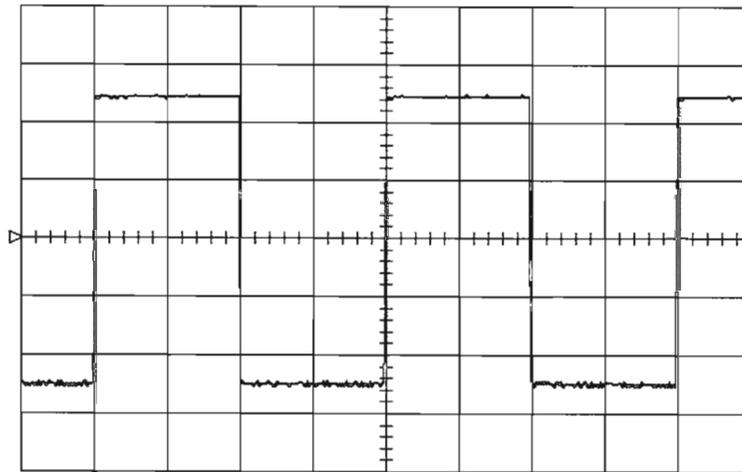
Frequency : 500 Hz to 2 MHz $\pm 1\%$

Probe Calibrator Verification Procedure

- Connect the Probe Calibrator output to Channel 1, using a 5 nsec BNC cable
 - Select : **Utilities**
 - Press : **Cal BNC Setup**
 - Mode : **Cal signal**
 - Set Frequency : **500 Hz**
 - Amplitude : **1 V (500 mV into 50 Ω)**
 - Turn on trace : **Ch1**
 - Display setup : **Standard, Persistence off, Dot join on, Single grid**
 - Input Coupling : **DC 50 Ω**
 - V/div. offset : **Normal**
 - Probe atten : **X1**
 - Input offset : **- 250 mV**
 - Input gain : **100 mV/div.**
 - Trigger setup : **Edge**
 - Trigger on : **1**
 - Trigger level : **DC 250 mV**
 - Coupling 1 : **DC**
 - Slope 1 : **Pos**
 - Mode : **Normal**
 - Holdoff : **Off**
 - Timebase : **.5 msec/div.**
 - Delay : **10 % Pre-Trigger**
 - Cursors/Measure : **Parameters**
 - Mode : **Custom**
 - Change parameters :
 - On line 1 : **Measure ampl of 1**
 - On line 2 : **Measure freq of 1**
-
- Check parameters readout : freq (1) = **500 Hz $\pm 1\%$** , and ampl (1) = **500 mV $\pm 6\%$**
 ($\pm 2\%$ plus $\pm 4\%$ due to the non linearity of the scope)
 - Set Cal frequency : **2 MHz**
 - Timebase : **.2 μ s**
 - Check that freq (1) is **2 MHz $\pm 1\%$**
 - Repeat test for amplitude of **0.05 V (25 mV into 50 Ω)**
 - Set Cal amplitude : **50 mV (25 mV into 50 Ω)**
 - DSO Input gain : **5 mV/div.**
-
- Check parameters readout ampl (1) = **25 mV $\pm 6\%$**

27-Jan-95
9:49:39

.5 ms
100 mV



1068 sweeps: average low high sigma
 ampl(1) 494 mV 494 496 1
 Freq(1) 500.005 Hz 500.000 500.013 0.006

CAL BNC OUT

mode
 CAL signal
 OFF
 Pass/Fail
 Trigger Out

SET TO 1 kHz
 1 V SQUARE

Shape
 Square
 Pulse(25 ns)

Amplitude
 1.00 V
 into 1 MΩ

Frequency
 500 Hz

10 MS/s

NORMAL

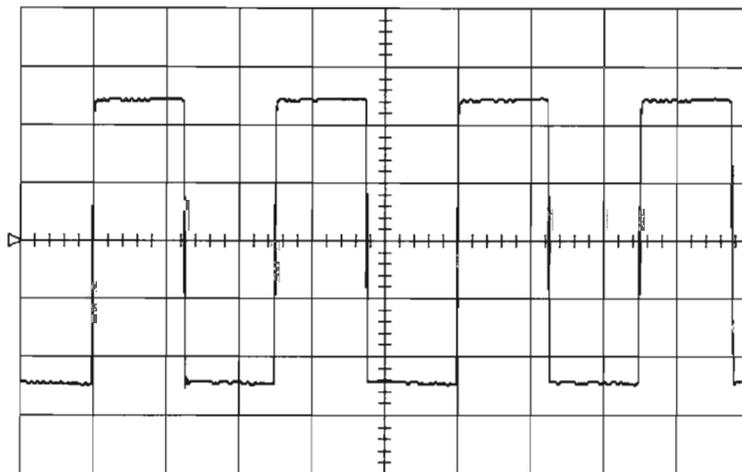
.5 ms

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

1 DC 250 mV

27-Jan-95
9:50:18

.2 μs
100 mV



161 sweeps: average low high sigma
 ampl(1) 488 mV 488 489 1
 Freq(1) 2.000 MHz 2.000 2.001 0.000

CAL BNC OUT

mode
 CAL signal
 OFF
 Pass/Fail
 Trigger Out

SET TO 1 kHz
 1 V SQUARE

Shape
 Square
 Pulse(25 ns)

Amplitude
 1.00 V
 into 1 MΩ

Frequency
 2 MHz

500 MS/s

NORMAL

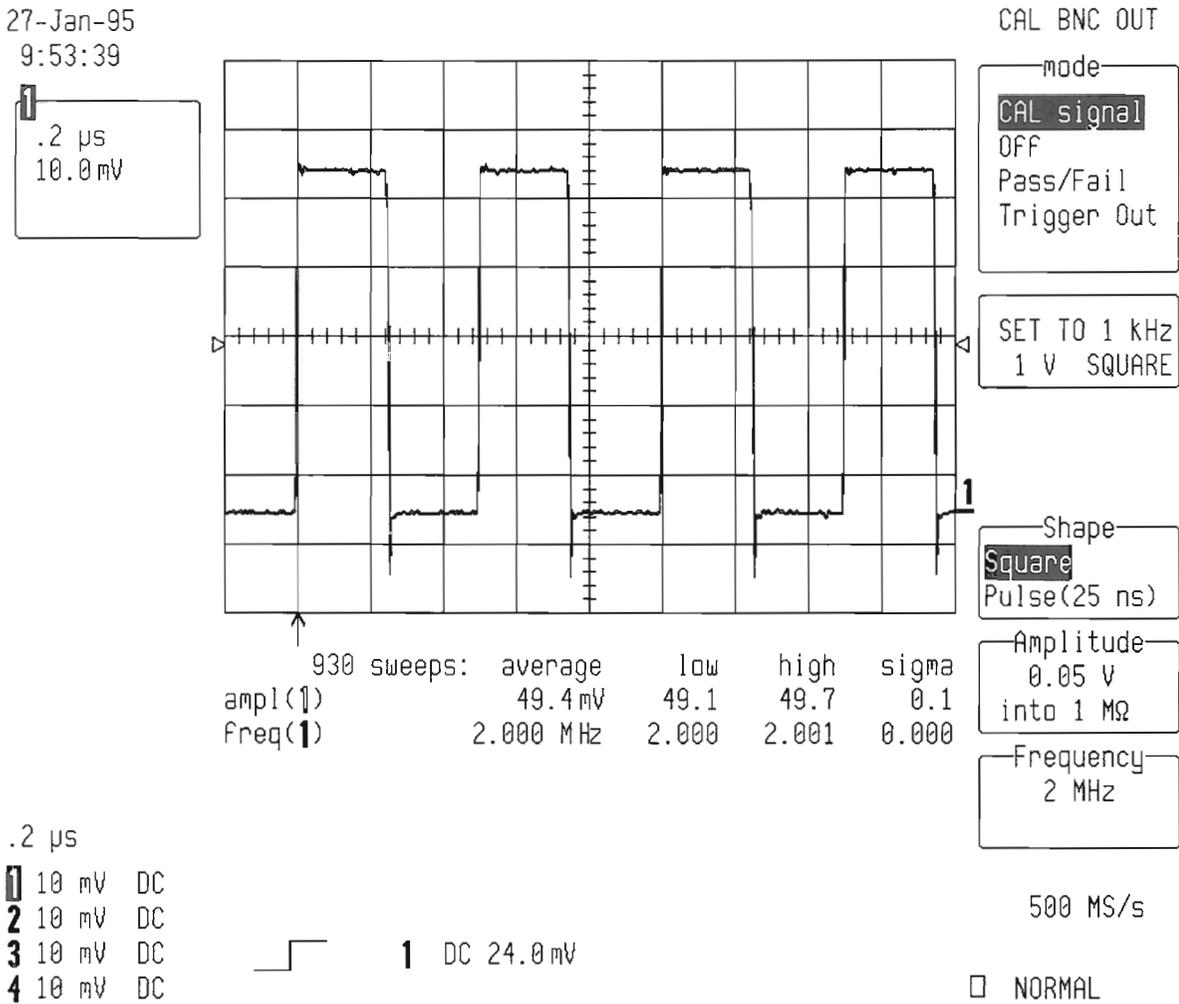
.2 μs

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

1 DC 250 mV

Section 5 Performance Verification

- Repeat the tests for the amplitude of 0.05 V and 1 V into 1 MΩ
- Cal amplitude : 50 mV
- Set Input Coupling : DC 1M Ω
- DSO Input gain : 10 mV/div.
- Check parameters readout $ampl(1) = 50\text{ mV} \pm 6\%$



- Set Cal amplitude : 1 V
- DSO Input gain : 200 mV/div.
- Check parameters readout $ampl(1) = 1\text{ V} \pm 6\%$

5.15 Overload

Specifications

1 Watt into 50 Ω : Overload < 17 seconds

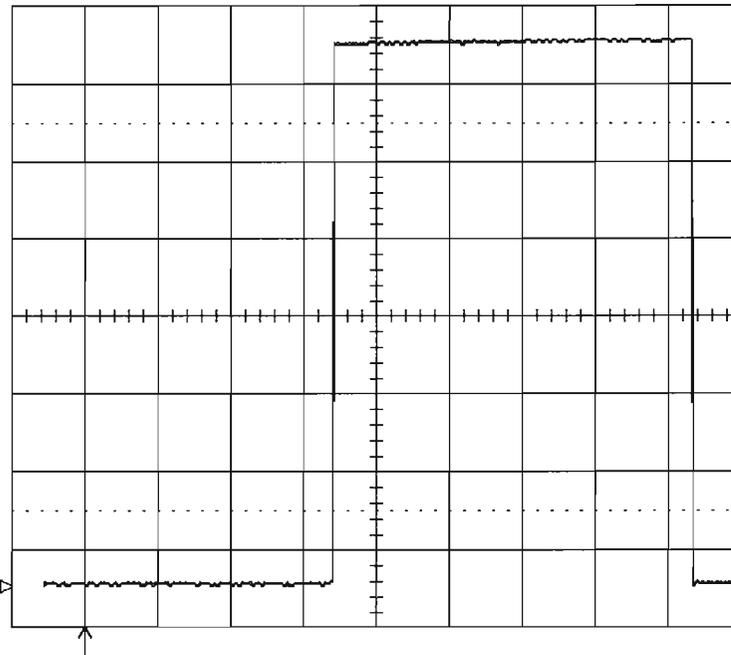
Procedure

- Set the DSO as follows :
 - Display setup : **Standard, Persistence off, Dot join on, Single grid**
 - Input Coupling : **DC 50 Ω**
 - V/div. offset : **Normal**
 - Global BWL : **Off**
 - Probe atten : **X1**
 - Input offset : **- 3.5 V**
 - Input gain : **1 V/div.**
 - Trigger setup : **Edge**
 - Trigger on : **1**
 - Trigger level : **DC - 0.04 V**
 - Delay : **zero**
 - Coupling 1 : **DC**
 - Slope 1 : **Pos**
 - Mode : **Norm**
 - Holdoff : **Off**
 - Timebase : **2 sec/div.**
 - Channel Use : **4**
 - Record up to : **1000 samples**
- From Tektronix power supply PS5004, apply **7.07 V** (1 Watt) to Channel 1.
- Check that the overload trips, within **17** seconds.
- Set Timebase : **5 sec/div.**
- From Tektronix power supply PS5004, apply **5 V** (.5 Watt) to Channel 1
- Check that the overload doesn't trip for at least **30** seconds.
- Repeat the above tests for Channel 2, Channel 3 and Channel 4 substituting channel controls and input connector, and check as above.

Section 5 Performance Verification

27-Jan-95
10:01:36

2 s
1.00 V



CHANNEL 1

Coupling
 DC50Ω
OVERLOAD
 DC1MΩ
 Grounded
 AC1MΩ

V/div Offset
NORMAL
 ECL TTL

Global BWL
OFF On
 (30 MHz)

Probe Atten
x1
 x2
 x5
 x10
 x20

50 S/s

STOPPED

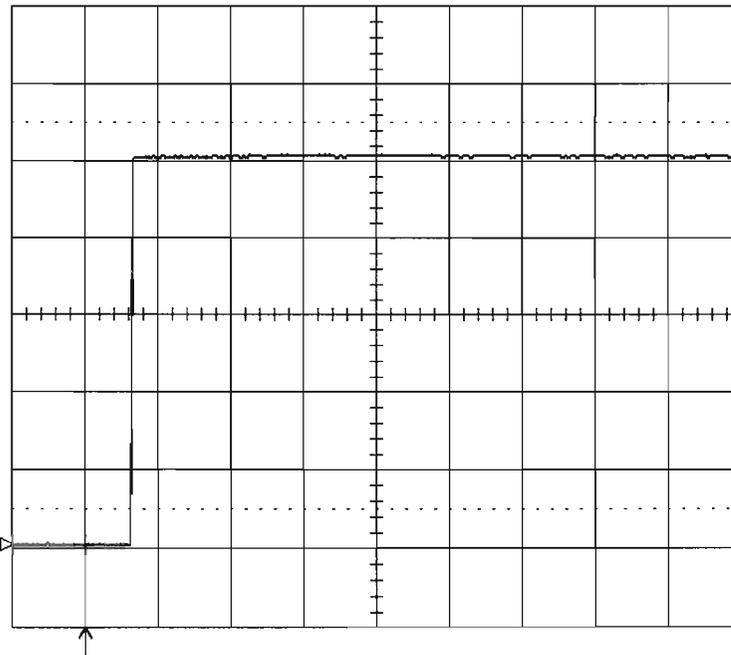
2 s

- 1 1 V $\frac{1}{2}$
- 2 1 V 50Ω
- 3 1 V 50Ω
- 4 1 V 50Ω

1 DC 0.04 V

27-Jan-95
10:09:34

5 s
1.00 V



CHANNEL 1

Coupling
DC50Ω
 Grounded
 DC1MΩ
 Grounded
 AC1MΩ

V/div Offset
NORMAL
 ECL TTL

Global BWL
OFF On
 (30 MHz)

Probe Atten
x1
 x2
 x5
 x10
 x20

20 S/s

NORMAL

5 s

- 1 1 V 50Ω
- 2 1 V 50Ω
- 3 1 V 50Ω
- 4 1 V 50Ω

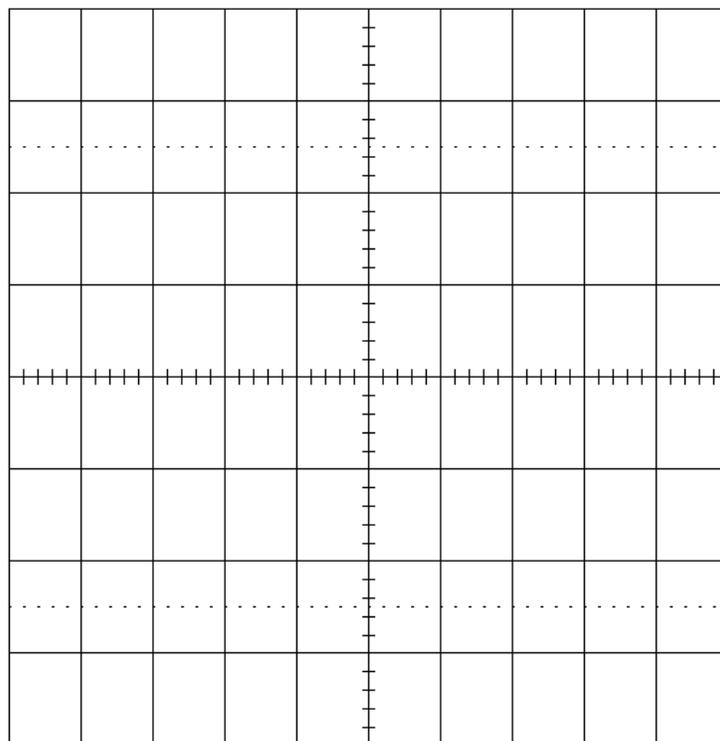
1 DC 0.04 V

SECTION 6 INTERNAL CALIBRATION and DIAGNOSTICS

6.1 Introduction

- The 9354A/T internal calibration use routines to confirm basic functionality, no test equipment is required to do these test procedures. The **diagnostics menu** is entered by simultaneously depressing the **third** and **fourth** menu push buttons on the right hand side of the CRT and then by depressing the **fifth**.
- To quickly check the performance of the digital storage oscilloscope, select the **calibration diagnostics**.
- Press the **recalibrate completely** button to do a full recalibration of the front end. It is advisable to perform this type of check when the scope is in a stable condition.

24-Jan-95
9:23:30



INTERNAL

- Calibration Diagnostics
- Maintenance
- Development
- Flash Update

10 μ s

- 0** .1 V 50 Ω
- 2** .1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω



1 DC 0mV

100 MS/s

AUTO

6.2 Diagnostic Summary

- Press **diagnostic summary**.
- This is a handy tool to perform a quick but comprehensive **internal performance** check, without touching the acquisition settings. The failures are indicated by channel identifiers.
- If no problem is detected, the fields are left **blank**.

```

24-Jan-95                                     CALIBRATION
9:23:50
30°           Calibration Diagnostic Summary           2.5 ns
Gain and Offset Calibration:
                2 mV   5 mV   10 mV   20 mV   50 mV   .1 V
ADC zero reading
gain measurement
gain is negative
gain control range
offset control range
final gain setting
final offset setting
Trigger Level Calibration:
                Trigger
                dc   bwl   hfr   ac
control
hysteresis
Trigger Interval Counter Calibration:  2.512 [ns]  passed

```

Diagnostic Summary

Diagnostic Results

Diagnostic Measurements

Recalibrate Completely

Failures are indicated by channel identifiers. Fields are left blank if no problem detected or a failure occurred previously.

- The **gain** and **offset** calibration results displayed for Channel 1, Channel 2, Channel 3 and Channel 4 are independent of the following conditions:
 - Time base
 - 50 Ω or 1 M Ω input impedance
 - BWL on or off
 - Variable gain
 - Offset
 - Trigger mode and coupling
- The internal calibration is checked at **DC 1 M Ω** , and for the **six gain** settings : 2 mV, 5 mV, 10 mV, 20 mV, 50 mV, .1 V/div.

6.2.1 Gain and Offset Calibration Description

- ADC zero reading : Failed to get 0 reading from ADC for some choice of V_{gain}, and Cal signal, while varying the Offset
- Gain measurement : Failed to measure Gain, the gain was not what was expected.
- Gain is negative : Measured a negative Gain or broken channel.
- Gain control range : The range of the variable Gain is checked.
- Offset control range : The range of the variable Offset is checked.
- Final gain setting : An error is detected if the variable Gain and fix Gain adjustment do not converge to the desired Gain.
- Final offset setting : An error is detected if the 3 Offset calibration points do not lie on a straight line.

6.2.2 Trigger Level Calibration

- The control of the trigger hysteresis is done in the trigger mode DC, BWL on, HFr, and AC. If an error has occurred 1, 2, 3, 4 or E is displayed corresponding to Channel 1, Channel 2, Channel 3, Channel 4 or External.
- Control : Failed if no transition of discriminator observed when stepping the Threshold level.
- Hysteresis : Failed to get correct Hysteresis.

6.3 Diagnostic Results

6.3.1 Gain Curves

- Press **diagnostic results**
- Select results for **gain**
- Press **recalibrate completely**
- Select show results for **Channel 1**
- Variable gain range, checked by software must be better than 0.95 to at least 2.75. With regards to the illustration, the lower portion of the curve must extend below **0.95** limit, and the upper portion above the **2.75** limit.
- If this is not true the Gain control range summary shows a violation for Channel 1.
- The maximum and minimum gain factors are displayed.

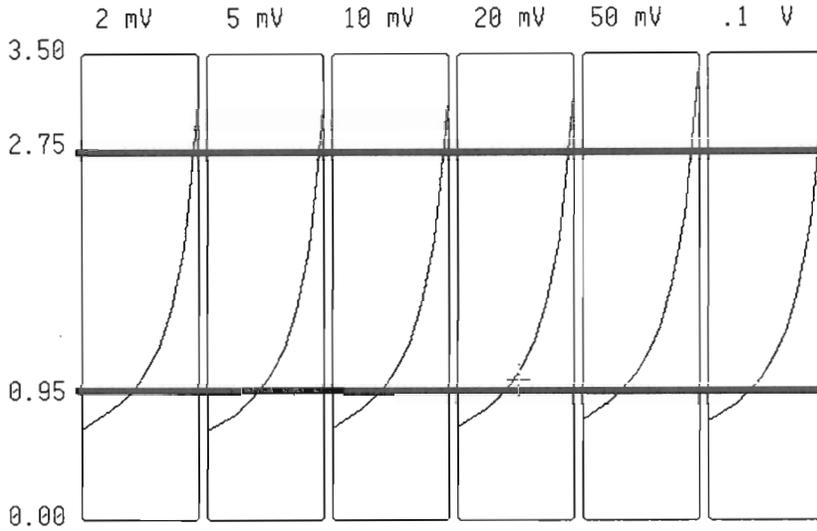
Section 6 Internal Calibration and Diagnostics

24-Jan-95
9:24:21
30°

CALIBRATION

Gain Calibration Results

1 2.5 ns



Diagnostic Summary

Results for:

- Gain
- Offset
- Trigger Level

Diagnostic Measurements

Recalibrate Completely

Show Result for Channel

1 2 3 4

maximum Factor	3.15	3.11	3.17	3.20	3.43	3.35
minimum Factor	0.68	0.67	0.69	0.70	0.75	0.74

BWL Factor	1.054	1.049	1.046	1.049	1.049	1.052
BWLD Factor	1.053	1.040	1.043	1.043	1.042	1.044
Monitor:	nc	4;	1: Δg	-76, Δσ	2	□

- Repeat the test for Channel 2, Channel 3 and Channel 4

6.3.2 Offset Curves

- Select results for **Offset**, and show result for **Channel 1**

X = offset DAC range
Y = offset

- The curves should be above the positive limits + 0.12 V / + 1.2 V and below the negative limits - 0.12 V / - 1.2 V.
- For the sensitivities 2 mV, 5 mV/div. a 1/10 attenuator is used, the limits are ± 0.12 V.
- For the sensitivities 10 mV, 20 mV, 50 mV, 0.1 V/div. the limits are ± 1.2 V.
- The maximum and minimum offset is ± 1.2 V. The calibration verifies that the DAC can reach this value.
- The intrinsic value represents the offset in mV that should be applied to get zero offset to the ADC.

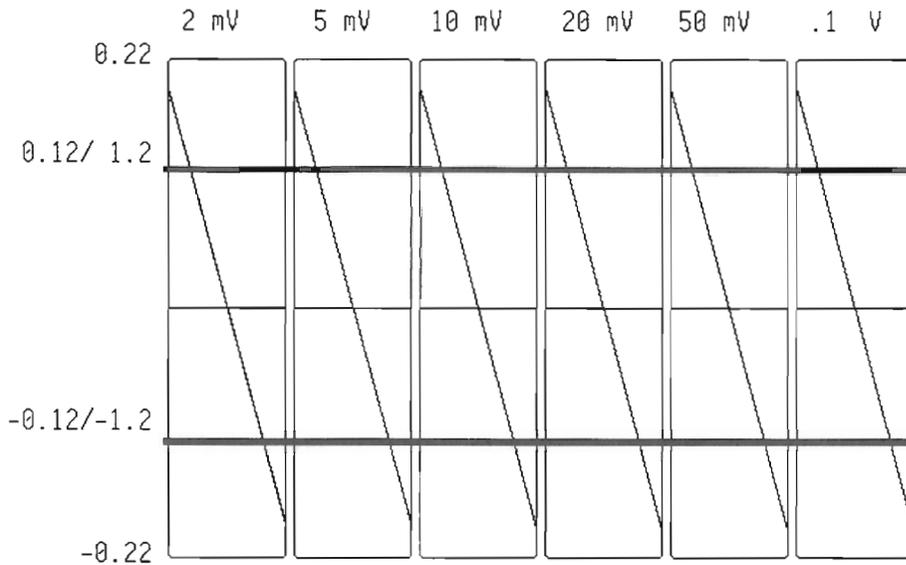
NB : ΔBWL is the difference between BWL on and BWL off.

24-Jan-95
9:24:37
30°

CALIBRATION

Offset Calibration Results

1 2.5 ns



Diagnostic Summary

Results for:
Gain
Offset
Trigger Level

Diagnostic Measurements

Recalibrate Completely

Show Result for Channel
1 2 3 4

range high [V]	0.193	0.193	1.941	1.939	1.932	1.939
range low [V]	-0.189	-0.189	-1.936	-1.938	-1.944	-1.938
intrinsic [mV]	2.3	2.4	3.2	0.5	-6.6	1.3
ΔBWL [mV]	-0.4	-0.9	-1.7	3.7	9.1	18.3
ΔBWLΔ [mV]	-0.0	-0.0	-0.1	0.3	0.8	1.2
Monitor: nc	4; 1: Δg	-136, Δo	0			

- Repeat the test for Channel 2, Channel 3 and Channel 4.

6.3.3 Trigger Level Calibration

- Select results for **trigger level**
- For Channel 1, Channel 2, Channel 3 and Channel 4 the hysteresis value for trigger DC, BWL, HFR, AC is given in **divisions**. The trigger range is ± 5 div. for the steep curve. The boxed region is zoomed to give the two lines with a vertical scale of ± 1 div. The external trigger hysteresis is given in Volt. The offset of the positive curve relating trigger threshold to DAC setting is given.
- Press **recalibrate completely**
- Select show result for **Channel 1**
- The **DC** hysteresis in div. should be ± 0.3 div. ± 0.05 div.
- Repeat the test for Channel 2, Channel 3 and Channel 4.

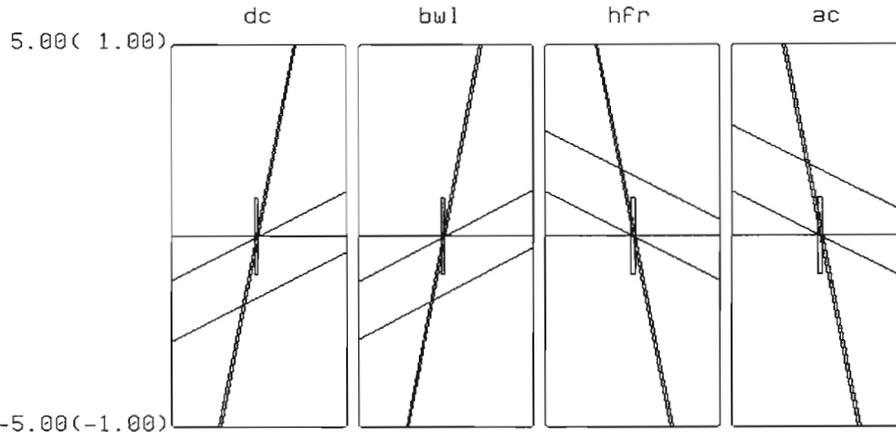
Section 6 Internal Calibration and Diagnostics

24-Jan-95
9:25:19
30°

Trigger Level Calibration Results

1 2.5 ns

CALIBRATION



hysteresis [div]	0.317	0.300	-0.319	-0.344
offset [div]	0.087	0.100	0.399	0.407

Diagnostic Summary

Results for:
Gain
Offset
Trigger Level

Diagnostic Measurements

Recalibrate Completely

Show Result For Channel
1 2 3 4 E

Monitor: nc 5; 1: Δg -13, Δo 17

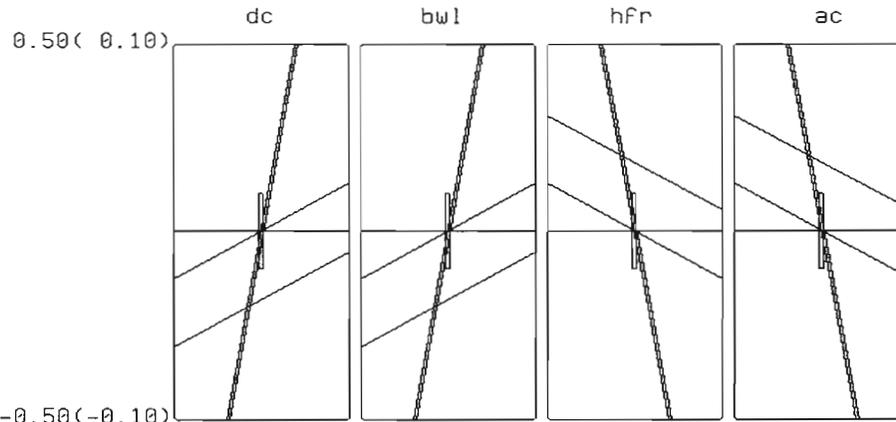
- Select show result for **External trigger**
- The hysteresis in Volt should be $\pm 0.035 \text{ V} \pm 0.01$

24-Jan-95
9:25:32
30°

Trigger Level Calibration Results

E 2.5 ns

CALIBRATION



hysteresis [V]	0.037	0.037	-0.037	-0.037
offset [V]	-0.025	-0.025	0.025	0.025

Diagnostic Summary

Results for:
Gain
Offset
Trigger Level

Diagnostic Measurements

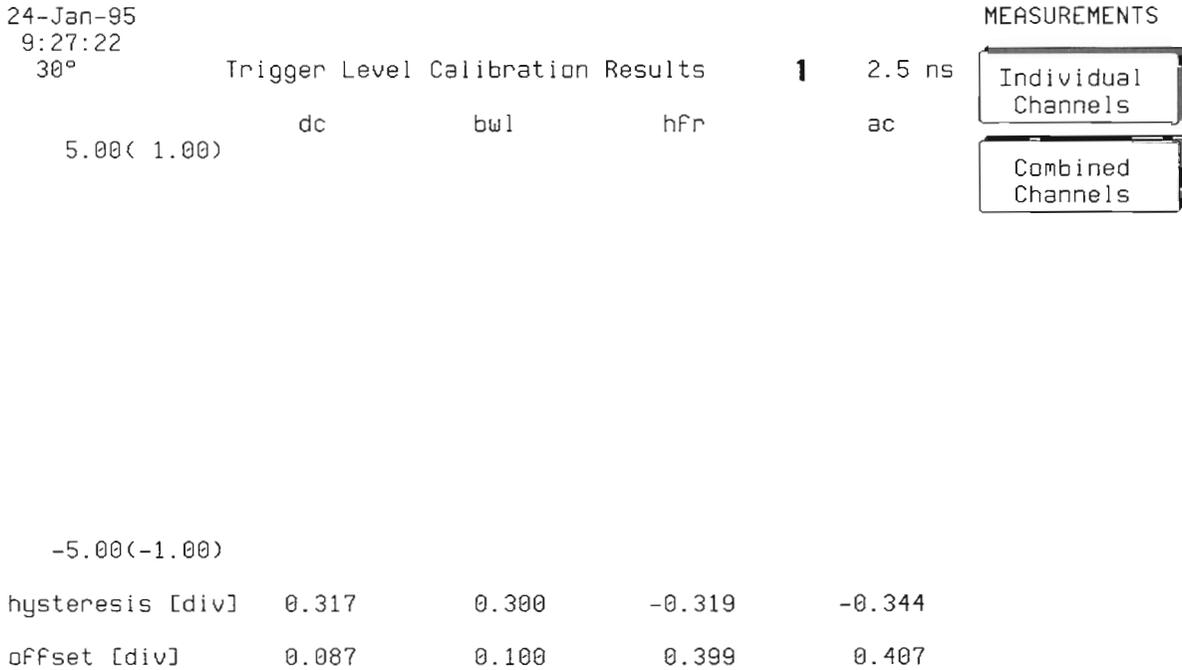
Recalibrate Completely

Show Result For Channel
1 2 3 4 E

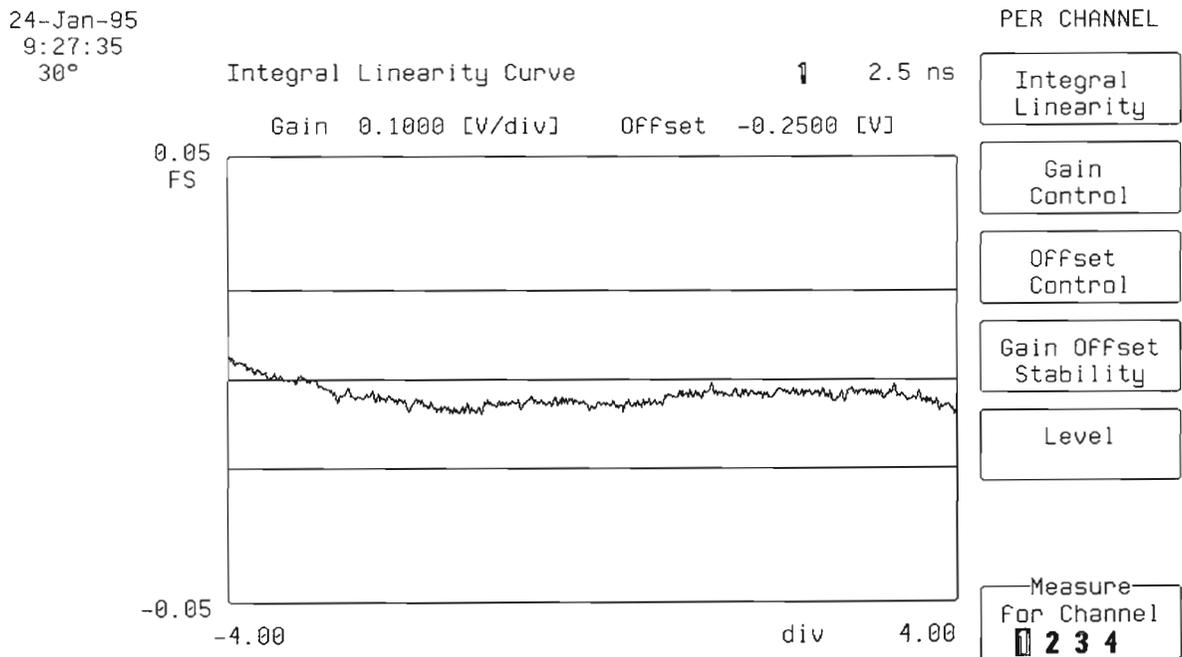
Monitor: nc 5

6.3.4 Integral Linearity

- Press **diagnostic measurements**
- Select **Individual Channels**

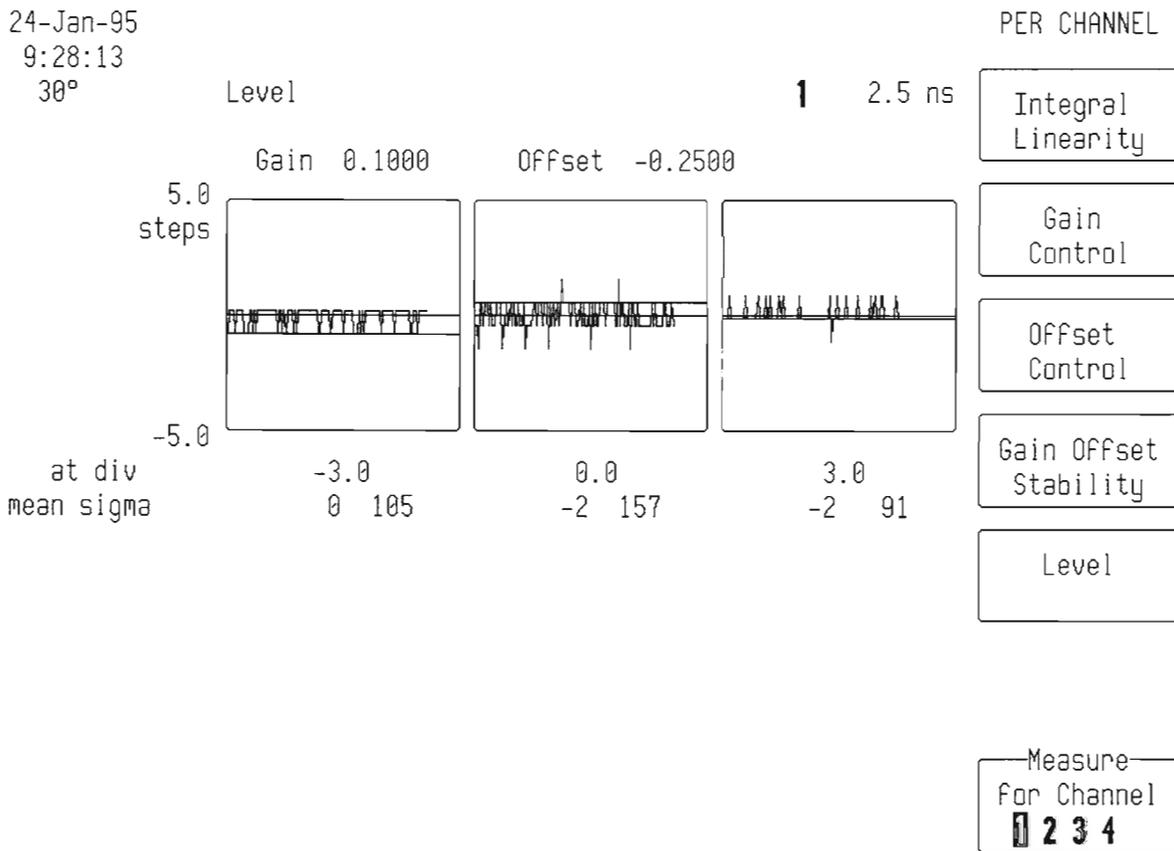


- Select **integral linearity**
- Measure for **Channel 1**



Section 6 Internal Calibration and Diagnostics

- The integral linearity curve should be within the $\pm 0.05 * FS$ bars, for offset = 0.0 V.
- Repeat the test for Channel 2, Channel 3 and Channel 4.
- Press **level**
- Measure for **Channel 1**
- The three plots show raw ADC data displayed around their mean value for 3 different CAL levels.
- The data should be **narrow** and random.
- The theoretical level is shown by the second horizontal line which should be near (< 4 steps) to the measured value for Offset = 0.



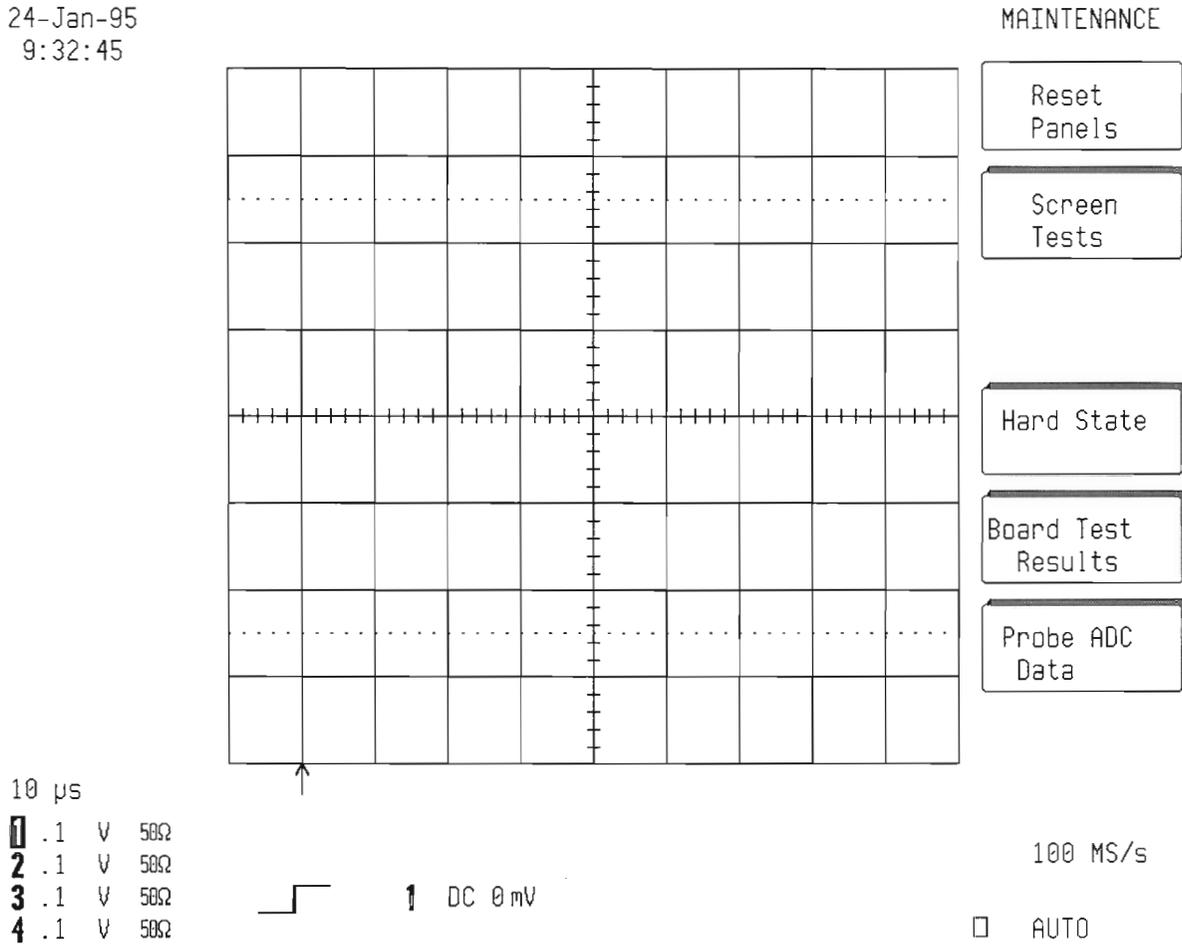
□

- Repeat the test for Channel 2, Channel 3 and Channel 4.

6.4 Board Test Results

- From the Internal menu press **Maintenance**
- Select **Board Test Results**

24-Jan-95
9:32:45



- This menu displays the board calibration measured at the factory, the calibration values are loaded in the I2C Prom.
- The header block indicates the following information :
 - The test version : i.e. 168
 - The revision of the printed circuit board : i.e. Rev B
 - The engineering change order level : i.e. ECO 1002
 - The work order number : i.e. WO 9452-0056
 - The tested date : i.e. tested 1995-01-10 it should be : \geq 1993-xx-xx.

- If the date says 1990-04-01 it is a sign that the I2C prom on the main board can not be read correctly.
- The gain, offset, level, timing, delay values shown in this menu are used to perform the internal calibration of the scope.

24-Jan-95
9:33:07

Board Test

Header: block lengths 20 32 14 Test version 168 4 chans
Rev: B, ECO 1002, W0 9452-0056, Tested: 1995-01-10 10:15

CAL levels: (E68F, -2000mV) (8015, 0mV) (199A, 2000mV)
EXT trigger: pos. (AA78, -410mV) (56F8, 418mV)
neg. (A6C8, -410mV) (5340, 418mV)
EXT/10 attenuator: 10.004
Delay correction: 20.00 ns

ADC control: clock period gain DAC offset DAC
2.00 ns 9c 93 2.50 ns 78 7F 5.00 ns 8c 6b
Inter channel delay: 0 ps

ADC control: clock period gain DAC offset DAC
2.00 ns 9d 91 2.50 ns 85 86 5.00 ns 88 7b
Inter channel delay: 0 ps

ADC control: clock period gain DAC offset DAC
2.00 ns 96 8a 2.50 ns 7c 81 5.00 ns 80 5f
Inter channel delay: 0 ps

ADC control: clock period gain DAC offset DAC
2.00 ns 93 87 2.50 ns 7a 7a 5.00 ns 88 65
Inter channel delay: 0 ps

□

6.5 Probe Bus Verification

- From the Internal menu press **Maintenance**
- Select **probe ADC data**
- This menu displays the probe bus and probe ring status.
- With no probe connected to the input, check that the value in the first column is 251 ± 2 for Channel A, B, C, D, and Ext.

24-Jan-95
9:35:01

Probe Data

	value	limits	interrupts	
Channel A	252 253	[245,255]	0	
Channel B	252 252	[245,255]	0	
Channel C	252 252	[245,255]	0	
Channel D	252 252	[245,255]	0	
Channel EXT	252 252	[245,255]	0	
Channel CAL	253 253	[0,255]	0	
Channel MON	125 125	[73, 79]	0	
Channel T	93 96	[90,102]	3	Temperature 30°C

- Connect a **AP020** LeCroy active probe to Channel 1 and check that:
 - The probe is identified on physical **Channel A**
 - The Channel A value indicates in the first column has changed to **21 ± 2**
 - An **interrupt** has been detected on Channel A

24-Jan-95
9:36:19

Probe Data

	value	limits	interrupts	
Channel A	21 21	[6, 26]	1	AP020
	01 08 00 41 50 30 32 30 04 06		93 25 01 59 11 06 41 20 00 00	
	15 06 3d cc cc cd 21 0a 40 19		ec da 38 99 f3 9d 22 0b c0 00	
	00 00 40 00 00 00 01 24 07 01		46 42 01 00 34 06 00 10 00 42	
	36 04 02 04 41 06 32 04 48 f5		ff	
Channel B	252 252	[245,255]	0	
Channel C	252 252	[245,255]	0	
Channel D	252 252	[245,255]	0	
Channel EXT	252 252	[245,255]	0	
Channel CAL	253 253	[0,255]	0	
Channel MON	125 125	[73, 79]	0	
Channel T	93 96	[90,102]	3	Temperature 30°C

- Repeat the test for Channel 2, Channel 3, Channel 4 and External Trigger.
 - Check that the probe is identified on physical Channel B, C, D, or Ext.
 - Connect a LeCroy passive probe with probe ring i.e. **PP002** to Channel 1 and check that :
 - The probe **X10** is identified on physical Channel A
 - The Channel A value indicates in the first column has changed to **195 ± 2**
 - An **interrupt** has been detected on A

24-Jan-95
9:37:48

Probe Data

	value	limits	interrupts	
Channel A	195 194	[173,204]	7	x10
Channel B	252 252	[245,255]	0	
Channel C	252 252	[245,255]	0	
Channel D	252 252	[245,255]	0	
Channel EXT	252 252	[245,255]	0	
Channel CAL	253 253	[0,255]	0	
Channel MON	125 125	[73, 79]	0	
Channel T	93 96	[90,102]	3	Temperature 30°C

- Repeat the test for Channel 2, Channel 3, Channel 4 and External Trigger.
- Check that the probe is identified on physical Channel B, C, D, or Ext.

24-Jan-95
9:38:54

Probe Data

	value	limits	interrupts	
Channel A	252 252	[242,255]	12	
Channel B	252 252	[245,255]	0	
Channel C	252 252	[245,255]	0	
Channel D	252 252	[245,255]	0	
Channel EXT	195 193	[173,204]	1	x10
Channel CAL	253 253	[0,255]	0	
Channel MON	125 125	[73, 79]	0	
Channel T	93 96	[90,102]	3	Temperature 30°C

- Connect a LeCroy passive probe with probe ring **PP012** to Channel 1 and check that :
 - The probe **X100** is identified on physical Channel A
 - The Channel A value indicates in the first column has changed to **165 ± 2**
 - An **interrupt** has been detected on A

24-Jan-95
9:38:15

Probe Data

	value	limits	interrupts	
Channel A	165 165	[140,167]	10	x100
Channel B	252 252	[245,255]	0	
Channel C	252 252	[245,255]	0	
Channel D	252 252	[245,255]	0	
Channel EXT	252 252	[245,255]	0	
Channel CAL	253 253	[0,255]	0	
Channel MON	125 125	[73, 79]	0	
Channel T	93 96	[90,102]	3	Temperature 30°C

- Repeat the test for Channel 2, Channel 3, Channel 4 and External Trigger.
- Check that the probe is identified on physical Channel B, C, D, or Ext.

6.6 PP092 Verification

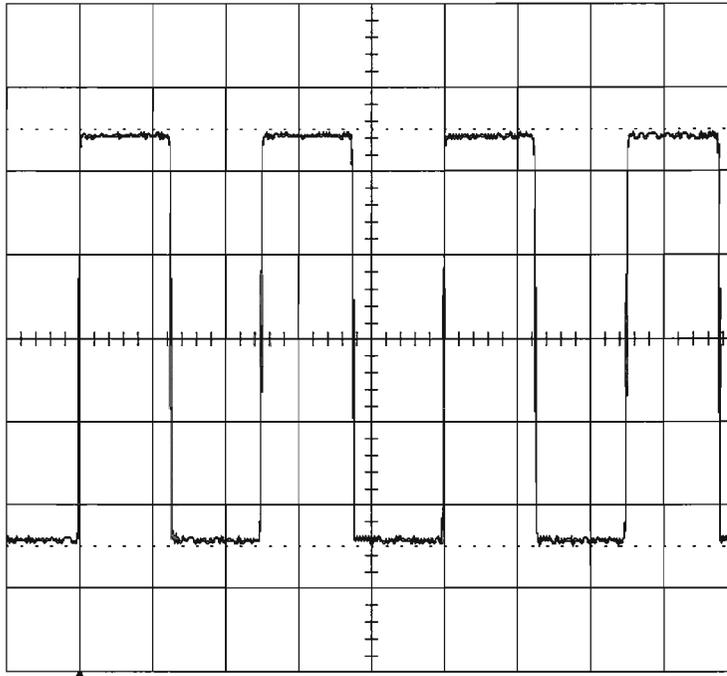
Channels can be combined to achieve more memory and more sampling rate by interleaving the ADC's in time. It is possible to achieve 2 GS/s and up to 8M record length (9354AL) by means of a special adaptor call PP092.

- Connect the **PP092** adaptor to Channel 2 and Channel 3 and check that :
- The PP092 is identified on **Channel 2**
- Channel 1, Channel 3 and Channel 4 are **disabled**
- Channel 2 is set to **DC 50 Ω, X2**
- Sampling rate is **2 GS/s**
- Connect the **Probe calibrator** output to **PP092** input using a 5 nsec BNC cable.
- Set Cal frequency to **2 MHz** and Amplitude to **1 V** into **1 MΩ**
- Turn on **trace 2** and check that :

Section 6 Internal Calibration and Diagnostics

24-Jan-95
10:15:19

1 ← 2
.2 μ s
100 mV



TIMEBASE
T/div .2 μ s
4000
samples at
2 GS/s
(.5 ns/pt)
for 2.0 μ s
Sampling
Single Shot
RIS

All Channels
combined for
2 GS/s (2)
Sequence
OFF On Wrap
Record up to
250k

.2 μ s
1 disabled
2 50 mV 50 Ω \times
3 disabled
4 disabled

2 DC 254 mV

2 GS/s
 NORMAL

- A Square wave of 500 mV is displayed on Channel 2
- Turn on trace 1, 3, 4 and check that :
- A Square wave of 500 mV is displayed on Channel 1, Channel 3, and Channel 4.

SECTION 7 MAINTENANCE**7.1 Introduction**

This section contains information necessary to disassemble, assemble, maintain, calibrate and troubleshoot the LeCroy 9354A, 9354AM, 9354AL, 9354T and 9354TM digital oscilloscope.

7.2 Disassembly and Assembly Procedure

The disassembly and assembly procedures detailed below refer to the assembly and disassembly diagram 7.2.3, and the view of figures 7.1, 7.2, 7.3, 7.4, 7.5 & 7.6. Please study the diagram and figures before attempting disassembly.

WARNING

Before removing any parts from the LeCroy 9354A/T, be sure to read carefully the instructions referring to those parts, noting any precautions needed to avoid problems caused by mechanical behaviour, high voltage supplies, etc.

CAUTION

The usual precautions against static electricity are required (see 1.10)

7.2.1 Removal of the Upper Cover (5.9)

The top cover (5.9) is secured by two M4x5 screws (5.11) on both sides of the front panel assembly (2), and by two M4x8 screws (5.10) on the rear panel (3). Remove the screws and carefully slide the cover off the unit to the rear. Removal of the top cover gives access to the boards and parts listed in section 7.2.3.

7.2.2 Removal of the PS9351 Power Supply (4)**WARNING**

Ensure the line cord is disconnected. Remove the following:

- Top cover (7.2.1).
- One M4X8 screw (5.7) from left side of the bottom cover (1.1).
- Two M4X8 screws (5.1) from left side of the rear panel (3).

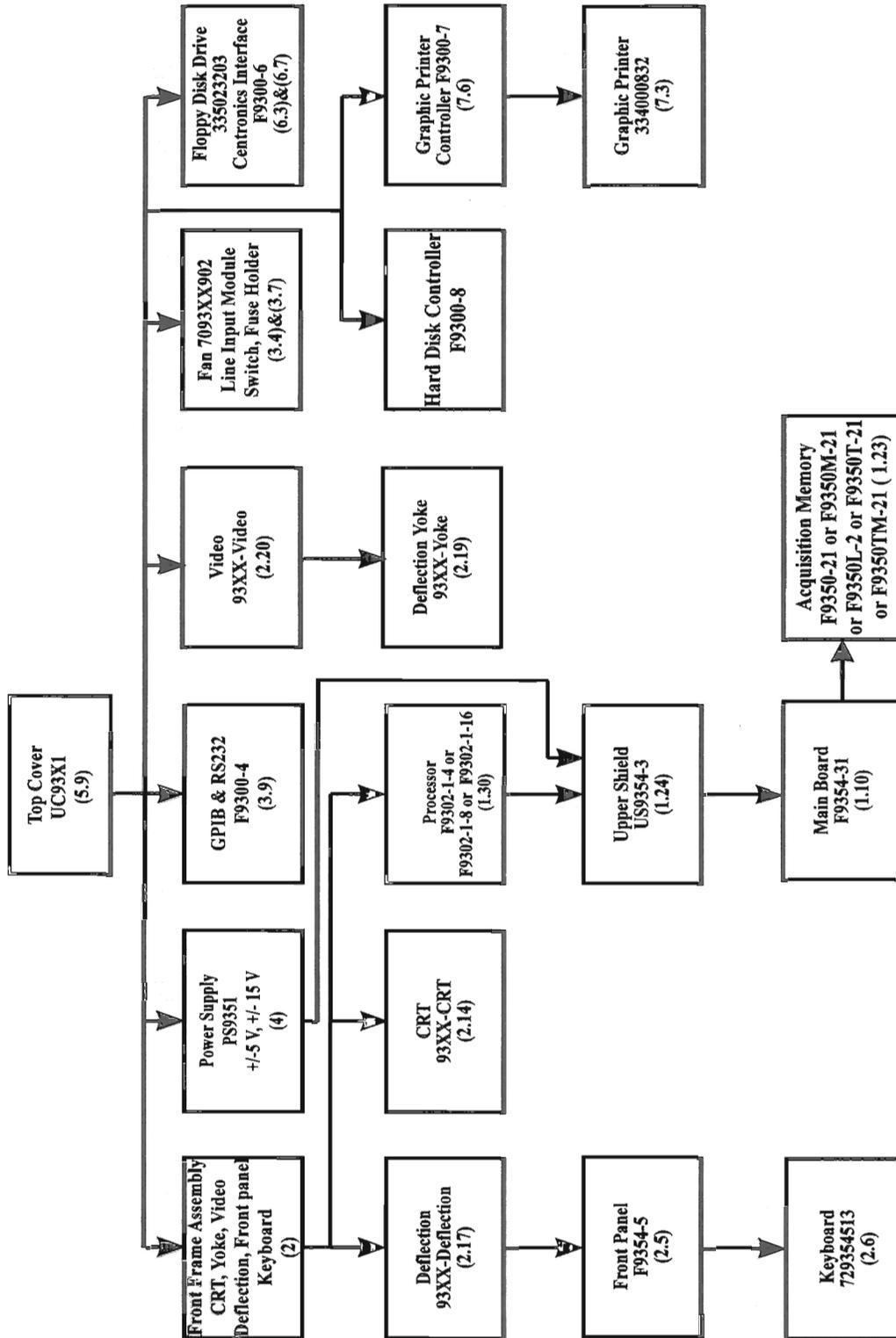
Disconnect the following:

- Base card power cable from main board connector J1/J2 (see figure 7.7).
- PS9351 line input cable (AC line, neutral, ground) from line input module (3.7) .
- Auxiliary power cable from optional internal graphic printer connector J4 (see figure 7.7).

The power supply can now be removed vertically from the oscilloscope.

7.2.3 Disassembly and Assembly Diagram

Disassembly : If it becomes necessary to replace a board or a part, use the disassembly diagram to disassemble the unit. Any board can be removed if items higher in the diagram and connected by a line are already out.



Assembly : Reassemble the unit in the reverse order.

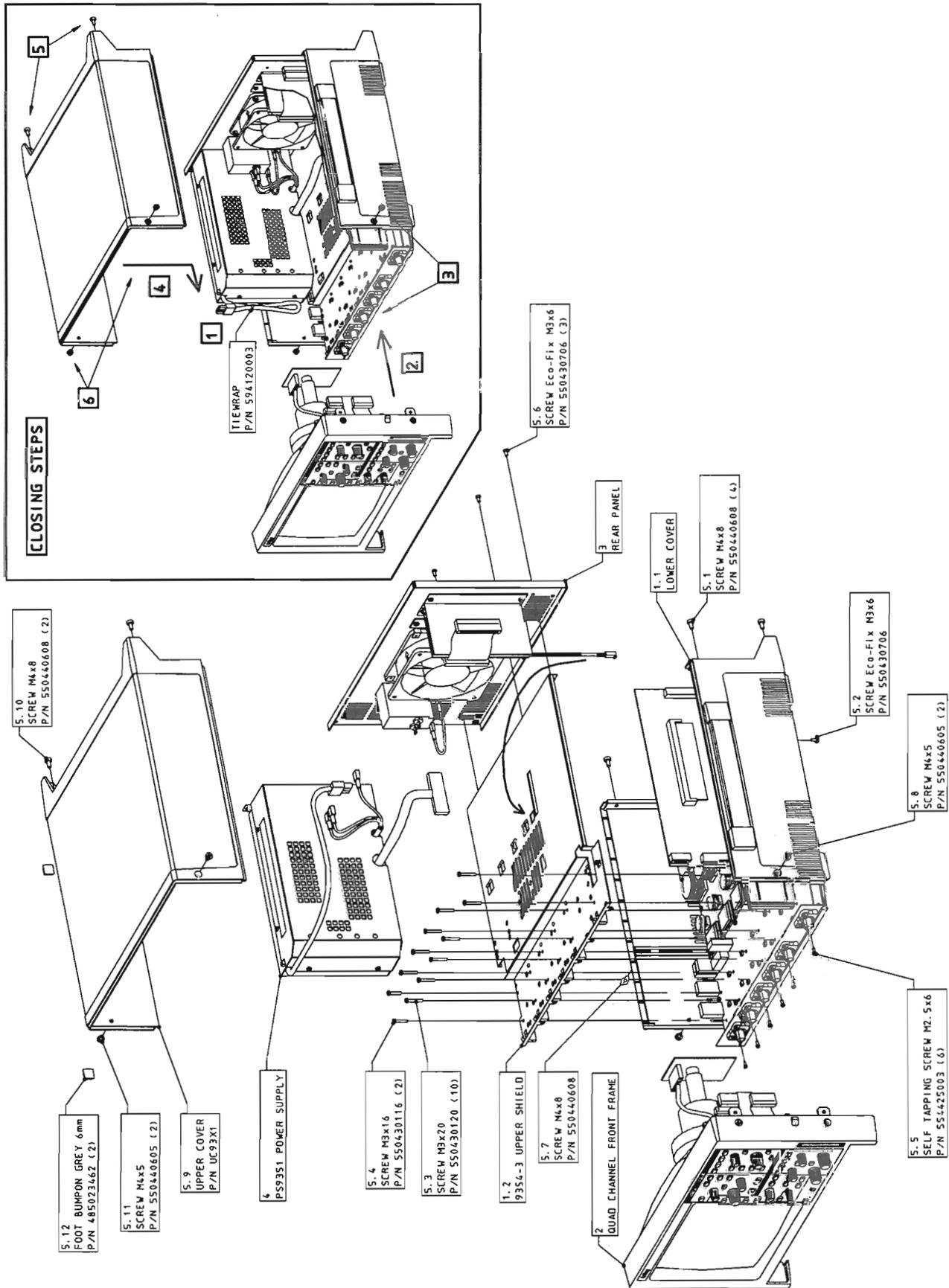


Figure 7.1 : 9354A/T Assembly

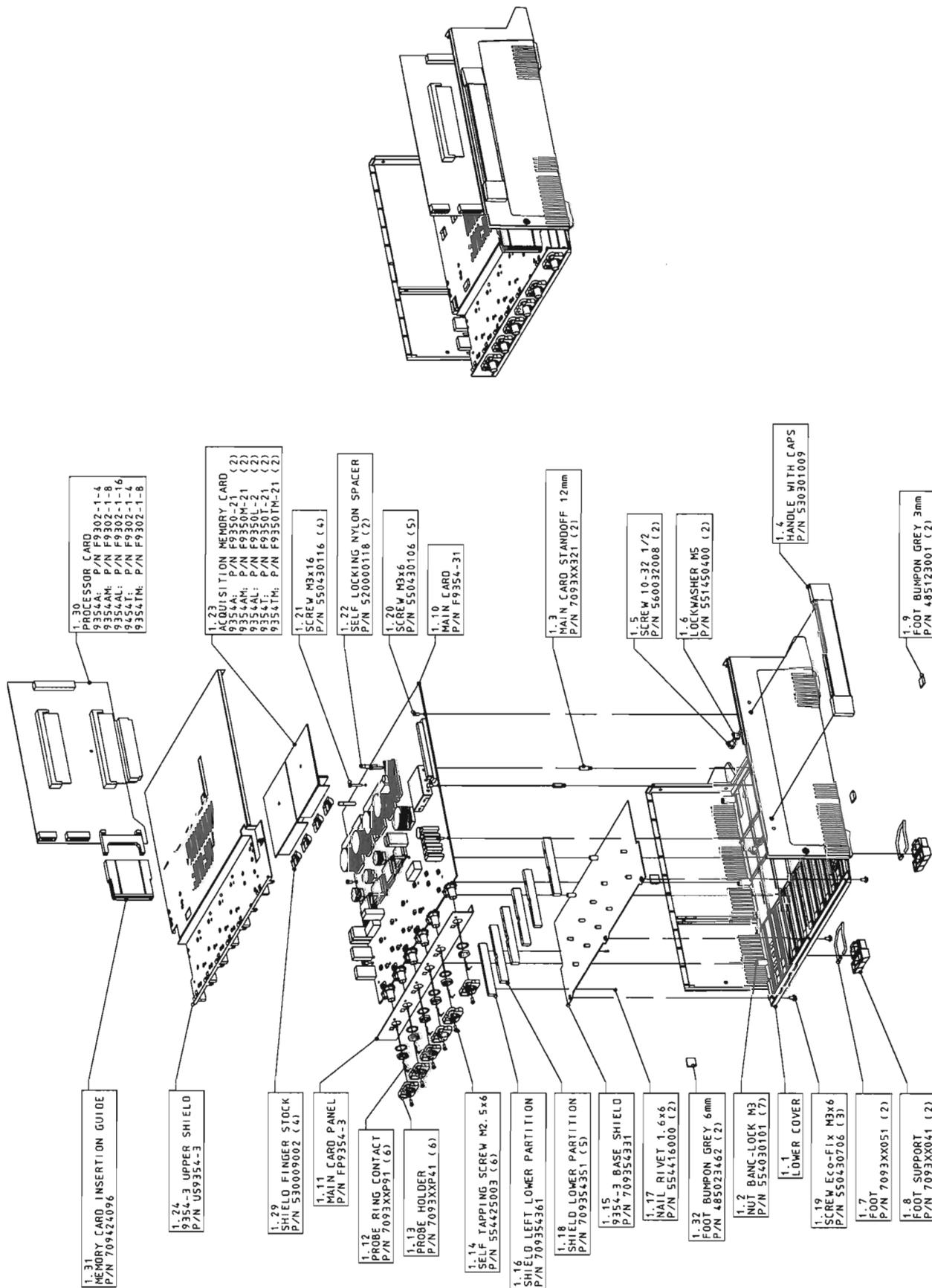


Figure 7.2 : 9354A/T Lower Cover Assembly

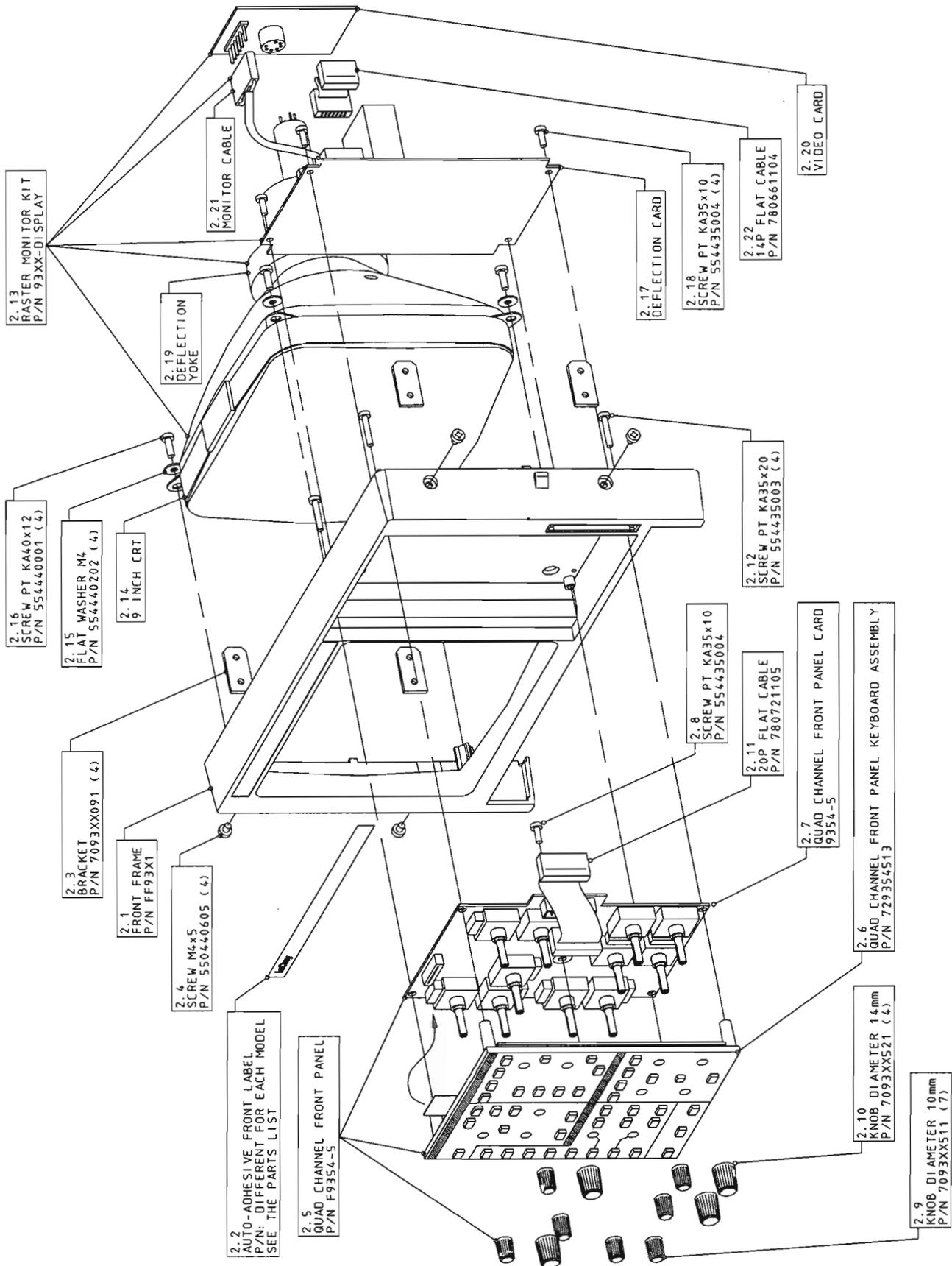


Figure 7.3 : 9354A/T Front Frame Assembly

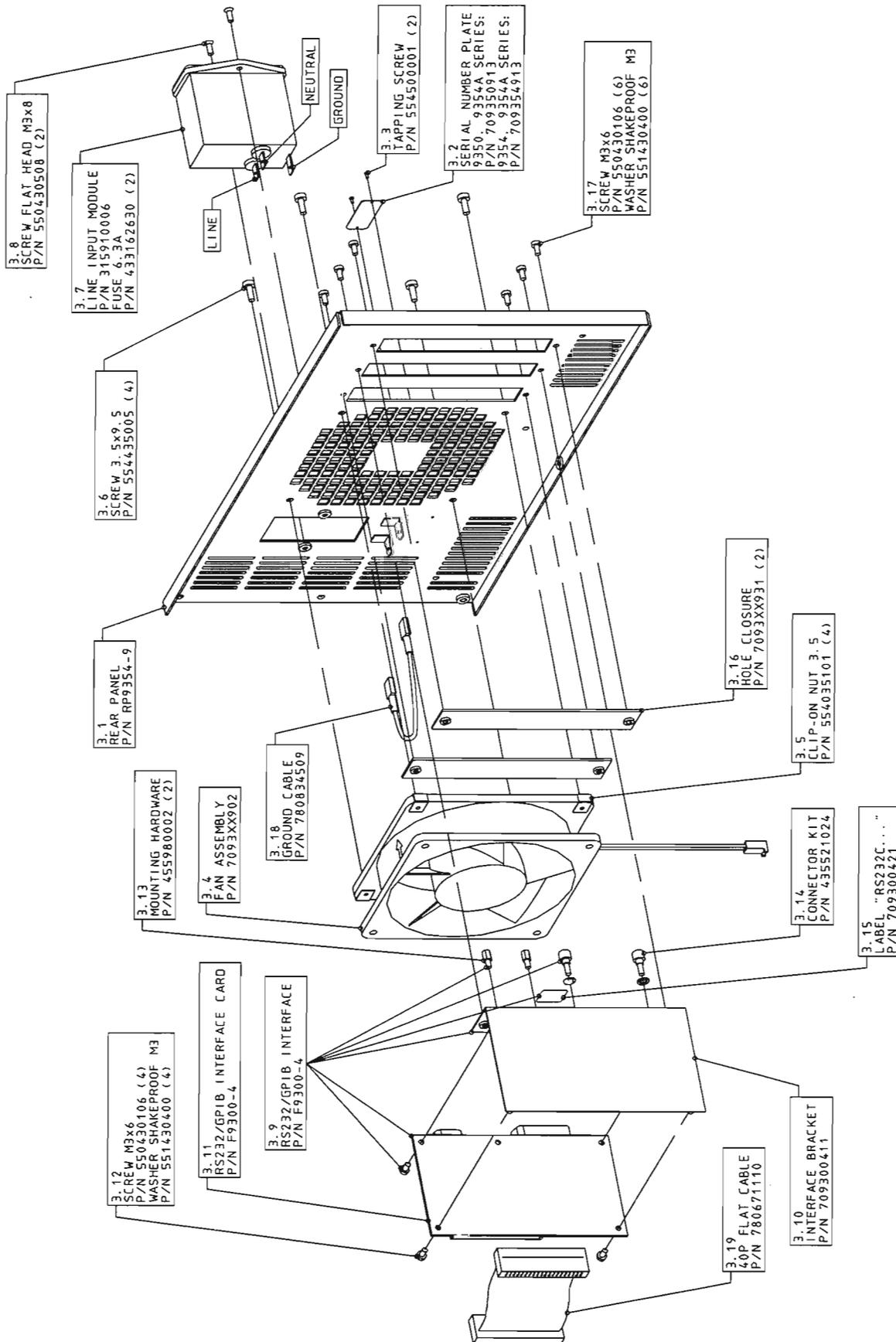


Figure 7.4 : 9354A/T Rear Panel Assembly

7.2.4 Removal of the F9300-4 GPIB/RS232 Interface (3.9)

The GPIB/RS232 interface (3.9) is vertically mounted on the rear panel (3.1).

Remove the following:

- Top cover (7.2.1).
- Two M3x6 screws (3.17) and washers from the rear panel (3.1).
- Disconnect the flat cable (3.19) from the processor board (1.30) connector J5.

The GPIB/RS232 board can be removed forward from the rear panel.

7.2.5 Removal of the Fan (3.4)

Remove the following:

- Top cover (7.2.1)
- Four screws (3.6) and nuts (3.5) from the rear panel (3.1).
- Disconnect the fan power cable from the main card F9354-31 connector J3.

The fan (3.4) part number : 7093XX902 can be removed from the unit.

CAUTION

Note the air flow, the fan extracts air from the unit and expels it.

7.2.6 Removal of the Line Input module (3.7)

WARNING

Disconnect the power cord.

Remove the following:

- Top cover (7.2.1).
- Two screws (3.8) from the rear panel.
- Disconnect the power cable from the power supply connector.
- Disconnect the earth cable (3.18).

The fuse holder assembly (3.7) can be removed from the rear panel (3.1).

7.2.7 Removal of the 93XX-Video (2.20)

- Remove the top cover (7.2.1).
- Disconnect the ground cable from CRT (black wire)
- Disconnect the monitor cable (2.21) from the deflection board, connector W301 & W302

Ease the video board (2.20) carefully toward the back of the DSO, until it is free.

7.2.8 Removal of the 93XX-Yoke (2.19)

- Remove the top cover (7.2.1).
- Remove the 93XX-video board (7.2.7)
- Disconnect the cable from the deflection board connector W201.
- Loose the screw on the yoke ring holder.

The deflection yoke (2.19) can be removed from the cathode ray tube (2.14).

7.2.9 Removal of the front frame Assembly (2)

Remove the following:

- Top cover (7.2.1)
- Two screws (5.8) that secure the front frame assembly (2) to the lower cover (1.1).
- Disconnect the front panel flat cable (2.11) from the processor (1.30) connector J4.
- Disconnect the deflection flat cable (2.22) from the processor board (1.30) connector J6.

The front frame assembly (2) with the CRT (2.14), yoke (2.19), video (2.20), deflection (2.17), front panel (2.7) and keyboard (2.6) can with care be removed forward from the unit.

CAUTION

Hold the CRT very carefully, or place soft padding under it.

7.2.10 Removal of the 93XX-Deflection (2.17)

The deflection board (2.17) is situated to the back of the front panel (2.5).

Remove the following

- Top cover (7.2.1).
- Front frame assembly (7.2.9).
- Disconnect the monitor cable (2.21) which lead to the video board (2.20), connector W301 and W302.
- Disconnect the cable from the deflection yoke, connector W201.
- Disconnect the EHT plug from the receptacle at the right side of the CRT (2.14).

WARNING

Touch the free end of the EHT cable to the ground, this ensures that no significant charge remains. The CRT must be discharged similarly, using a tool or a long screw driver which is first placed to the ground and on the CRT receptacle.

Remove the four M35x10 screws (2.18) that secure the deflection board to the plastic front frame.

The board (2.17) can now be removed from the unit.

7.2.11 Removal of the 93XX-CRT (2.14)

It is necessary to remove the front frame assembly (7.2.9). The CRT is secured to the plastic front frame by four screws (2.16).

- Remove the 93XX-video (7.2.7).
- Remove the 93XX-yoke (7.2.8).
- Disconnect the EHT cable from the deflection board. - Discharge the tube.
- Remove the four screws.

The CRT can now be removed from the front frame.

WARNING

Use care when handling the CRT. Avoid striking it on any object which may cause the tube to impode. Store the cathode ray tube face down on a soft surface.

To avoid electrical shock the CRT should be discharged after the 9354A/T oscilloscope is powered OFF. After disconnecting the EHT plug, ground the CRT anode lead to the metallic display support, repeat the operation to fully dissipate the charge.

7.2.12 Removal of the F9354-5 Front Panel (2.5)

Remove the following:

- Upper cover (7.2.1).
- Front frame assembly (7.2.9).
- 93XX-deflection board (7.2.10).
- Four screws (2.12) that secure the front panel.

The front panel (2.5) with the keyboard (2.6) can be removed forward from the unit.

7.2.13 Removal of the Front Panel Keyboard (2.6)

Remove the following:

- Upper cover (7.2.1).
- Front frame assembly (7.2.9).
- 93XX-deflection board (7.2.10).
- F9354-5 front panel (7.2.12).
- The 11 rotary knobs (2.9 and 2.10). Take great care of the soft plastic
- One screw (2.8) that secures the keyboard to the front panel.
- Disconnect the flat ribbon cable from the front panel connector J2, and remove the keyboard P/N : 729354513.

CAUTION

When removing or installing the keyboard or the front panel, be careful of the fragile flat ribbon cable and connector.

7.2.14 Removal of the Processor (1.30)

The processor F9302-1-4 or F9302-1-8 or F9302-1-16 board is located along the right side of the instrument.

Remove the following:

- Top cover (7.2.1).
- Front frame assembly (7.2.9).
- Disconnect the flat cable (3.19) from the F9300-4 GPIB interface connector J5

The processor can be removed vertically from the main card (1.10) F9354-31 connector J1

CAUTION

Static electricity can damage components (RAM, Eproms, microprocessor...). Antistatic precautions are required.

7.2.15 Removal of the F9354-31 Main Card (1.10)

Remove the following:

- Top cover (7.2.1).
- Front frame assembly (7.2.9).
- Power supply (7.2.2).
- Processor (7.2.14).

The main board with the upper shield (1.2) is horizontally mounted to the lower case cover (1.1).

- Remove the ten M3x20 screws (5.3), two M3x6 (5.4) and six M2.5x6 (5.5) that secure the upper shield (1.2) to the main board and front panel.
- Remove the two M4x8 (5.1) and one M3x6 (5.2) that secure the rear panel assembly (3) to the lower cover (1.1)
- Disconnect the fan cable from connector J3.

The upper shield (1.2) attached to the rear panel (3) can be removed forward from the board.

- Remove the five M3x6 screws (1.20), four M3x16 (1.21) and three M3x6 flat head screws (1.19) that secure the board to the lower cover (1.1).

The main board F9354-31 (1.10) with acquisition memory card F9350/M/T-21 (1.23), base shield (1.15) and card panel (1.11) can be removed from the scope.

CAUTION

Antistatic precautions are required.

7.2.16 Removal of the Handle (1.4)

The handle with two black end caps is secured to the right side of the lower cover (1.1) by two screws (1.5) and washers (1.6).

- Remove the upper cover (7.2.1), and processor board (7.2.14).

The handle can be removed from the lower case.

7.2.17 Removal of the Foot Support (1.8)

The two foot supports are clipped on the lower cover (1.1).

- Remove the foot (1.7) or the support (1.8) by inserting a small flat screwdriver under the support

7.2.18 Removal of the 93XX-FD01 Floppy Disk Drive Option

- Remove the upper cover (7.2.1).
- Disconnect the flat ribbon cable from the F9300-6 interface (see figure 7.6).
- Remove the two M3x6 screws that secure the floppy drive support to the upper cover.
- Remove the support 70FD01021 and frame 70FD01031 from the cover.
- Remove the four M2.5x4 screws that secure the floppy to the support

The floppy disk (6.3) drive can be removed from the frame

7.2.19 Removal of the 93XX-GP01 Graphic Printer and F9300-7 Controller Option

- Remove the upper cover (7.2.1).
- Disconnect the power cable (780210030) from the PS9351 power supply (see figure 7.7).
- Disconnect the flat ribbon cable (780791604) from the F9300-7 controller (see figure 7.7).
- Disconnect the flat ribbon cable (780721022) between the F9300-6 interface and F9300-7 controller.
- Remove the four M3x6 screws that secure the F9300-7 controller to frame (70GP01031).
- Remove the F9300-7 controller
- Remove the two M3x6 screws that secure the printer to the frame

The graphic printer (7.3) can now be removed from the upper cover.

7.2.20 Removal of the F9300-6 Centronics Interface Option

- Remove the upper cover (7.2.1).
- Remove the two M3x6 screws from the rear panel
- Disconnect the flat cable from the F9300-4 GPIB/RS232 board (see figure 7.6 or 7.7).

The Centronics interface board can be removed forward from the rear panel.

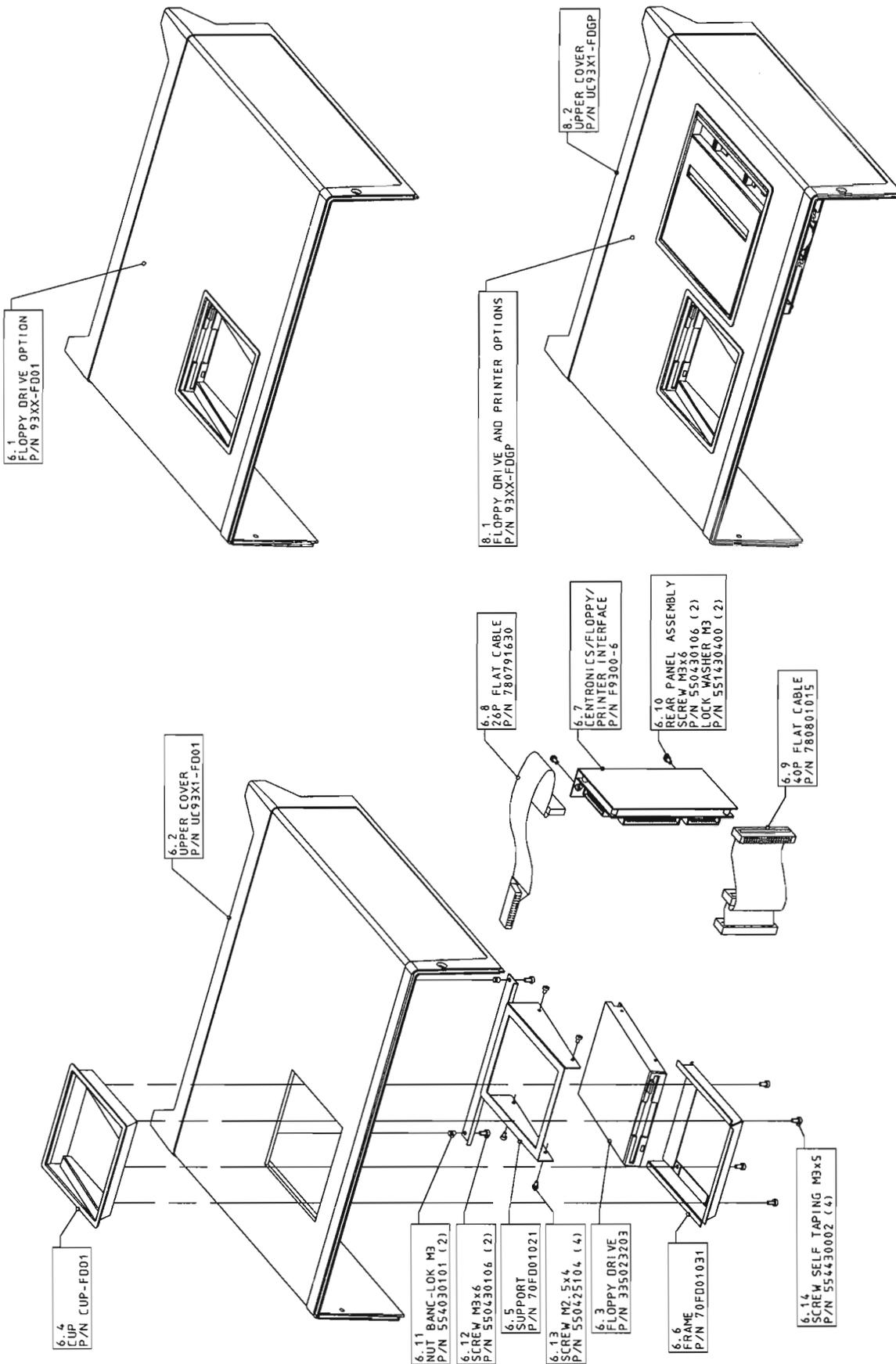


Figure 7.5 : 9354A/T Floppy Assembly

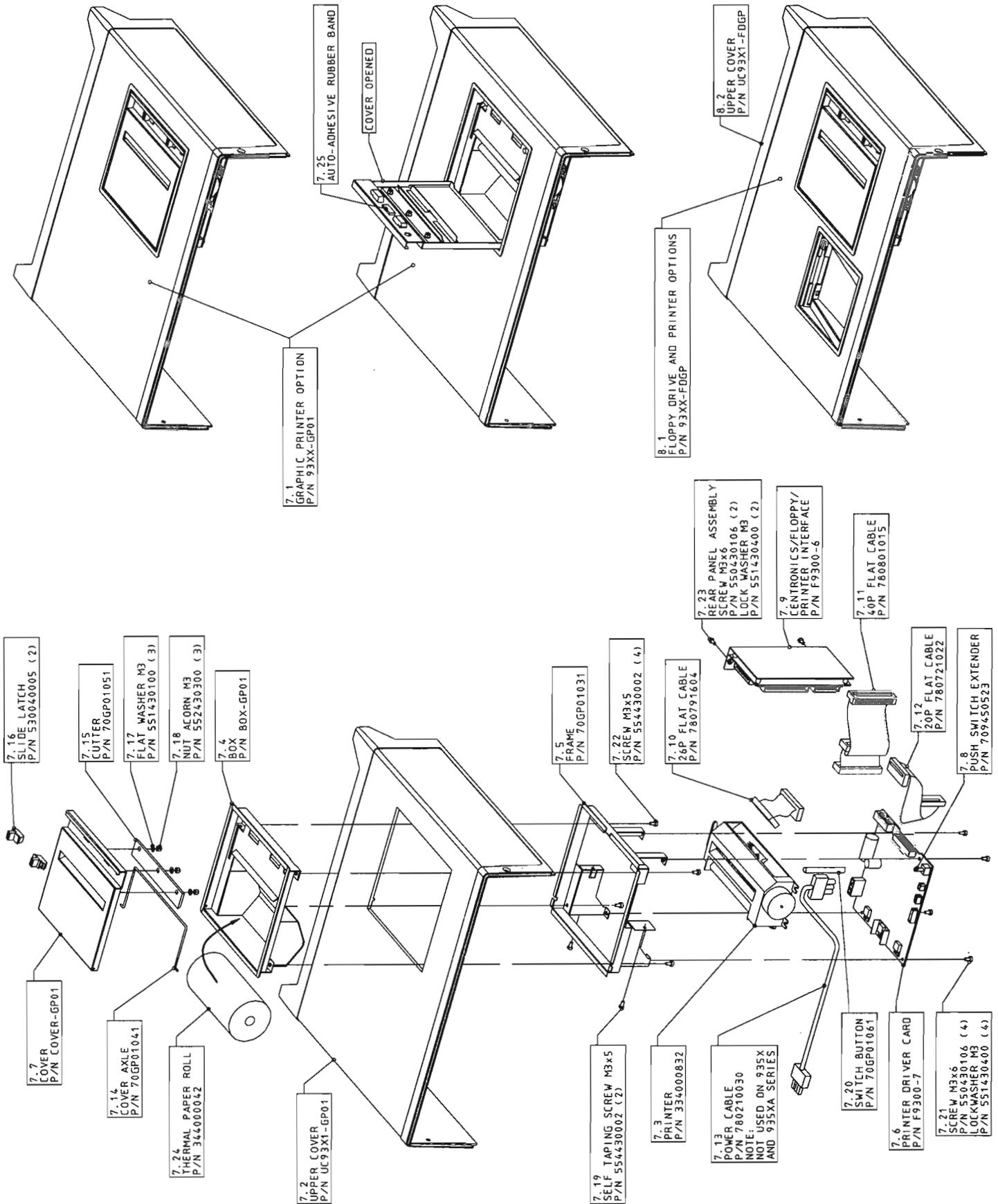


Figure 7.6 : 9354A/T Graphic Printer Assembly

7.3 Software Upgrade Procedure

F9302-1-X processor board has one 8MB Flash Prom which contains the program memory and the character font used by the graphic processor of the raster scan display.

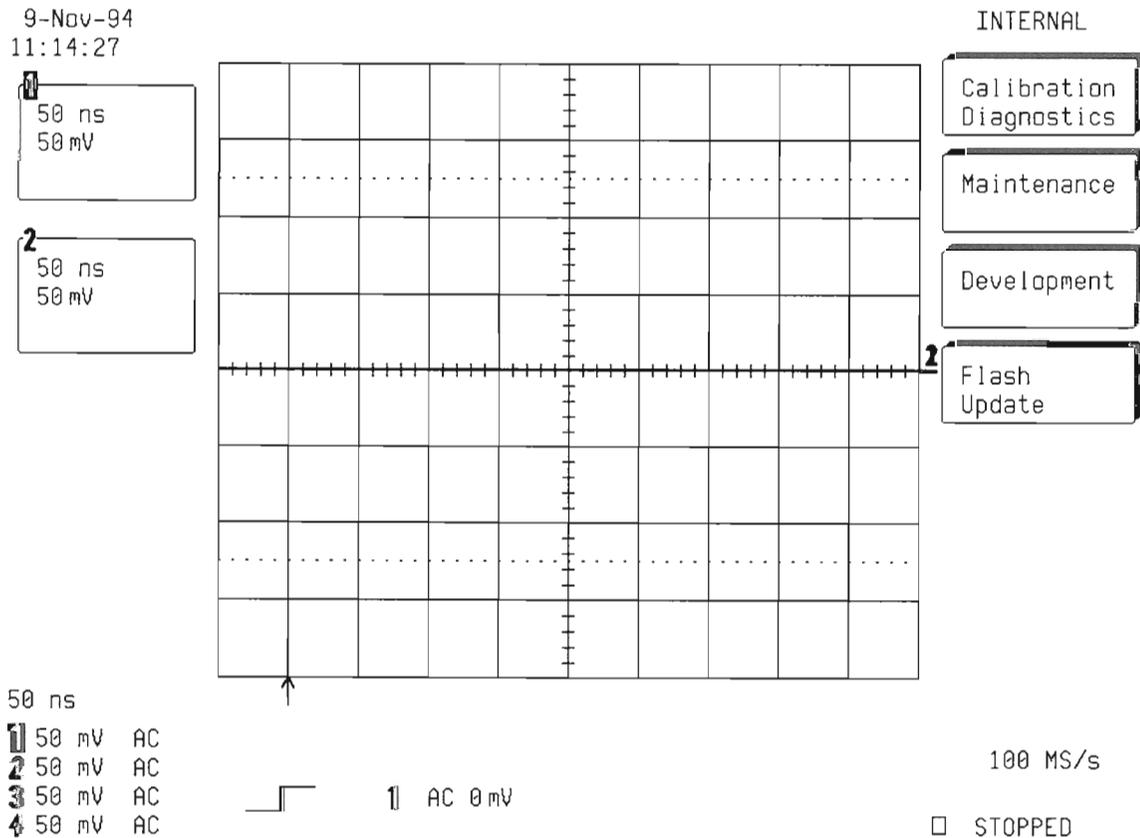
After any software change, a general instrument reset is mandatory. Simultaneously press the autsetup button, the top menu button and the return button.

7.3.1 Upgrading Firmware

LeCroy Corporation has a policy of continually improving and upgrading its products.

The instrument is equipped with Flash Prom on processor board, the Software is upgraded to the latest version using the Memory Card interface.

- Insert one Memory card with latest firmware revision, and power on the scope.
- The internal menu is entered by simultaneously depressing the third and fourth menu push buttons on the right hand side of the CRT and then by depressing the fifth.



- Select " **Flash Update** " and push twice " **Update Program** ".

The Software is then downloaded to the Flash Prom on the processor board.

30-Nov-94
9:51:00

FLASH UPDATE

Update
Program

Warning:

Reprogramming the flash memory is a procedure to be performed by qualified service personnel.

Update
Loader

Any loss of power during the update process could cause the scope to require factory service.

Update
Both

The update process requires a LeCroy supplied memory card which contains the necessary information to update your scope software.

30-Nov-94
9:51:52

Program transferred to Flash memory without error

FLASH UPDATE

Update
Program

FLASH UPDATE SUCCESSFUL:

The flash memory reprogramming process is complete and was successful.

Update
Loader

Please cycle the power to the scope to start the updated code.

Update
Both

7.3.2 Changing Software Options

The software option selection GAL is located on the processor board at location A49. Insert or replace the GAL to select new options. Make sure that the orientation notch is correctly aligned with the PCB.

7.3.3 Software Option Selection GAL

The following software options are available : (see section 2)

- WP01 Advanced Math package
- WP02 Basic FFT package
- CARD Memory card

OPTIONS			GAL Description
Memory Card	WP02	WP01	CLE XXX-R XXX = Software option, R = Release
no	no	no	GAL Not Necessary
no	no	yes	CLE 001-A
no	yes	no	CLE 002-A
no	yes	yes	CLE 003-A
yes	no	no	CLE 200-A
yes	no	yes	CLE 201-A
yes	yes	no	CLE 202-A
yes	yes	yes	CLE 203-A

7.3.4 Processor Board Exchange Procedure

The replacement board is supplied without any options. Therefore the existing GAL (Loc A49) must be transferred from the faulty board to the new board. After upgrading firmware or changing the software option, check that the scope boots correctly. Then check in the system summary, by using the show status button on the front panel, the software version, software options and serial number.

The serial number of the 9354A/T oscilloscope is loaded in the real time clock memory which is battery backed up. If it becomes necessary to replace the processor board, the serial number must be loaded in the memory of the new board by using LeCroy program " LeCalsoft " under GPIB remote control.

To run " LeCalsoft " type SKP.exe, in the main menu type S, and follow the instructions, use five digits to enter the serial number (i.e. 02175).

16-Jan-95
16:24:16

Serial Number 935402175

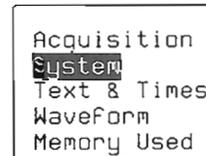
Soft Version 9354A- 06.0.0
Wednesday, November 23, 1994 5:14 PM
(build 43)

Soft Options
WP01 WP02 CKI0 MC01

Hard Options
GPIB R232 CLBZ CPU3 I2C

Main RAM size 4 Mbytes

STATUS



7.4 Equipment and Spare Parts Recommended for Service

7.4.1 Equipment

The following equipment is needed to provide the technician access to the 9354A/T subassemblies during repair and calibration (see also Performance Verification section 5).

Instrument	Qty	Specifications	Recommended
Signal Generator (sine wave)	1	Frequency : 500 KHz to 1 GHz Accuracy : 0.001 % Amplitude : 1 V peak to peak	Marconi 2030
Signal Generator (sine wave)	1	Frequency : 5 KHz Amplitude : 6 V peak to peak	LeCroy LW420
DC precision Power Supply	1	Amplitude : 10 V, DC Accuracy : < 0.1 %	Tektronix PS5004
Digital Multimeter	1	5 digits	Keithley 199
Fast pulser	1	Rise time < 500 psec	LeCroy 4969
Digital scope	1	Bandwidth 350 MHz	LeCroy 9310A
Cable	1	BNC, 50 Ω , length 20 cm (7.87 inches)	Suhner
Cable	1	BNC, 50 Ω , length 100 cm (39.37 inches)	Suhner
BNC T adapter	1	BNC, 50 Ω , T adapter	Suhner

7.4.2 Spare Parts

In order to make the repair of 9354A/T DSO's series at board level, a minimum stock of boards is at least one each:

- F9302-1-4 : Processor board for 9354A and 9354T
- F9302-1-8 : Processor board for 9354AM and 9354TM
- F9302-1-16 : Processor board for 9354AL

- F9350-21 : Acquisition memory for 9354A
- F9350M-21 : Acquisition memory for 9354AM
- F9350T-21 : Acquisition memory for 9354T
- F9350TM-21 : Acquisition memory for 9354TM
- F9350L-2 : Acquisition memory for 9354AL

- F9354-31 : Main board for 9354A, 9354AM, 9354AL, 9354T & 9454TM

- F9300-4 : GPIB/RS232 interface

- F9354-5 : Front panel with keyboard
- 93XX-Display : Raster monitor kit
- PS9351 : Power supply

If the unit is equipped with the 93XX-FD01 option :

- F9300-6 : Floppy, Graphic printer, Centronics Interface
- 335023203 : Floppy disk drive

If the unit is equipped with the 93XX-GP01 option :

- F9300-6 : Graphic printer, Floppy, Centronics Interface
- F9300-7 : Graphic printer controller
- 334000832 : LPT5446 Seiko Graphic printer

If the unit is equipped with the 93XX-HD01 option :

- F9300-8 : Hard disk Interface
- HDD02 : Hard disk drive

The other parts (fan, fuse holder, scope handle, covers, rear panel...) are not on the above list because they are reliable parts and the probability of failure is very low.

7.5 Troubleshooting and Flow Charts

7.5.1 Introduction

The troubleshooting information contained in this section is intended for use by qualified personnel having a basic understanding of electronics (analog and digital). In order to simplify servicing and minimize downtime, the following list of possible symptoms, likely causes, and troubleshooting steps have been prepared.

The first step in troubleshooting is to check for obvious items like blown fuses.

The power supply is the next item to check before proceeding to more detailed troubleshooting, since noise or low power supply voltages can cause a variety of digital and analog problems.

7.5.2 Line Voltage Autoranging

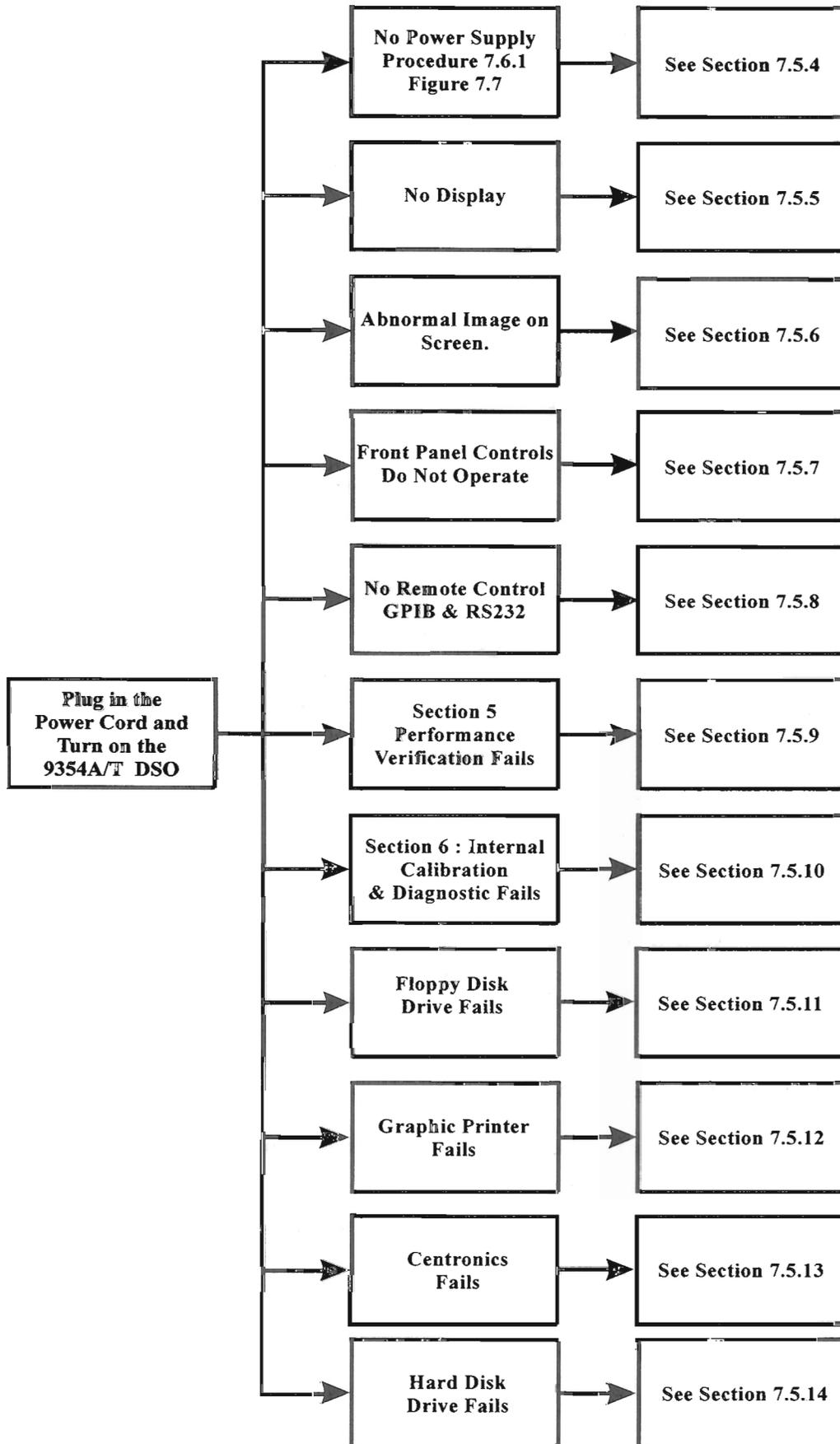
The 9354A/T oscilloscope operates from a 115 V (90 to 130 V) or 220 V (180 to 260 V) normal power source at 47 Hz to 63Hz.

No voltage selection is required since the instrument automatically adapts to the line voltage which is present. The instrument operates at line frequencies up to 440 Hz.

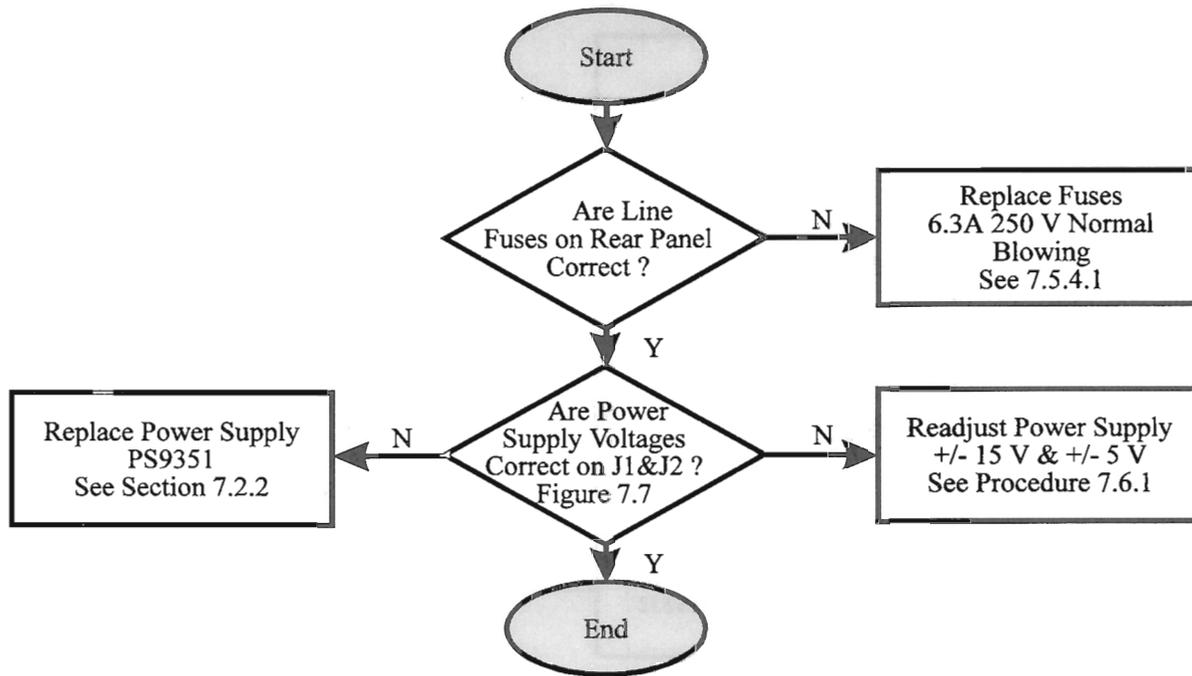
7.5.3 Initial Troubleshooting Chart

Most procedures in this section will allow troubleshooting down to the **BOARD LEVEL**.

Defective circuit boards will be repaired or exchanged by the regional LeCroy service office or the local representative (see section 1.4).



7.5.4 No Power Supply



7.5.4.1 Line Fuses Replacement

The power supply of the oscilloscope is protected against short circuits and overload by means of two 6.3A / 250 V fuses located above the main plugs.

WARNING

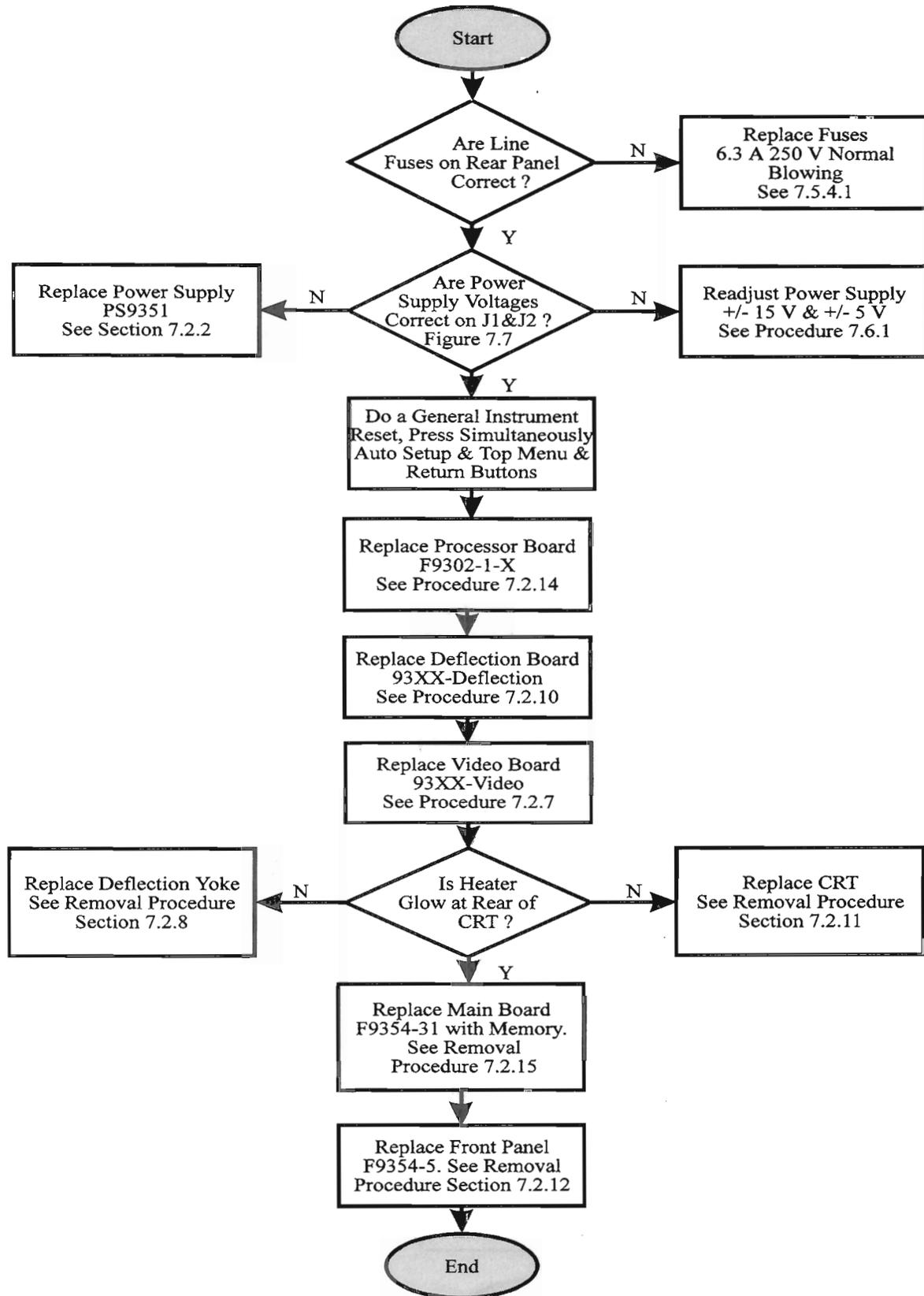
Disconnect the instrument from the power line and from other equipment before replacing fuses.

To replace line fuses, proceed as follow :

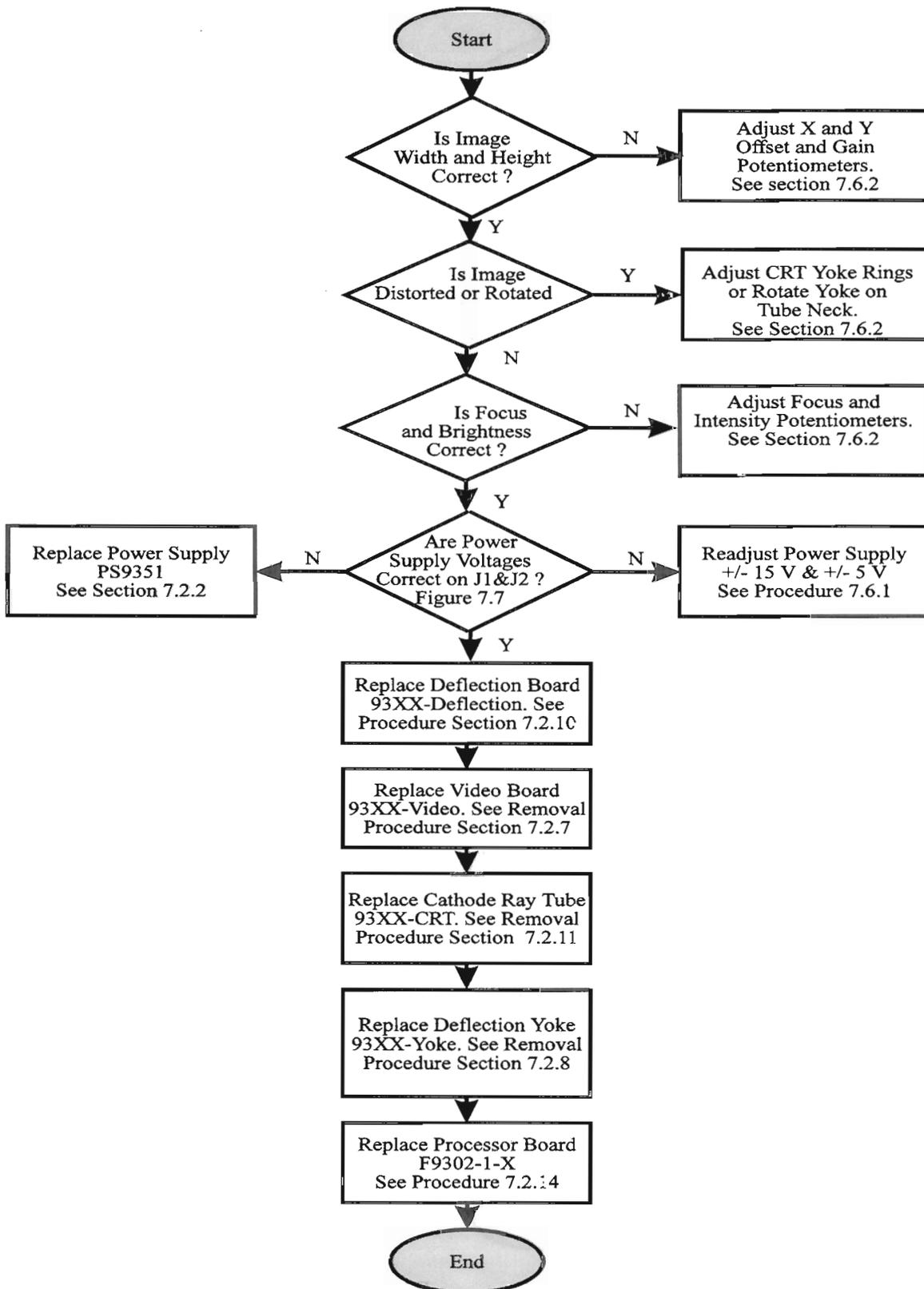
- Turn off the power and disconnect the line cord from the instrument
- Open the fuse box by inserting a small flat screwdriver under the plastic cover and remove the fuse carrier from the holder
- Remove the 6.3 amp fuse and replace it with the proper type:

6.3 amp/250 V, normal blowing.
LeCroy part number: 433 162 630

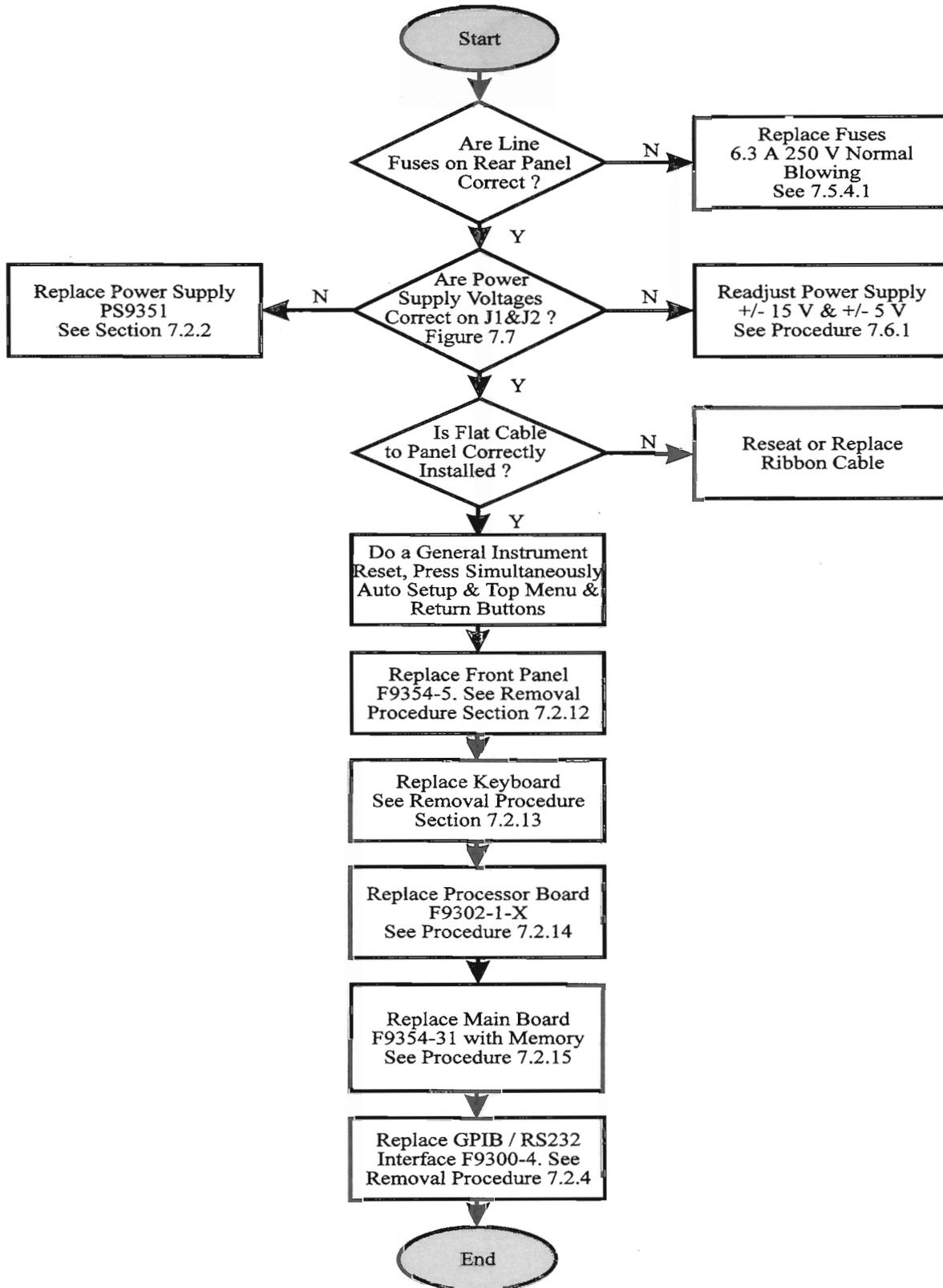
7.5.5 No Display



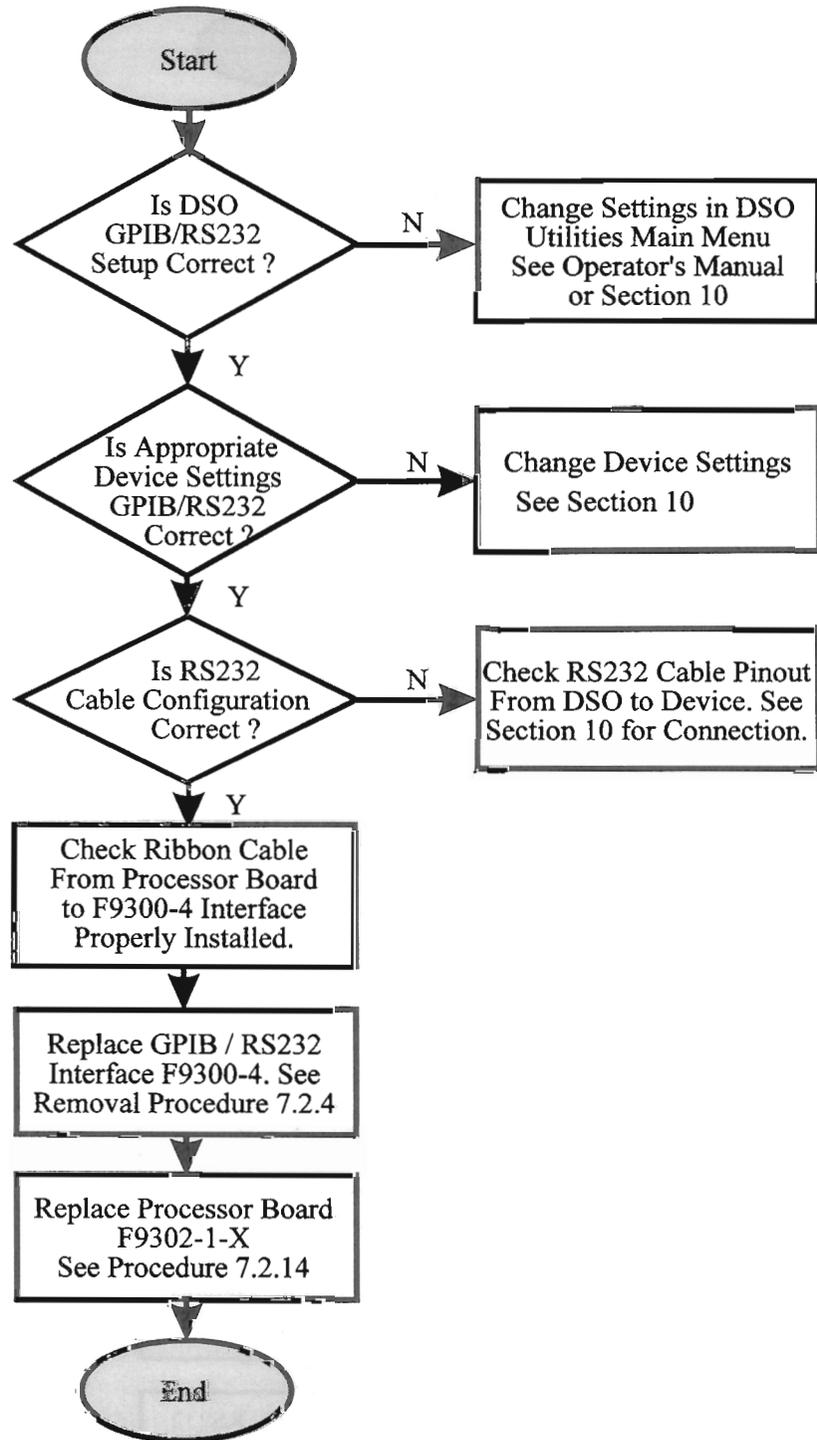
7.5.6 Abnormal Image On Screen



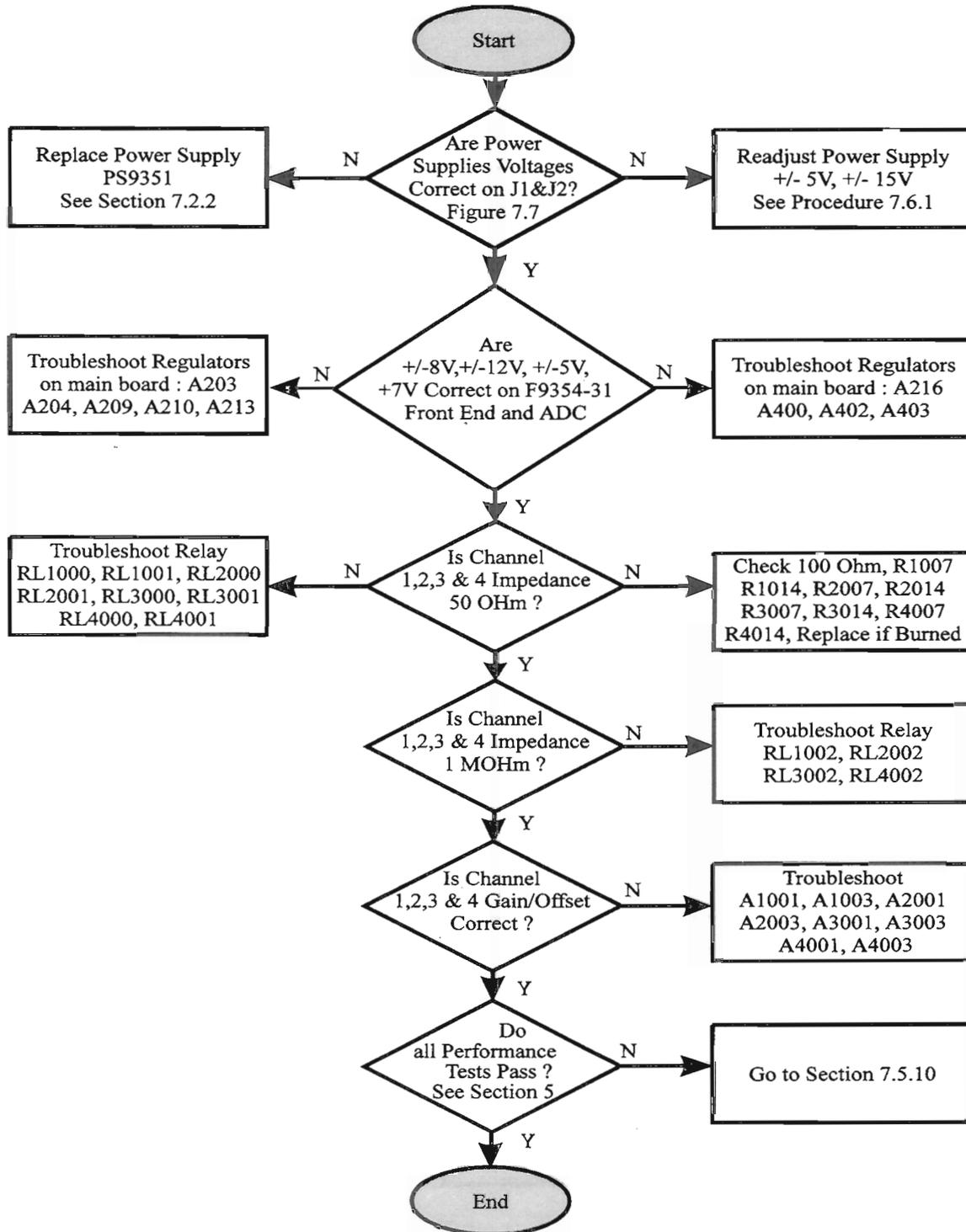
7.5.7 Front Panel Controls Do Not Operate



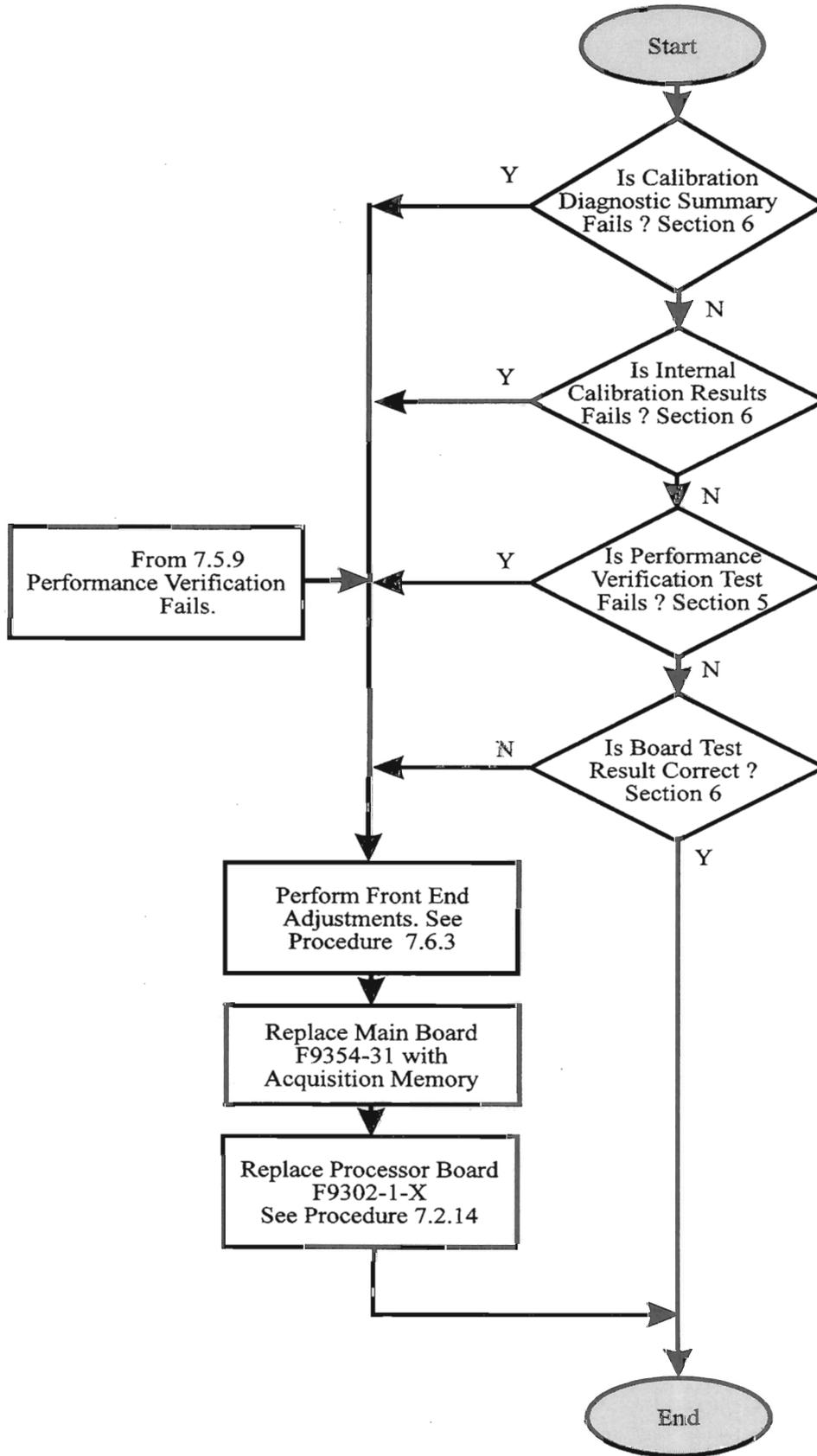
7.5.8 No Remote Control GPIB and RS232



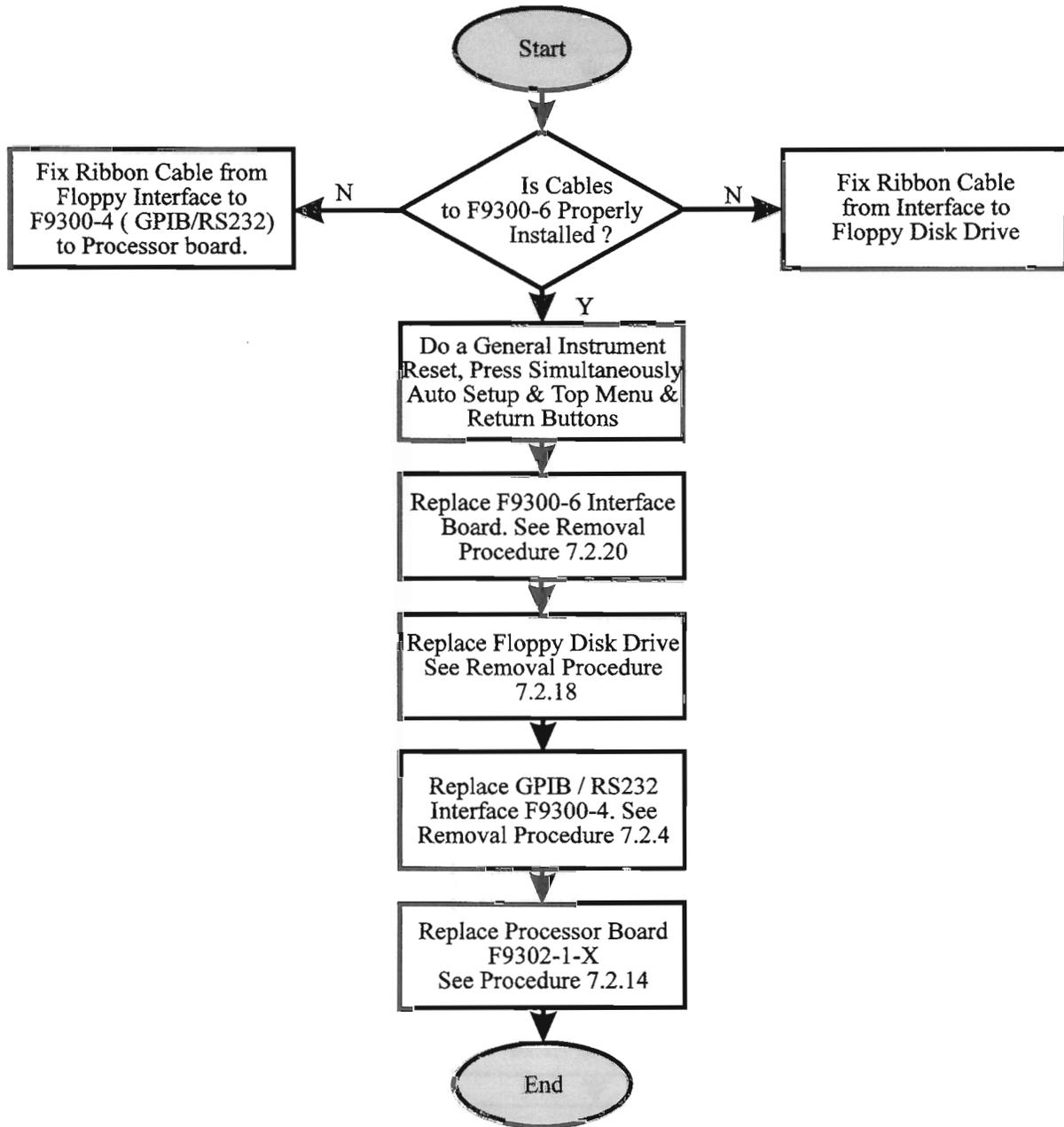
7.5.9 Performance Verification Fails



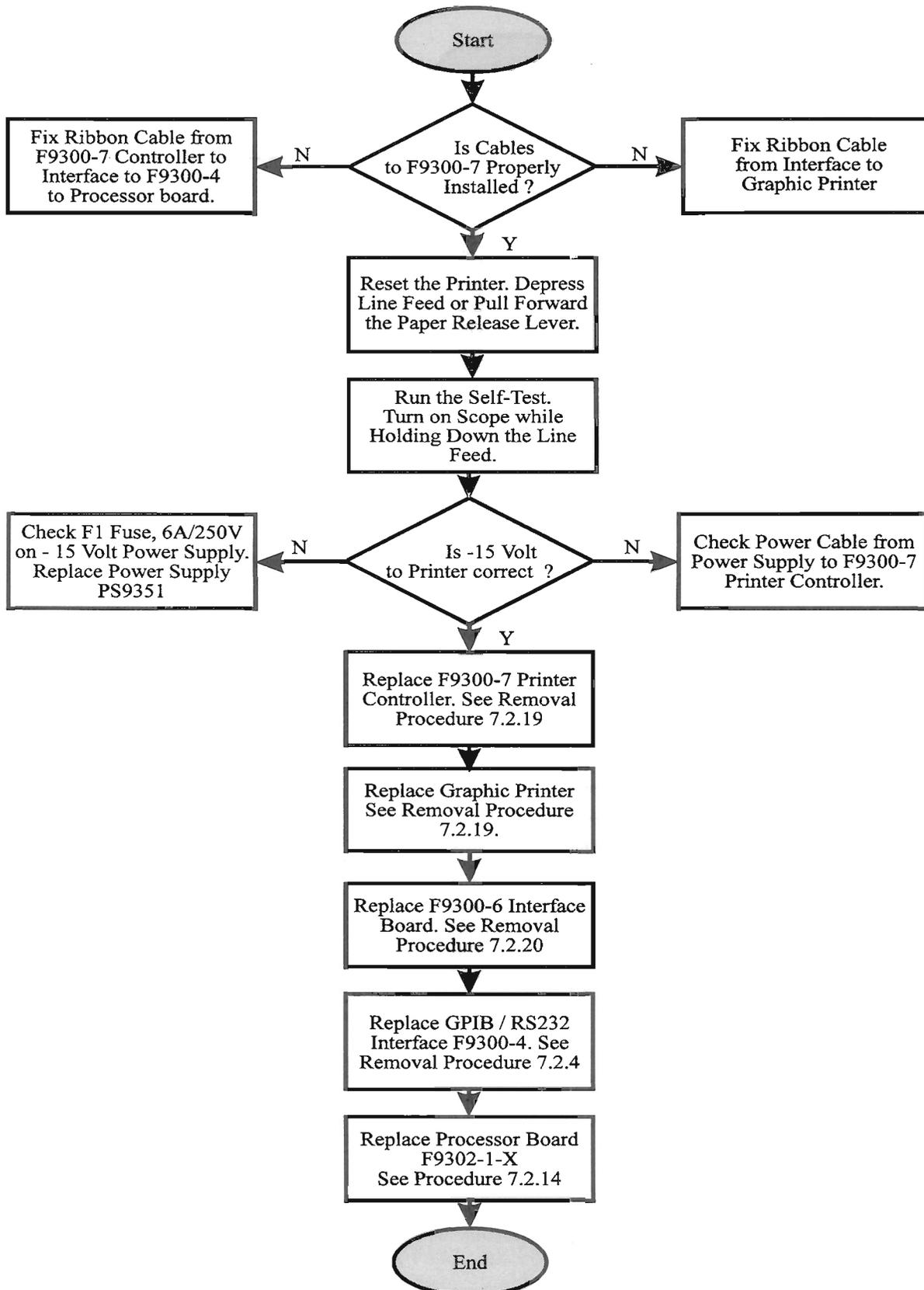
7.5.10 Internal Calibration Fails



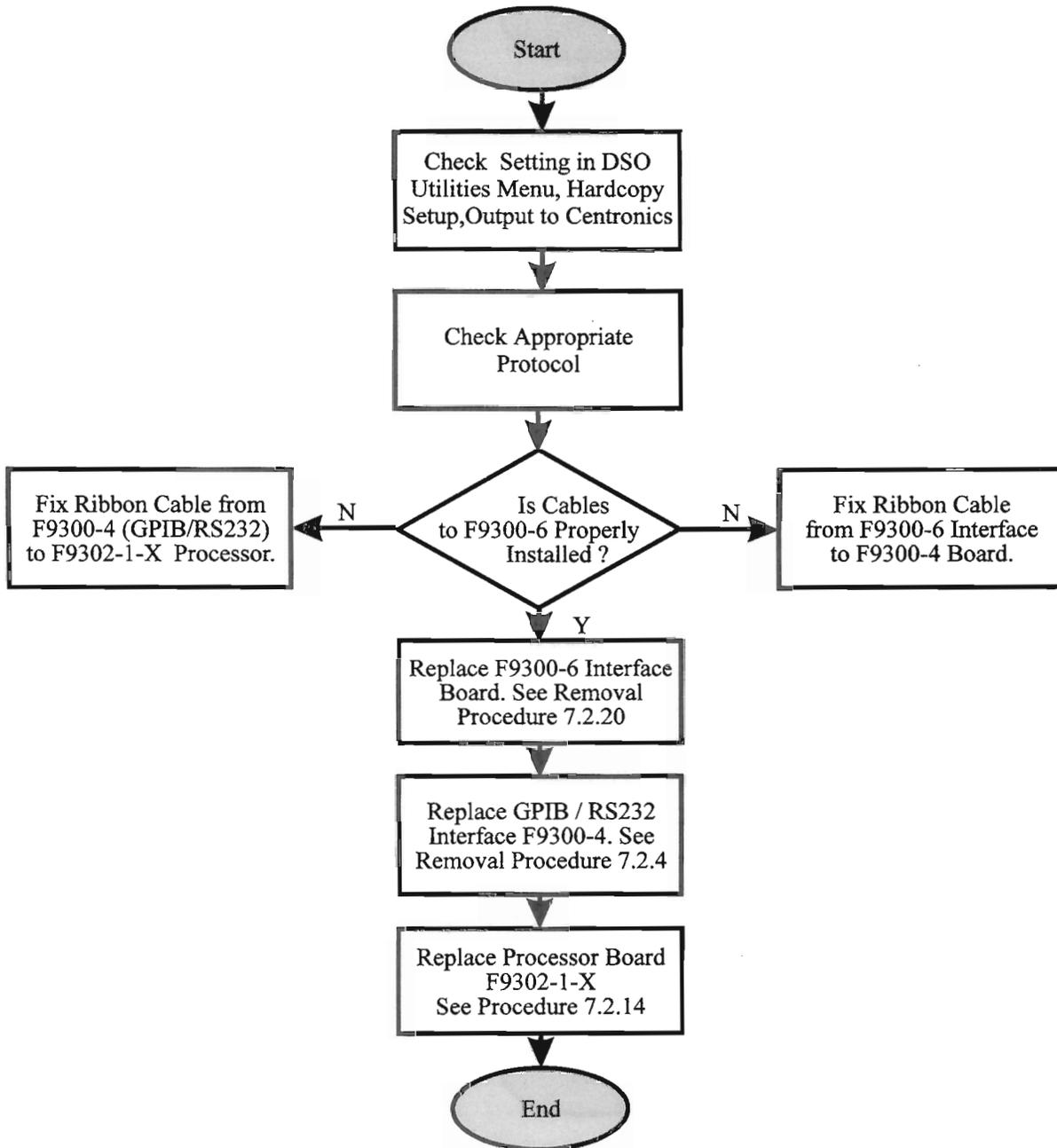
7.5.11 Floppy Disk Drive Fails



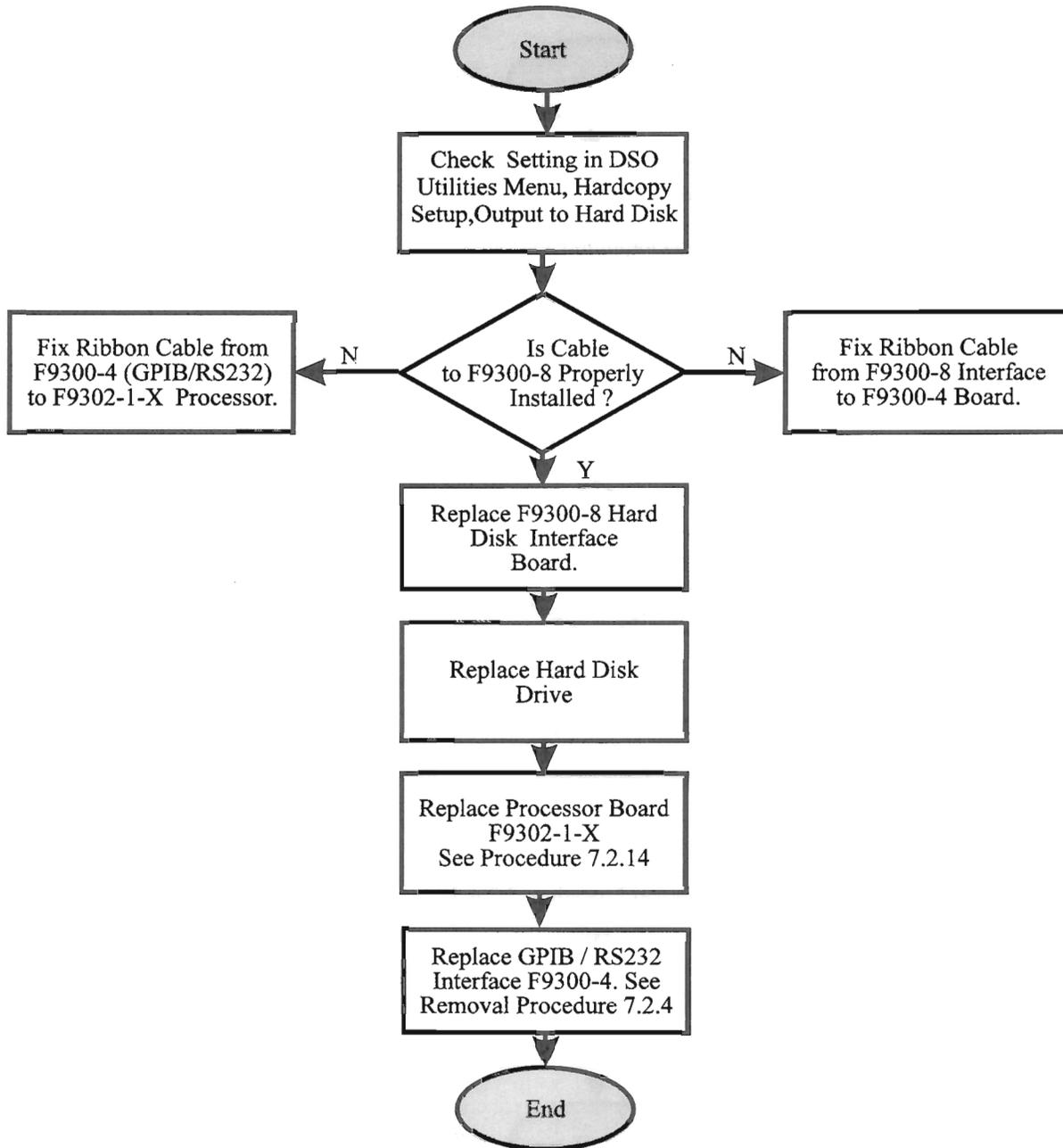
7.5.12 Graphic Printer Fails



7.5.13 Centronics Fails



7.5.14 Hard Disk Fails



7.6 Calibration Procedures

The following section includes the adjustments required for the power supply, front end and display. It is recommended that they be verified at one year intervals.

7.6.1 PS9351 Power Supply Calibration

The four voltages are adjustable by $\pm 5\%$ of the nominal value.

The reference for the measurements are the pins on top of connector J1 connected to the main board F9354-31.

For the power supply calibration proceed as follow:

- Turn off the power
- Remove the top cover (7.2.1)
- Remove the front frame assembly (7.2.9) and put it to the right of the unit.

- By using two extension cables, reconnect the processor board to the front panel (J4) and to the deflection board (J6).

- Once the top cover is removed and the front panel is disassembled from the scope, extra cooling of the main board is required. It's mandatory to disconnect the existing Fan from connector J3, located on F9354-31 card, and to use a Fan with the air flow oriented to the front end section of the board.

- The front frame assembly is now reconnected to the processor through the extension cables.

- Turn on the power, set the scope to Auto Trigger, and perform the adjustments to get on J1 (see figure 7. 7).

Pin 4, 5, 6	:	+ 5.12 V (Min = + 5.05 V, Max = + 5.15 V)
Pin 9, 10, 11	:	- 5.2 V (Min = - 5.15 V, Max = - 5.25 V)
Pin 12	:	+15 V (Min = +14.9 V, Max = +15.1 V)
Pin 14	:	- 15 V (Min = -14.9 V, Max = -15.1 V)
Pin 3, 7, 8, 13	:	Ground

The four potentiometers are accessible from the right side through holes in the PS9351 power supply chassis.

- Turn the potentiometer clockwise to increase the tension or counterclockwise to decrease the voltage. When the adjustment is done, stop the acquisition by depressing the stop trigger push button, and verify that there is no large difference on the + 5.12 V, typically less than 80 mV.

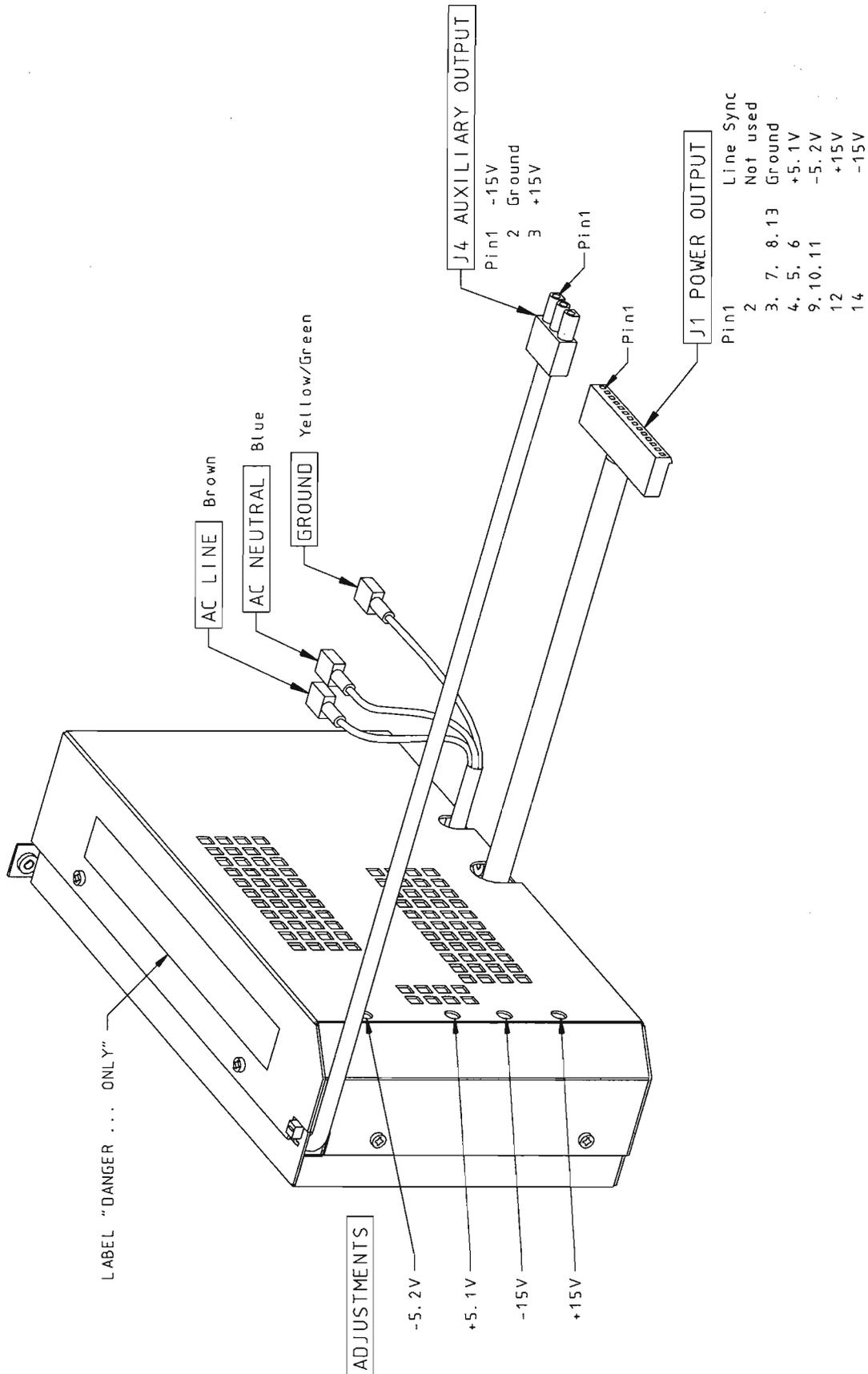


Figure 7.7 : PS9351 Power Supply

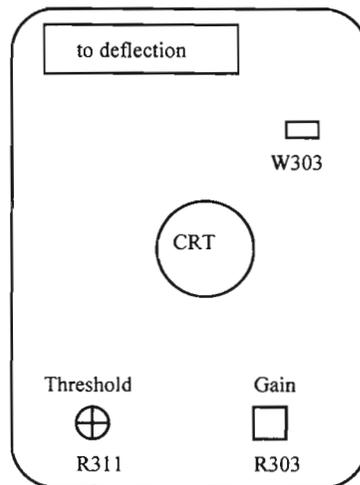
7.6.2 93XX-Display Adjustment Procedure

7.6.2.1 Introduction

There is a total of 12 potentiometers or variable coils to adjust the deflection and video board.

Video: (2 adjustments)

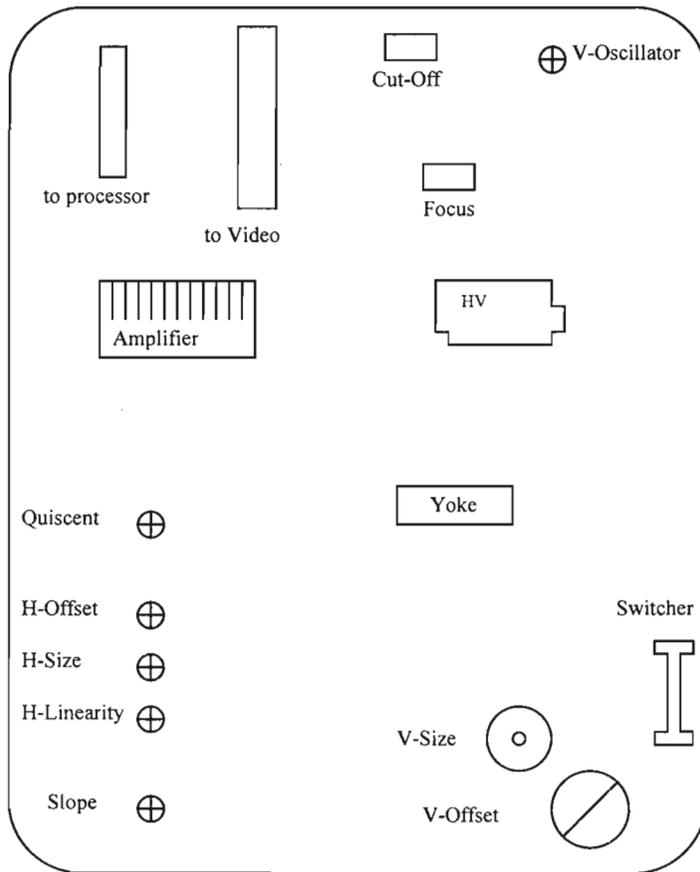
- **Threshold** : **Level of the video board.**
- **Gain** : **Intensity of the screen.**



Video board component side

Deflection : (10 adjustments)

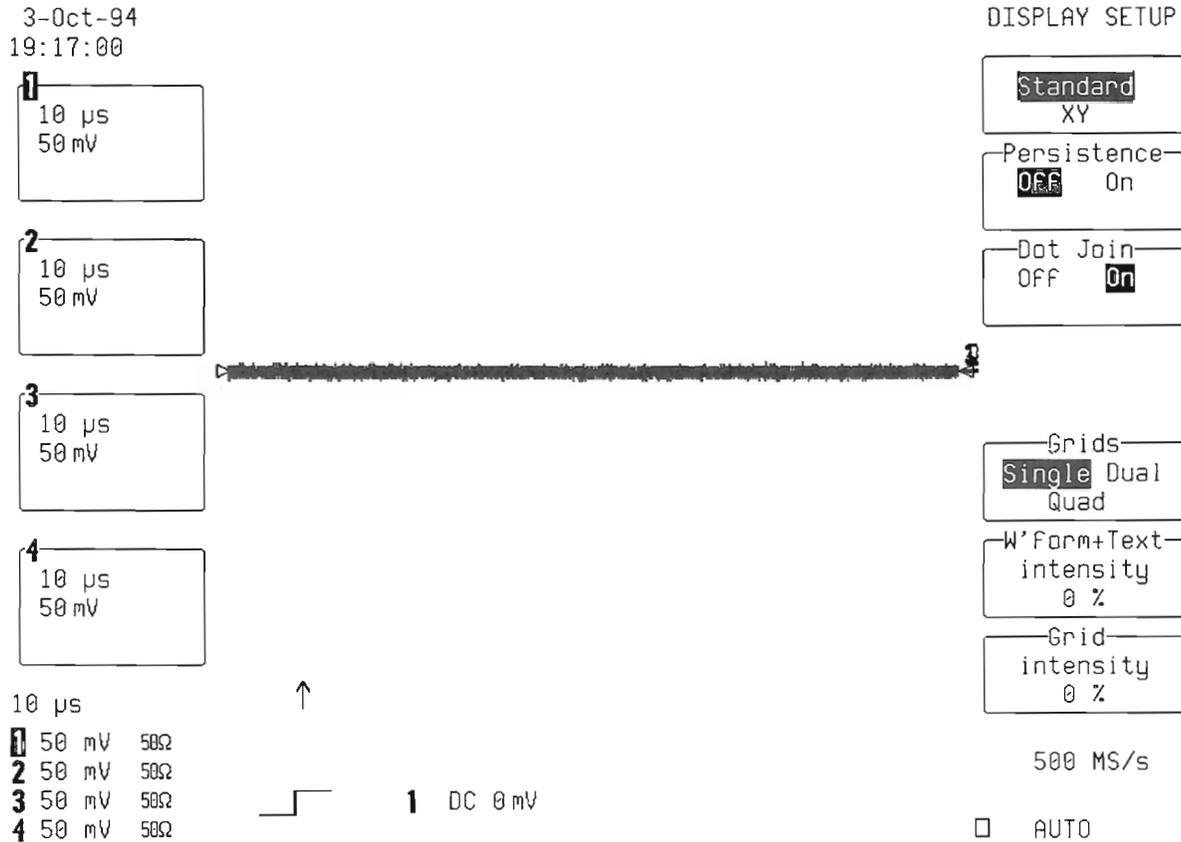
- **Vosc** : **Frequency of the vertical oscillator.**
- **Slope** : **Speed of the horizontal ramp.**
- **Focus** : **Focus of the screen.**
- **Cut off** : **Cathode ray tube cut off.**
- **Quiescent** : **Standby current of the horizontal deflection amplifier.**
- **H Linearity** : **Horizontal linearity.**
- **H Size** : **Horizontal size (Max 165mm).**
- **H Offset** : **Horizontal position.**
- **V Size** : **Vertical size (Max 120mm).**
- **V Offset** : **Vertical position.**



Deflection board component side

7.6.2.2 Coarse Adjustment

- Depress display button.
- Set W'form + text intensity to 0%.
- Set grid intensity to 0%
- Turn fully clockwise the intensity potentiometer on the video board.
- On the video board connect a digital multimeter on test point : W303
- Adjust threshold potentiometer to get $2\text{ V} \pm 0.1\text{ V}$ on W303.



- Set W'form intensity to 100%.
- Set grid intensity to 60%.
- Adjust H-size, H-offset, V-size, V-offset to center the image in the screen.
The vertical position should be adjusted to get the push buttons of the front panel in front of the software menus, use the utilities set up.
The small magnets mounted on the deflection yoke influence the vertical position.
- Turn the quiescent potentiometer clockwise until the default of the horizontal lines just disappears from the vertical center of the screen.
- Increase the cut off until a vertical line appears on the right side of the screen.
- Adjust the slope potentiometer to get 5mm gap between the highlighted vertical line and the right border of the selection menus.
- Adjust H-linearity to get the best linearity.

7.6.2.3 Fine Adjustment

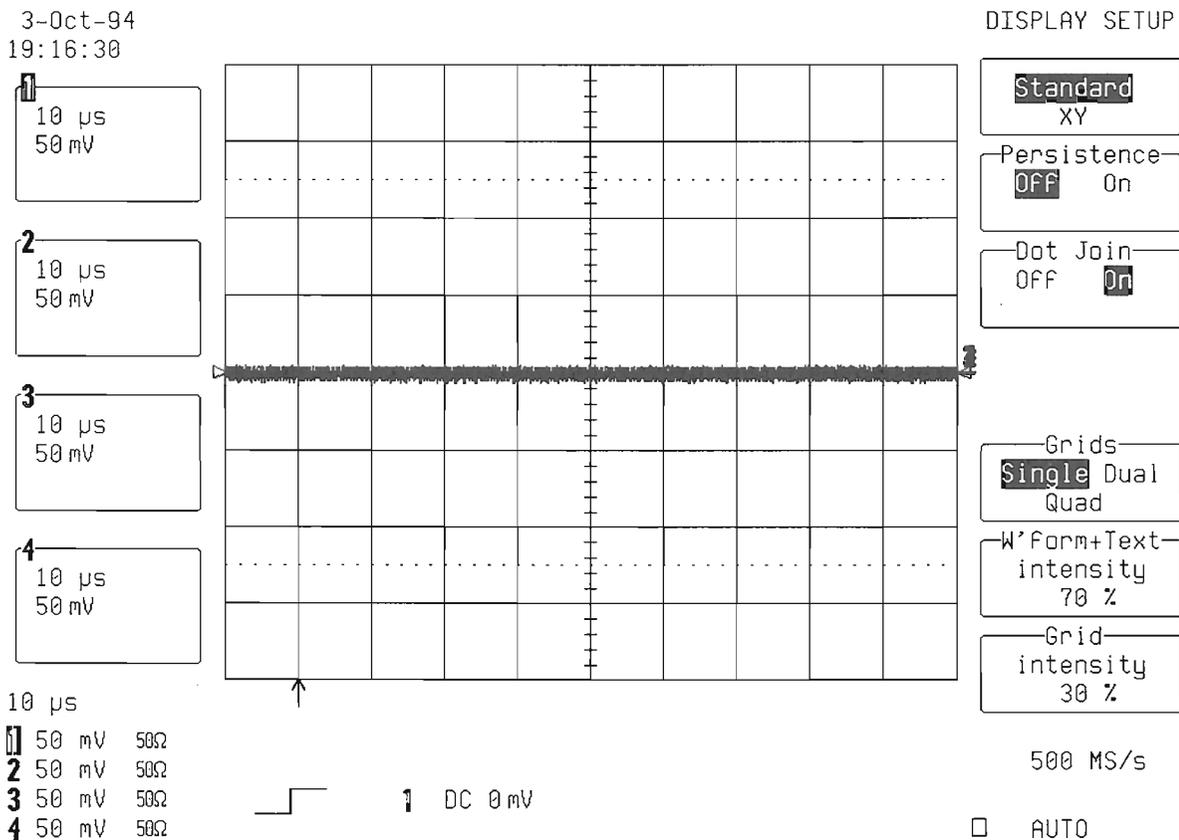
The final adjustment of the intensity, cut off, and focus must be made in a dark room.

Section 7 Maintenance

- Set W'form intensity to 30%.
- Set grid intensity to 0%.
- Adjust the cut off potentiometer until the highlighted vertical line disappears from the right side of the screen.

- Set W'form intensity to 20%.
- Display four traces.
- On the video board adjust the gain potentiometer (intensity) in order to get the text just readable.

- Set W'form + text intensity to 70%.
- Set grid intensity to 30%



- Adjust the focus (usually fully clockwise) for most uniform focus over the entire screen.
- In a standard luminosity environment set W'form + text to 90%, and grid intensity to 60%.
- Verify the intensity, focus, and contrast adjustment, for best definition of the displayed text.

CAUTION

Never change the Vosc calibration.

7.6.3 Front End Test and Calibration Procedure

7.6.3.1 Introduction

The adjustments describe in the following calibration procedure require extension of the front panel assembly out of the scope, using two flat cables.

In order to access the front end potentiometers and variable caps located underneath the Cathode Ray tube and deflection board, dismount the front panel assembly from the scope and reconnect it to the processor board connectors J4 and J6, using the extension cable set.

Once the top cover is removed and the front panel is disassembled from the scope, extra cooling of the main board is required. It's mandatory to disconnect the existing Fan from connector J3, located on F9354-31 card, and to use a Fan with the air flow oriented to the front end section of the board.

7.6.3.2 Power Supplies

Remove the upper shield to access the test point TP203. Use a high precision DMM.

7.6.3.2.1 Front End Power Supply Verification

- Check on test point the following tensions :

TP203



Front of DSO

- Pin 1 and Pin 2 : Ground
- + 12 VFEP : pin 6 (+) = + 12 Volt \pm 2% : if problem troubleshoot regulator A204
- + 12 VFE : pin 3 (+) = + 12 Volt \pm 2% : if problem troubleshoot regulator A210
- + 8 VFE : pin 5 (+) = + 8 Volt \pm 2% : if problem troubleshoot regulator A216
- - 12 VFEP : pin 7 (-) = - 12 Volt \pm 2% : if problem troubleshoot regulator A209
- - 12 VFE : pin 4 (-) = - 12 Volt \pm 2% : if problem troubleshoot regulator A203
- - 8 VFE : pin 8 (-) = - 8 Volt \pm 2% : if problem troubleshoot regulator A213

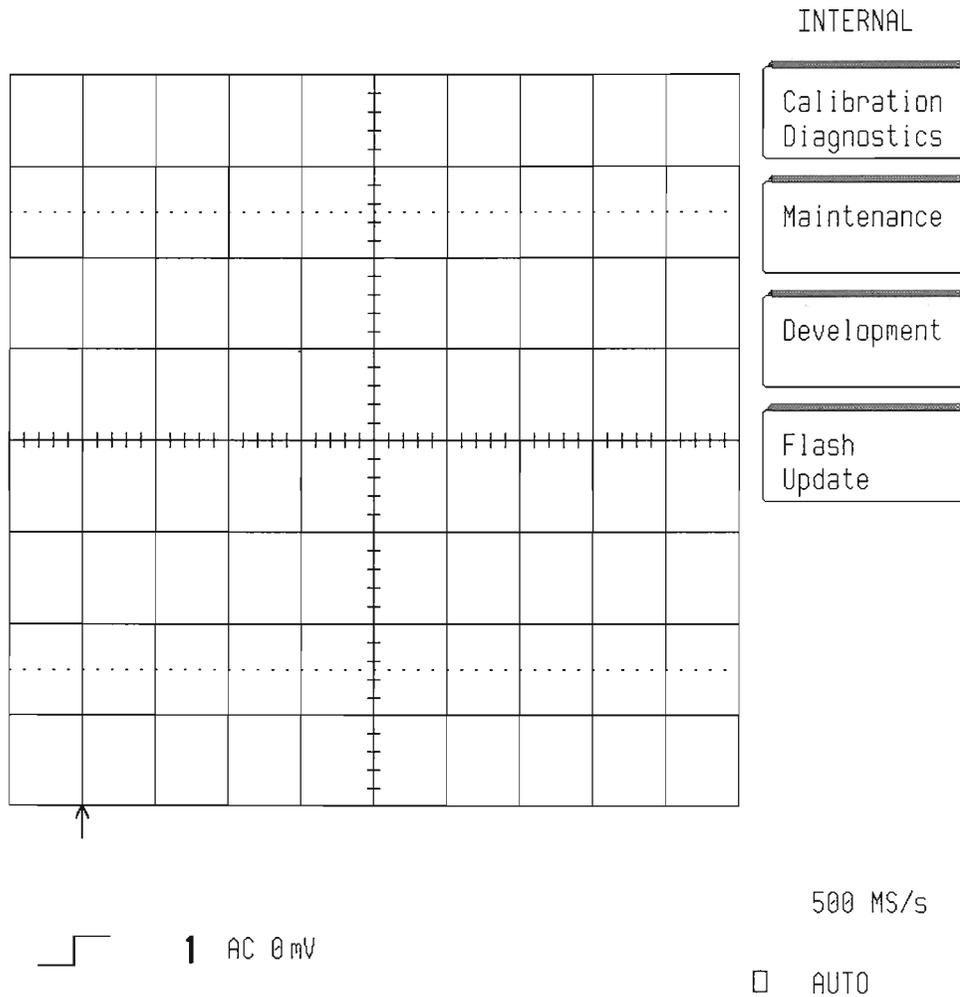
7.6.3.2.2 ADC Power Supply Verification

- Check on test point TP203 the following tensions :
- + 12 VADC : pin 9 (+) = + 12 Volt \pm 2% : if problem troubleshoot regulator A402
- - 12 VADC : pin 10 (-) = - 12 Volt \pm 2% : if problem troubleshoot regulator A400
- + 7 VADC : A403 pin 3 = + 7 Volt \pm 2% : if problem troubleshoot regulator A403

7.6.3.3 16 bit DAC Verification

- Select Channel 1, Channel 2, Channel 3 and Channel 4 : Coupling DC 1 MΩ
- Enter in the internal calibration diagnostics by simultaneously depressing the third and fourth push buttons, and then by depressing the fifth.
- Select Development menu

20-Jan-95
17:06:01



- Select Front End Control menu

DEVELOPMENT

- Signal Simulator
- Front End Control
- Calibration Control
- Autsetup Log
- Display Controls
- MORE ...

▪ Set Cal Level : /1 and 0,00 V

FE CONTROL

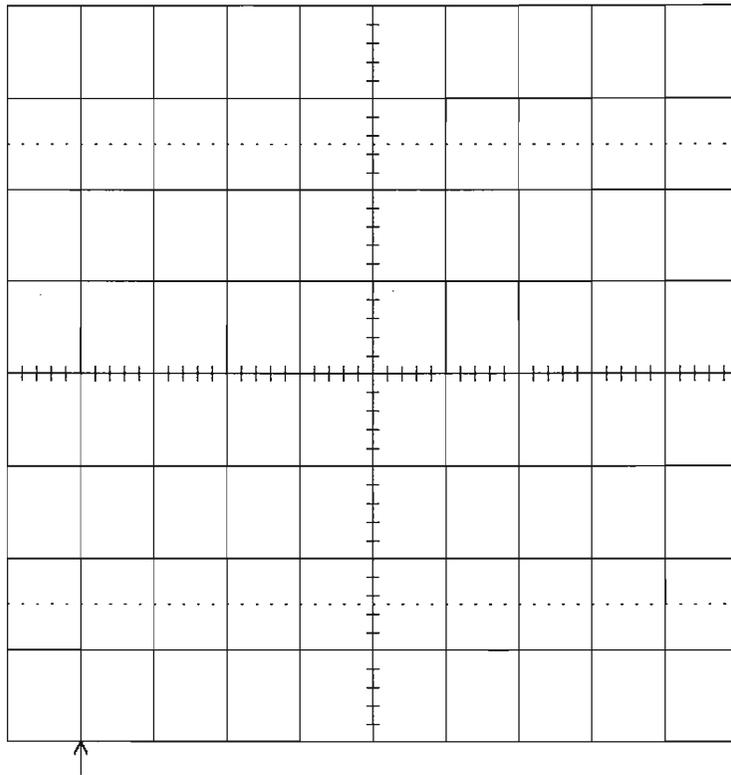
- Offset 1
0.00 V
- Gain 1
0.00 V
- Set to last calibrated
Gain Offset
- ADC DAC for
Offset
Gain
Sample-EFF
Delay
- Gain 1
0
Set to calib.
- CAL Level 1
0.00 V
-- [1] /10 osc

▪ Check that we get on pin 5 (+) of TP201 : 0.00 mV ± 0.1 mV

2	4	6	8	10
1	3	5	7	9

Front of DSO

- Set Cal Level : /1 and + 4.00 V (use front panel potentiometer)



FE CONTROL

Offset 1
0.00 V

Gain 1
0.00 V

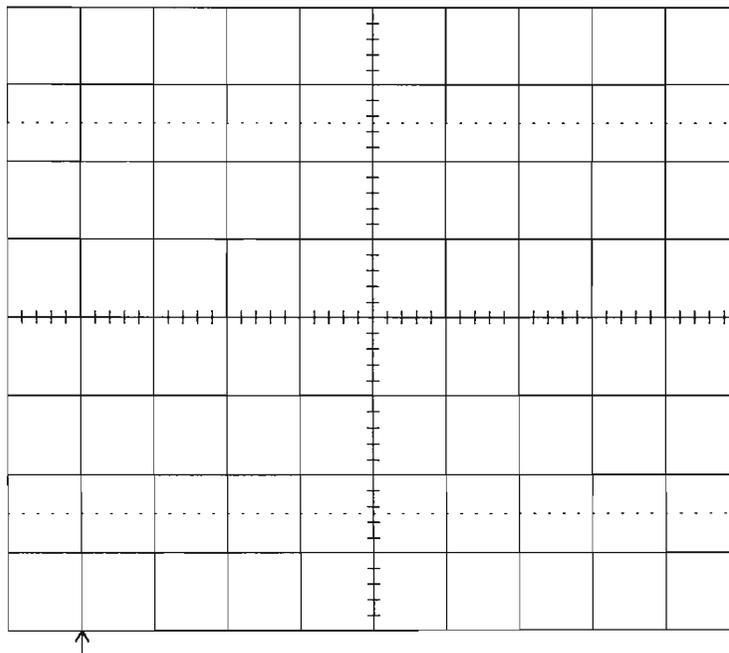
Set to last calibrated
Gain Offset

ADC DAC for
Offset
Gain
Sample-EFF
Delay

Gain 1
0
Set to calib.

CAL Level 1
4.00 V
-- /1 /10 osc

- Check that we get on pin 5 (+) of TP201 : 1.00 V ± 1%
- Set Cal Level : /1 and - 4.00 V (use front panel potentiometer)



FE CONTROL

Offset 1
0.00 V

Gain 1
0.00 V

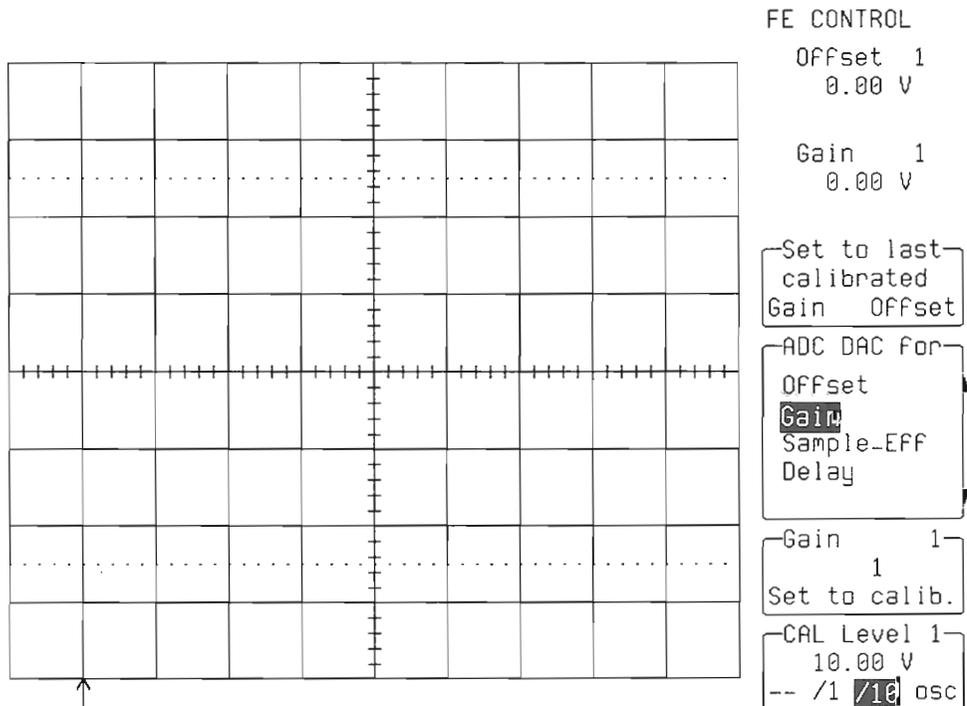
Set to last calibrated
Gain Offset

ADC DAC for
Offset
Gain
Sample-EFF
Delay

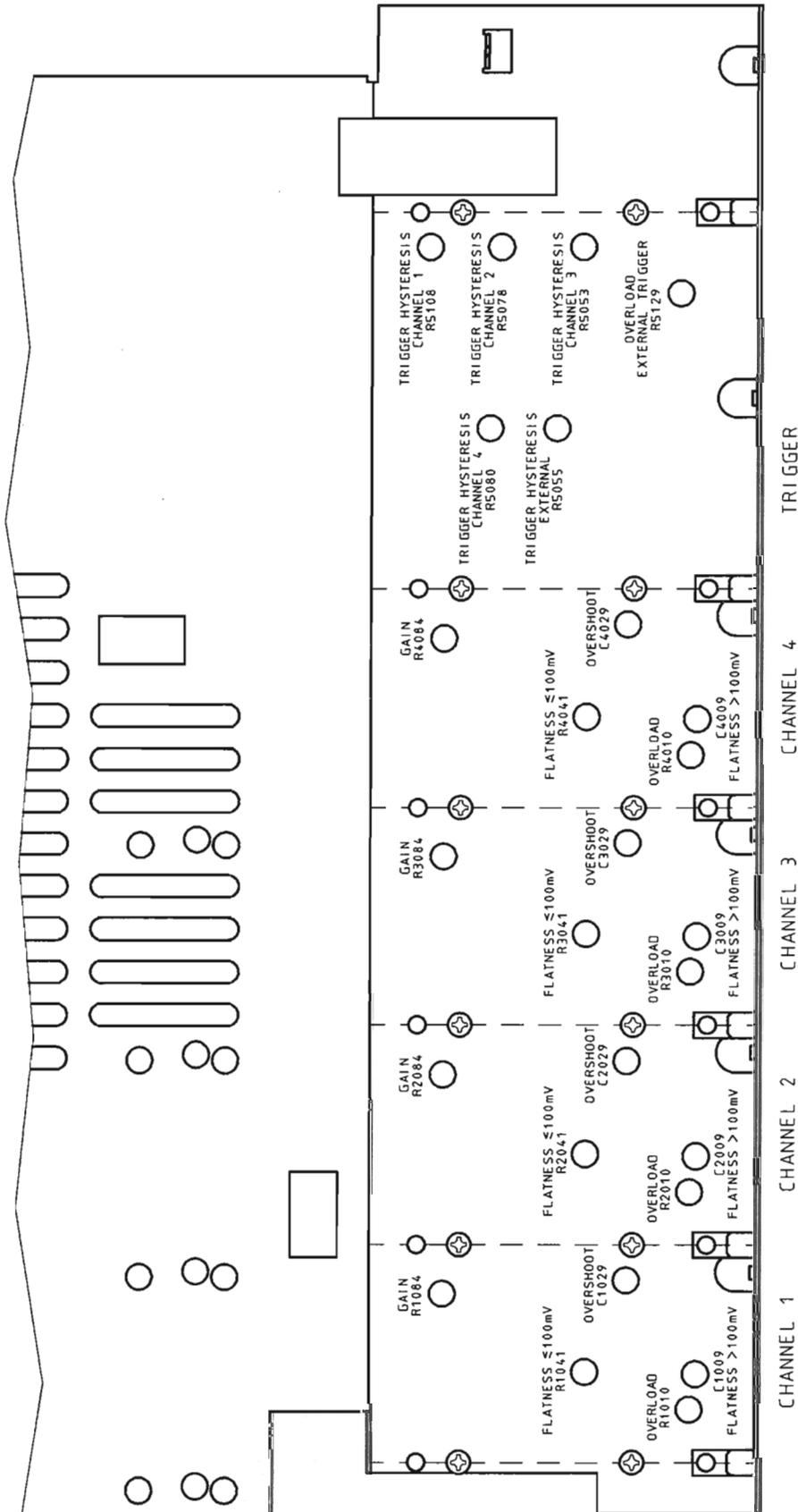
Delay 1
0
Set to calib.

CAL Level 1
-4.00 V
-- /1 /10 osc

- Check on pin 5 (+) of TP201 that we get - 1.00 V ± 1%
- Set Cal Level : /10 and + 10.00 V (use front panel potentiometer)



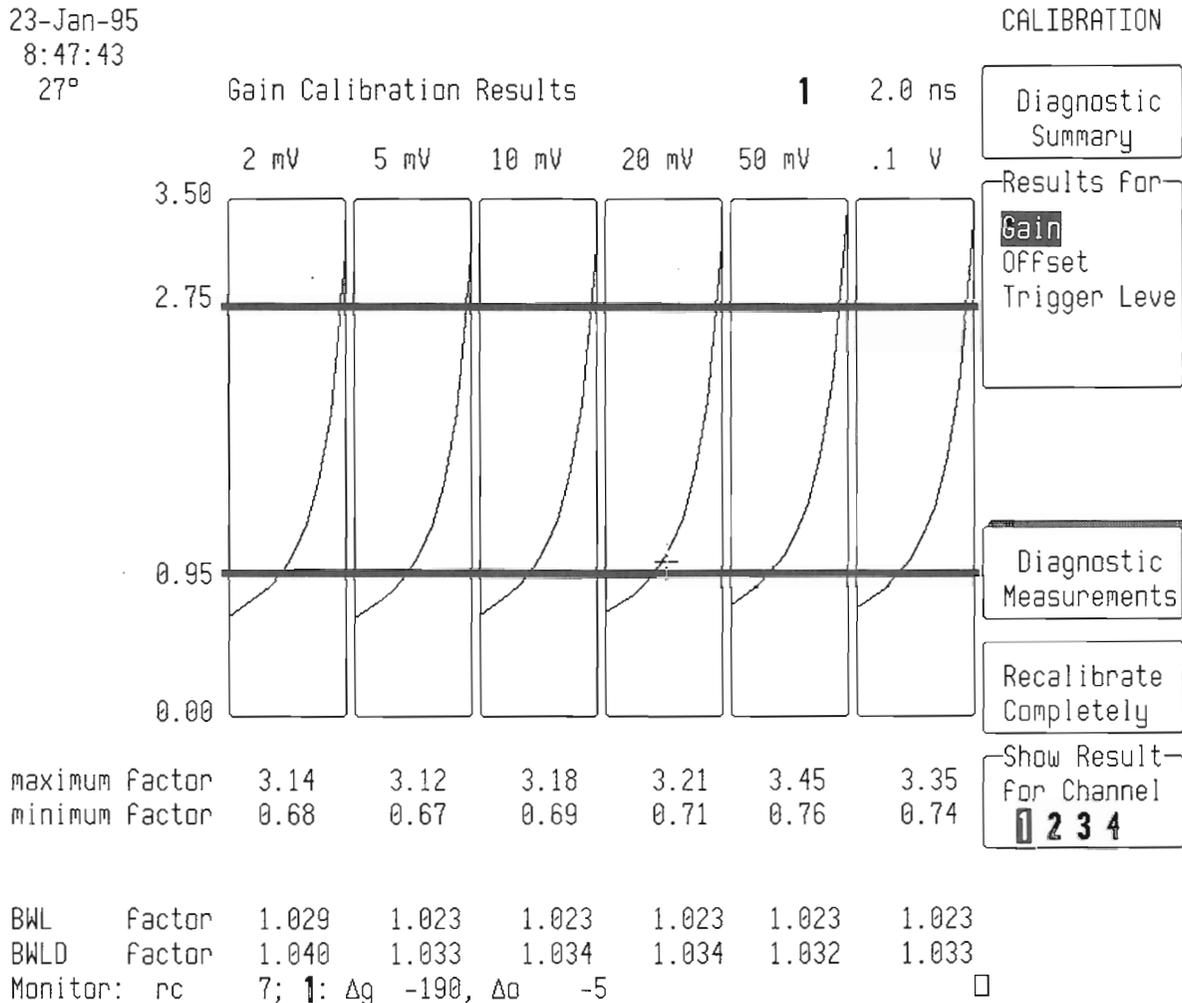
- Check on pin 5 (+) of TP201 that we get + 0.25 V ± 1%
- Set Cal Level : /10 and - 10.00 V (use front panel potentiometer)
- Check on pin 5 (+) of TP201 that we get - 0.25 V ± 1%



7.6.3.4 Input Buffer DC Gain Adjustment

7.6.3.4.1 Channel 1 DC Gain Adjustment

- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Gain, and Show Result for Channel 1
- Push Recalibrate Completely



- Adjust Potentiometer R1084 to get :

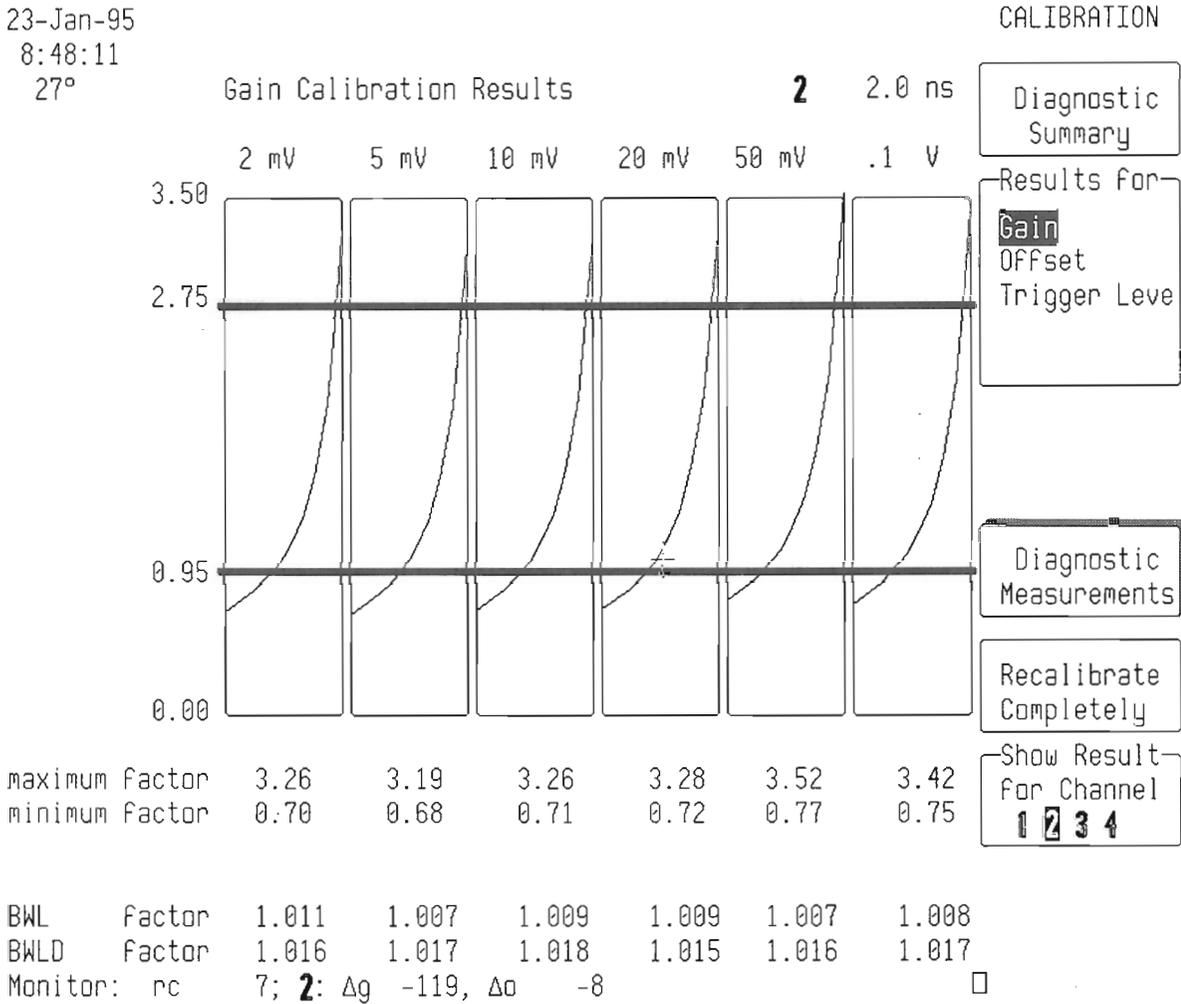
Maximum Factor at 5 mV/div > 2.90

Minimum Factor at 50 mV/div < 0.85

- During the adjustment, push recalibrate completely .

7.6.3.4.2 Channel 2 DC Gain Adjustment

- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Gain, and Show Result for Channel 2
- Push Recalibrate Completely



- Adjust Potentiometer R2084 to get :

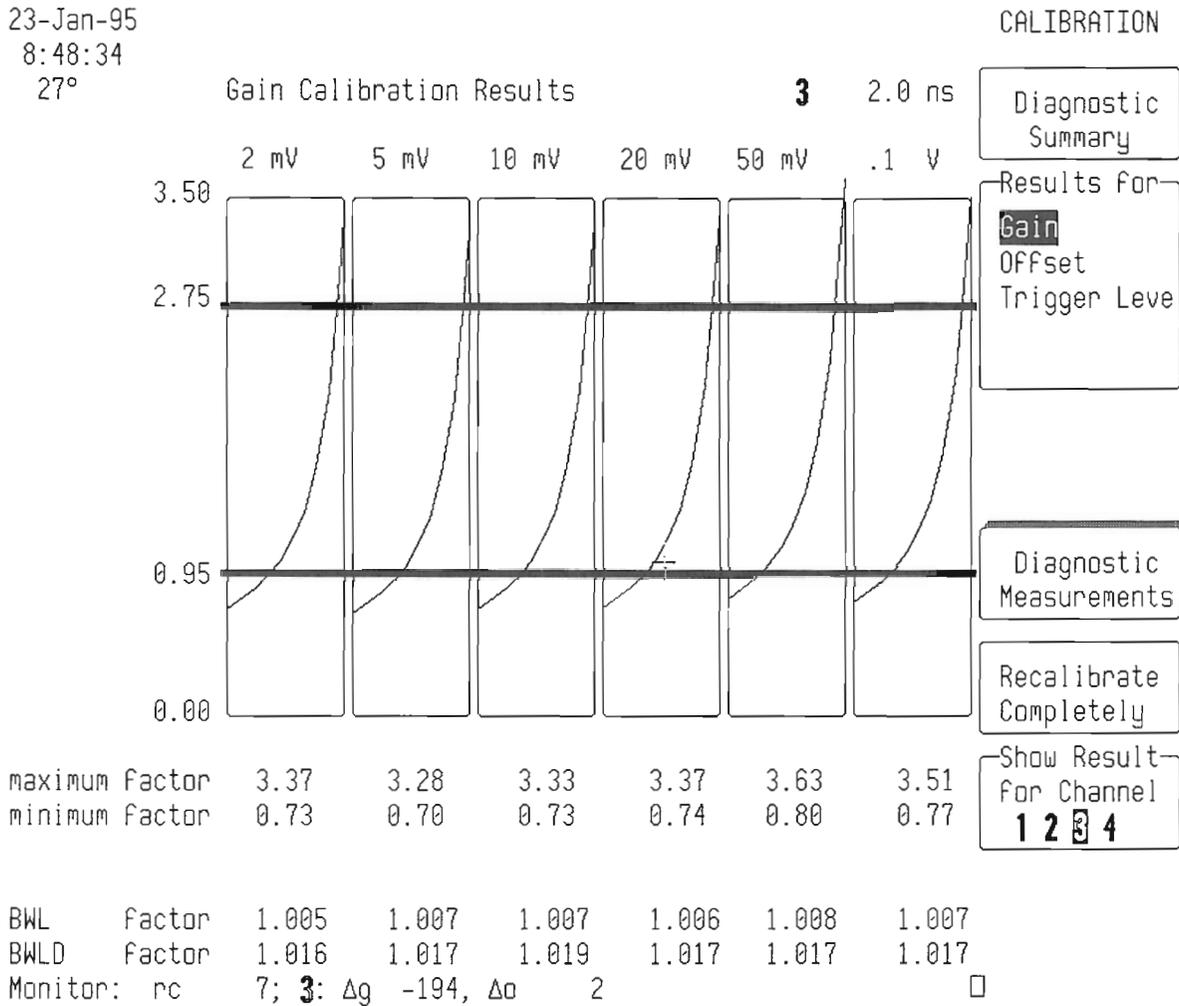
Maximum Factor at 5 mV/div > 2.90

Minimum Factor at 50 mV/div < 0.85

- During the adjustment, push recalibrate completely .

7.6.3.4.3 Channel 3 DC Gain Adjustment

- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Gain, and Show Result for Channel 3
- Push Recalibrate Completely



- Adjust Potentiometer R3084 to get :

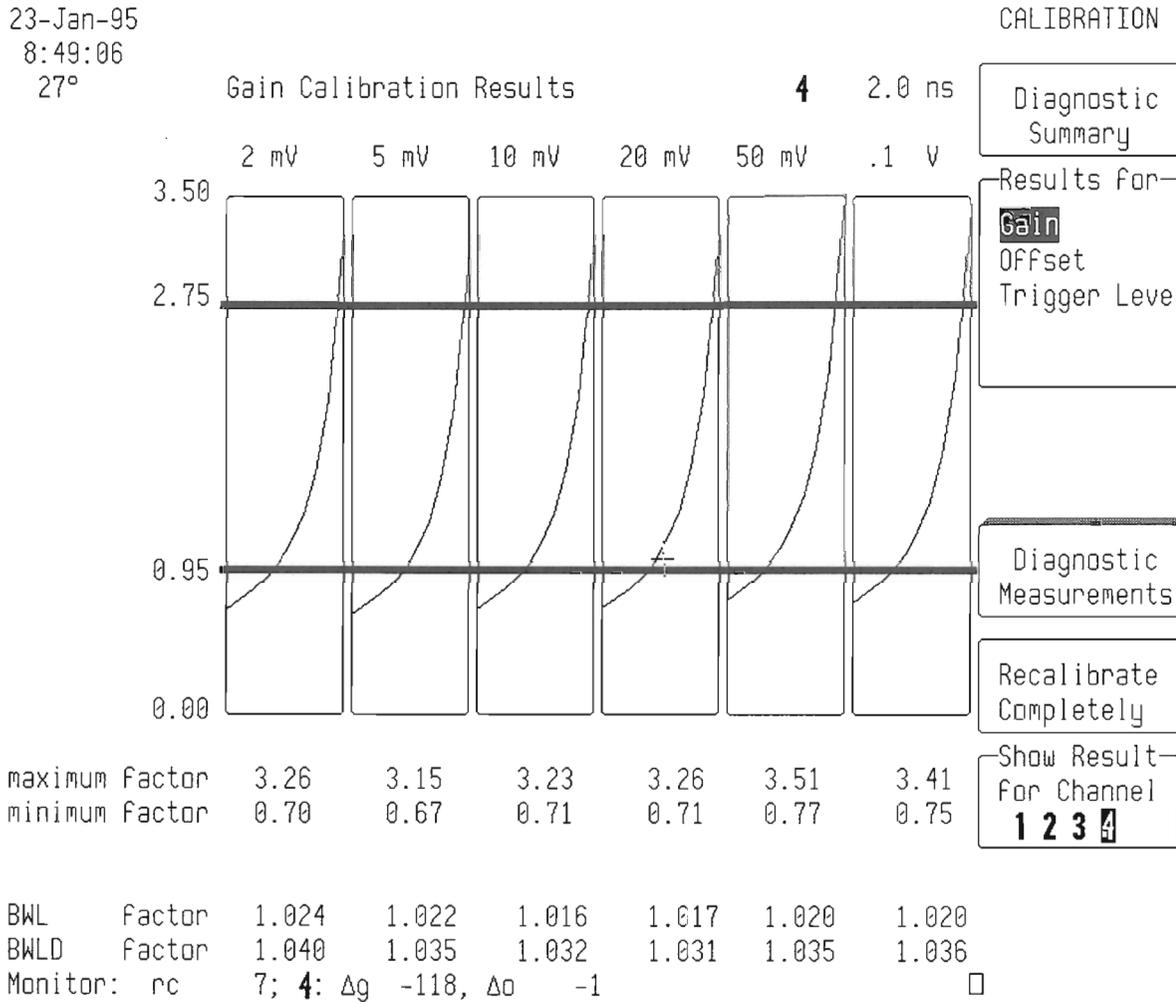
Maximum Factor at 5 mV/div > 2.90

Minimum Factor at 50 mV/div < 0.85

- During the adjustment, push recalibrate completely .

7.6.3.4.4 Channel 4 DC Gain Adjustment

- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Gain, and Show Result for Channel 4
- Push Recalibrate Completely



- Adjust Potentiometer R4084 to get :

Maximum Factor at 5 mV/div > 2.90

Minimum Factor at 50 mV/div < 0.85

- During the adjustment, push recalibrate completely

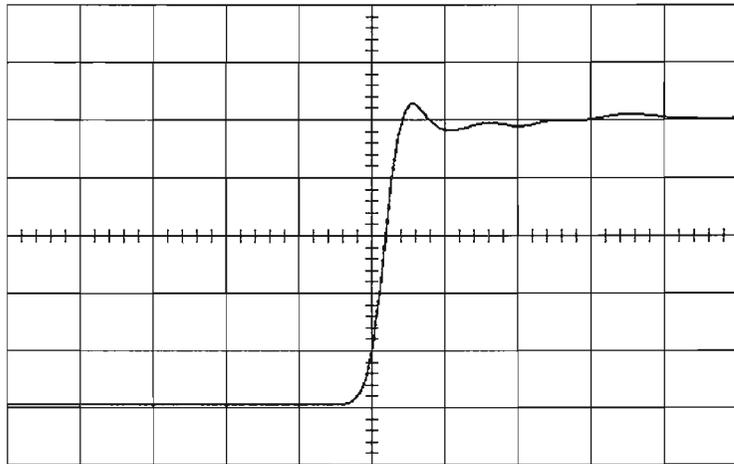
7.6.3.5 Overshoot and Rise time Adjustment

7.6.3.5.1 Channel 1 Overshoot and Rise time Adjustment

- Apply the fast Rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 1.
- Turn on trace : Ch1
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 1 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div
- Trigger setup : Edge
- Trigger on : 1
- Trigger level : DC 250 mV
- Coupling 1 : DC
- Slope 1 : Pos
- Mode : Normal
- Holdoff : Off
- Timebase : 2 nsec/div
- Record up to : 50K samples
- Delay : 50 % Pre-Trigger
- Turn on trace : A
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine A
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 1
- Turn off trace : Channel 1
- Cursors/Measure : Parameters
- Mode : Custom
- Statistics : on
- Change Parameters :
- on displayed trace : A
- On line 1 :
- Measure : Over + of A
- On line 2 :
- Measure : Rise of A
- Adjust C1029 to get : Over + (A) = + 5.5 % , ± 3 %
- Check that Rise time is less than 0.9 nsec

Section 7 Maintenance

23-Jan-95
10:23:52



102 sweeps:	average	low	high	sigma
over+(A)	5.2 %	5.1	6.0	0.2
rise(A)	0.83 ns	0.82	0.85	0.00

SETUP OF A

use Math? No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

For 1000 (sweeps)

of
2 3 4 B C D
M1 M2 M3 M4

10 GS/s

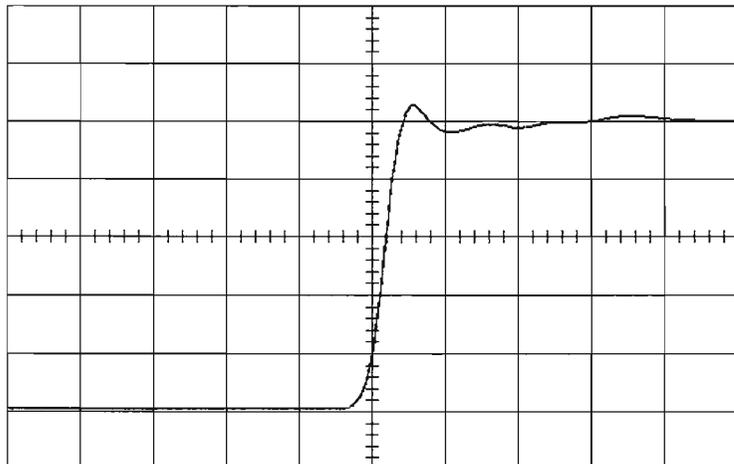
NORMAL

2 ns RIS

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

Average(1) 200 pts

23-Jan-95
10:24:10



276 sweeps:	average	low	high	sigma
over+(A)	5.3 %	5.1	6.0	0.1
rise(A)	0.83 ns	0.82	0.85	0.00

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL PARAMETERS

measure
median
minimum
over+
over-
period

of
1 2 3 4
A B C D

10 GS/s

NORMAL

2 ns RIS

- 1 .1 V 50Ω
- 2 .1 V 50Ω
- 3 .1 V 50Ω
- 4 .1 V 50Ω

1 DC 250 mV

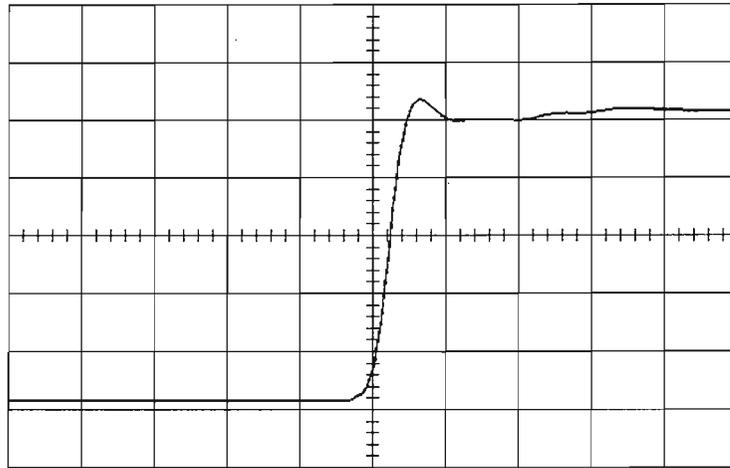
7.6.3.5.2 Channel 2 Overshoot and Rise time Adjustment

- Apply the fast Rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 2.
- Turn on trace : Ch2
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 2 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div
- Trigger setup : Edge
- Trigger on : 2
- Trigger level : DC 250 mV
- Coupling 2 : DC
- Slope 2 : Pos
- Mode : Normal
- Holdoff : Off
- Timebase : 2 nsec/div
- Record up to : 50K samples
- Delay : 50 % Pre-Trigger
- Turn on trace : B
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine B
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 2
- Turn off trace : Channel 2
- Cursors/Measure : Parameters
- Mode : Custom
- Statistics : On
- Change Parameters :
- On displayed trace : B
- On line 1 :
- Measure : Over + of B
- On line 2 :
- Measure : Rise of B
- Adjust C2029 to get : Over + (B) = + 5.5 % , ± 3 %
- Check that Rise time is less than 0.9 nsec

Section 7 Maintenance

23-Jan-95
10:21:00

B: Average(2)
2 ns
100 mV
743 swps



361 sweeps: average low high sigma
over+(**B**) 5.0 % 4.1 5.7 0.2
rise(**B**) 0.84 ns 0.81 0.84 0.01

SETUP OF **B**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

for
1000
(sweeps)

of
1 2 3 4 A C D
M1 M2 M3 M4

10 GS/s

NORMAL

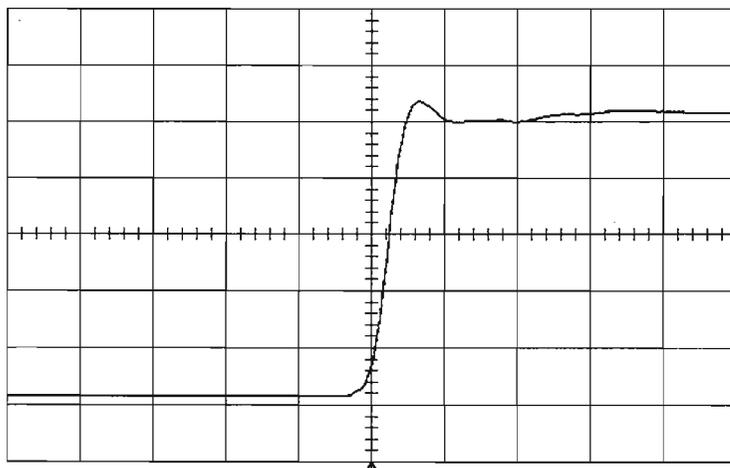
2 ns RIS

- 1** .1 V 50Ω
- 2** .1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

B: Average(2) 200 pts

23-Jan-95
10:21:19

B: Average(2)
2 ns
100 mV
1000 swps



486 sweeps: average low high sigma
over+(**B**) 5.0 % 4.1 5.7 0.2
rise(**B**) 0.83 ns 0.81 0.84 0.00

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL
PARAMETERS

measure
median
minimum
over+
over-
period

of
1 2 3 4
A B C D

10 GS/s

NORMAL

2 ns RIS

- 1** .1 V 50Ω
- 2** .1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

2 DC 250 mV

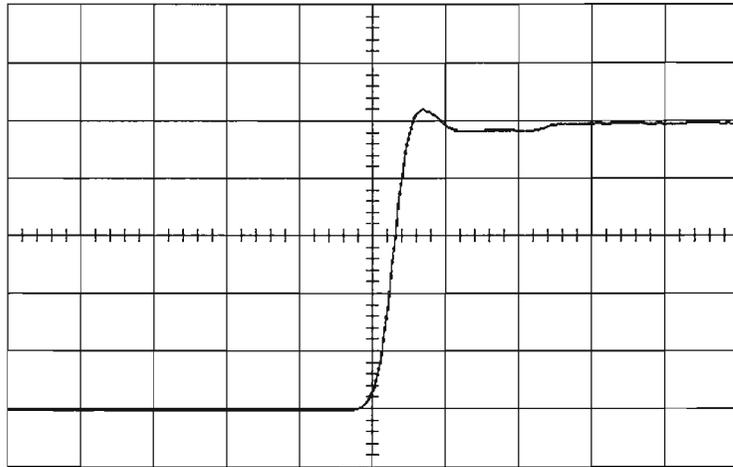
7.6.3.5.3 Channel 3 Overshoot and Rise time Adjustment

- Apply the fast Rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 3.
- Turn on trace : Ch3
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 3 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div
- Trigger setup : Edge
- Trigger on : 3
- Trigger level : DC 250 mV
- Coupling 3 : DC
- Slope 3 : Pos
- Mode : Normal
- Holdoff : Off
- Timebase : 2 nsec/div
- Record up to : 50K samples
- Delay : 50 % Pre-Trigger
- Turn on trace : C
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine C
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 3
- Turn off trace : Channel 3
- Cursors/Measure : Parameters
- Mode : Custom
- Statistics : On
- Change Parameters :
- On displayed trace : C
- On line 1 :
- Measure : Over + of C
- On line 2 :
- Measure : Rise of C
- Adjust C3029 to get : Over + (C) = + 5.5 % , ± 3 %
- Check that Rise time is less than 0.9 nsec

Section 7 Maintenance

23-Jan-95
10:25:33

C: Average(3)
2 ns
100 mV
147 swps



66 sweeps:	average	low	high	sigma
over+(C)	5.0 %	5.0	5.9	0.1
rise(C)	0.82 ns	0.81	0.83	0.00

SETUP OF **C**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

for
1000
(sweeps)

of
1 2 3 4 A B D
M1 M2 M3 M4

10 GS/s

NORMAL

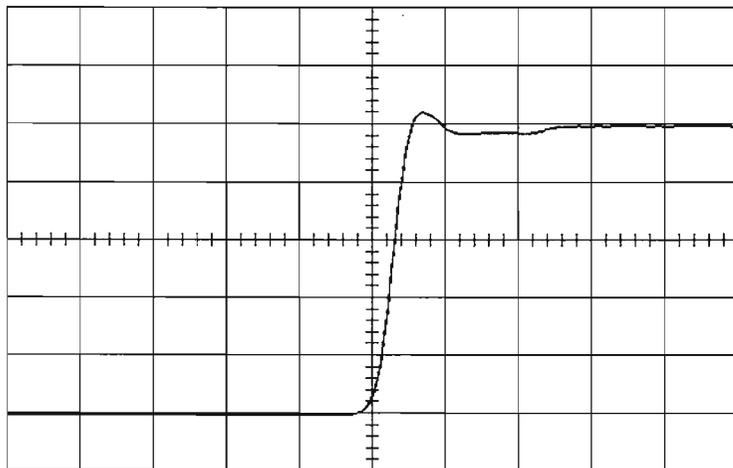
2 ns RIS

- 1** .1 V 50Ω
- 2** .1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

C: Average(3) 200 pts

23-Jan-95
10:25:51

C: Average(3)
2 ns
100 mV
533 swps



240 sweeps:	average	low	high	sigma
over+(C)	5.1 %	5.0	6.0	0.2
rise(C)	0.83 ns	0.81	0.83	0.00

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL
PARAMETERS

measure
median
minimum
over+
over-
period

of
1 2 3 4
A B C D

10 GS/s

NORMAL

2 ns RIS

- 1** .1 V 50Ω
- 2** .1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

3 DC 250 mV

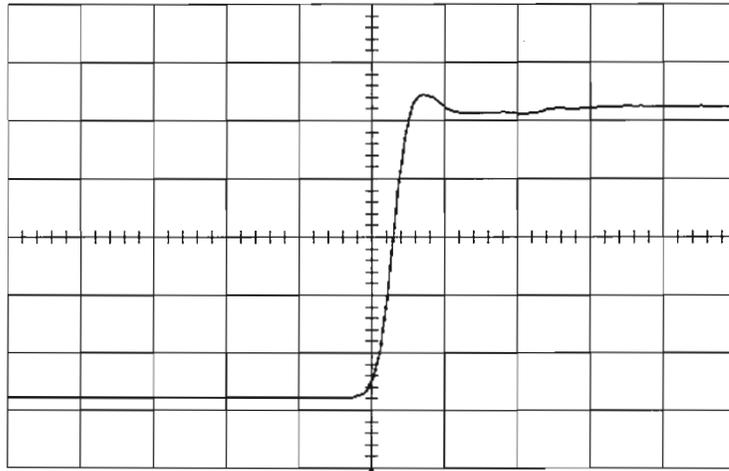
7.6.3.5.4 Channel 4 Overshoot and Rise time Adjustment

- Apply the fast **Rise time** pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 4.
- Turn on trace : Ch4
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 4 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div
- Trigger setup : Edge
- Trigger on : 4
- Trigger level : DC 250 mV
- Coupling 4 : DC
- Slope 4 : Pos
- Mode : Normal
- Holdoff : Off
- Timebase : 2 nsec/div
- Record up to : 50K samples
- Delay : 50 % Pre-Trigger
- Turn on trace : D
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine D
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 4
- Turn off trace : Channel 4
- Cursors/Measure : Parameters
- Mode : Custom
- Statistics : On
- Change Parameters :
- On displayed trace : D
- On line 1 :
- Measure : Over + of D
- On line 2 :
- Measure : Rise of D
- Adjust C4029 to get : Over + (D) = + 5.5 % , ± 3 %
- Check that Rise time is less than 0.9 nsec

Section 7 Maintenance

23-Jan-95
10:26:26

0: Average(4)
2 ns
100 mV
166 swps



	69 sweeps:	average	low	high	sigma
over+(0)		5.1 %	4.0	5.1	0.2
rise(0)		0.81 ns	0.80	0.82	0.00

SETUP OF **0**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

For
1000
(sweeps)

of
1 2 3 4 A B C
M1 M2 M3 M4

10 GS/s

NORMAL

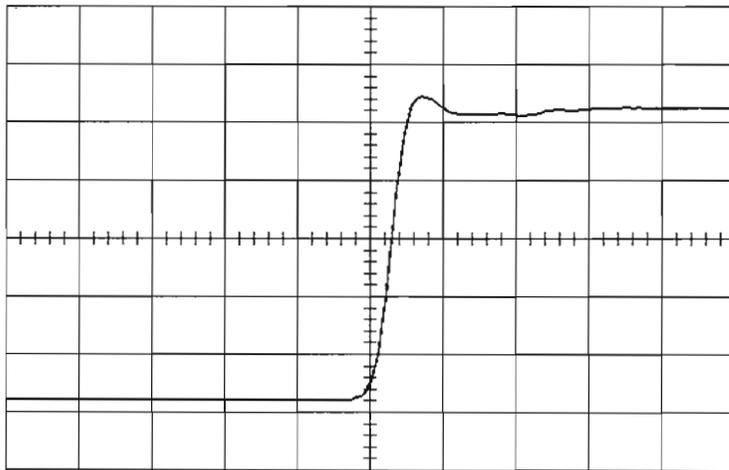
2 ns RIS

- 1** .1 V 50Ω
- 2** .1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

0: Average(4) 200 pts

23-Jan-95
10:26:39

0: Average(4)
2 ns
100 mV
413 swps



	179 sweeps:	average	low	high	sigma
over+(0)		5.1 %	4.0	5.1	0.1
rise(0)		0.81 ns	0.80	0.82	0.00

CHANGE PARAM

On line
1 2 3 4 5

DELETE ALL PARAMETERS

measure
median
minimum
over+
over-
period

of
1 2 3 4
A B C 0

10 GS/s

NORMAL

2 ns RIS

- 1** .1 V 50Ω
- 2** .1 V 50Ω
- 3** .1 V 50Ω
- 4** .1 V 50Ω

4 DC 250 mV

7.6.3.6 Flatness Adjustment

7.6.3.6.1 Channel 1 HF Adjustment

- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 1. Set pulser to 62.5 msec low frequency.

- Turn on trace : Ch1
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 1 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div

- Trigger setup : Edge
- Trigger on : 1
- Trigger level : DC 250 mV
- Coupling 1 : DC
- Slope 1 : Pos
- Mode : Normal
- Holdoff : Off

- Timebase : 20 μ sec/div
- Record up to : 50K samples
- Delay : 10 % Pre-Trigger

- Turn on trace : A
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine A
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 1

- With the vertical Zoom set A to 10 mV

- Adjust pot R1041 to get a flat square wave.

- Set Input gain : 200 mV/div
- Coupling Channel 1 : DC 1 M Ω

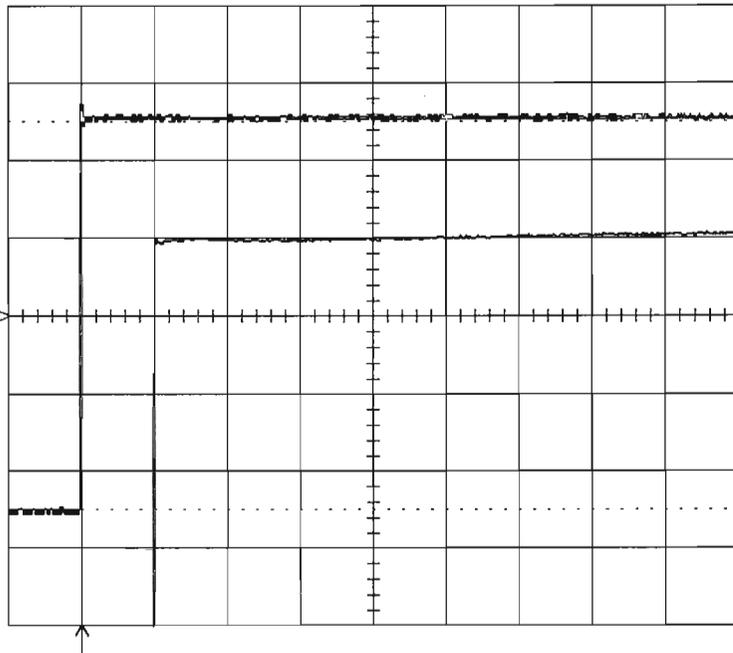
- Adjust cap C1009 to get a flat square wave.

Section 7 Maintenance

23-Jan-95
10:31:28

20 μ s
100 mV

Average(1)
20 μ s
10.0 mV
131 swps



SETUP OF **A**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

for
1000
(sweeps)

of
1 2 3 4 B C D
M1 M2 M3 M4

250 MS/s

NORMAL

20 μ s

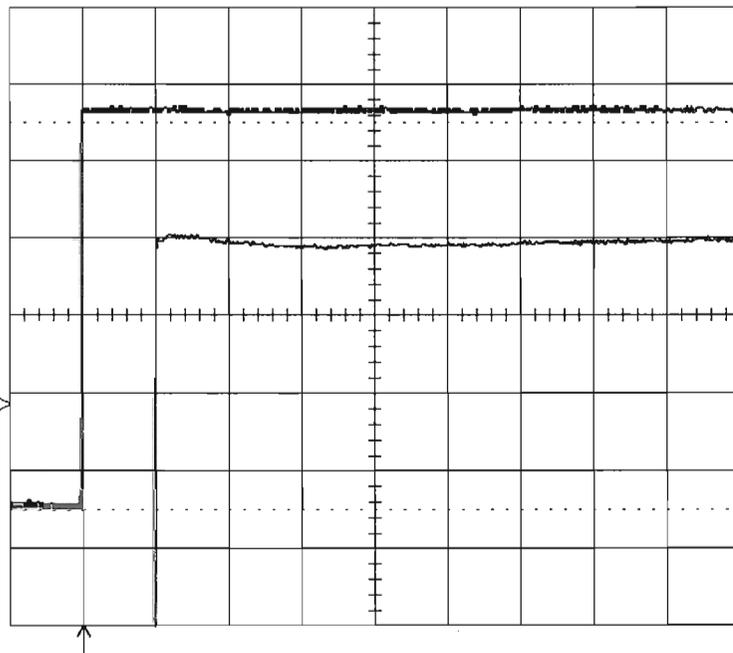
- 1** .1 V 50 Ω
- 2** .1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

Average(1) 50000 -> 1000 pts

23-Jan-95
10:32:33

20 μ s
200 mV

Average(1)
20 μ s
20.0 mV
96 swps



CHANNEL **1**

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

250 MS/s

NORMAL

20 μ s

- 1** .2 V DC
- 2** .1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

1 DC 0.248 V

7.6.3.6.2 Channel 2 HF Adjustment

- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 2. Set pulser to 62.5 msec low frequency.

- Turn on trace : Ch2
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 2 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div

- Trigger setup : Edge
- Trigger on : 2
- Trigger level : DC 250 mV
- Coupling 2 : DC
- Slope 2 : Pos
- Mode : Normal
- Holdoff : Off

- Timebase : 20 μ sec/div
- Record up to : 50K samples
- Delay : 10 % Pre-Trigger

- Turn on trace : B
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine B
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 2

- With the vertical Zoom set B to 10 mV

- Adjust pot R2041 to get a flat square wave.

- Set Input gain : 200 mV/div
- Coupling Channel 2 : DC 1 M Ω

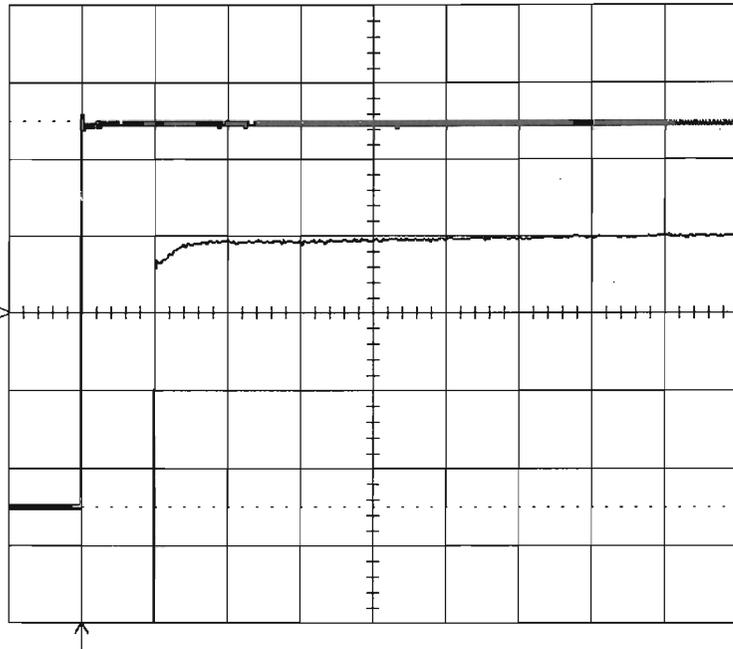
- Adjust cap C2009 to get a flat square wave.

Section 7 Maintenance

23-Jan-95
10:34:44

2
20 μ s
100 mV

B: Average(2)
20 μ s
10.0 mV
125 swps



20 μ s

- 1** .2 V DC
- 2** .1 V 50 Ω
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

B: Average(2)
50000 \rightarrow 1000 pts

SETUP OF **B**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

For
1000
(sweeps)

of
1 2 3 4 A C D
M1 M2 M3 M4

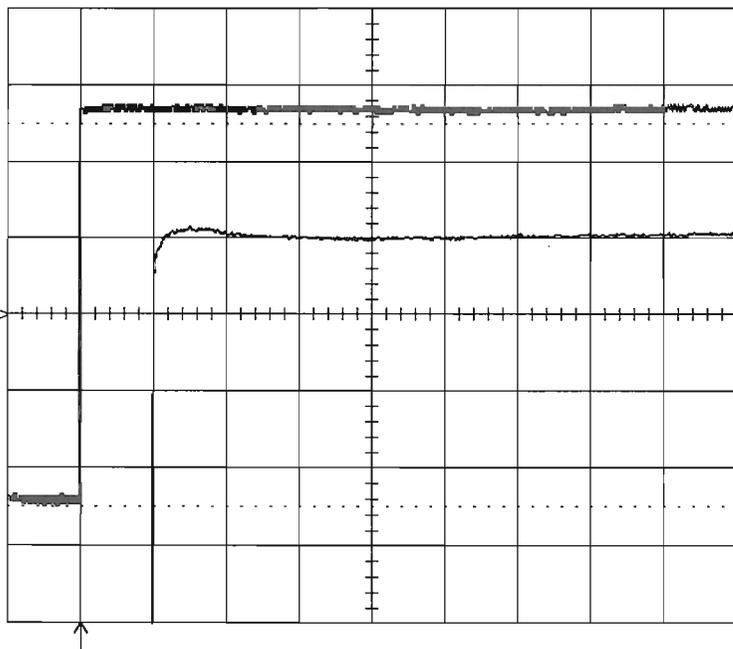
250 MS/s

NORMAL

6-Oct-94
12:24:05

2
20 μ s
200 mV

B: Average(2)
20 μ s
20.0 mV
125 swps



20 μ s

- 1** .2 V DC
- 2** .2 V DC
- 3** .1 V 50 Ω
- 4** .1 V 50 Ω

2 DC 0.480 V

CHANNEL **2**

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

250 MS/s

NORMAL

7.6.3.6.3 Channel 3 HF Adjustment

- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 3. Set pulser to 62.5 msec low frequency.

- Turn on trace : Ch3
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 3 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div

- Trigger setup : Edge
- Trigger on : 3
- Trigger level : DC 250 mV
- Coupling 3 : DC
- Slope 3 : Pos
- Mode : Normal
- Holdoff : Off

- Timebase : 20 μ sec/div
- Record up to : 50K samples
- Delay : 10 % Pre-Trigger

- Turn on trace : C
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine C
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 3

- With the vertical Zoom set C to 10 mV

- Adjust pot R3041 to get a flat square wave.

- Set Input gain : 200 mV/div
- Coupling Channel 3 : DC 1 M Ω

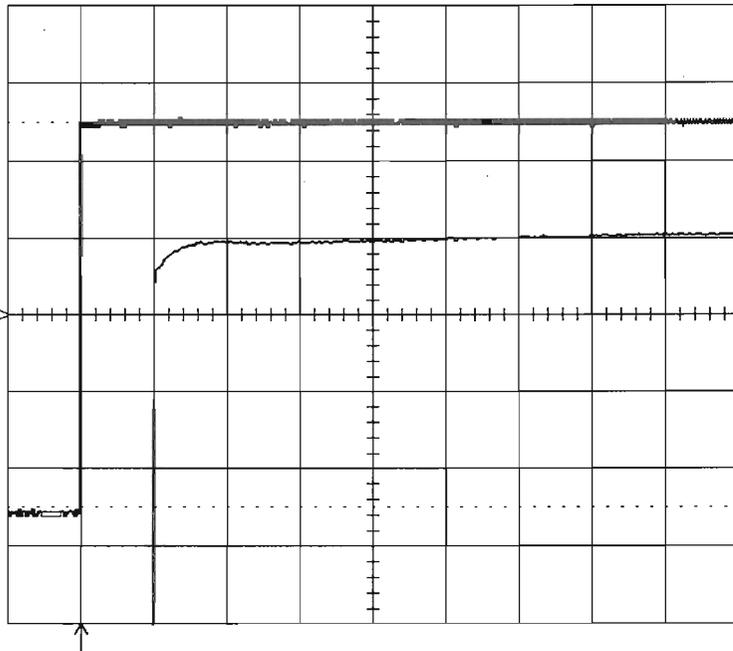
- Adjust cap C3009 to get a flat square wave.

Section 7 Maintenance

23-Jan-95
10:40:09

20 μ s
100 mV

Average(3)
20 μ s
10.0 mV
333 swps



SETUP OF C

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

For
1000
(sweeps)

of
1 2 3 4 A B D
M1 M2 M3 M4

250 MS/s

NORMAL

20 μ s

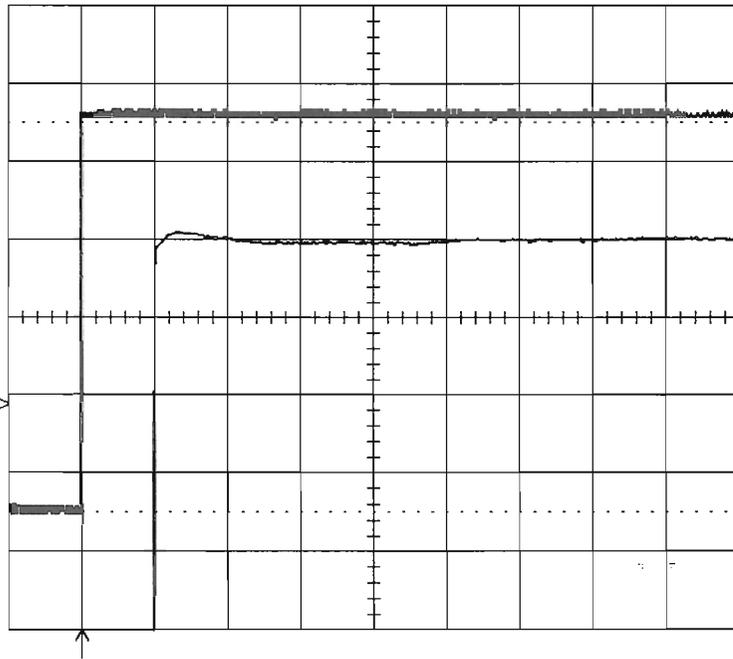
- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .1 V 50 Ω
- 4 .1 V 50 Ω

C: Average(3)
50000 -> 1000 pts

23-Jan-95
10:41:38

20 μ s
200 mV

Average(3)
20 μ s
20.0 mV
228 swps



CHANNEL 3

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

250 MS/s

NORMAL

20 μ s

- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .2 V DC
- 4 .1 V 50 Ω

3 DC 0.248 V

7.6.3.6.4 Channel 4 HF Adjustment

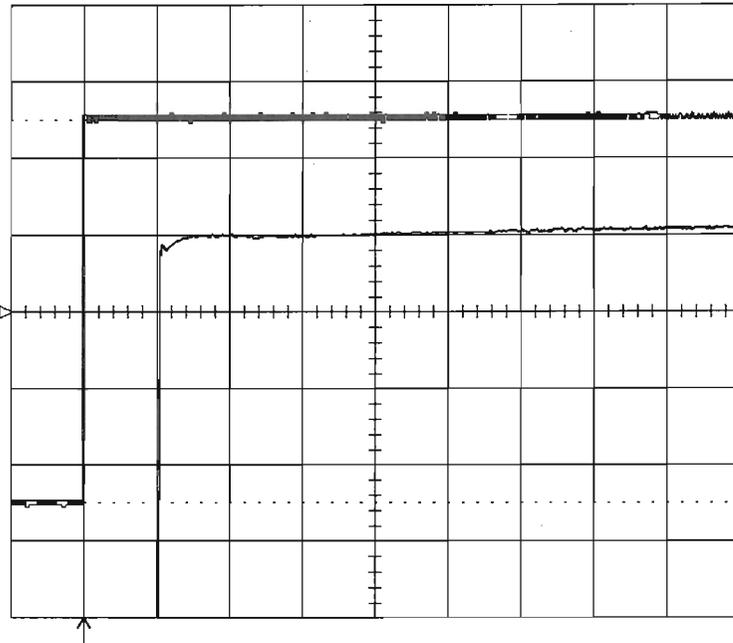
- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 4. Set pulser to 62.5 msec low frequency.
- Turn on trace : Ch4
- Display setup : Standard, Persistence off, Dot join on, Single grid
- Coupling Channel 4 : DC 50 Ω
- V/div. offset : Normal
- Global BWL : Off
- Probe atten : X1
- Input offset : - 250 mV
- Input gain : 100 mV/div
- Trigger setup : Edge
- Trigger on : 4
- Trigger level : DC 250 mV
- Coupling 4 : DC
- Slope 4 : Pos
- Mode : Normal
- Holdoff : Off
- Timebase : 20 μ sec/div
- Record up to : 50K samples
- Delay : 10 % Pre-Trigger
- Turn on trace : D
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine D
- Use Math ? : Yes
- Math Type : Average
- Avg Type : Summed
- Of : Channel 4
- With the vertical Zoom set D to 10 mV
- Adjust pot R4041 to get a flat square wave.
- Set Input gain : 200 mV/div
- Coupling Channel 4 : DC 1 M Ω
- Adjust cap C4009 to get a flat square wave.

Section 7 Maintenance

23-Jan-95
10:43:33

4
20 μ s
100 mV

0: Average(**4**)
20 μ s
10.0 mV
256 swps



SETUP OF **0**

use Math?
No **Yes**

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

for
1000
(sweeps)

of
1 2 3 4 A B C
M1 M2 M3 M4

250 MS/s

NORMAL

20 μ s

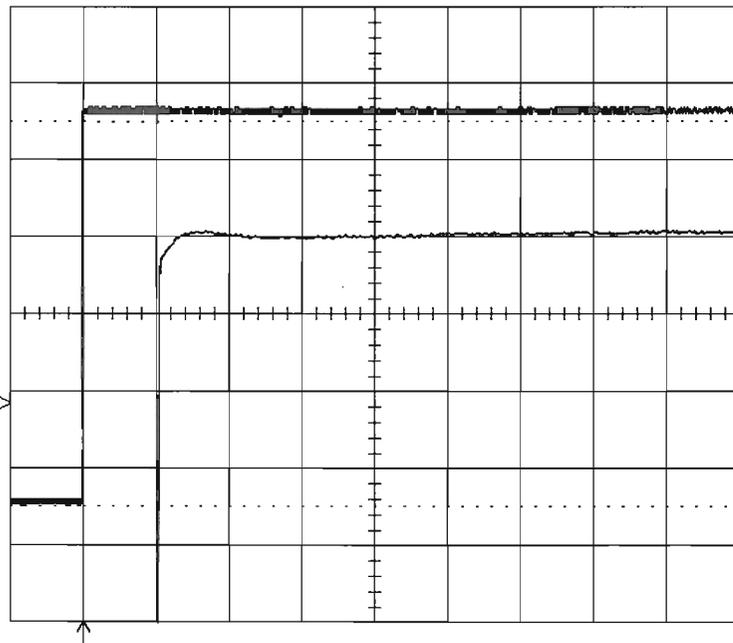
- 1** .1 V 50 Ω
- 2** .1 V 50 Ω
- 3** .2 V 50 Ω
- 4** .1 V 50 Ω

0: Average(**4**)
50000 -> 1000 pts

23-Jan-95
10:44:12

4
20 μ s
200 mV

0: Average(**4**)
20 μ s
20.0 mV
200 swps



CHANNEL **4**

Coupling
DC50 Ω
Grounded
DC1M Ω
Grounded
AC1M Ω

V/div Offset
NORMAL
ECL TTL

Global BWL
OFF On
(30 MHz)

Probe Atten
x1
x2
x5
x10
x20

250 MS/s

NORMAL

20 μ s

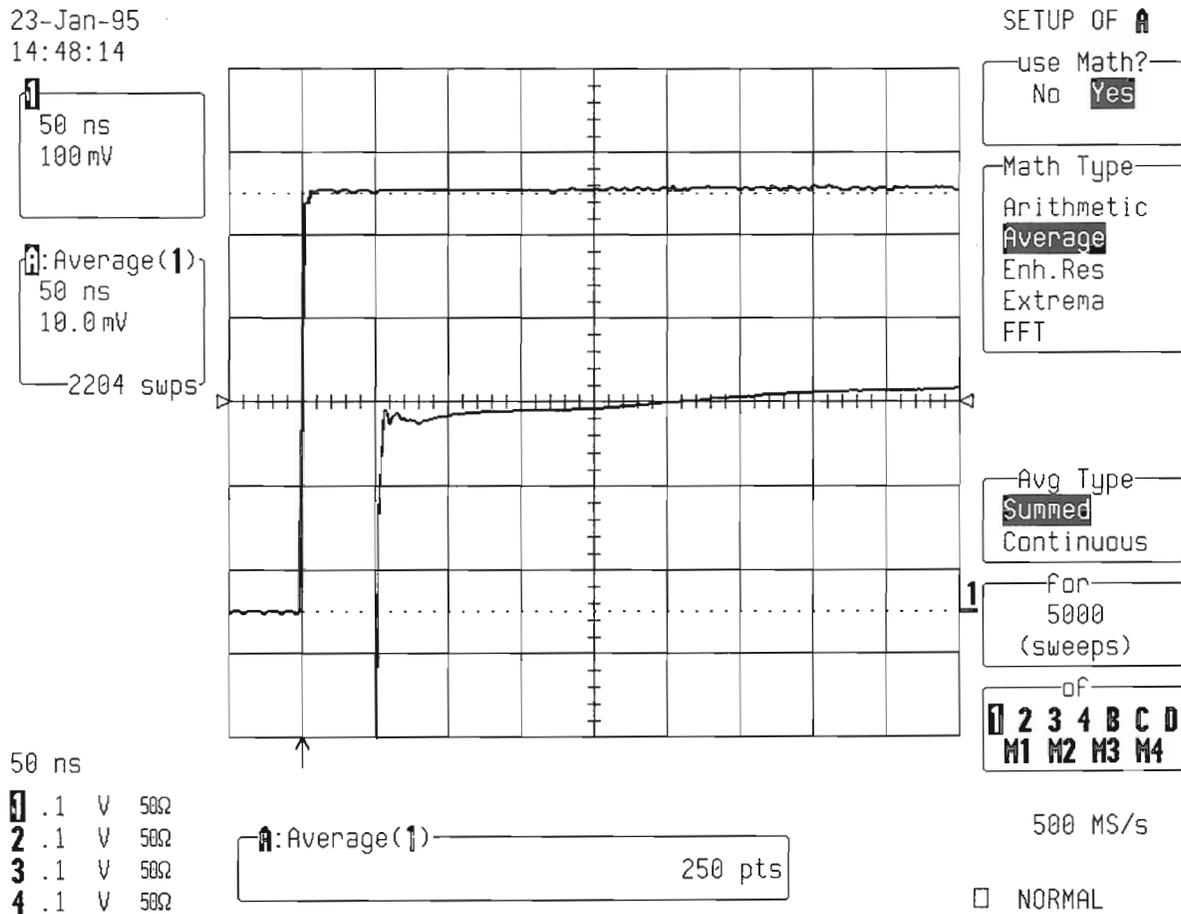
- 1** .1 V 50 Ω
- 2** .1 V 50 Ω
- 3** .2 V 50 Ω
- 4** .2 V DC

4 DC 0.248 V

7.6.3.7 Sample & Hold Flatness Adjustment

7.6.3.7.1 Channel 1 Sample&Hold Flatness Adjustment

- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 1. Set pulser to 62.5 μ sec high frequency.
- Turn on trace : Ch1
- Coupling Channel 1 : DC 50 Ω
- Input gain : 100 mV/div
- Trigger on : 1
- Trigger level : DC 250 mV
- Coupling 1 : DC
- Slope 1 : Pos
- Timebase : 50 nsec/div
- Delay : 10 % Pre-Trigger
- Turn on trace : A
- Select Math Setup
 - For Math : Use at most 1000 points
 - Redefine A : Summed Average of Channel 1
 - With the vertical Zoom set A to 10 mV
- Adjust pot R1518, C1553, R1577 (at left of A1500 HSH416) to get the best flatness as possible.



7.6.3.7.2 Channel 2 Sample&Hold Flatness Adjustment

- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 2. Set pulser to 62.5 μ sec high frequency.
- Turn on trace : Ch2
- Coupling Channel 2 : DC 50 Ω
- Input gain : 100 mV/div
- Trigger on : 2
- Trigger level : DC 250 mV
- Coupling 2 : DC
- Slope 2 : Pos
- Timebase : 50 nsec/div
- Delay : 10 % Pre-Trigger
- Turn on trace : B
- Select Math Setup
- For Math : Use at most 1000 points
- Redefine B : Summed Average of Channel 2

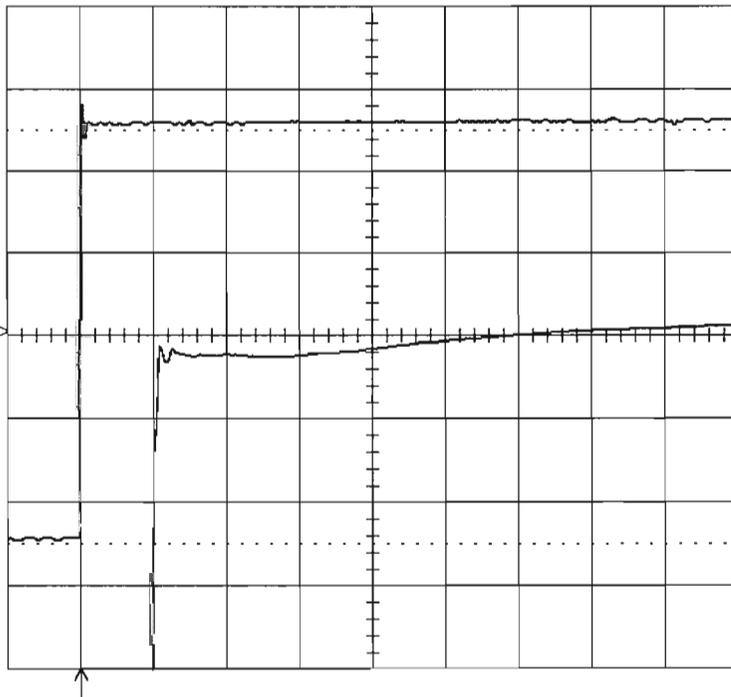
- With the vertical Zoom set B to 10 mV

- Adjust pot R2518, C2553, R2577 (at left of A2500 HSH416) to get the best flatness as possible.

23-Jan-95
14:23:11

2
50 ns
100 mV

B: Average(2)
50 ns
10.0 mV
4672 swps



SETUP OF B

use Math?
No Yes

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

For
5000
(sweeps)

of
1 2 3 4 A C D
M1 M2 M3 M4

50 ns

- 1 .1 V 50 Ω
- 2 .1 V 50 Ω
- 3 .2 V 50 Ω
- 4 .2 V 50 Ω

B: Average(2) 250 pts

500 MS/s

NORMAL

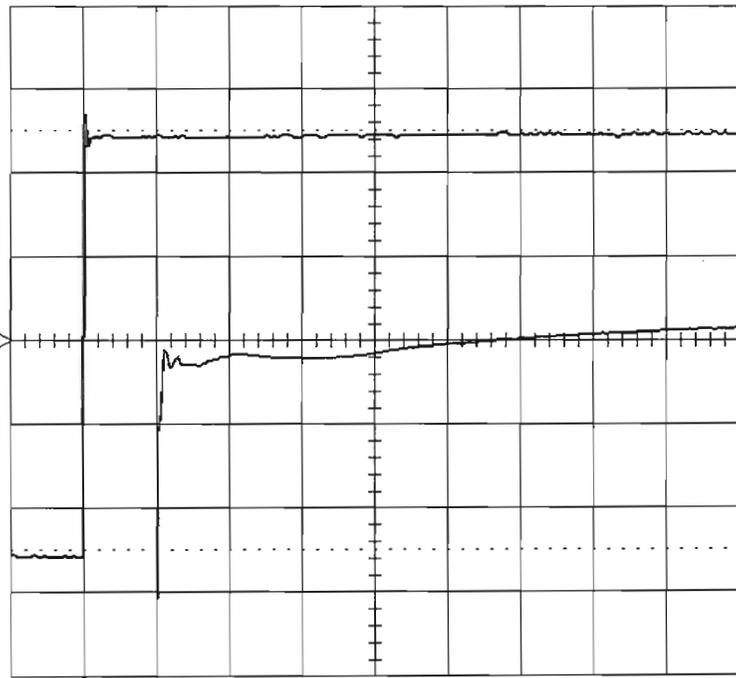
7.6.3.7.3 Channel 3 Sample&Hold Flatness Adjustment

- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 3. Set pulser to 62.5 μ sec high frequency.
 - Turn on trace : Ch3
 - Coupling Channel 3 : DC 50 Ω
 - Input gain : 100 mV/div
 - Trigger on : 3
 - Trigger level : DC 250 mV
 - Coupling 3 : DC
 - Slope 3 : Pos
 - Timebase : 50 nsec/div
 - Delay : 10 % Pre-Trigger
 - Turn on trace : C
 - Select Math Setup
 - For Math : Use at most 1000 points
 - Redefine C : Summed Average of Channel 3
- With the vertical Zoom set C to 10 mV
- Adjust pot R3518, C3553, R3577 (at left of A3500 HSH416) to get the best flatness as possible.

23-Jan-95
14:26:15

50 ns
100 mV

Average(3)
50 ns
10.0 mV
1850 swps



50 ns

1	.1	V	50 Ω
2	.1	V	50 Ω
3	.1	V	50 Ω
4	.1	V	50 Ω

C: Average(3) 250 pts

SETUP OF C

use Math?
No Yes

Math Type
Arithmetic
Average
Enh.Res
Extrema
FFT

Avg Type
Summed
Continuous

for
5000
(sweeps)

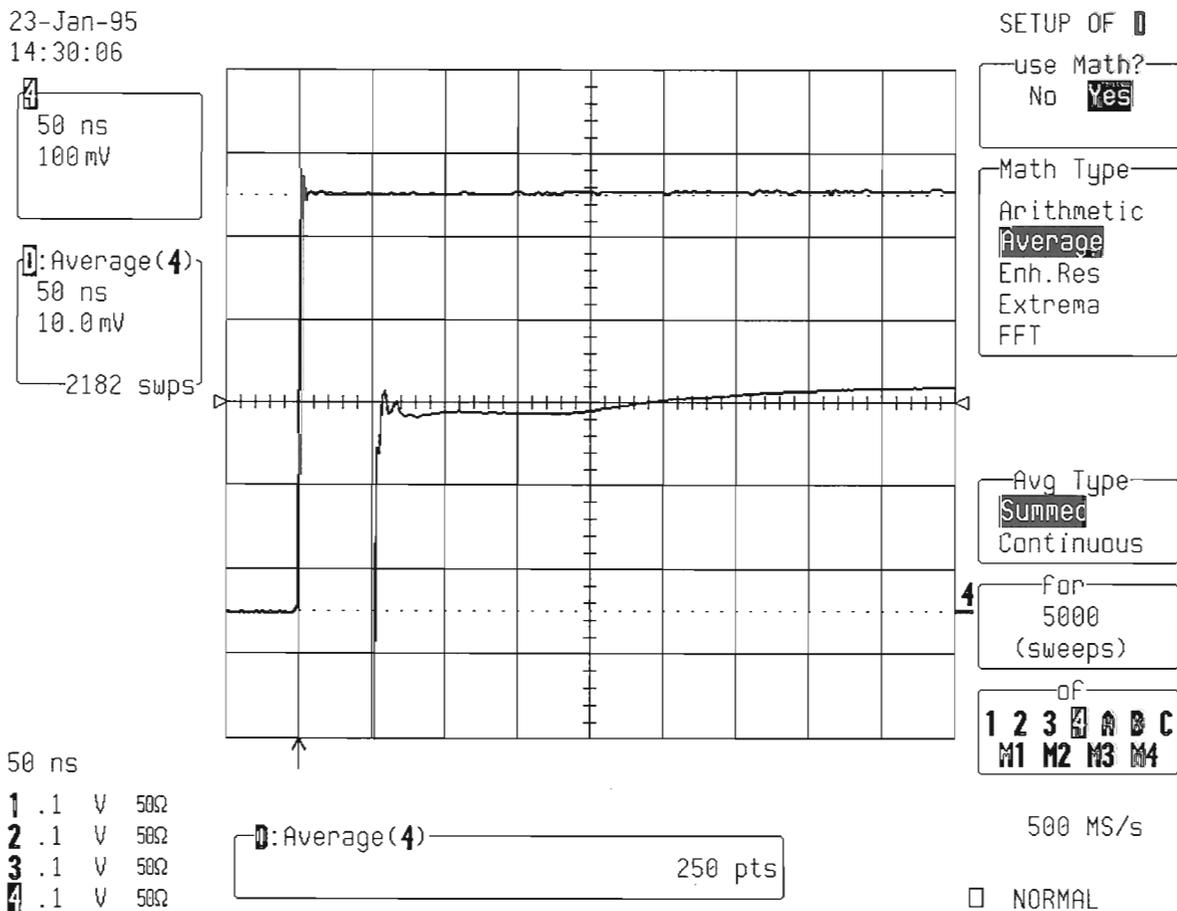
of
1 2 3 4 A B D
M1 M2 M3 M4

500 MS/s

NORMAL

7.6.3.7.4 Channel 4 Sample&Hold Flatness Adjustment

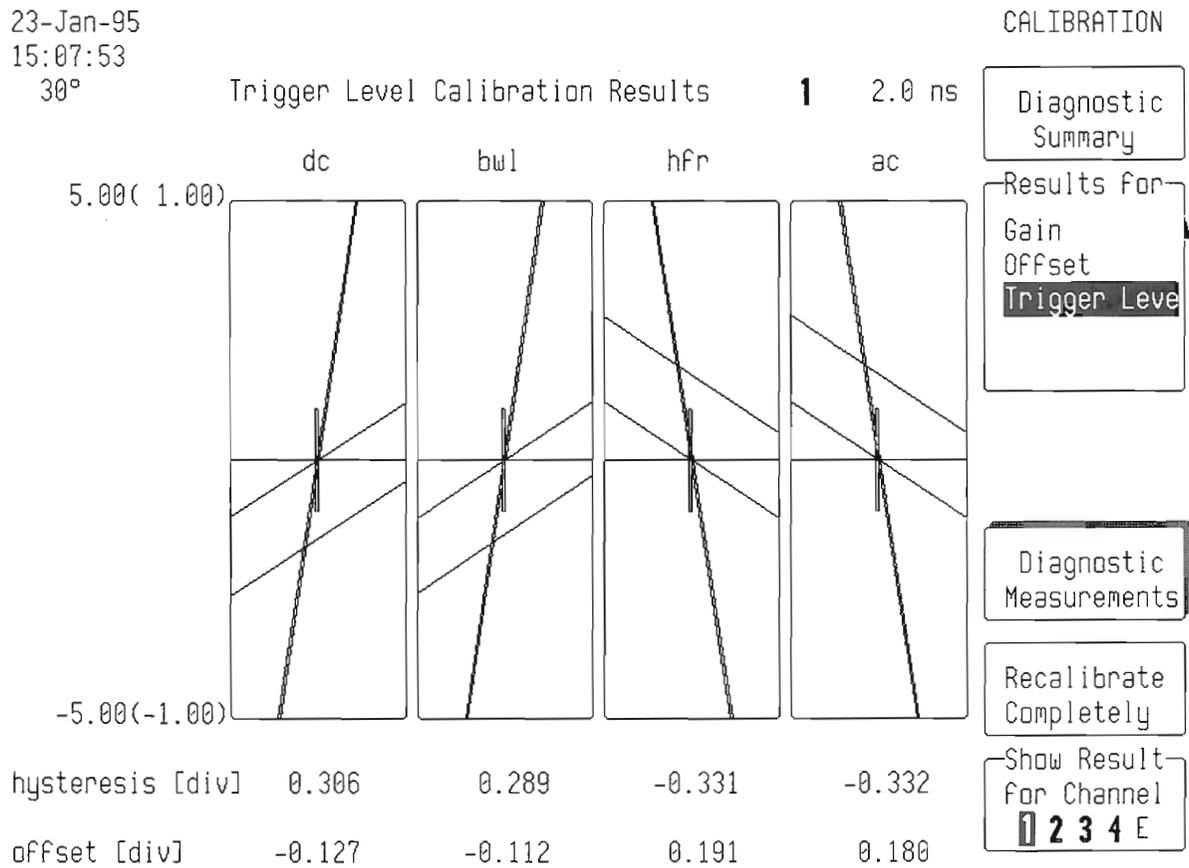
- Apply the fast rise time pulse generator LeCroy 4969 or equivalent (< 600 psec) to Channel 4. Set pulser to 62.5 μ sec high frequency.
 - Turn on trace : Ch4
 - Coupling Channel 4 : DC 50 Ω
 - Input gain : 100 mV/div
 - Trigger on : 4
 - Trigger level : DC 250 mV
 - Coupling 4 : DC
 - Slope 4 : Pos
 - Timebase : 50 nsec/div
 - Delay : 10 % Pre-Trigger
 - Turn on trace : D
 - Select Math Setup
 - For Math : Use at most 1000 points
 - Redefine D : Summed Average of Channel 4
-
- With the vertical Zoom set D to 10 mV
-
- Adjust pot R4518, C4553, R4577 (at left of A4500 HSH416) to get the best flatness as possible.



7.6.3.8 Trigger Hysteresis Control

7.6.3.8.1 Channel 1 Trigger Hysteresis Adjustment

- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Trigger level, and Show Result for Channel 1
- Push Recalibrate Completely



Monitor: rc 2; **1**: Δg -139, Δo -42

- Adjust potentiometer R5108 to get :

$$\text{DC Hysteresis (div)} = 0.3 \text{ div} \pm 0.05 \text{ div}$$

Section 7 Maintenance

7.6.3.8.2 Channel 2 Trigger Hysteresis Adjustment

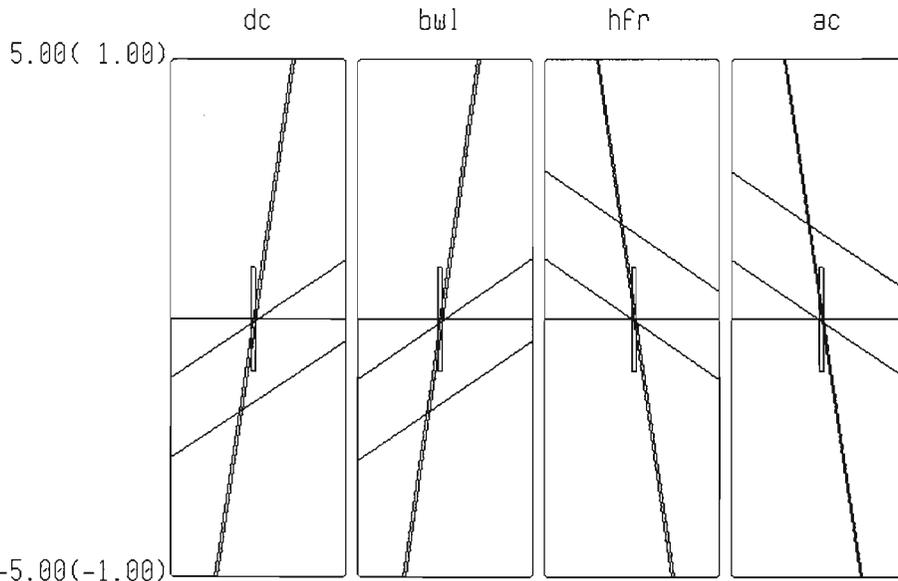
- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Trigger level, and Show Result for Channel 2
- Push Recalibrate Completely

23-Jan-95
15:09:17
33°

CALIBRATION

Trigger Level Calibration Results

2 2.0 ns



Diagnostic Summary

Results for

Gain

Offset

Trigger Level

Diagnostic Measurements

Recalibrate Completely

Show Result For Channel

1 2 3 4 E

hysteresis [div]	0.313	0.319	-0.340	-0.338
offset [div]	0.330	0.342	0.649	0.635

Monitor: rc 4; **2**: Δg -7, Δ0 -1

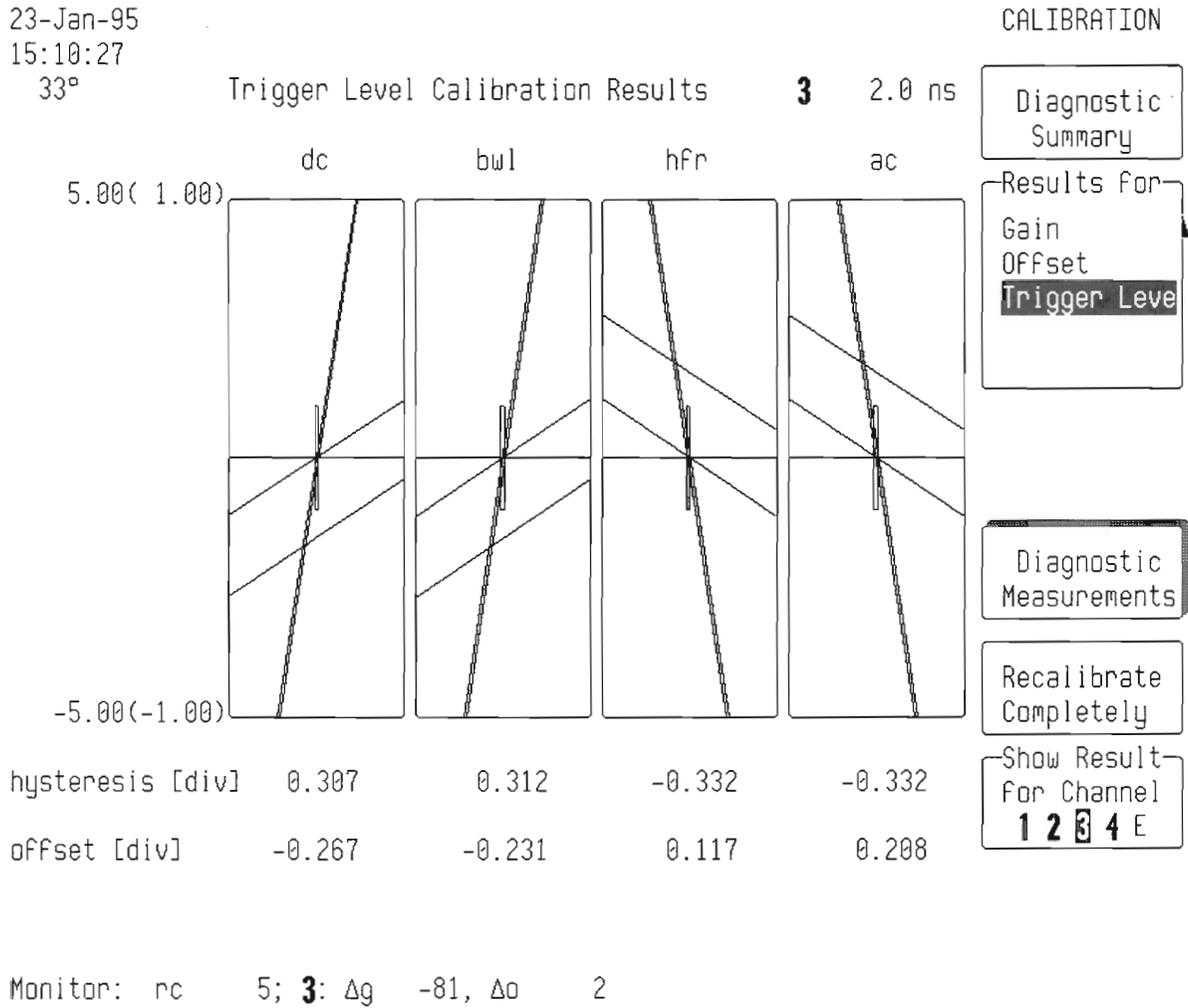
- Adjust potentiometer R5078 to get :

$$\text{DC Hysteresis (div)} = 0.3 \text{ div} \pm 0.05 \text{ div}$$

7.6.3.8.3 Channel 3 Trigger Hysteresis Adjustment

- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Trigger level, and Show Result for Channel 3
- Push Recalibrate Completely

23-Jan-95
15:10:27
33°



- Adjust potentiometer R5053 to get :

$$\text{DC Hysteresis (div)} = 0.3 \text{ div} \pm 0.05 \text{ div}$$

7.6.3.8.4 Channel 4 Trigger Hysteresis Adjustment

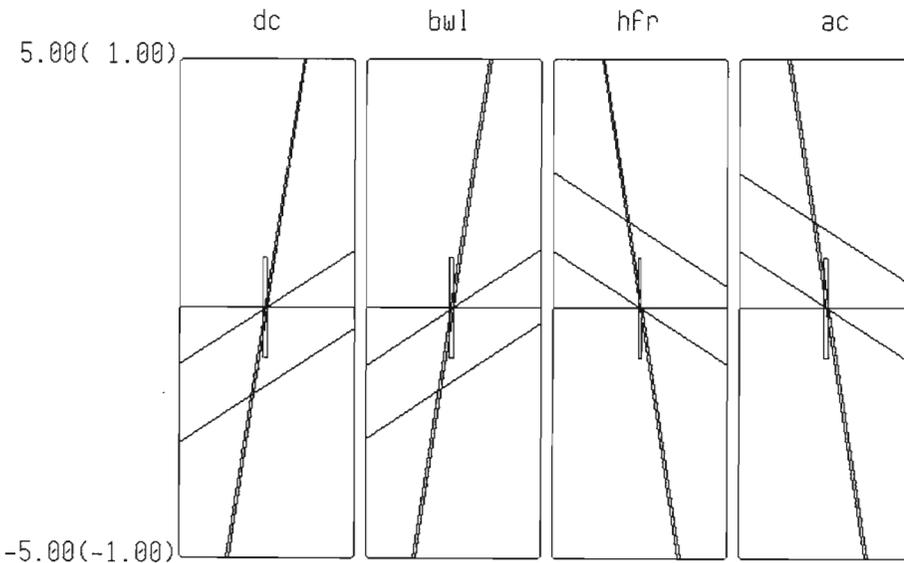
- In the Calibration Diagnostics select Diagnostics Results.
- Select Results for Trigger level, and Show Result for Channel 4
- Push Recalibrate Completely

23-Jan-95
15:11:49
35°

Trigger Level Calibration Results

4 2.0 ns

CALIBRATION



Diagnostic Summary

Results for:

- Gain
- Offset
- Trigger Level

Diagnostic Measurements

Recalibrate Completely

Show Result for Channel

1 2 3 4 E

hysteresis [div]	0.311	0.294	-0.313	-0.312
offset [div]	-0.017	0.023	0.312	0.254

Monitor: rc 6; 4: Δg -50, Δ0 11

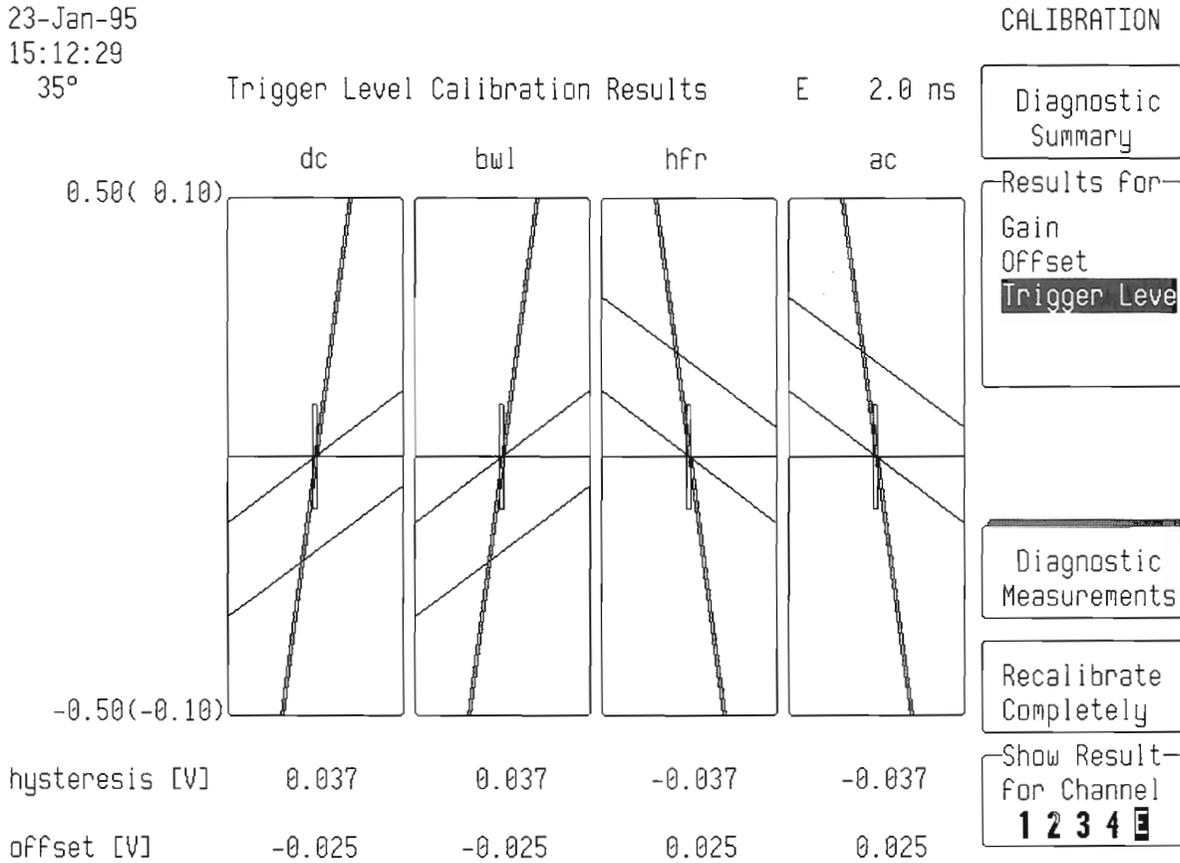
▪ Adjust potentiometer R5080 to get :

$$\text{DC Hysteresis (div)} = 0.3 \text{ div} \pm 0.05 \text{ div}$$

7.6.3.8.5 External Trigger Hysteresis

- In the Calibration Diagnostics, select **Diagnostics Results**.
- Select Results for Trigger level, and Show Result for E.
- Push **Recalibrate Completely**

23-Jan-95
15:12:29
35°



Monitor: rc 6

- Check that the DC External Trigger Hysteresis is $0.035 \text{ V} \pm 0.01$

CAUTION

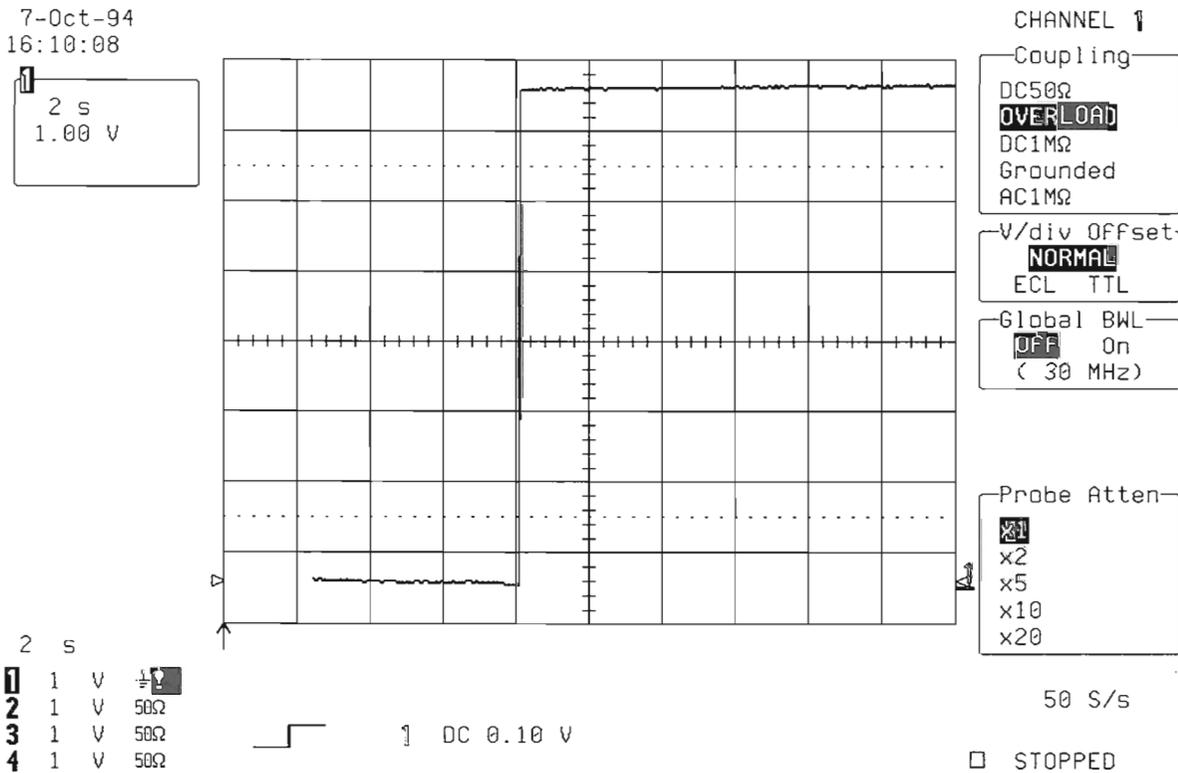
- **Do not adjust potentiometer R5055. The External Trigger Hysteresis value cannot be modified without using a special tester.**

7.6.3.9 DC 50 Ω Overload Adjustment

7.6.3.9.1 Channel 1 DC 50 Ω Overload Adjustment

- Turn on trace : Channel 1
- Input Coupling : DC 50 Ω
- Probe atten : X1
- Input gain : 1 V/div.
- Input offset : - 3.5 V
- Trigger setup : Edge
- Trigger on : 1
- Trigger level : DC 0.1 V
- Delay : zero
- Coupling 1 : DC
- Slope 1 : Pos
- Mode : Auto
- Timebase : 2 sec/div.
- Record up to : 1000 samples

- From the power supply (Tektronix PS5004) apply DC 7.07 V (1 Watt) to Channel 1.
- Adjust the potentiometer R1010, such that the overload trips within 10 to 15 seconds. (turn clockwise if it's too slow or counterclockwise if it's too fast)

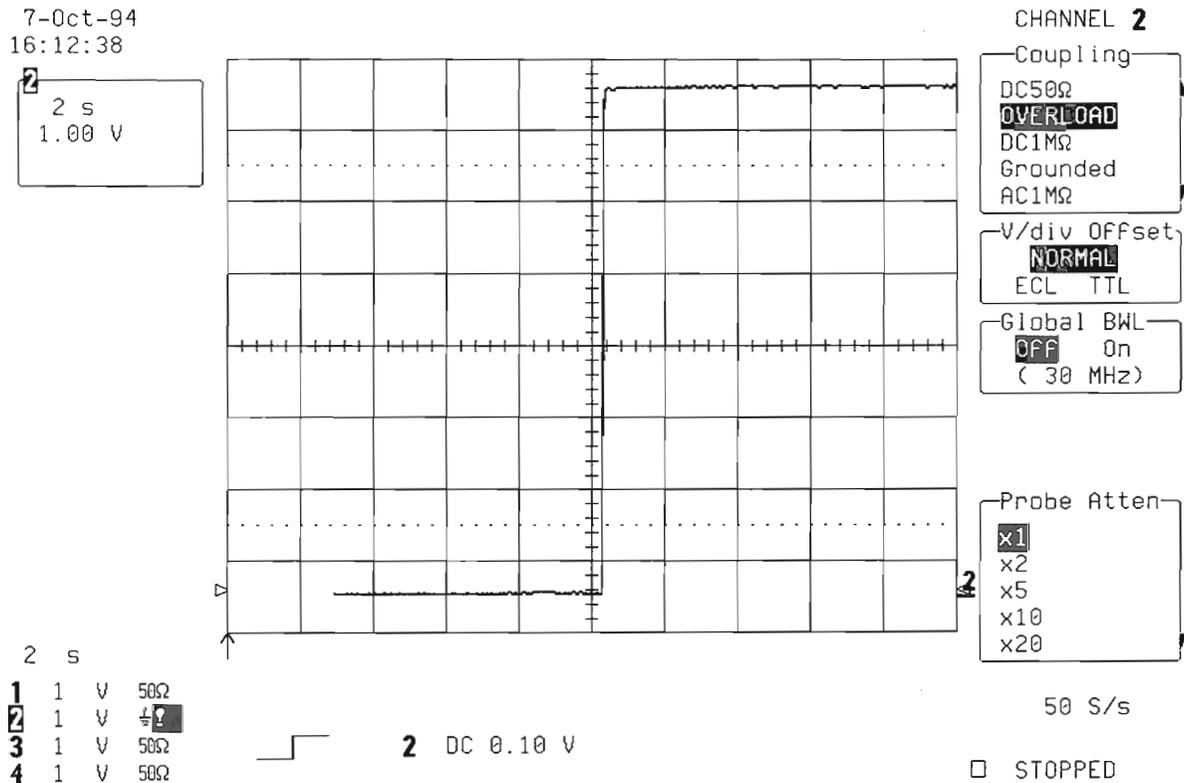


- Set Timebase : 5 sec/div.
- From the power supply (Tektronix PS5004) apply 5 V (.5 Watt) to Channel 1
- Check that the overload doesn't trip for at least 30 seconds.

7.6.3.9.2 Channel 2 DC 50 Ω Overload Adjustment

- Turn on trace : Channel 2
- Input Coupling : DC 50 Ω
- Probe atten : X1
- Input gain : 1 V/div.
- Input offset : - 3.5 V
- Trigger setup : Edge
- Trigger on : 2
- Trigger level : DC 0.1 V
- Delay : zero
- Coupling 2 : DC
- Slope 2 : Pos
- Mode : Auto
- Timebase : 2 sec/div.
- Record up to : 1000 samples

- From the power supply (Tektronix PS5004) apply DC 7.07 V (1 Watt) to Channel 2.
- Adjust the potentiometer R2010, such that the overload trips within 10 to 15 seconds.
(turn clockwise if it's too slow or counterclockwise if it's too fast)



- Set Timebase : 5 sec/div.
- From the power supply (Tektronix PS5004) apply 5 V (.5 Watt) to Channel 2
- Check that the overload doesn't trip for at least 30 seconds.

7.6.3.9.3 Channel 3 DC 50 Ω Overload Adjustment

- Turn on trace : Channel 3
- Input Coupling : DC 50 Ω
- Probe atten : X1
- Input gain : 1 V/div.
- Input offset : - 3.5 V
- Trigger setup : Edge
- Trigger on : 3
- Trigger level : DC 0.1 V
- Delay : zero
- Coupling 3 : DC
- Slope 3 : Pos
- Mode : Auto
- Timebase : 2 sec/div.
- Record up to : 1000 samples
- From the power supply (Tektronix PS5004) apply DC 7.07 V (1 Watt) to Channel 3.
- Adjust the potentiometer R3010, such that the overload trips within 10 to 15 seconds.
(turn clockwise if it's too slow or counterclockwise if it's too fast)
- Set Timebase : **5 sec/div.**
- From the power supply (Tektronix PS5004) apply **5 V** (.5 Watt) to Channel 3
- Check that the overload doesn't trip for at least **30** seconds.

7.6.3.9.4 Channel 4 DC 50 Ω Overload Adjustment

- Turn on trace : Channel 4
- Input Coupling : DC 50 Ω
- Probe atten : X1
- Input gain : 1 V/div.
- Input offset : - 3.5 V
- Trigger setup : Edge
- Trigger on : 4
- Trigger level : DC 0.1 V
- Delay : zero
- Coupling 4 : DC
- Slope 4 : Pos
- Mode : Auto
- Timebase : 2 sec/div.
- Record up to : 1000 samples
- From the power supply (Tektronix PS5004) apply DC 7.07 V (1 Watt) to Channel 4.
- Adjust the potentiometer R4010, such that the overload trips within 10 to 15 seconds.
(turn clockwise if it's too slow or counterclockwise if it's too fast)
- Set Timebase : **5 sec/div.**
- From the power supply (Tektronix PS5004) apply **5 V** (.5 Watt) to Channel 4
- Check that the overload doesn't trip for at least **30** seconds.

SECTION 8 SCHEMATICS, LAYOUTS, PARTS LIST

9354A, 9354AM, 9354AL, 9354T & 9354TM

Digital Storage Oscilloscope

PART : 9354A DESC : 500 MHz, QUAD CHANNEL 500 MS/s DSO, 50 KB

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
205750000	IC AND-OR GATE ARRAY 16V8	1
554500001	TAPPING SCREW W/U-THREAD	2
709354A16	FRONT LABEL 9354A	1
709354913	SERIAL NUMBER PLATE 9354A	1
F9302-1-4	PROCESSOR CARD WITH 4Mb DRAM	1
F9350-21	ACQUISITION MEMORY 2 X 50 K	2
F9354-31	MAIN CARD (FRONT END, ADC, TDC)	1
F9300-4	GPIB + RS232 INTERFACE CARD	1
F9354-5	QUAD CHANNEL FRONT PANEL	1
M935X	MECHANICAL FOR 9354A	1
ACCESSORIES-9354	ACCESSORIES FOR 9354A	1

PART : 9354AM DESC : 500 MHz, QUAD CHANNEL 500 MS/s DSO, 250 KB

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
205750000	IC AND-OR GATE ARRAY 16V8	1
554500001	TAPPING SCREW W/U-THREAD	2
709354AM16	FRONT LABEL 9354AM	1
709354913	SERIAL NUMBER PLATE 9354AM	1
F9302-1-8	PROCESSOR CARD WITH 8Mb DRAM	1
F9350M-21	ACQUISITION MEMORY 2 X 250 K	2
F9354-31	MAIN CARD (FRONT END, ADC, TDC)	1
F9300-4	GPIB + RS232 INTERFACE CARD	1
F9354-5	QUAD CHANNEL FRONT PANEL	1
M935X	MECHANICAL FOR 9354AM	1
ACCESSORIES-9354	ACCESSORIES FOR 9354AM	1

PART : 9354AL DESC : 500 MHz, QUAD CHANNEL 500 MS/s DSO, 2 MB

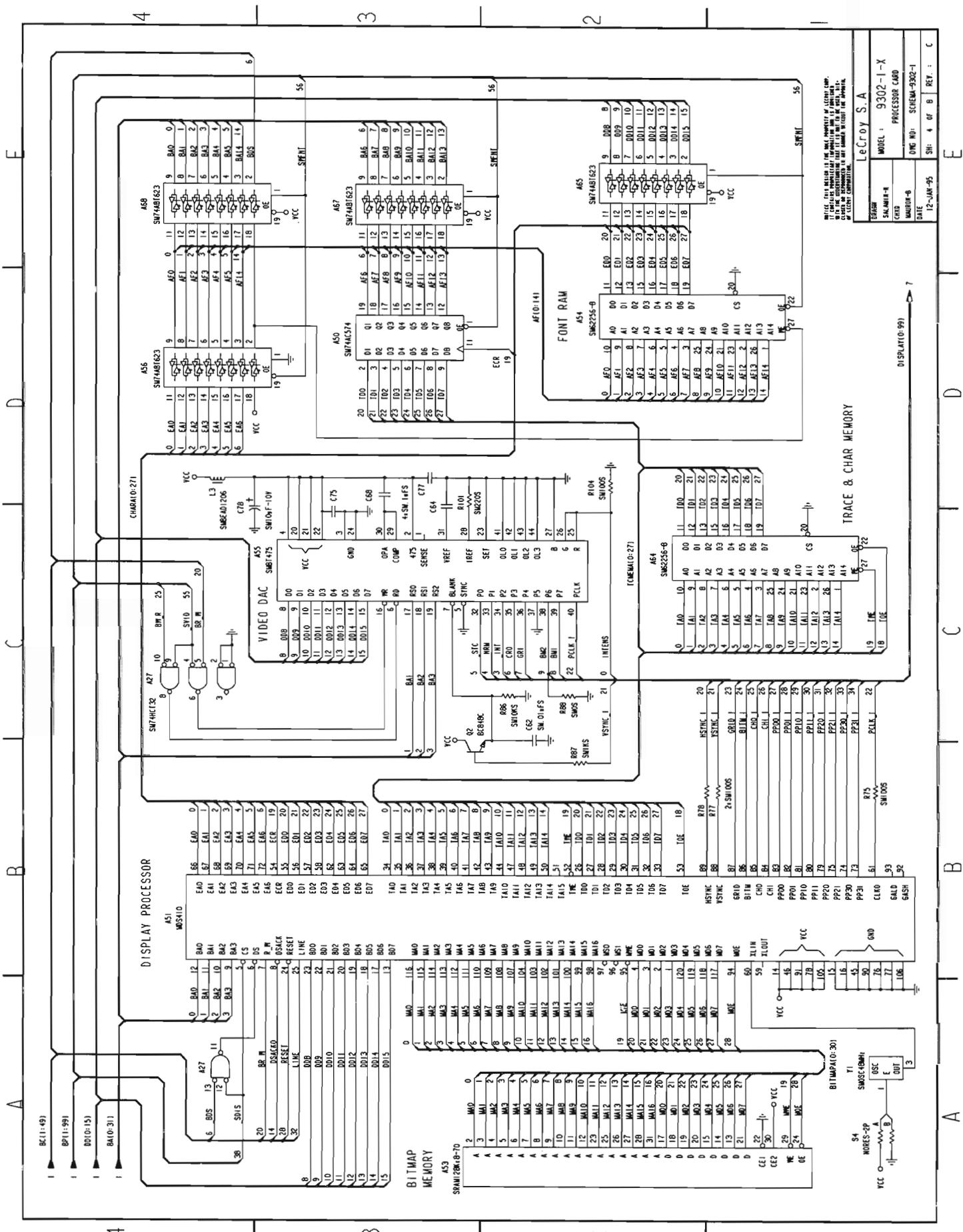
COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
205750000	IC AND-OR GATE ARRAY 16V8	1
554500001	TAPPING SCREW W/U-THREAD	2
709354AL16	FRONT LABEL 9354AL	1
709354913	SERIAL NUMBER PLATE 9354AL	1
F9302-1-16	PROCESSOR CARD WITH 16Mb DRAM	1
F9350L-2	ACQUISITION MEMORY 2 X 2 MB	2
F9354-31	MAIN CARD (FRONT END, ADC, TDC)	1
F9300-4	GPIB + RS232 INTERFACE CARD	1
F9354-5	QUAD CHANNEL FRONT PANEL	1
M935X	MECHANICAL FOR 9354AL	1
ACCESSORIES-9354	ACCESSORIES FOR 9354AL	1

PART : 9354T DESC : 500 MHz, QUAD CHANNEL 500 MS/s DSO, 100 KB

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
205750000	IC AND-OR GATE ARRAY 16V8	1
554500001	TAPPING SCREW W/U-THREAD	2
709354T16	FRONT LABEL 9354T	1
709354913	SERIAL NUMBER PLATE 9354T	1
F9302-1-4	PROCESSOR CARD WITH 4Mb DRAM	1
F9350T-21	ACQUISITION MEMORY 2 X 100 KB	2
F9354-31	MAIN CARD (FRONT END, ADC, TDC)	1
F9300-4	GPIB + RS232 INTERFACE CARD	1
F9354-5	QUAD CHANNEL FRONT PANEL	1
M935X	MECHANICAL FOR 9354T	1
ACCESSORIES-9354	ACCESSORIES FOR 9354T	1

PART : 9354TM DESC : 500 MHz, QUAD CHANNEL 500 MS/s DSO, 500 KB

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
205750000	IC AND-OR GATE ARRAY 16V8	1
554500001	TAPPING SCREW W/U-THREAD	2
709354TM16	FRONT LABEL 9354TM	1
709354913	SERIAL NUMBER PLATE 9354TM	1
F9302-1-8	PROCESSOR CARD WITH 8Mb DRAM	1
F9350TM-21	ACQUISITION MEMORY 2 X 500 KB	2
F9354-31	MAIN CARD (FRONT END, ADC, TDC)	1
F9300-4	GPIB + RS232 INTERFACE CARD	1
F9354-5	QUAD CHANNEL FRONT PANEL	1
M935X	MECHANICAL FOR 9354TM	1
ACCESSORIES-9354	ACCESSORIES FOR 9354TM	1

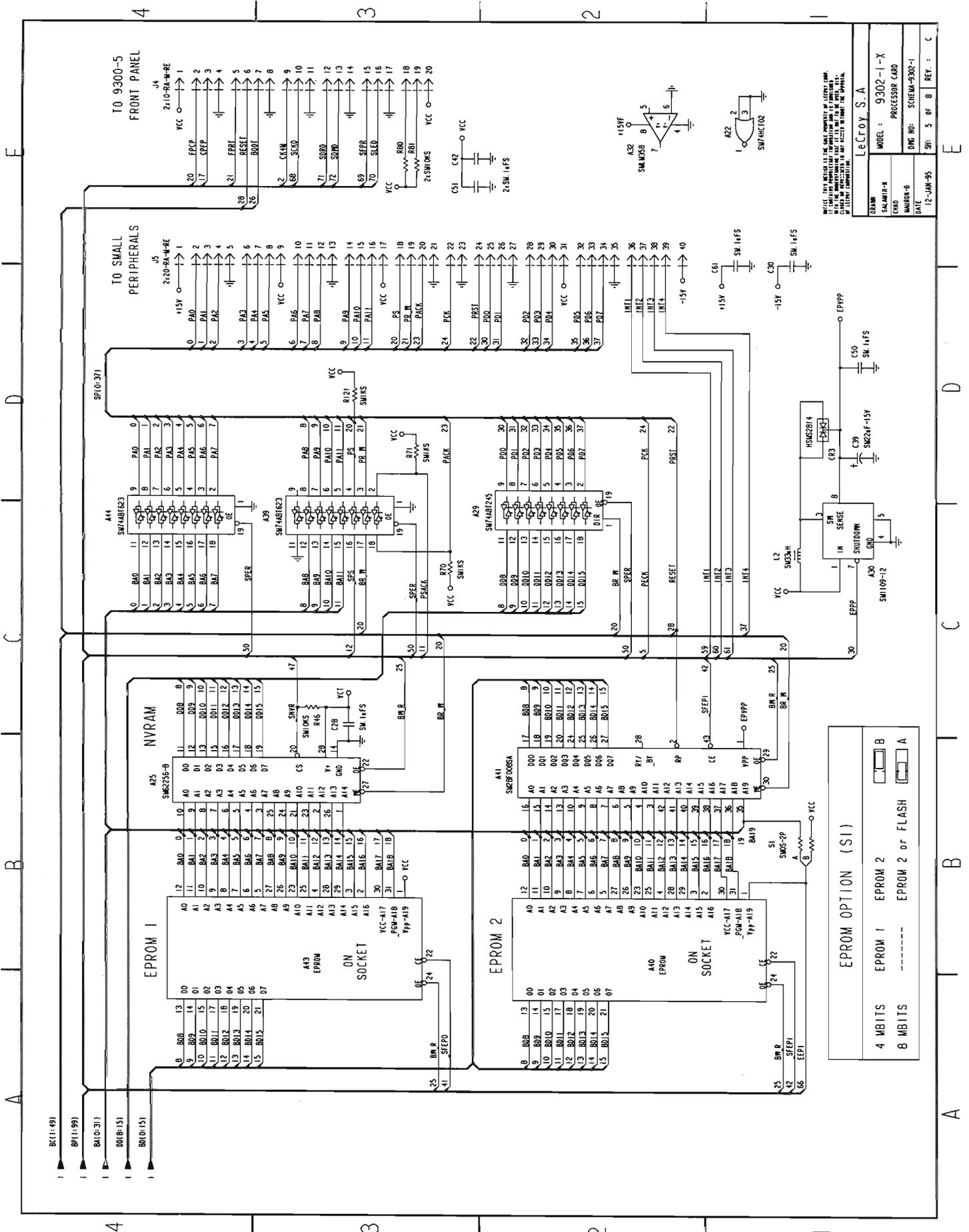


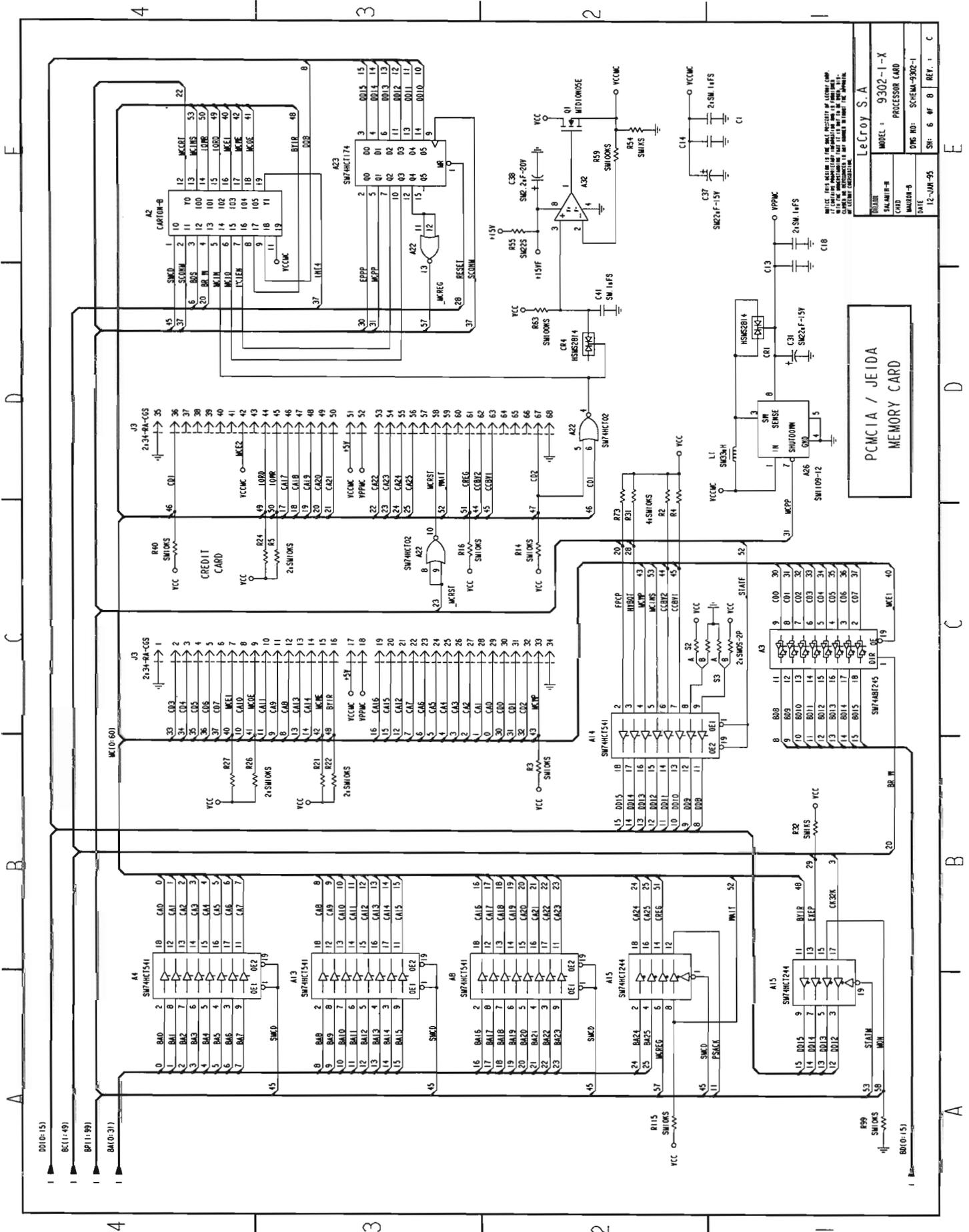
NOTICE: THIS MANUAL IS THE PROPERTY OF LEADERSHIP COMPUTERS. IT IS LOANED TO YOU FOR INFORMATIONAL PURPOSES ONLY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEADERSHIP COMPUTERS.

LEADERSHIP	MODEL 1	9302-1-X
SH-MEM-H		PROCESSOR CARD
CRD		
MAINT-H		
DATE	12-JAN-95	SH: 4 OF 8 REV: C

LeCroy S.A.
015-SPAL01-991

Section 8 Schematics, Layouts, Parts list

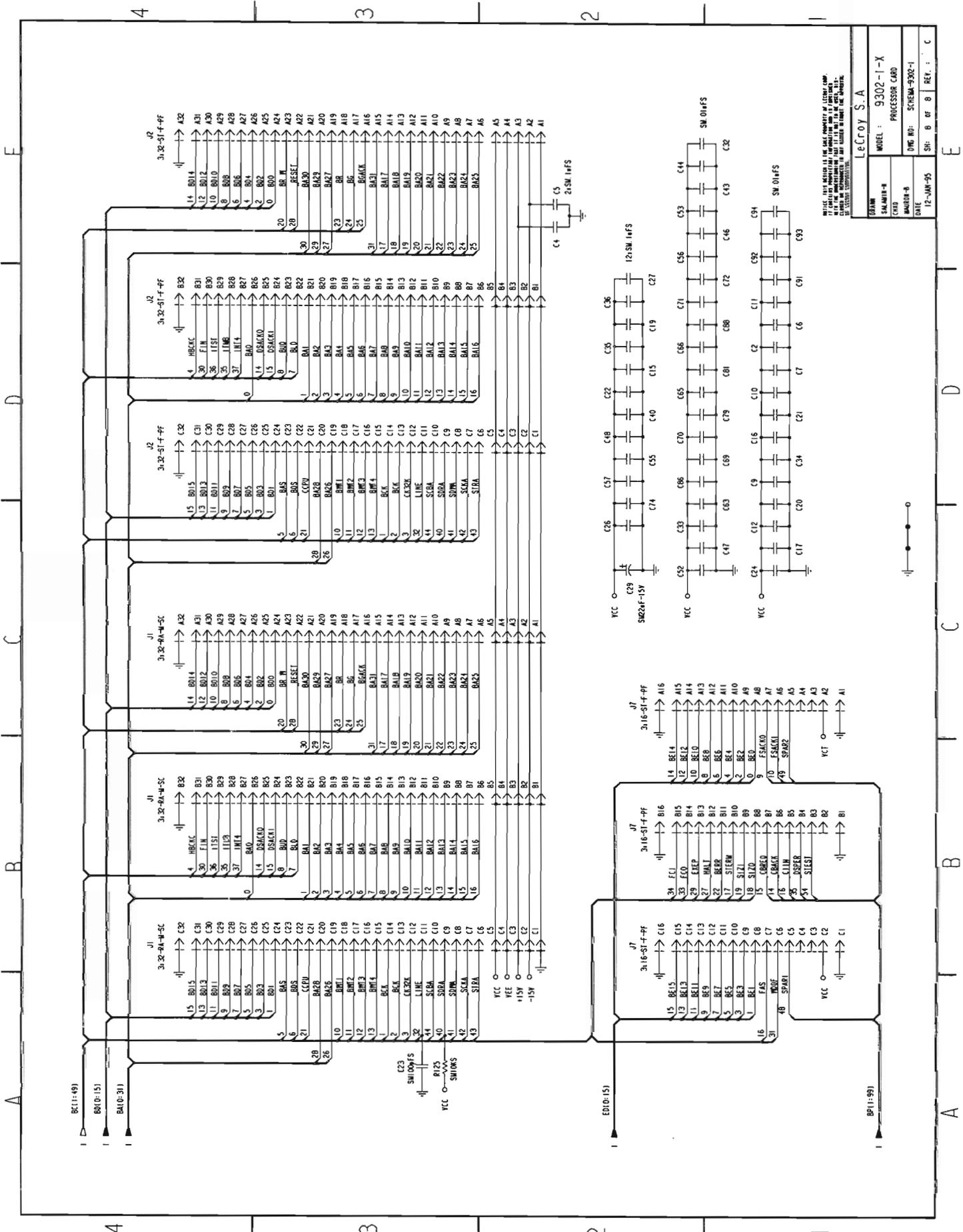




LeCroy S.A.
 MODEL: 9302-1-X
 PROCESSOR CARD
 DATE: 12-JAN-95
 SH: 6 # 8 REF: 1 C

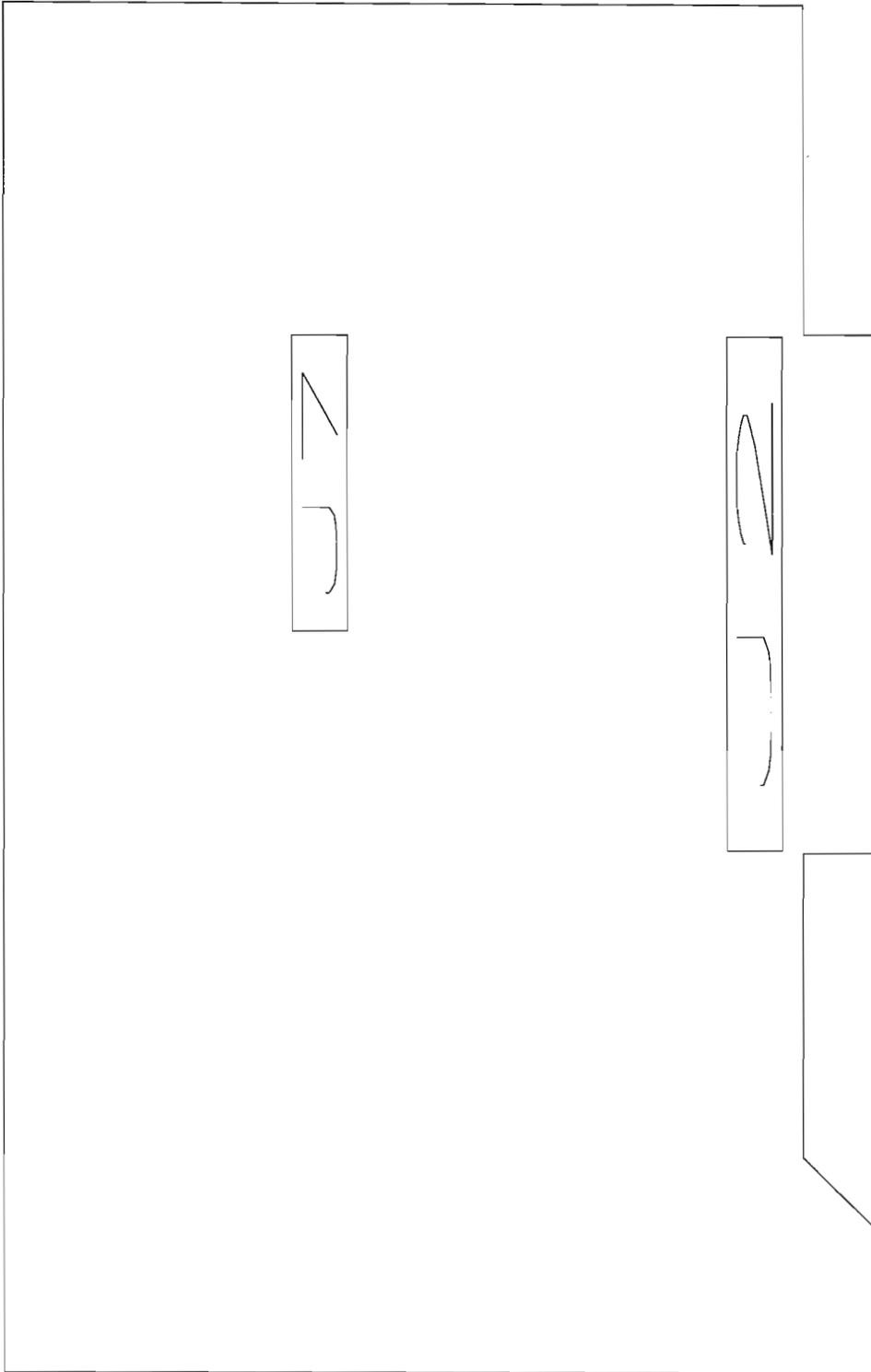
PCMCIA / JEIDA
 MEMORY CARD

NOTE: THIS DRAWING IS THE SOLE PROPERTY OF LECOY S.A.
 ALL RIGHTS ARE RESERVED. NO PART OF THIS DRAWING
 MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM
 OR BY ANY MEANS, ELECTRONIC OR MECHANICAL,
 INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY
 INFORMATION STORAGE AND RETRIEVAL SYSTEM,
 WITHOUT PERMISSION IN WRITING FROM LECOY S.A.

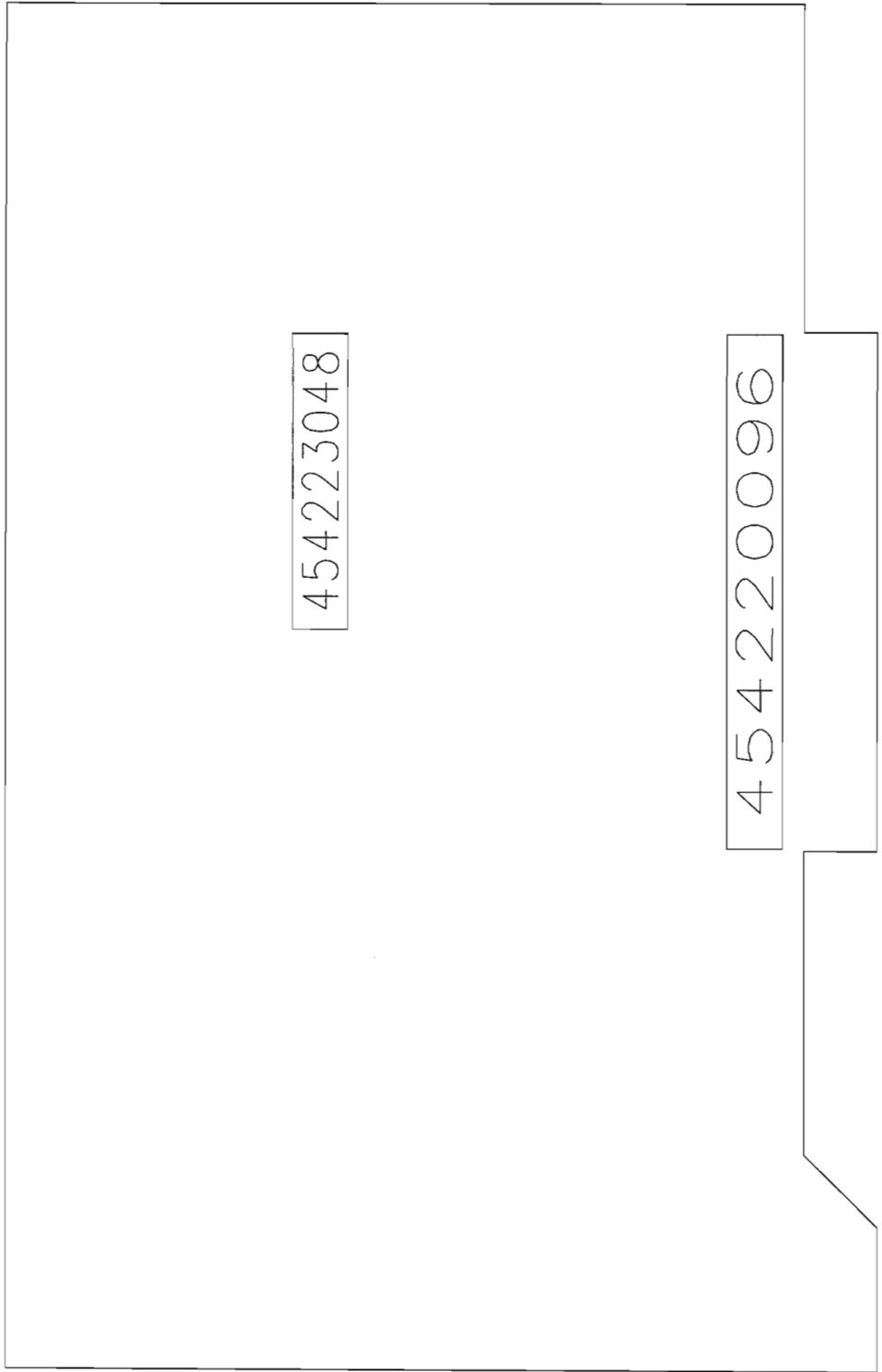


NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF LECROY CORP.
IT IS THE PROPERTY OF LECROY CORP. AND IS NOT TO BE REPRODUCED,
COPIED, OR TRANSMITTED IN ANY MANNER WITHOUT THE WRITTEN
PERMISSION OF LECROY CORP.

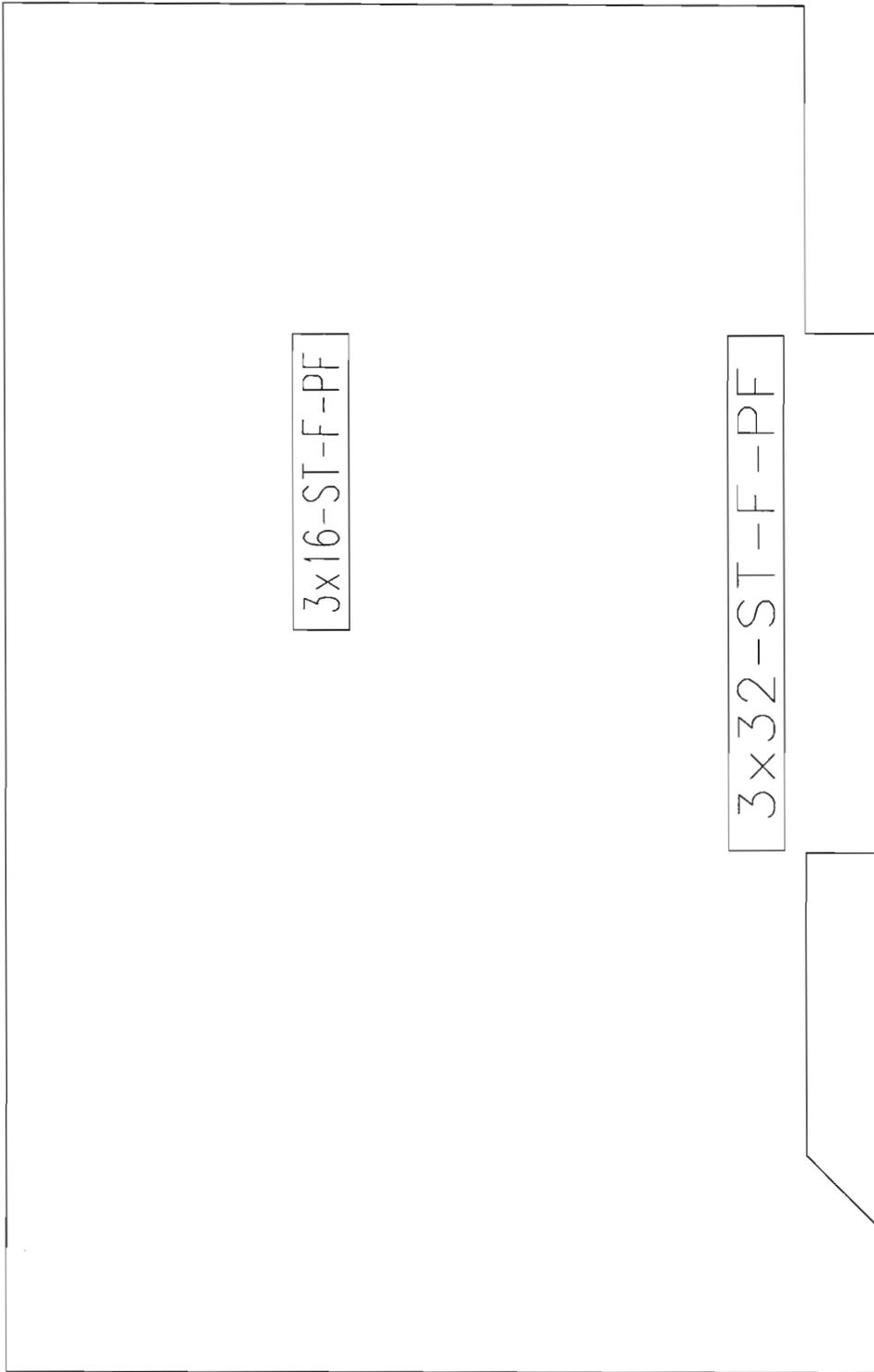
LeCroy S.A	
DATE	12-JAN-95
WORKER	9302-1-Y
PROCESSOR CARD	PROCESSOR CARD
DATE	12-JAN-95
REV.	1



9302-1 Rev: B



9302-1 Rev:B



9302-1 Rev: B

Section 8 Schematics, Layouts, Parts list

PART: F9302-1-X DESC : PROCESSOR with 4 Mb or 8Mb or 16Mb RAM

Location	Part Number	Description	Location	Part Number	Description
A1	SM205010153	SERAIL-B	A52	SM205010103	RASOIR-A
A2	SM205010150	CARTON-B	A53	SM205701070	SRAM 128Kx8
A3	SM206885245	SM74ABT245	A54	SM205219256	SM62256-8
A4	SM207178541	SM74HCT541	A55	SM207260475	SMBT475
A5	SM205219264	SM6264-7	A56	SM206884623	SM74ABT623
A6	SM205219264	SM6264-7	A57	SM207972157	SM74F157A
A7	SM205010154	SOLDAT-A	A58	SM207972157	SM74F157A
A8	SM207178541	SM74HCT541	A59	SM205010155	TRICOT-A
A9	SM206885245	SM74ABT245	A60	SM208277770	SMTL7770-5
A10	SM205010200	BUTANE-A	A61	SM207972157	SM74F157A
A12	453250072	DRAMOD72	A63	SM205010101	CONRAD-A
A13	SM207178541	SM74HCT541	A64	SM205219256	SM62256-8
A14	SM207178541	SM74HCT541	A65	SM206884623	SM74ABT623
A15	SM207179244	SM74HCT244	A66	SM200276068	SM68HC68T1
A17	SM205010151	COPAIN-A	A67	SM206884623	SM74ABT623
A18	MNX401	MNX401	A68	SM206884623	SM74ABT623
A19	SM227132830	SM68EC030FE	B1	312590070	BAT-2.4V-50
A20	SM206884623	SM74ABT623	C1	SM661207104	SM.1uFS
A21	SM207970139	SM74F139	C2	SM661207103	SM.01uFS
A22	SM200178002	SM74HCT02	C3	SM661207102	SM.001uFS
A23	SM200344174	SM74HCT174	C4	SM661207104	SM.1uFS
A24	SM200172138	SM74F138	C5	SM661207104	SM.1uFS
A25	SM205219256	SM62256-8-PS	C6	SM661207103	SM.01uFS
A26	SM208780109	SM1109-12	C7	SM661207103	SM.01uFS
A27	SM200178032	SM74HCT32	C8	SM661207104	SM.1uFS
A28	SM206884623	SM74ABT623	C9	SM661207103	SM.01uFS
A29	SM206885245	SM74ABT245	C10	SM661207103	SM.01uFS
A30	SM208780109	SM1109-12	C11	SM661207103	SM.01uFS
A32	SM208470358	SMLM358	C12	SM661207103	SM.01uFS
A33	SM205010257	MINIME-A	C13	SM661207104	SM.1uFS
A34	SM205010252	MAXIME-A	C14	SM661207104	SM.1uFS
A35	SM205010102	INTIME-B	C15	SM661207104	SM.1uFS
A36	SM207668882	SM68882FN	C16	SM661207103	SM.01uFS
A39	SM206884623	SM74ABT623	C17	SM661207103	SM.01uFS
A40	EPROM	EPROM	C18	SM661207104	SM.1uFS
A41	SM205144001	SM28F008SA	C19	SM661207104	SM.1uFS
A42	SM206885245	SM74ABT245	C20	SM661207103	SM.01uFS
A43	EPROM	EPROM	C21	SM661207103	SM.01uFS
A44	SM206884623	SM74ABT623	C22	SM661207104	SM.1uFS
A45	SM208680916	SM88916	C23	SM661255101	SM100pFS
A46	SM205010156	VISION-C	C24	SM661207103	SM.01uFS
A48	453250072	DRAMOD72	C25	SM661255101	SM100pFS
A49	205750000	C16R6L	C26	SM661207104	SM.1uFS
A50	SM201186574	SM74AC574	C27	SM661207104	SM.1uFS
A51	MDS410	MDS410	C28	SM661207104	SM.1uFS

PART: F9302-1-X DESC : PROCESSOR with 4 Mb or 8Mb or 16Mb RAM

Location	Part Number	Description	Location	Part Number	Description
C29	SM666377226	SM22uF-15V	C77	SM661207104	SM.1uFS
C30	SM661207104	SM.1uFS	C78	SM666217106	SM10uF-10V
C31	SM666377226	SM22uF-15V	C79	SM661207103	SM.01uFS
C32	SM661207103	SM.01uFS	C80	SM661207103	SM.01uFS
C33	SM661207103	SM.01uFS	C81	SM661207103	SM.01uFS
C34	SM661207103	SM.01uFS	C82	SM666377226	SM22uF-15V
C35	SM661207104	SM.1uFS	C83	SM666377226	SM22uF-15V
C36	SM661207104	SM.1uFS	C84	SM661207104	SM.1uFS
C37	SM666377226	SM22uF-15V	C85	SM661255180	SM18pFS
C38	SM666327225	SM2.2uF-20V	C86	SM661207103	SM.01uFS
C39	SM666377226	SM22uF-15V	C87	SM661207104	SM.1uFS
C40	SM661207104	SM.1uFS	C88	SM661207103	SM.01uFS
C41	SM661207104	SM.1uFS	C89	SM661207103	SM.01uFS
C42	SM661207104	SM.1uFS	C90	SM661207104	SM.1uFS
C43	SM661207103	SM.01uFS	C91	SM661207103	SM.01uFS
C44	SM661207103	SM.01uFS	C92	SM661207103	SM.01uFS
C45	SM661207103	SM.01uFS	C93	SM661207103	SM.01uFS
C46	SM661207103	SM.01uFS	C94	SM661207103	SM.01uFS
C47	SM661207103	SM.01uFS	J1	455410096	3x32-RA-M-SC
C48	SM661207104	SM.1uFS	J2	454220096	3x32-ST-F-PF
C50	SM661207104	SM.1uFS	J3	404500068	2x34-RA-CGS
C51	SM661207104	SM.1uFS	J4	454511020	2x10-RA-M-RE
C52	SM661207103	SM.01uFS	J5	454511040	2x20-RA-M-RE
C53	SM661207103	SM.01uFS	J6	454511014	2x7-RA-M-RE
C55	SM661207104	SM.1uFS	J7	454223048	3x16-ST-F-PF
C56	SM661207103	SM.01uFS	L1	SM300056332	SM33uH
C57	SM661207104	SM.1uFS	L2	SM300056332	SM33uH
C58	SM661207104	SM.1uFS	L3	SM301502001	SMBEAD1206
C59	SM661207104	SM.1uFS	Q1	SM280171005	MTD10N05E
C60	SM666217106	SM10uF-10V	Q2	SM270330848	BC848C
C61	SM661207104	SM.1uFS	Q3	SM270330848	BC848C
C62	SM661207103	SM.01uFS	R1	SM652101103	SM10KS
C63	SM661207103	SM.01uFS	R2	SM652101103	SM10KS
C64	SM661207104	SM.1uFS	R3	SM652101103	SM10KS
C65	SM661207103	SM.01uFS	R4	SM652101103	SM10KS
C66	SM661207103	SM.01uFS	R5	SM652101103	SM10KS
C68	SM661207104	SM.1uFS	R6	SM652101220	SM22S
C69	SM661207103	SM.01uFS	R7	SM652101220	SM22S
C70	SM661207103	SM.01uFS	R8	SM652101220	SM22S
C71	SM661207103	SM.01uFS	R9	SM652101220	SM22S
C72	SM661207103	SM.01uFS	R10	SM652101220	SM22S
C73	SM661207104	SM.1uFS	R11	SM652101103	SM10KS
C74	SM661207104	SM.1uFS	R12	SM652101102	SM1KS
C75	SM661207104	SM.1uFS	R13	SM652101102	SM1KS
C76	SM661255180	SM18pFS	R14	SM652101103	SM10KS

Section 8 Schematics, Layouts, Parts list

PART: F9302-1-X DESC : PROCESSOR with 4 Mb or 8Mb or 16Mb RAM

Location	Part Number	Description	Location	Part Number	Description
R15	SM652101820	SM82S	R63	SM652101104	SM100KS
R16	SM652101103	SM10KS	R65	SM652101103	SM10KS
R17	SM652101220	SM22S	R66	SM652101102	SM1KS
R18	SM652101220	SM22S	R67	SM652101820	SM82S
R19	SM652101220	SM22S	R68	SM652101102	SM1KS
R20	SM652101220	SM22S	R69	SM652101102	SM1KS
R21	SM652101103	SM10KS	R70	SM652101102	SM1KS
R22	SM652101103	SM10KS	R71	SM652101102	SM1KS
R23	SM652101220	SM22S	R72	SM652101102	SM1KS
R24	SM652101103	SM10KS	R73	SM652101103	SM10KS
R25	SM652101511	SM510S	R75	SM652101101	SM100S
R26	SM652101103	SM10KS	R76	SM652101103	SM10KS
R27	SM652101103	SM10KS	R77	SM652101101	SM100S
R28	SM652101102	SM1KS	R78	SM652101101	SM100S
R29	SM652101103	SM10KS	R79	SM652101220	SM22S
R30	SM652101102	SM1KS	R80	SM652101103	SM10KS
R31	SM652101103	SM10KS	R81	SM652101103	SM10KS
R32	SM652101102	SM1KS	R82	SM652101470	SM47S
R34	SM652101102	SM1KS	R83	SM652101474	SM470KS
R35	SM652101103	SM10KS	R84	SM652101331	SM330S
R36	SM652101103	SM10KS	R85	SM652101470	SM47S
R37	SM652101220	SM22S	R86	SM652101103	SM10KS
R38	SM652101103	SM10KS	R87	SM652101102	SM1KS
R39	SM652101103	SM10KS	R88	SM654101000	SM0S
R40	SM652101103	SM10KS	R89	SM652101220	SM22S
R41	SM652101102	SM1KS	R90	SM652101220	SM22S
R42	SM652101102	SM1KS	R91	SM652101220	SM22S
R43	SM652101103	SM10KS	R92	SM652101220	SM22S
R44	SM652101102	SM1KS	R93	SM652101220	SM22S
R45	SM652101102	SM1KS	R94	SM652101220	SM22S
R46	SM652101103	SM10KS	R95	SM652101220	SM22S
R47	SM652101103	SM10KS	R96	SM652101220	SM22S
R48	SM652101102	SM1KS	R97	SM652101220	SM22S
R49	SM652101102	SM1KS	R98	SM652101220	SM22S
R50	SM652101220	SM22S	R99	SM652101103	SM10KS
R51	SM652101102	SM1KS	R100	SM652101332	SM3.3KS
R52	SM652101220	SM22S	R101	SM652101221	SM220S
R53	SM652101102	SM1KS	R102	SM652101102	SM1KS
R54	SM652101102	SM1KS	R103	SM652101152	SM1.5KS
R55	SM652101220	SM22S	R104	SM652101101	SM100S
R57	SM652101220	SM22S	R105	SM652101102	SM1KS
R58	SM652101102	SM1KS	R106	SM652101221	SM220S
R59	SM652101104	SM100KS	R107	SM652101820	SM82S
R61	SM652101220	SM22S	R108	SM652101152	SM1.5KS
R62	SM652101102	SM1KS	R109	SM652101154	SM150KS

PART: F9302-1-X DESC : PROCESSOR with 4 Mb or 8Mb or 16Mb RAM

Location	Part Number	Description	Location	Part Number	Description
R110	SM652101152	SM1.5KS	R127	SM652101102	SM1KS
R111	SM652101152	SM1.5KS	R129	SM652101103	SM10KS
R112	SM652101106	SM10MS	S1	SM654101000	SM0S-2P
R115	SM652101103	SM10KS	S2	SM654101000	SM0S-2P
R116	SM652101220	SM22S	S3	SM654101000	SM0S-2P
R117	SM652101220	SM22S	Y1	SM311248000	SMOSC48MHz
R118	SM652101220	SM22S	Y2	309380016	16.000MHZ
R119	SM652101220	SM22S	Y3	SM310300406	SM32.768KHz
R120	SM652101103	SM10KS	CR1	SM232032814	HSMS2814
R121	SM652101102	SM1KS	CR3	SM232032814	HSMS2814
R123	SM652101820	SM82S	CR4	SM232032814	HSMS2814
R124	SM652101153	SM15KS	CR5	SM236030099	BAV99 SOT23
R125	SM652101103	SM10KS	CR6	SM232032814	HSMS2814
R126	SM652101153	SM15KS	CR7	SM256232013	SLM-13V
			TP1	454314016	2x8-ST-M-NW

PART: F9302-1-4 DESC: PROCESSOR CARD with 4MB DRAM for 9354A & 9354T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
205800130	MODULE DRAM 1MX32 BIT	1
454370002	SHUNT 2 POS	2
S9302-1	PROCESSOR CARD WHOUT DRAM	1

PART: F9302-1-8 DESC: PROCESSOR CARD with 8MB DRAM for 9354AM & 9354TM

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
205800230	MODULE DRAM 2MX32 BIT	1
454370002	SHUNT 2 POS	2
S9302-1	PROCESSOR CARD WHOUT DRAM	1

PART: F9302-1-16 DESC: PROCESSOR CARD with 16MB DRAM for 9354AL

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
205800230	MODULE DRAM 2MX32	2
454370002	SHUNT 2 POS	2
S9302-1	PROCESSOR CARD WHOUT DRAM	1

PART: S9302-1**DESC: PROCESSOR CARD without DRAM**

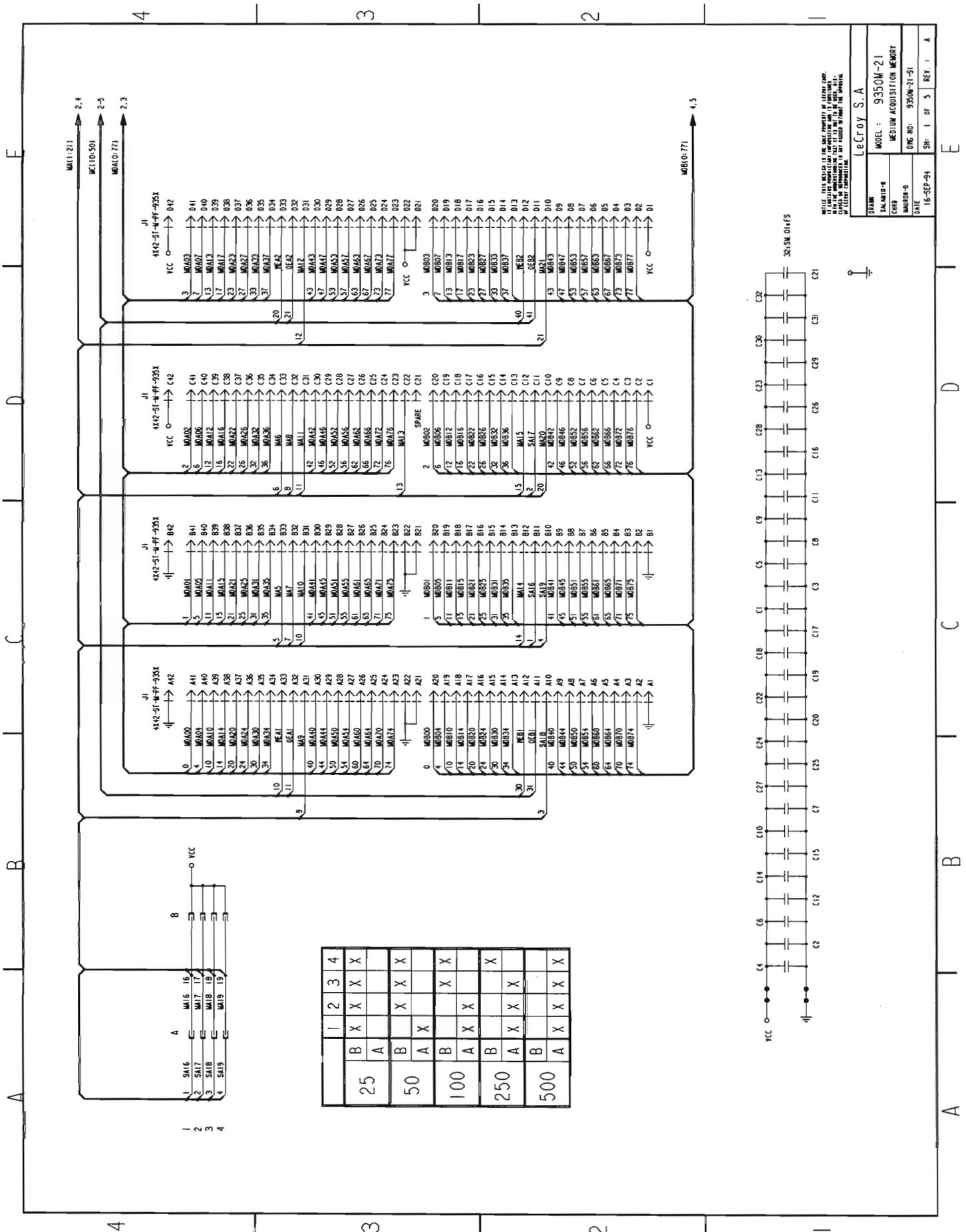
COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
309380016	CRYSTAL OSC (PROGR) 16 MHZ	1
312590070	BATTERY LITHIUM 3V 70MAH	1
400331020	SOCKET IC ST DIP-20	1
404500068	CONN BD TO BD 68 POS	1
453250072	CONN PC EDGE/SOLD TAIL 72	2
454314016	HDR DIP SOLD TO MALE 16	1
454511014	HDR SOLD TAIL/MALE/14/RT	1
454511020	HDR SOLD TAIL/MALE 20	1
454511040	HDR SOLD TAIL/MALE/40/RT	1
455410096	CONN RT ANGLE MALE 96 S-CLIP	1
550130108	SCREW CYL HD M3X8	2
552130101	NUT HEX M3	2
719302103	PC BD PREASS'Y 9302-1	1
MDS410	IC RSDP GATE ARRAY MDS410	1
MNX401	ICMIN MAX GATEARR. MNX401	1
SM200172138	IC 3-8 DECODER 74F138	1
SM200178002	IC 2-INPUT NOR HCT02	1
SM200178032	IC 2-IN OR HCT32	1
SM200276068	IC RTC SERIAL 68HC68T1	1
SM200344174	IC HEX D-FLOP HCT174	1
SM201186574	IC OCTAL D-TYP FLOP 74AC574	1
SM205010101	PROGRAMMED GAL CONRAD-A	1
SM205010102	PROGRAMMED GAL INTIME-B	1
SM205010103	PROGRAMMED GAL RASOIR-A	1
SM205010150	PROGRAMMED GAL CARTON-B	1
SM205010151	PROGRAMMED GAL COPAIN-A	1
SM205010153	PROGRAMMED GAL SERAIL-C	1
SM205010154	PROGRAMMED GAL SOLDAT-A	1
SM205010155	PROGRAMMED GAL TRICOT-A	1
SM205010156	PROGRAMMED GAL VISION-C	1
SM205010200	PROGRAMMED GAL BUTANE-A	1
SM205010252	PROGRAMMED GAL MAXIME-A	1
SM205010257	PROGRAMMED GAL MINIME-A	1
SM205144001	8-MBIT FLASH MEM 28F008SA	1
SM205219256	IC 32K X 8 SRAM MS62256	3
SM205219264	IC 8K X 8 SRAM 70 NSEC 6264	2
SM205701070	IC 128KX8 STAT RAM 70 NS	1
SM206884623	IC OCTAL BUS TRANSCVR ABT623	8
SM206885245	IC BUS TRANSCVR ABT245	4
SM207178541	IC BUFFER/LINE DR HCT541	4
SM207179244	IC BUF/LINE DRIV HCT244	1
SM207260475	IC RAMDAC 256W 50MHZ BT475	1
SM207668882	IC CO PROCESSOR 68882	1
SM207970139	IC DECODER/DEMUX 74F139	1

PART: S9302-1

DESC: PROCESSOR CARD without DRAM

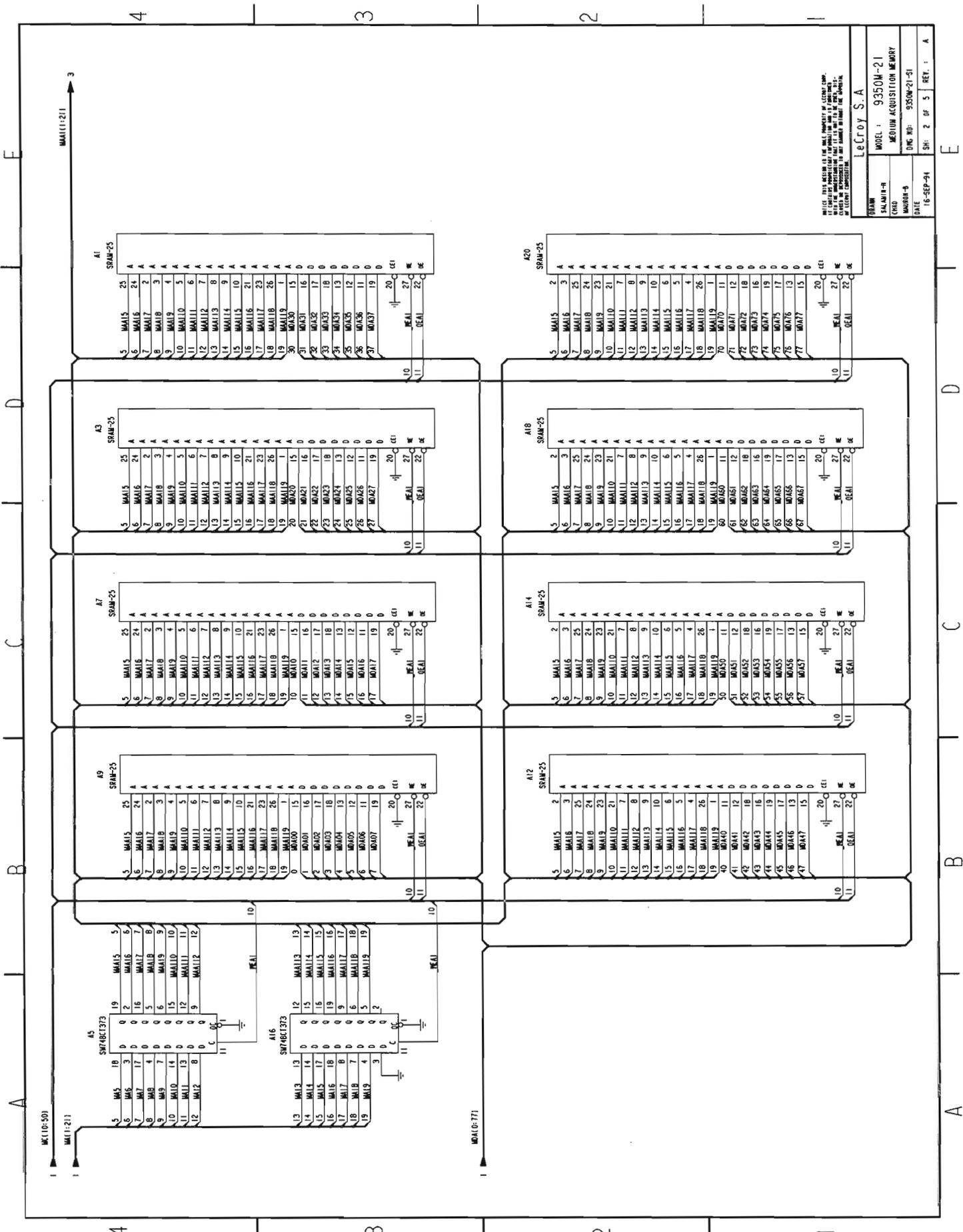
COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
SM207972157	IC DATA SEL/MUX 74F157A	3
SM208277770	IC DUAL PWR SUPPLY SUP 7770-5	1
SM208470358	IC DUAL OP AMP 358D	1
SM208680916	IC LOW SKEW CLOCK DRIVER 88916	1
SM208780109	IC MICROPOWER DC-DC CONV.	2
SM227132830	IC 32-BIT U PROC 68EC030	1
SM232032814	DIODE 2814	4
SM236030099	DIODE SO-PKG BAV99	1
SM256232013	DIODE LIGHT EMITTING RED	1
SM270330848	TRANSISTOR NPN BC848C	2
SM280171005	TRANS POWER MOSFET MTD10N05E	1
SM300056332	INDUCTOR WOUND 33 UH	2
SM301502001	BEAD (FERRITE CHIP)	1
SM310300406	CRYSTAL 32768HZ	1
SM311248000	CRYSTAL OSCILLATOR 48MHZ	1
SM652101101	RES CHIP (E24) 1% 100 OHM	4
SM652101102	RES CHIP (E24) 1% 1 K	28
SM652101103	RES CHIP (E24) 1% 10 K	34
SM652101104	RES CHIP (E24) 1% 100 K	2
SM652101106	RES CHIP (E24) 1% 10 MEG	1
SM652101152	RES CHIP (E24) 1% 1.5 K	4
SM652101153	RES CHIP (E24) 1% 15 K	2
SM652101154	RES CHIP (E24) 1% 150 K	1
SM652101220	RES CHIP (E24) 1% 22 OHMS	31
SM652101221	RES CHIP (E24) 1% 220 OHM	2
SM652101331	RES CHIP (E24) 1% 330 OHM	1
SM652101332	RES CHIP (E24) 1% 3.3 K	1
SM652101470	RES CHIP (E24) 47 OHMS	2
SM652101474	RES CHIP (E24) 1% 470 K	1
SM652101511	RES CHIP (E24) 1% 510 OHM	1
SM652101820	RES CHIP (E24) 1% 82 OHMS	4
SM654101000	CHIP JUMPER ZERO OHMS	4
SM661207102	CAP CERA CHIP 10% .001UF	1
SM661207103	CAP CERA CHIP 20% .01UF (0805)	41
SM661207104	CAP CERA CHIP 20% .1 UF	36
SM661255101	CAP CERA CHIP 5% 100 PF	2
SM661255180	CAP CERA CHIP 5% 18PF	2
SM666217106	CAP MOLD TANT CHIP 10 UF	2
SM666327225	CAP MOLD TANT CHIP 2.2 UF	1
SM666377226	CAP MOLD TANT CHIP 22 UF	6

Section 8 Schematics, Layouts, Parts list



NOTE: THIS MEMORY IS THE PROPERTY OF AERONAUTICAL SYSTEMS CORPORATION. IT IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS DESIGNED AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

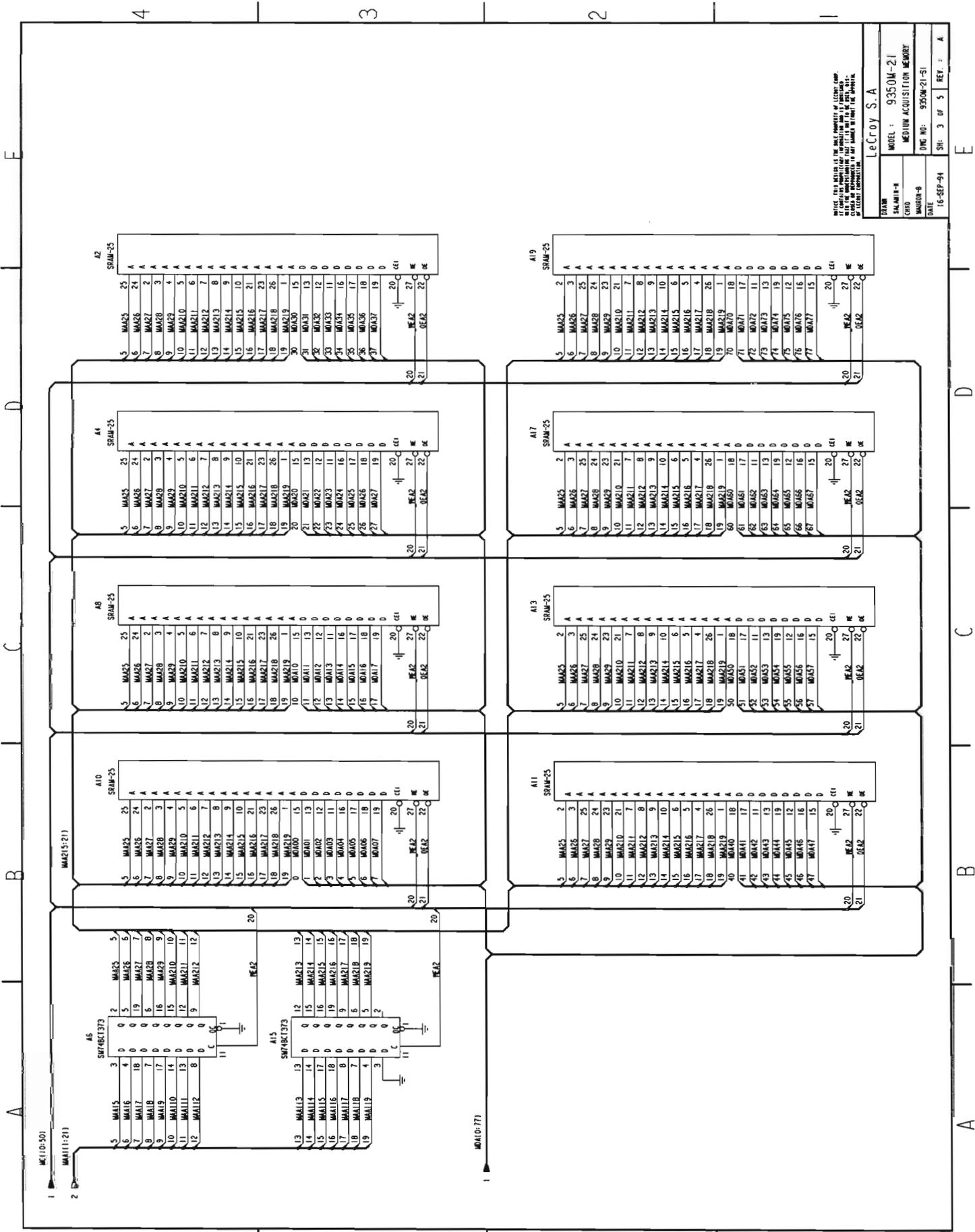
LeCroy S.A.
 MODEL: 9350M-21
 MEDIUM ACQUISITION MEMORY
 DATE: 16-SEP-94
 SH: 1 OF 5 | REV: A



PLEASE REFER TO THE QUALITY PROPERTY OF ALLIANCE CORP.
FOR THE SPECIFICATIONS OF THE MEMORY MODULES.
THESE PARTS ARE NOT TO BE USED IN THE ORIGINAL EQUIPMENT.
THESE PARTS ARE NOT TO BE USED IN THE ORIGINAL EQUIPMENT.
THESE PARTS ARE NOT TO BE USED IN THE ORIGINAL EQUIPMENT.

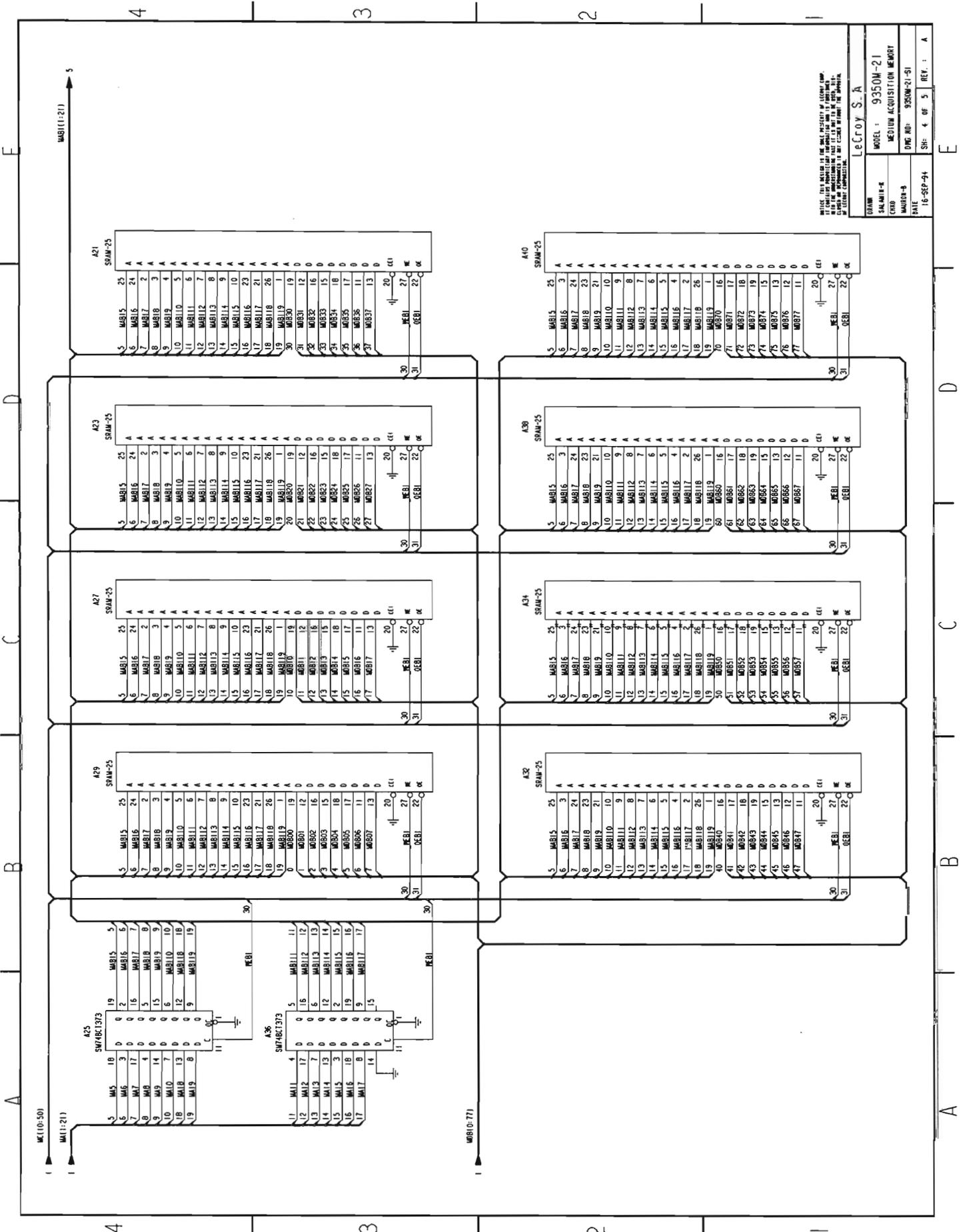
DRUM	LeCroy S.A
SALAHIT-4	MODEL : 9350M-21
CRD	MEMORY ACQUISITION MEMORY
WARRIOR-3	DWG NO: 9350M-21-51
DATE	16-SEP-94
SH:	2 OF 5
REV:	A

Section 8 Schematics, Layouts, Parts list



NOTE: THIS MODULE IS THE SOLE PROPERTY OF LEICROY. IT IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS DESIGNED. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

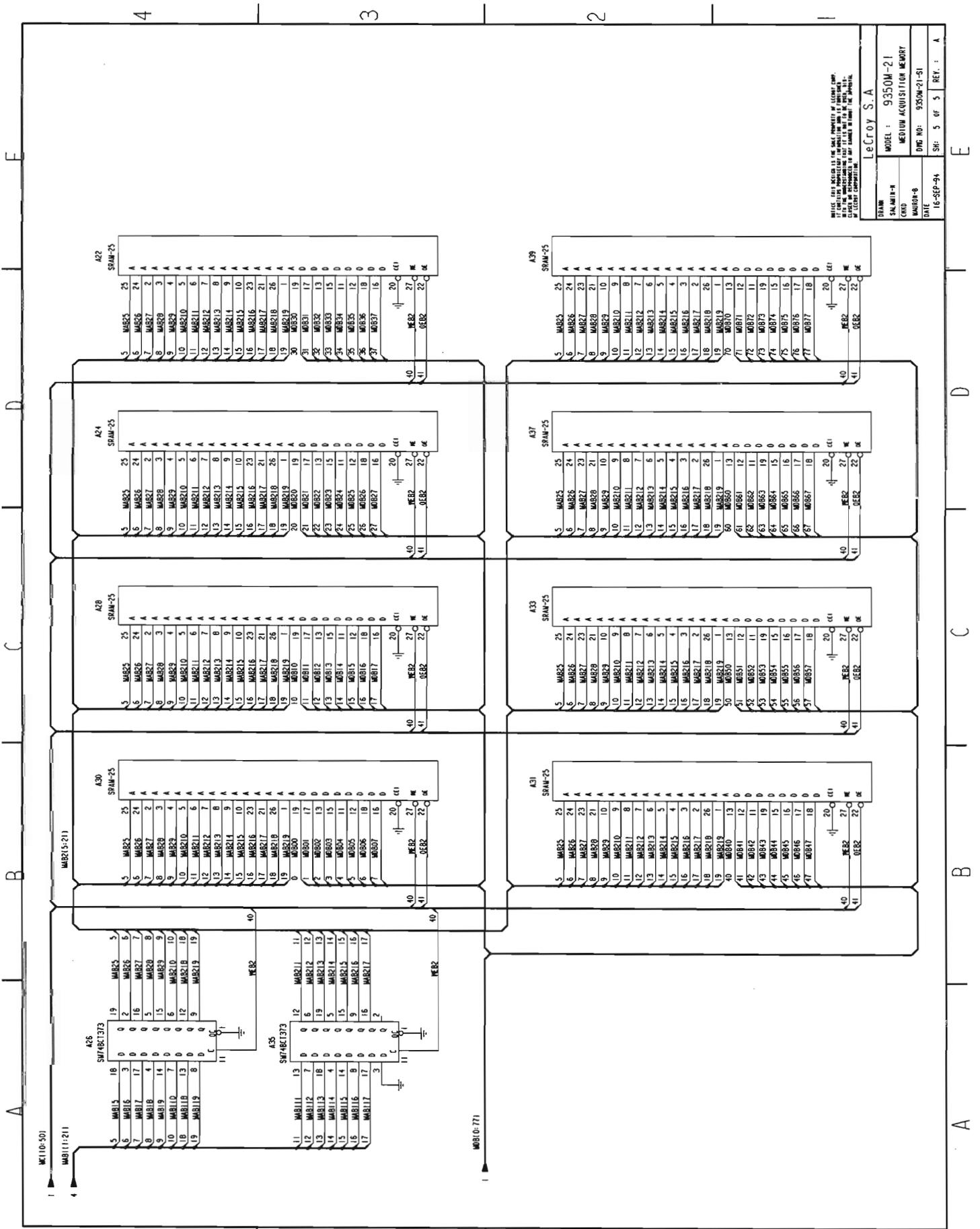
DRAWN	LeCroy, S.A.
SAL. UNIT-N	MODEL : 9350W-21
CHES	MEDIUM ACQUISITION MEMORY
MASSON-B	DATE
15-SEP-94	SH: 3 OF 5 REF: A



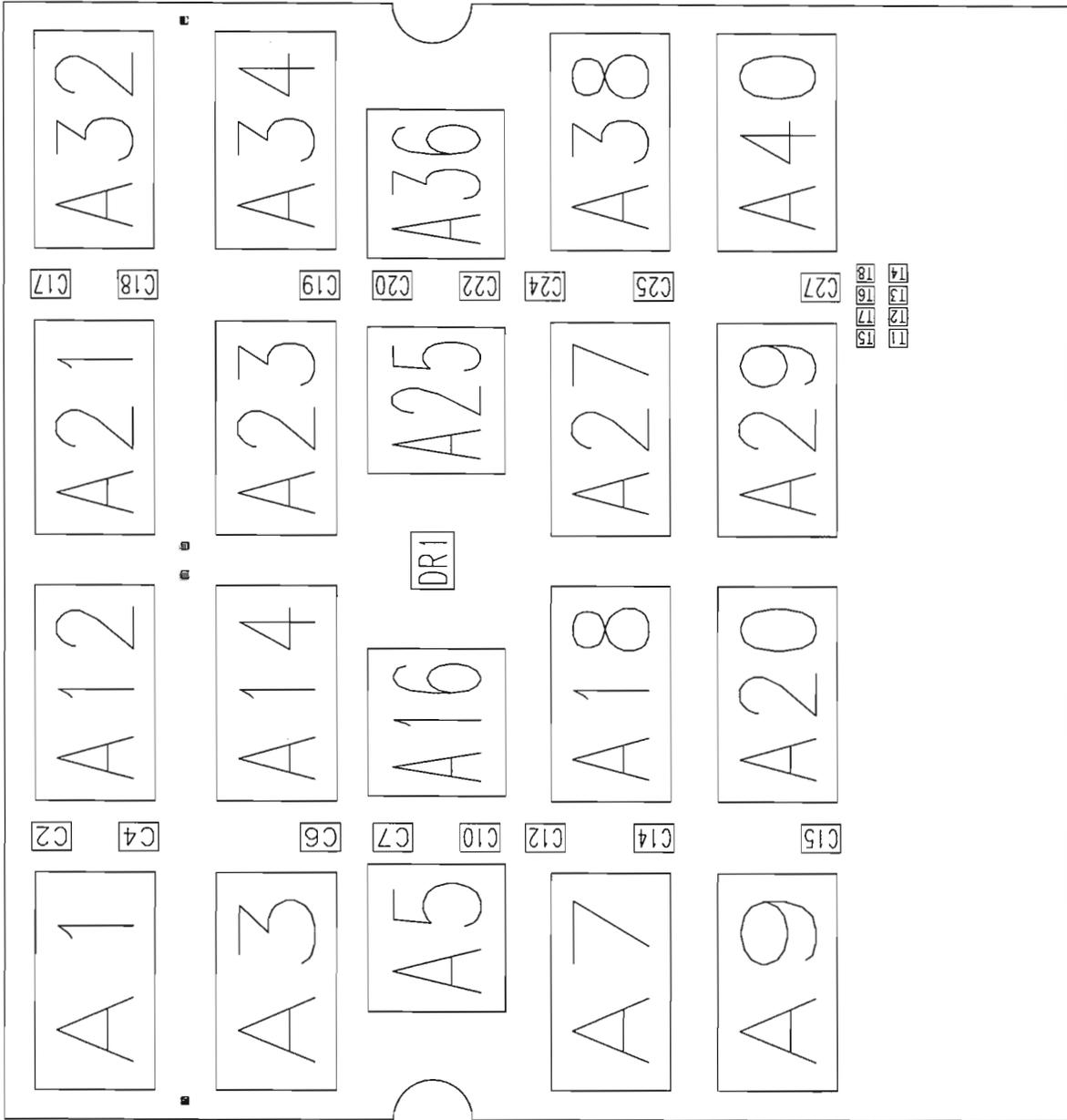
NOTE: THIS DRAWING IS THE PROPERTY OF LEROY COMPANY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEROY COMPANY.

LeCroy S.A	
ITEM	SA-MEM-21
MODEL	9350M-21
DESCRIPTION	MEDIUM ACQUISITION MEMORY
DATE	16-SEP-94
REV	5
SH	4 OF 5
REV	A

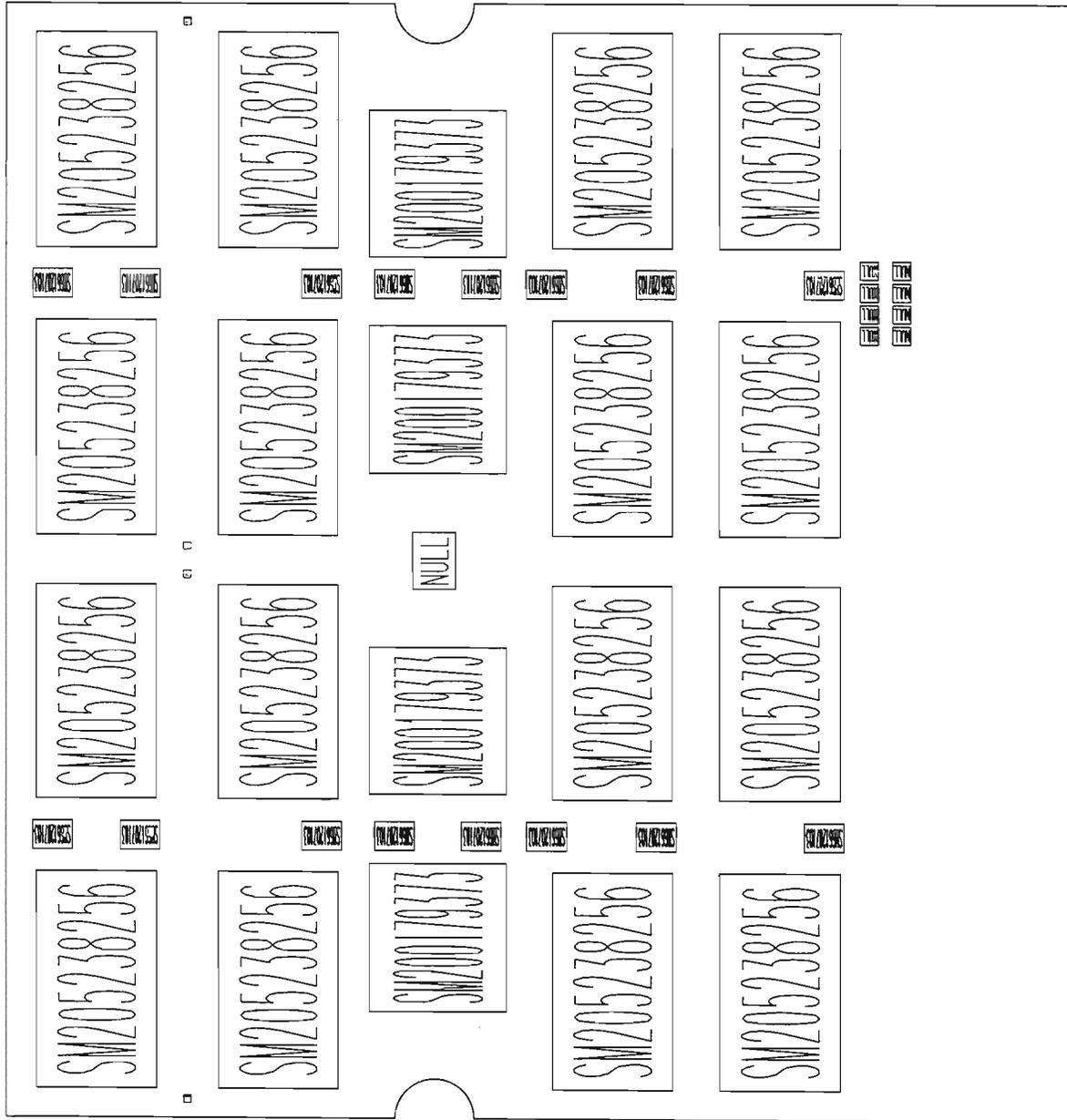
Section 8 Schematics, Layouts, Parts list



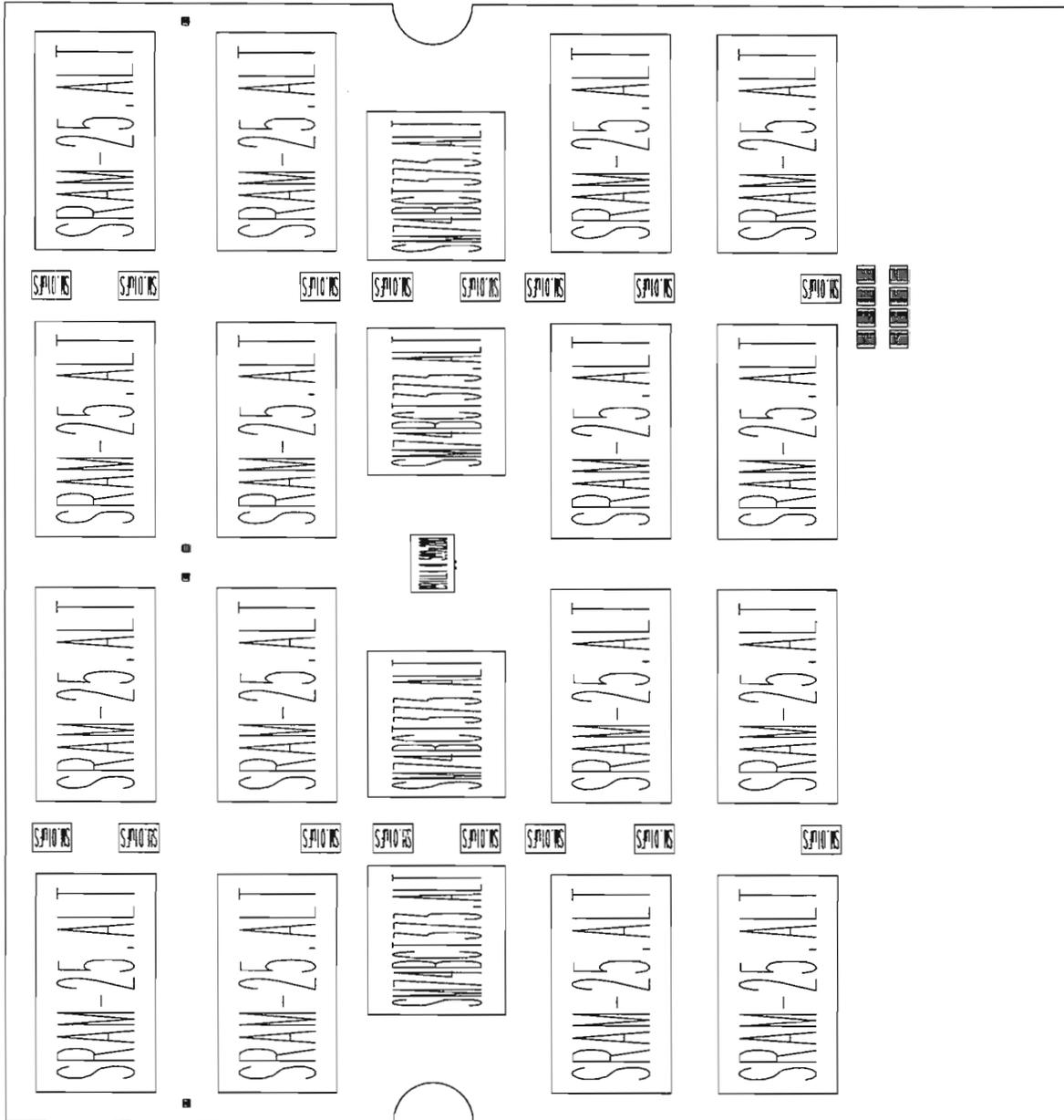
9350M-21 Rev: A



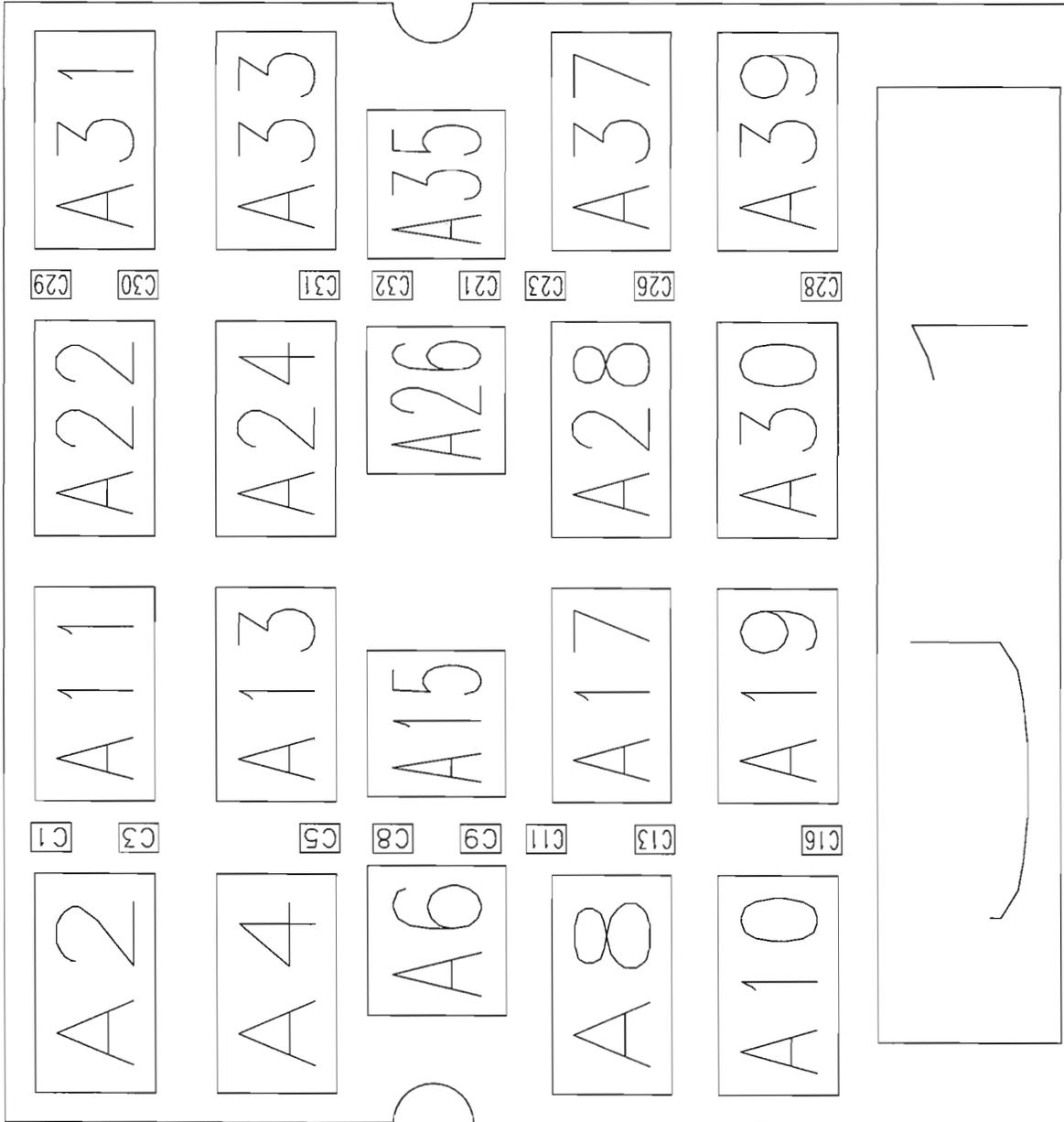
9350M-21 Rev: A



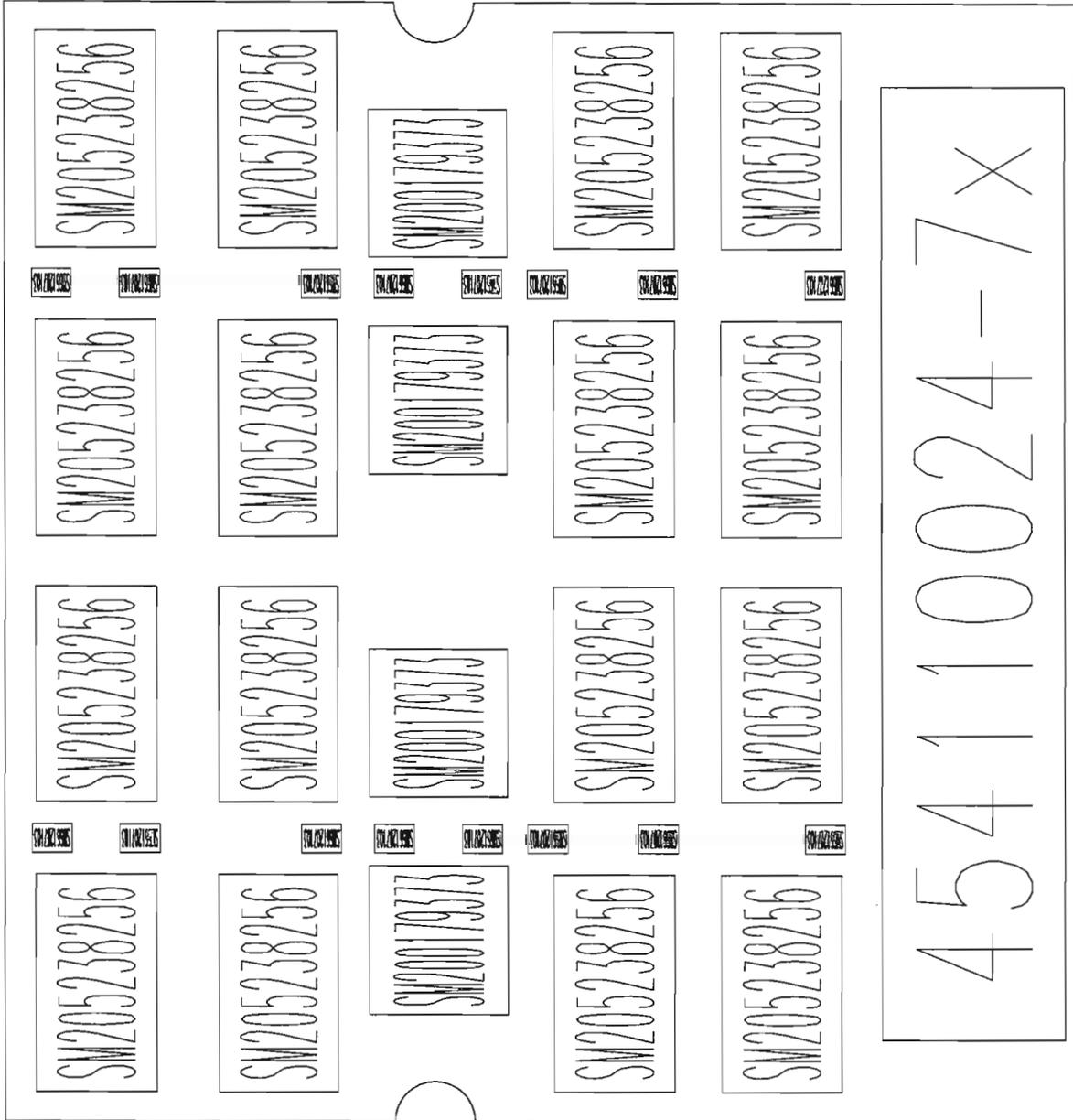
9350M-21 Rev:A



9350M-21 Rev:A



9350M-21 Rev: A



PART: F9350-21 DESC: ACQUISITION MEMORY CARD 2x50K for 9354A & 9354T

Location	Part Number	Description	Location	Part Number	Description
A1	SM205228863	SRAM8Kx8-25	A38	SM205228863	SRAM8Kx8-25
A2	SM205228863	SRAM8Kx8-25	A39	SM205228863	SRAM8Kx8-25
A3	SM205228863	SRAM8Kx8-25	A40	SM205228863	SRAM8Kx8-25
A4	SM205228863	SRAM8Kx8-25	C1	SM661207103	SM.01uFS
A5	SM200179373	SM74BCT373	C2	SM661207103	SM.01uFS
A6	SM200179373	SM74BCT373	C3	SM661207103	SM.01uFS
A7	SM205228863	SRAM8Kx8-25	C4	SM661207103	SM.01uFS
A8	SM205228863	SRAM8Kx8-25	C5	SM661207103	SM.01uFS
A9	SM205228863	SRAM8Kx8-25	C6	SM661207103	SM.01uFS
A10	SM205228863	SRAM8Kx8-25	C7	SM661207103	SM.01uFS
A11	SM205228863	SRAM8Kx8-25	C8	SM661207103	SM.01uFS
A12	SM205228863	SRAM8Kx8-25	C9	SM661207103	SM.01uFS
A13	SM205228863	SRAM8Kx8-25	C10	SM661207103	SM.01uFS
A14	SM205228863	SRAM8Kx8-25	C11	SM661207103	SM.01uFS
A15	SM200179373	SM74BCT373	C12	SM661207103	SM.01uFS
A16	SM200179373	SM74BCT373	C13	SM661207103	SM.01uFS
A17	SM205228863	SRAM8Kx8-25	C14	SM661207103	SM.01uFS
A18	SM205228863	SRAM8Kx8-25	C15	SM661207103	SM.01uFS
A19	SM205228863	SRAM8Kx8-25	C16	SM661207103	SM.01uFS
A20	SM205228863	SRAM8Kx8-25	C17	SM661207103	SM.01uFS
A21	SM205228863	SRAM8Kx8-25	C18	SM661207103	SM.01uFS
A22	SM205228863	SRAM8Kx8-25	C19	SM661207103	SM.01uFS
A23	SM205228863	SRAM8Kx8-25	C20	SM661207103	SM.01uFS
A24	SM205228863	SRAM8Kx8-25	C21	SM661207103	SM.01uFS
A25	SM200179373	SM74BCT373	C22	SM661207103	SM.01uFS
A26	SM200179373	SM74BCT373	C23	SM661207103	SM.01uFS
A27	SM205228863	SRAM8Kx8-25	C24	SM661207103	SM.01uFS
A28	SM205228863	SRAM8Kx8-25	C25	SM661207103	SM.01uFS
A29	SM205228863	SRAM8Kx8-25	C26	SM661207103	SM.01uFS
A30	SM205228863	SRAM8Kx8-25	C27	SM661207103	SM.01uFS
A31	SM205228863	SRAM8Kx8-25	C28	SM661207103	SM.01uFS
A32	SM205228863	SRAM8Kx8-25	C29	SM661207103	SM.01uFS
A33	SM205228863	SRAM8Kx8-25	C30	SM661207103	SM.01uFS
A34	SM205228863	SRAM8Kx8-25	C31	SM661207103	SM.01uFS
A35	SM200179373	SM74BCT373	C32	SM661207103	SM.01uFS
A36	SM200179373	SM74BCT373	J1	454110024	7x 4x42
A37	SM205228863	SRAM8Kx8-25			

PART: S9350-21 DESC: ACQUISITION MEMORY CARD 2x50K for 9354A & 9354T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
145344109	CAP ALU COMPACT AXIAL 10000UF	2
454110024	HDR 2MM PRESSFIT TO MALE 24	7
719350M21	PC BD PREASS'Y 9350M-21	1
SM200179373	IC OCTAL LATCH 74BCT373	8
SM205228863	IC 8K X 8 STATIC RAM 25NS	32
SM661207103	CAP CERA CHIP 20% .01UF (0805)	32

PART: S9350M-21 DESC: ACQUISITION MEMORY CARD 2x250K for 9354AM & 9354MT

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
145344109	CAP ALU COMPACT AXIAL 10000UF	2
454110024	HDR 2MM PRESSFIT TO MALE 24	7
719350M21	PC BD PREASS'Y 9350M-21	1
SM200179373	IC OCTAL LATCH 74BCT373	8
SM205238256	IC 32K X 8 SRAM 25NS	32
SM661207103	CAP CERA CHIP 20% .01UF (0805)	32

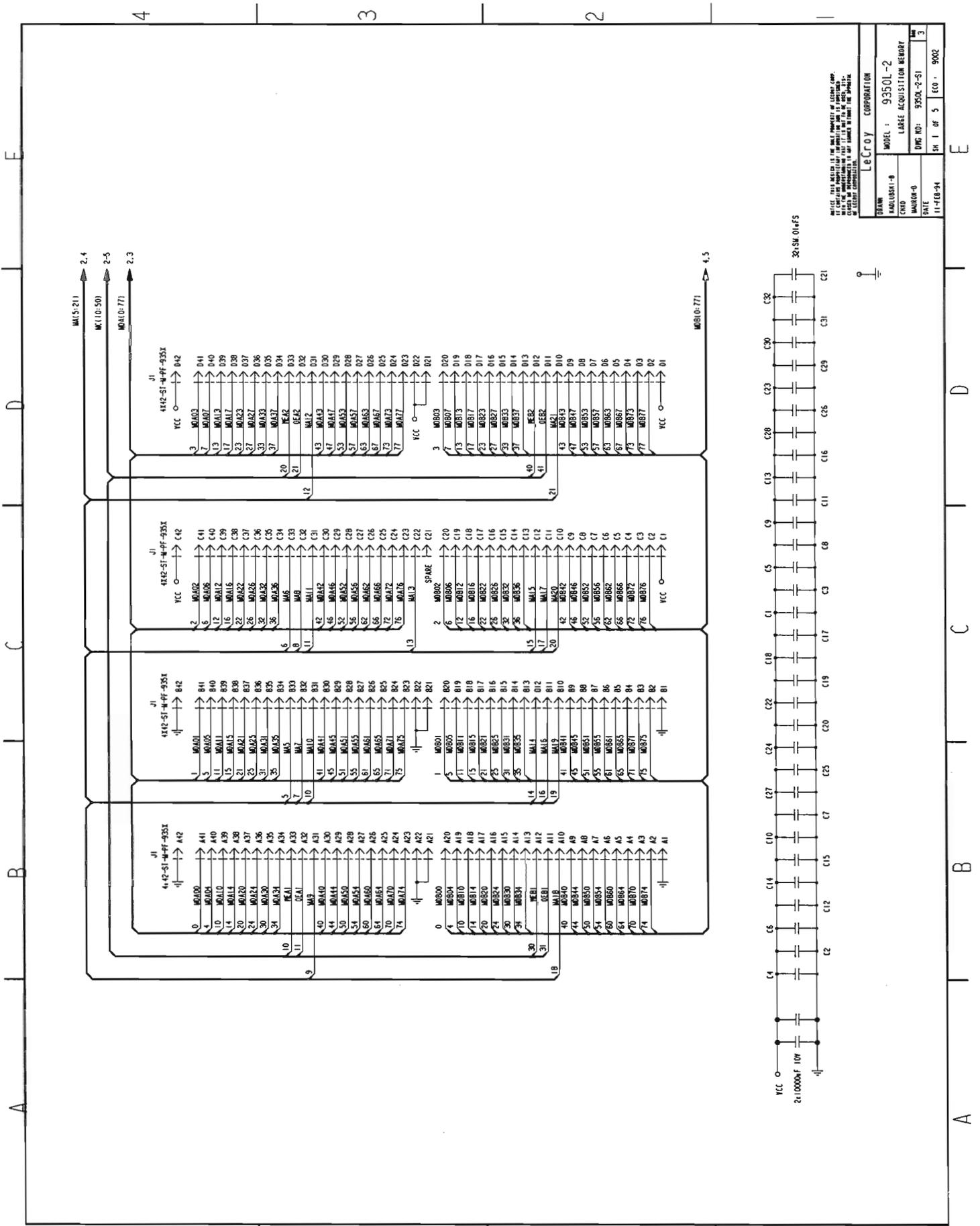
PART: F9350L-2 DESC: ACQUISITION MEMORY CARD 2 x 2 M for 9354AL

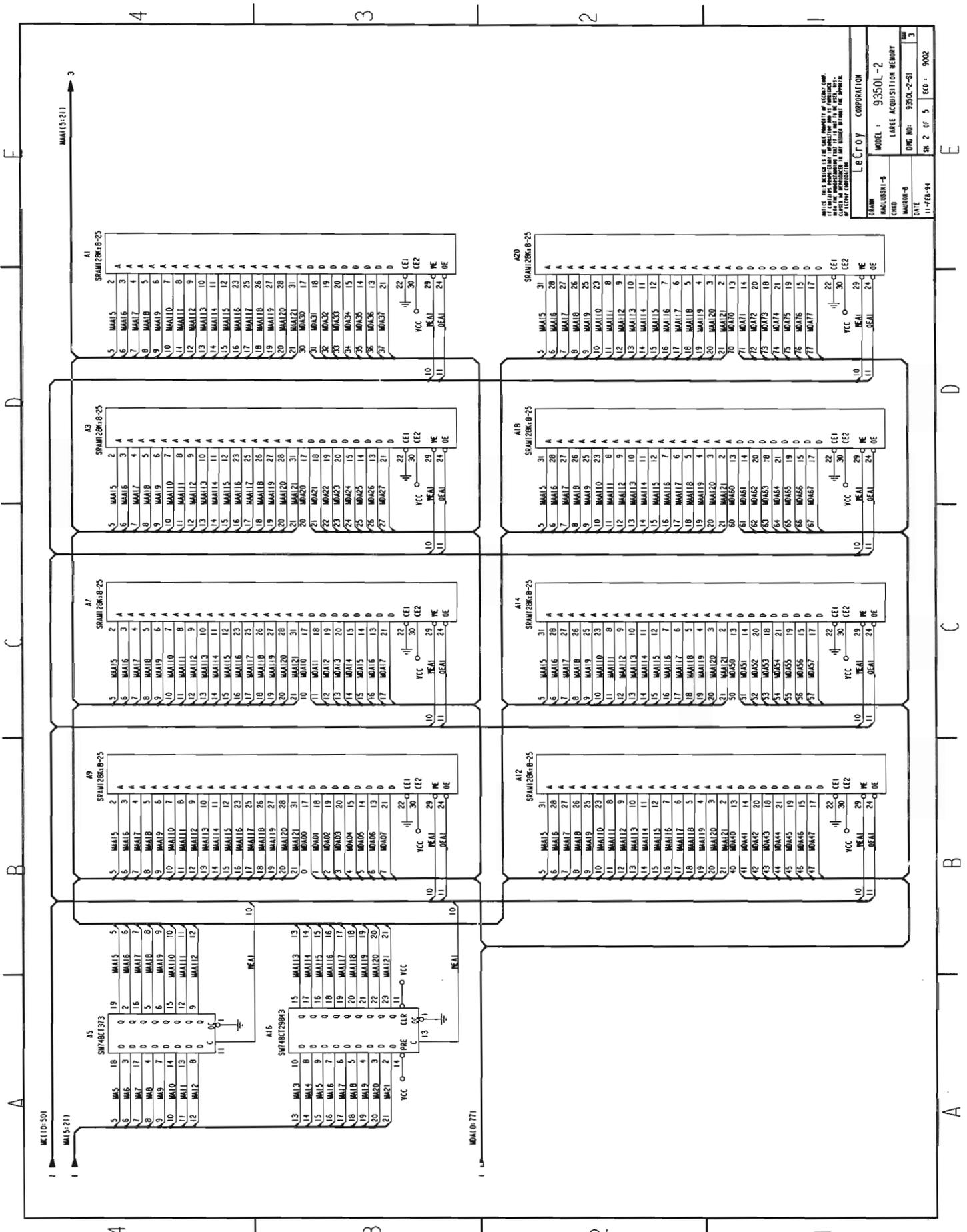
COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
145344109	CAP ALU COMPACT AXIAL 10000UF	2
454110024	HDR 2MM PRESSFIT TO MALE 24	7
719350L23	PC BD PREASS'Y 9350L-2	1
SM200179373	IC OCTAL LATCH 74BCT373	4
SM205232226	IC 128KX8 SRAM 25 6226AWJ25	32
SM207480843	IC 9-BIT BUS INT LA 74BCT29843	4
SM661207103	CAP CERA CHIP 20% .01UF (0805)	32

PART: F9350M-21 DESC: ACQUISITION MEMORY CARD 2x250K for 9354AM & 9354TM

Location	Part Number	Description	Location	Part Number	Description
-----	-----	-----	-----	-----	-----
A1	SM205238256	SRAM-25	A38	SM205238256	SRAM-25
A2	SM205238256	SRAM-25	A39	SM205238256	SRAM-25
A3	SM205238256	SRAM-25	A40	SM205238256	SRAM-25
A4	SM205238256	SRAM-25	C1	SM661207103	SM.01uFS
A5	SM200179373	SM74BCT373	C2	SM661207103	SM.01uFS
A6	SM200179373	SM74BCT373	C3	SM661207103	SM.01uFS
A7	SM205238256	SRAM-25	C4	SM661207103	SM.01uFS
A8	SM205238256	SRAM-25	C5	SM661207103	SM.01uFS
A9	SM205238256	SRAM-25	C6	SM661207103	SM.01uFS
A10	SM205238256	SRAM-25	C7	SM661207103	SM.01uFS
A11	SM205238256	SRAM-25	C8	SM661207103	SM.01uFS
A12	SM205238256	SRAM-25	C9	SM661207103	SM.01uFS
A13	SM205238256	SRAM-25	C10	SM661207103	SM.01uFS
A14	SM205238256	SRAM-25	C11	SM661207103	SM.01uFS
A15	SM200179373	SM74BCT373	C12	SM661207103	SM.01uFS
A16	SM200179373	SM74BCT373	C13	SM661207103	SM.01uFS
A17	SM205238256	SRAM-25	C14	SM661207103	SM.01uFS
A18	SM205238256	SRAM-25	C15	SM661207103	SM.01uFS
A19	SM205238256	SRAM-25	C16	SM661207103	SM.01uFS
A20	SM205238256	SRAM-25	C17	SM661207103	SM.01uFS
A21	SM205238256	SRAM-25	C18	SM661207103	SM.01uFS
A22	SM205238256	SRAM-25	C19	SM661207103	SM.01uFS
A23	SM205238256	SRAM-25	C20	SM661207103	SM.01uFS
A24	SM205238256	SRAM-25	C21	SM661207103	SM.01uFS
A25	SM200179373	SM74BCT373	C22	SM661207103	SM.01uFS
A26	SM200179373	SM74BCT373	C23	SM661207103	SM.01uFS
A27	SM205238256	SRAM-25	C24	SM661207103	SM.01uFS
A28	SM205238256	SRAM-25	C25	SM661207103	SM.01uFS
A29	SM205238256	SRAM-25	C26	SM661207103	SM.01uFS
A30	SM205238256	SRAM-25	C27	SM661207103	SM.01uFS
A31	SM205238256	SRAM-25	C28	SM661207103	SM.01uFS
A32	SM205238256	SRAM-25	C29	SM661207103	SM.01uFS
A33	SM205238256	SRAM-25	C30	SM661207103	SM.01uFS
A34	SM205238256	SRAM-25	C31	SM661207103	SM.01uFS
A35	SM200179373	SM74BCT373	C32	SM661207103	SM.01uFS
A36	SM200179373	SM74BCT373	J1	454110024	7x 4x42-ST-M
A37	SM205238256	SRAM-25			

Section 8 Schematics, Layouts, Parts list

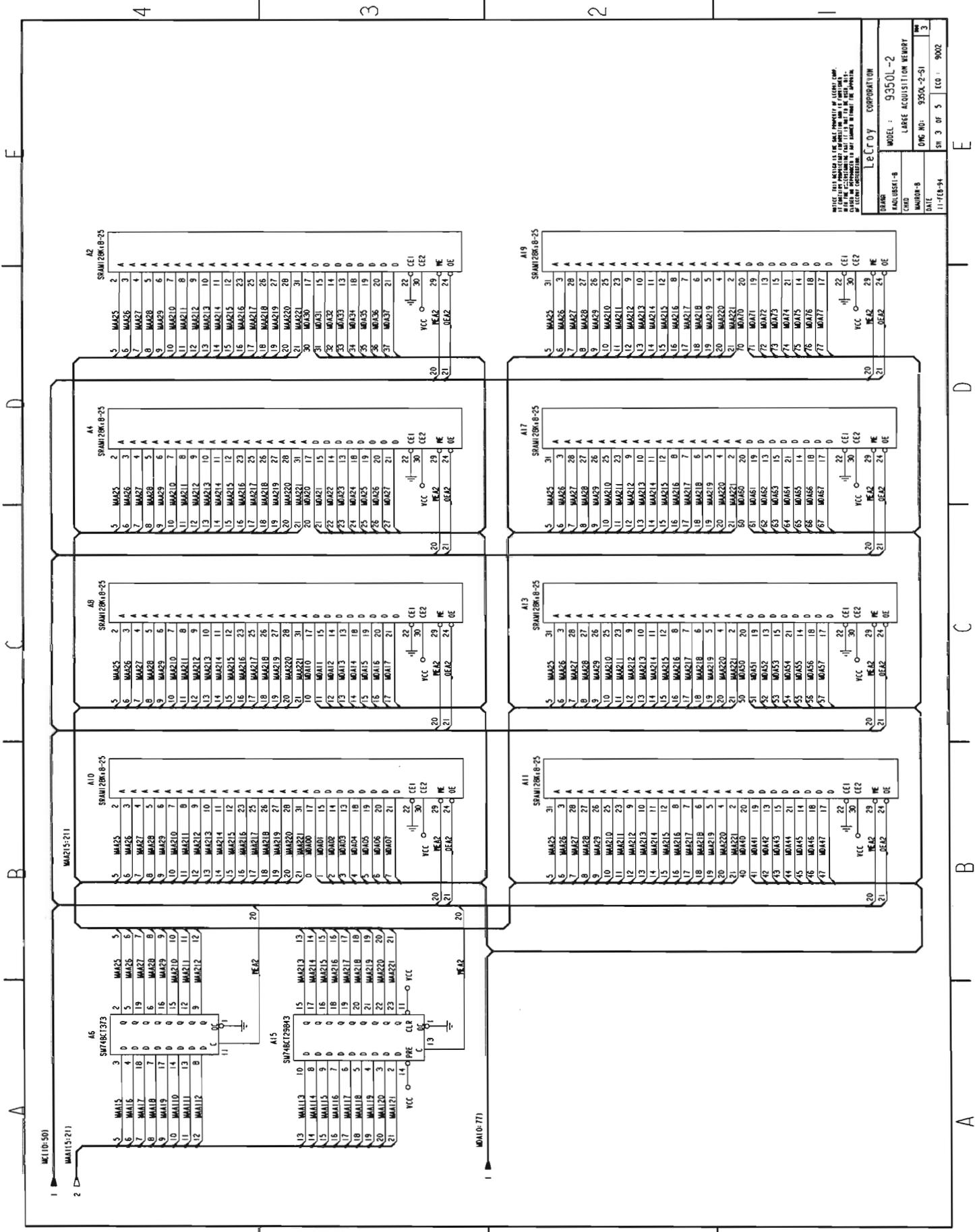




NOTES: THIS DEVICE IS THE SOLE PROPERTY OF LEXCOM, INC. IT IS TO BE USED ONLY FOR THE PURPOSES INTENDED BY LEXCOM, INC. NO PARTS ARE TO BE REPAIRED OR REPLACED WITHOUT THE WRITTEN CONSENT OF LEXCOM, INC.

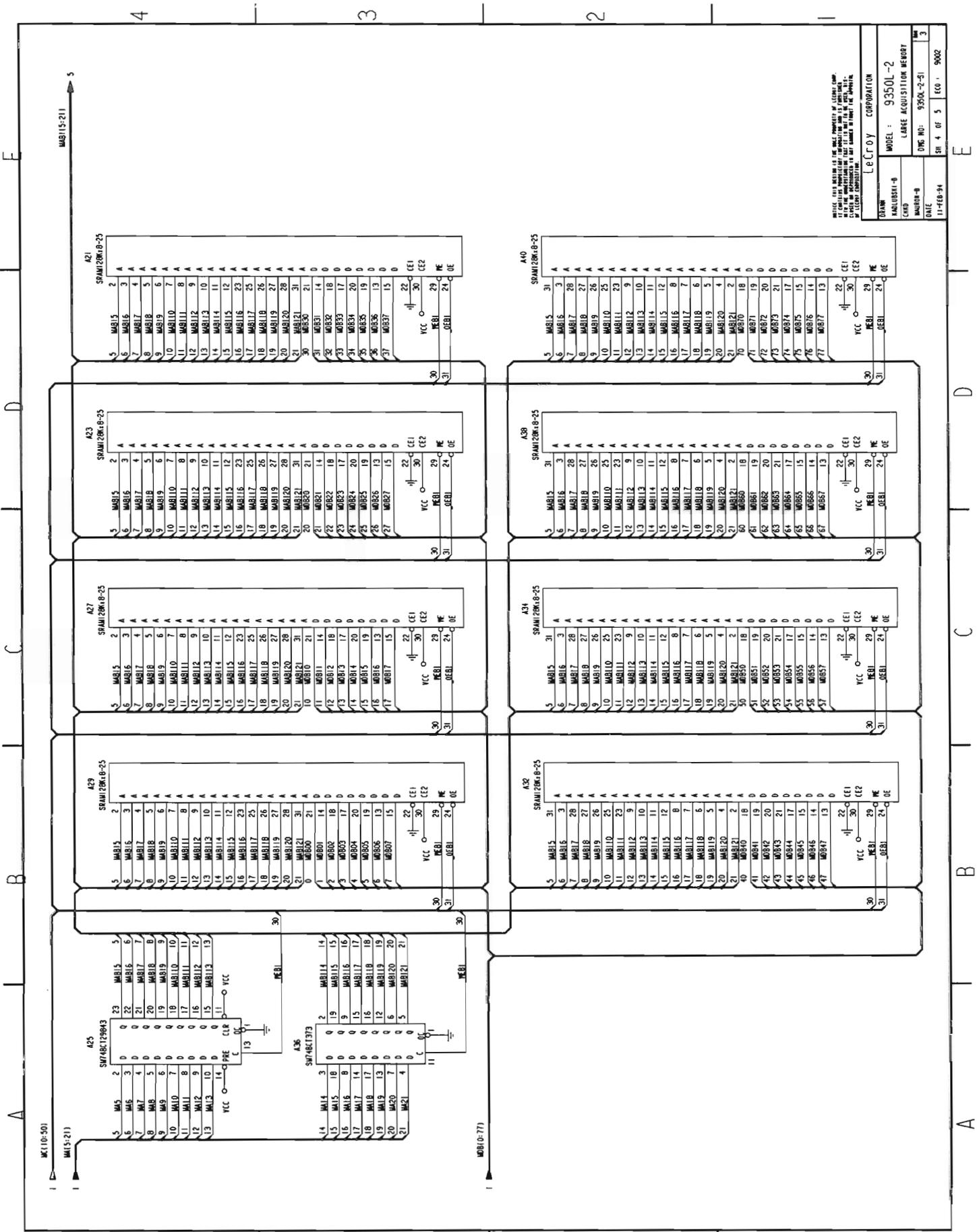
DRAWN	LEXCOM CORPORATION
MODEL	9350L-2
REVISION	LABRE ACQUISITION REVISION
DATE	11-FEB-94
FIG NO	9350L-2-51
REV	3
SH 2 OF 5	ECO - 9002

Section 8 Schematics, Layouts, Parts list



PLEASE REFER TO THE SMT PROPERTY OF USING COMP. IN ORDER TO PREVENT THE DAMAGE OF THE PRODUCT. PLEASE REFER TO THE SMT PROPERTY OF USING COMP. IN ORDER TO PREVENT THE DAMAGE OF THE PRODUCT.

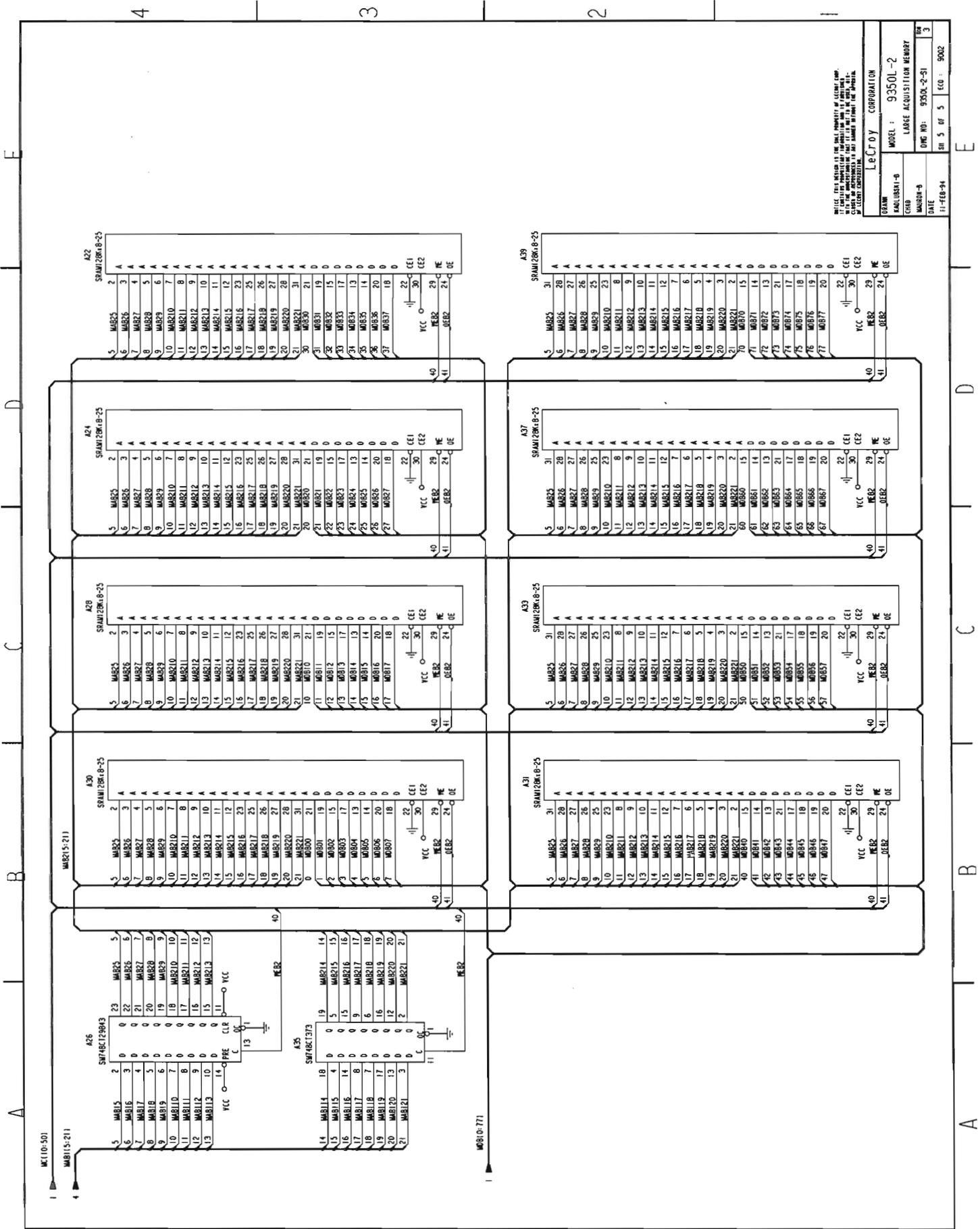
LECROY CORPORATION
 MODEL : 9350L-2
 LABEL ACQUISITION MEMORY
 DATE : 11-FEB-94
 SN 3 OF 5 (CO : 9002



NOTICE: THIS DRAWING IS THE PROPERTY OF LEXROY CORPORATION. IT IS TO BE USED ONLY FOR THE MANUFACTURE OF THE PRODUCT SPECIFIED HEREIN. IT IS TO BE KEPT IN CONFIDENTIALITY AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

FORM	LEXROY CORPORATION
MODEL	9350L-2
LABELED ACQUISITION REPORT	
DWG NO.	9350L-2-51
REV	3
DATE	11-4-83-94
SR	4 of 5
ECO	9002

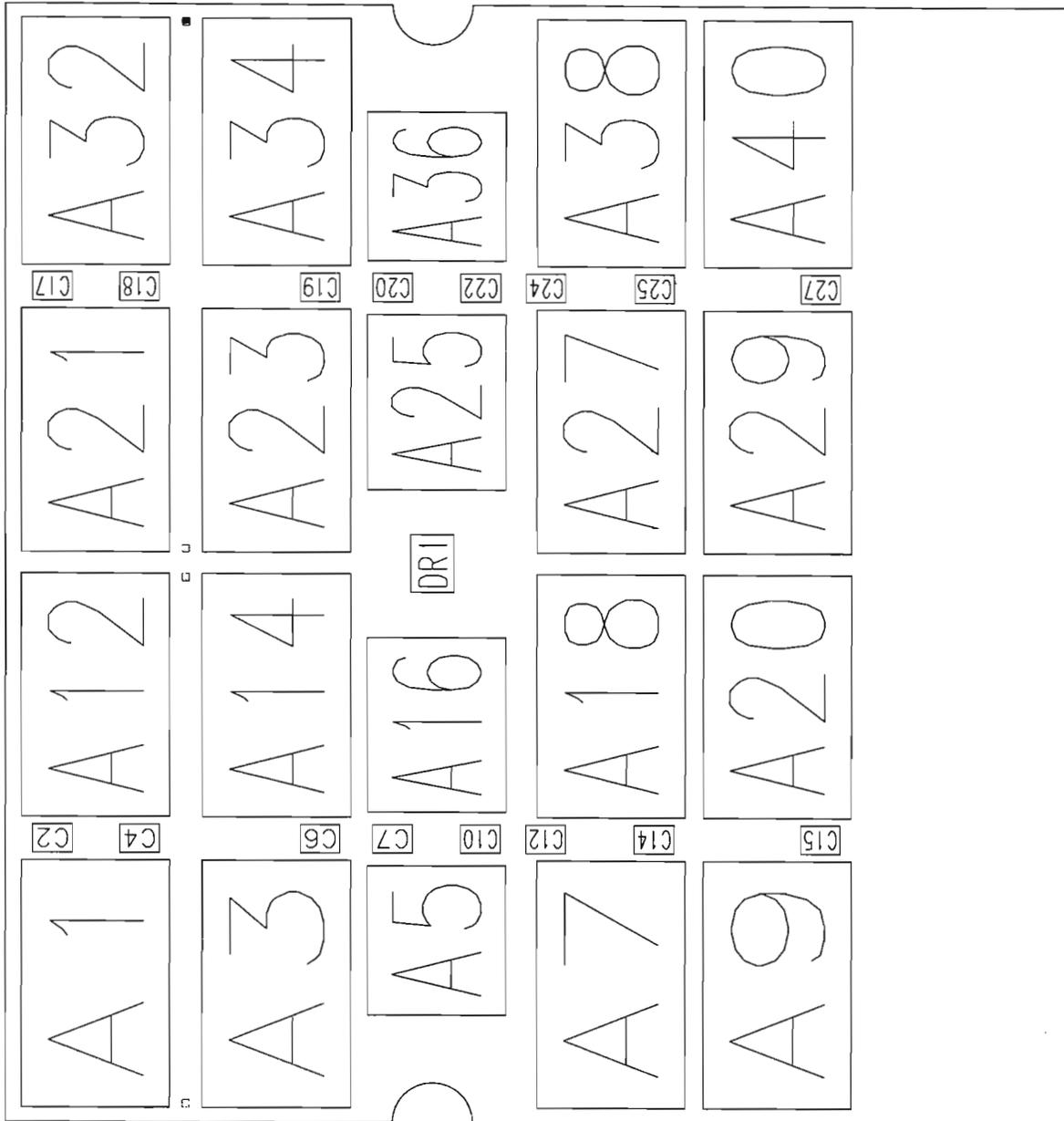
Section 8 Schematics, Layouts, Parts list



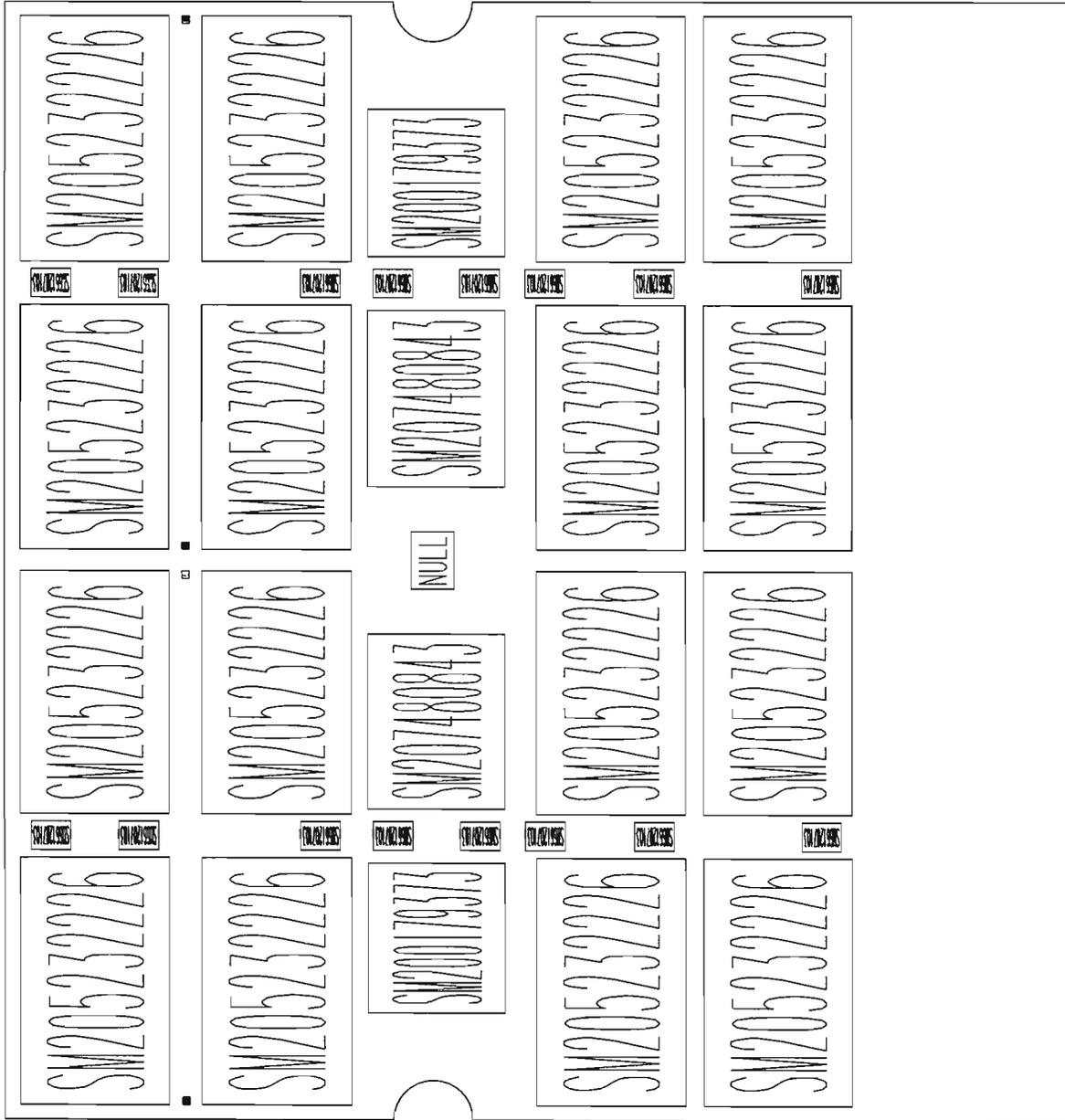
NOTICE: THIS MANUAL IS THE PROPERTY OF LECTROY CORPORATION. IT IS LOANED TO YOU FOR YOUR INFORMATION ONLY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM. RETURN THIS MANUAL TO THE ORIGINAL ISSUING OFFICE.

LECTROY CORPORATION	
MODEL :	9350L-2
TYPE :	LARGE ACQUISITION MEMORY
DATE :	11-FEB-94
REV :	3
ECO :	5002

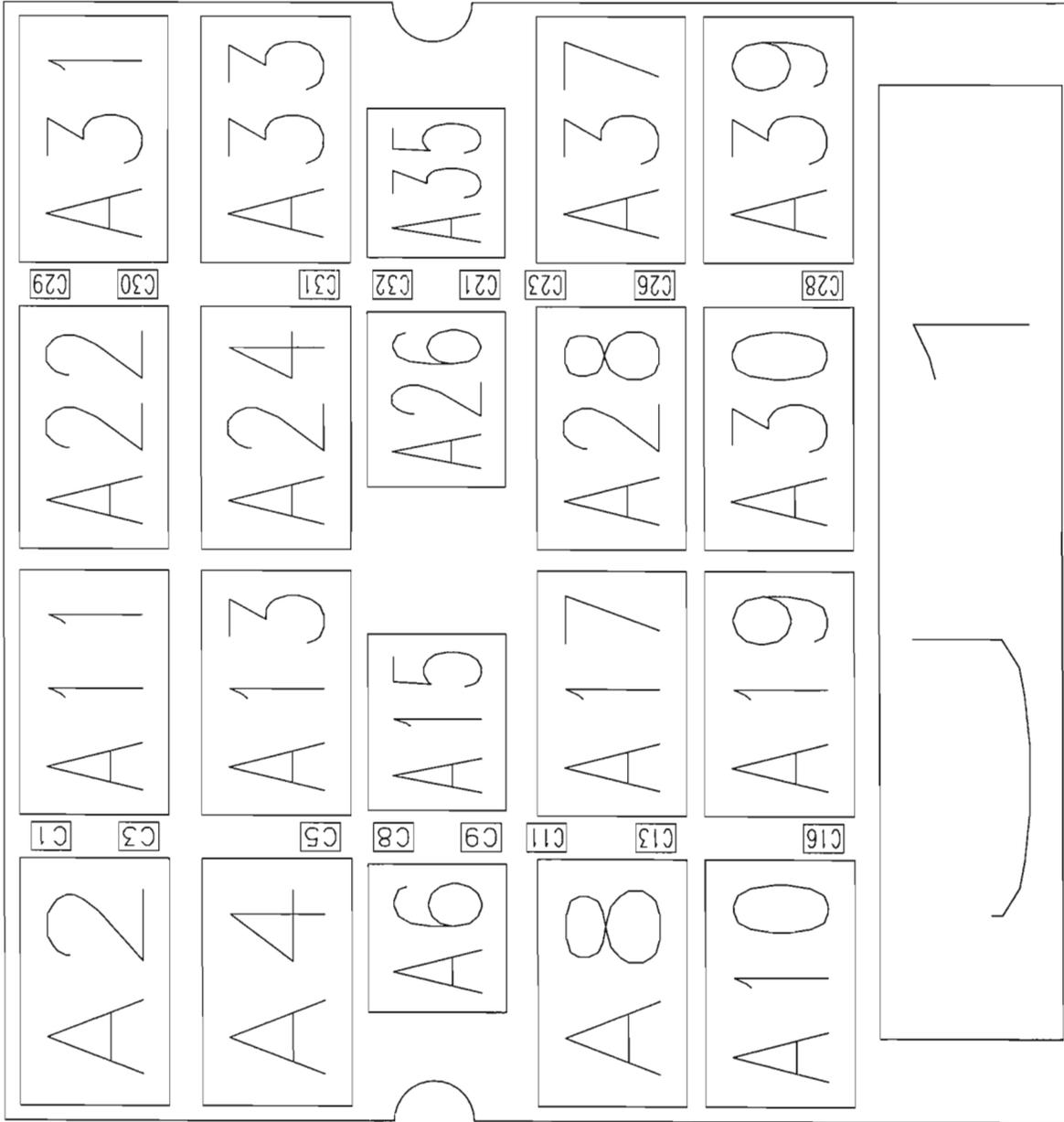
9350L-2 Rev:C



9350L-2 Rev:C



9350L-2 Rev:C



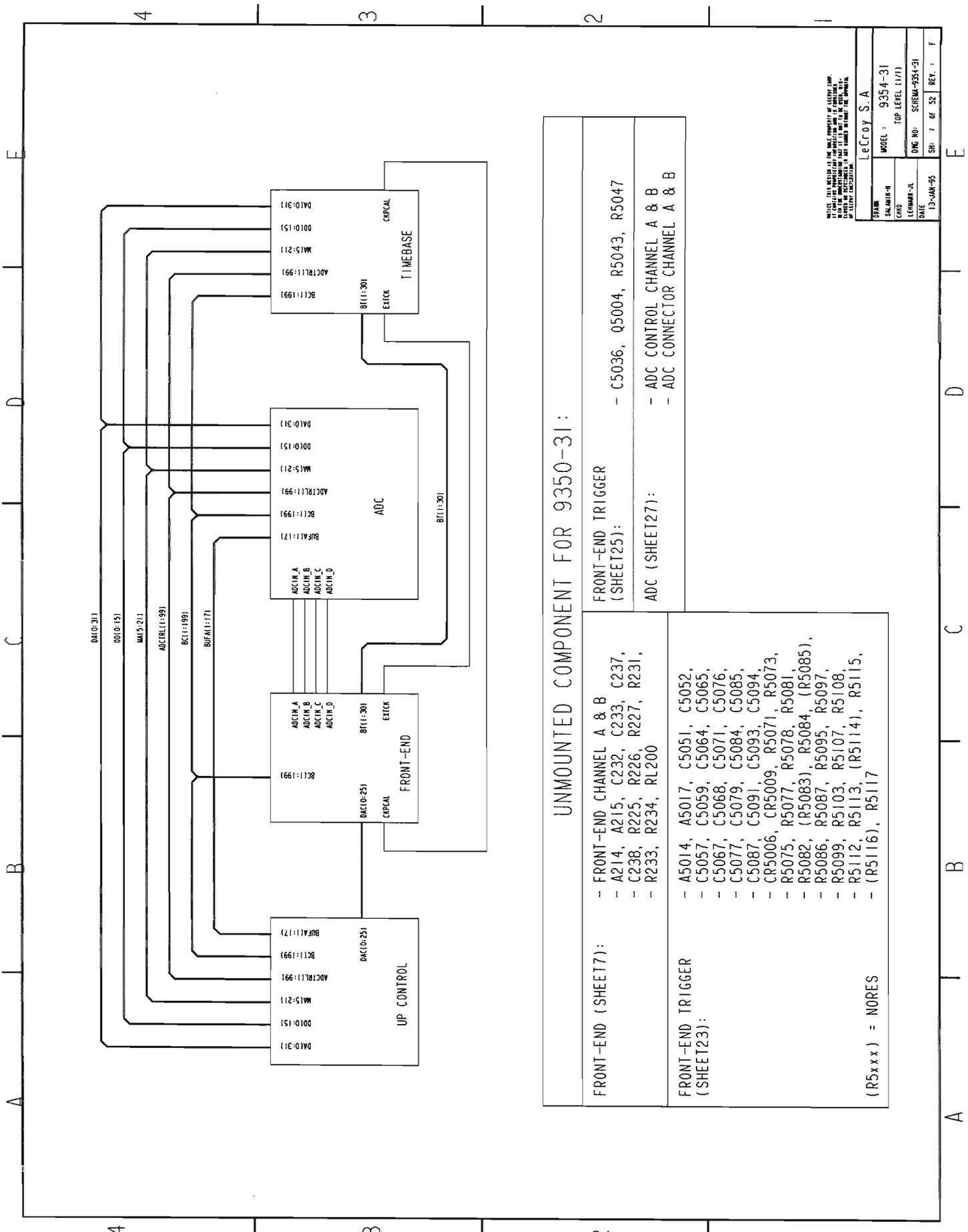
9350L-2 Rev:C



PART: F9350L-2 DESC: ACQUISITION MEMORY CARD 2x2 M for 9354AL

Location	Part Number	Description	Location	Part Number	Description
-----	-----	-----	-----	-----	-----
A1	SM205232226	SRAM128Kx8-25	A38	SM205232226	SRAM128Kx8-25
A2	SM205232226	SRAM128Kx8-25	A39	SM205232226	SRAM128Kx8-25
A3	SM205232226	SRAM128Kx8-25	A40	SM205232226	SRAM128Kx8-25
A4	SM205232226	SRAM128Kx8-25	C1	SM661207103	SM.01uFS
A5	SM200179373	SM74BCT373	C2	SM661207103	SM.01uFS
A6	SM200179373	SM74BCT373	C3	SM661207103	SM.01uFS
A7	SM205232226	SRAM128Kx8-25	C4	SM661207103	SM.01uFS
A8	SM205232226	SRAM128Kx8-25	C5	SM661207103	SM.01uFS
A9	SM205232226	SRAM128Kx8-25	C6	SM661207103	SM.01uFS
A10	SM205232226	SRAM128Kx8-25	C7	SM661207103	SM.01uFS
A11	SM205232226	SRAM128Kx8-25	C8	SM661207103	SM.01uFS
A12	SM205232226	SRAM128Kx8-25	C9	SM661207103	SM.01uFS
A13	SM205232226	SRAM128Kx8-25	C10	SM661207103	SM.01uFS
A14	SM205232226	SRAM128Kx8-25	C11	SM661207103	SM.01uFS
A15	SM207480843	SM74BCT29843	C12	SM661207103	SM.01uFS
A16	SM207480843	SM74BCT29843	C13	SM661207103	SM.01uFS
A17	SM205232226	SRAM128Kx8-25	C14	SM661207103	SM.01uFS
A18	SM205232226	SRAM128Kx8-25	C15	SM661207103	SM.01uFS
A19	SM205232226	SRAM128Kx8-25	C16	SM661207103	SM.01uFS
A20	SM205232226	SRAM128Kx8-25	C17	SM661207103	SM.01uFS
A21	SM205232226	SRAM128Kx8-25	C18	SM661207103	SM.01uFS
A22	SM205232226	SRAM128Kx8-25	C19	SM661207103	SM.01uFS
A23	SM205232226	SRAM128Kx8-25	C20	SM661207103	SM.01uFS
A24	SM205232226	SRAM128Kx8-25	C21	SM661207103	SM.01uFS
A25	SM207480843	SM74BCT29843	C22	SM661207103	SM.01uFS
A26	SM207480843	SM74BCT29843	C23	SM661207103	SM.01uFS
A27	SM205232226	SRAM128Kx8-25	C24	SM661207103	SM.01uFS
A28	SM205232226	SRAM128Kx8-25	C25	SM661207103	SM.01uFS
A29	SM205232226	SRAM128Kx8-25	C26	SM661207103	SM.01uFS
A30	SM205232226	SRAM128Kx8-25	C27	SM661207103	SM.01uFS
A31	SM205232226	SRAM128Kx8-25	C28	SM661207103	SM.01uFS
A32	SM205232226	SRAM128Kx8-25	C29	SM661207103	SM.01uFS
A33	SM205232226	SRAM128Kx8-25	C30	SM661207103	SM.01uFS
A34	SM205232226	SRAM128Kx8-25	C31	SM661207103	SM.01uFS
A35	SM200179373	SM74BCT373	C32	SM661207103	SM.01uFS
A36	SM200179373	SM74BCT373	J1	454110024	7x 4x42-ST-M-
A37	SM205232226	SRAM128Kx8-25			

Section 8 Schematics, Layouts, Parts list



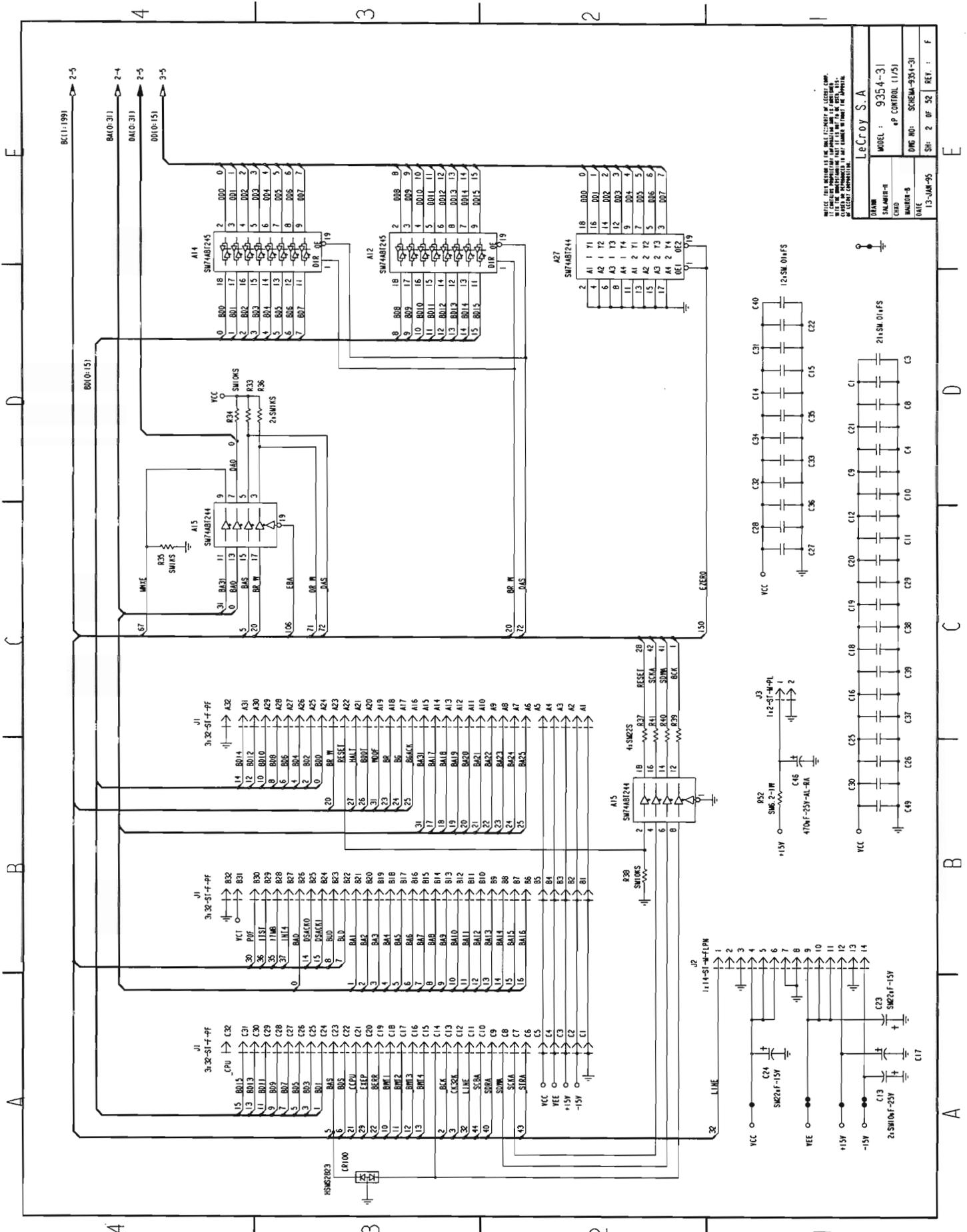
UNMOUNTED COMPONENT FOR 9350-31:

- FRONT-END (SHEET17):
- FRONT-END CHANNEL A & B
 - A214, A215, C232, C233, C237,
 - C238, R225, R226, R227, R231,
 - R233, R234, RL200
- FRONT-END TRIGGER (SHEET23):
- A5014, A5017, C5051, C5052,
 - C5057, C5059, C5064, C5065,
 - C5067, C5068, C5071, C5076,
 - C5077, C5079, C5084, C5085,
 - C5087, C5091, C5093, C5094,
 - CR5006, CR5009, R5071, R5073,
 - R5075, R5077, R5078, R5081,
 - R5082, (R5083), R5084, (R5085),
 - R5086, R5087, R5095, R5097,
 - R5099, R5103, R5107, R5108,
 - R5112, R5113, (R5114), R5115,
 - (R5116), R5117
- (R5xxx) = NORES

- FRONT-END TRIGGER (SHEET25):
- C5036, Q5004, R5043, R5047
- ADC (SHEET27):
- ADC CONTROL CHANNEL A & B
 - ADC CONNECTOR CHANNEL A & B

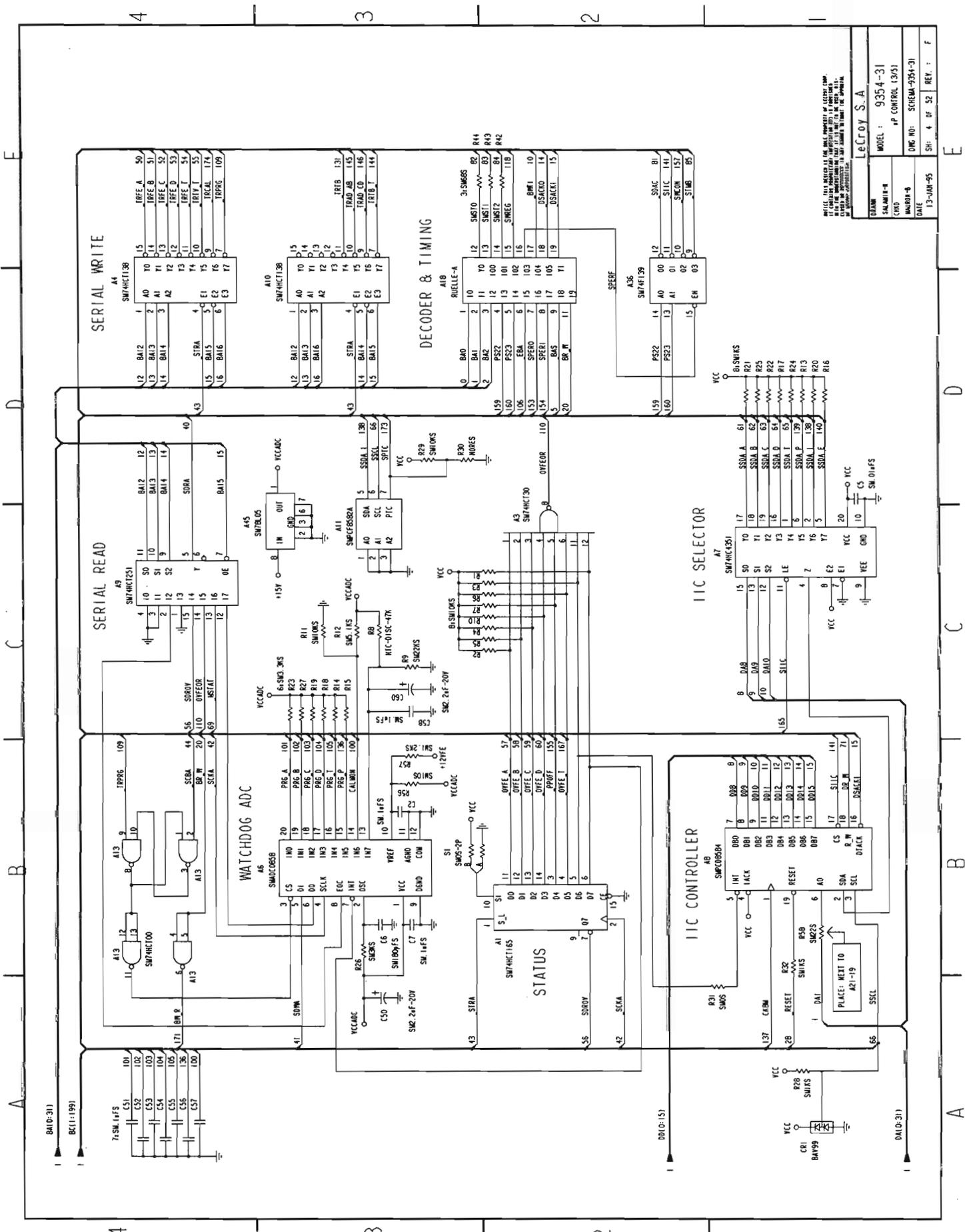
THIS IS THE ORIGINAL AND THE PROPERTY OF LEICROY CORP.
 IT IS TO BE USED ONLY FOR THE PURPOSES OF THE ORIGINAL
 ORDER. NO REPRODUCTION OR ALTERATION OF THIS DRAWING
 IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF LEICROY CORP.

LeCroy S.A.	
STRAW	MODEL : 9354-31
SALINIE-R	TOP LEVEL (1/71)
CARD	
LENAME-RL	DWG NO: SCHEMA-9354-31
DATE	SH: 1 OF 52 REV: F
13-JAN-95	



PLEASE REFER TO THE MOUNTING INSTRUCTIONS FOR THE BOARD TO BE USED IN THIS CASE.
IT IS THE USER'S RESPONSIBILITY TO VERIFY THE BOARD IS PROPERLY MOUNTED AND THE BOARD IS
CORRECTLY CONNECTED TO THE SYSTEM. THE BOARD IS NOT GUARANTEED TO BE WORKING
IF NOT MOUNTED AND CONNECTED AS SHOWN.

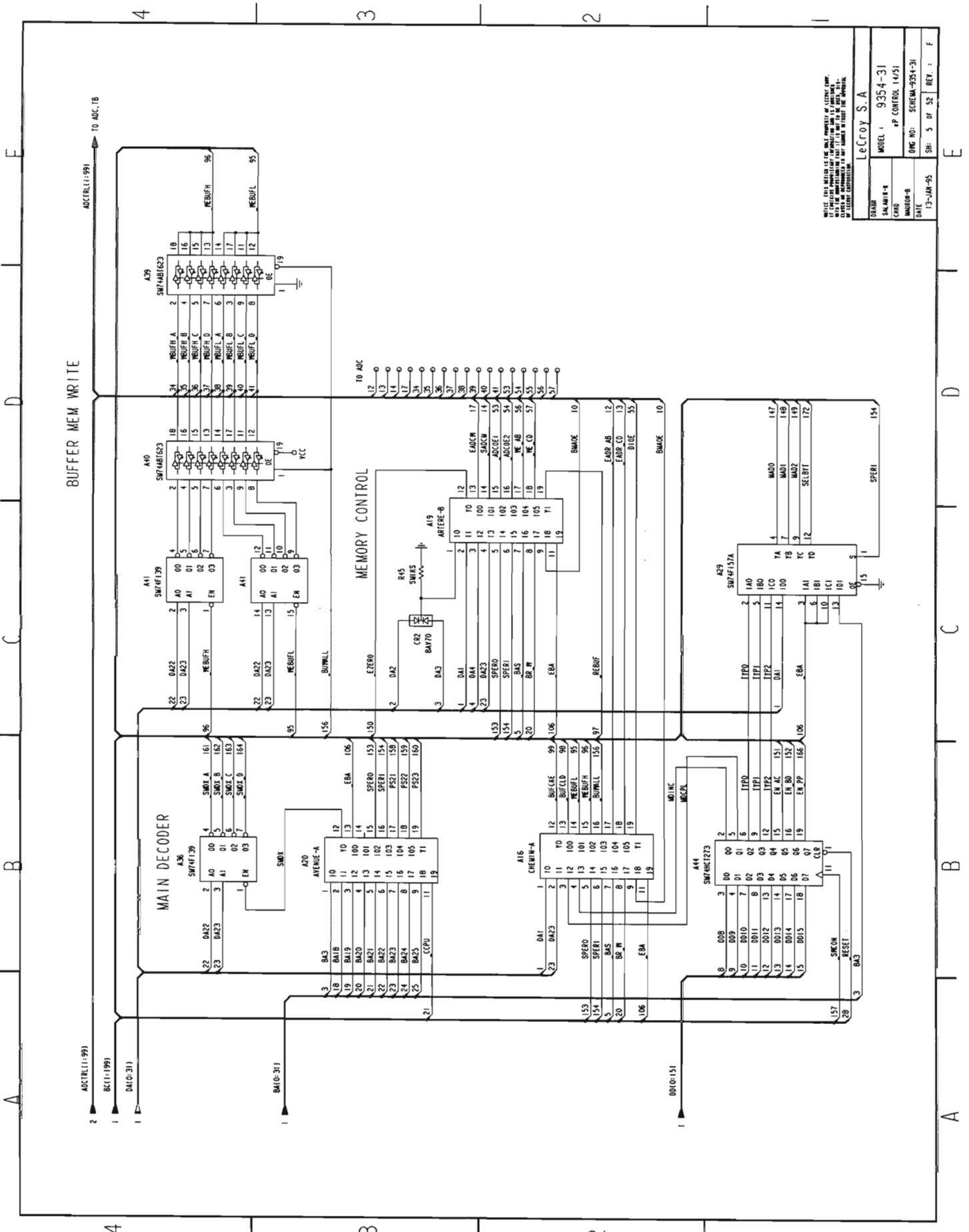
LeCroy S.A.	
MODEL :	9354-31
REV :	#P CONTROL 11/51
DATE :	13-JAN-95
SH :	2 OF 52
REV :	F



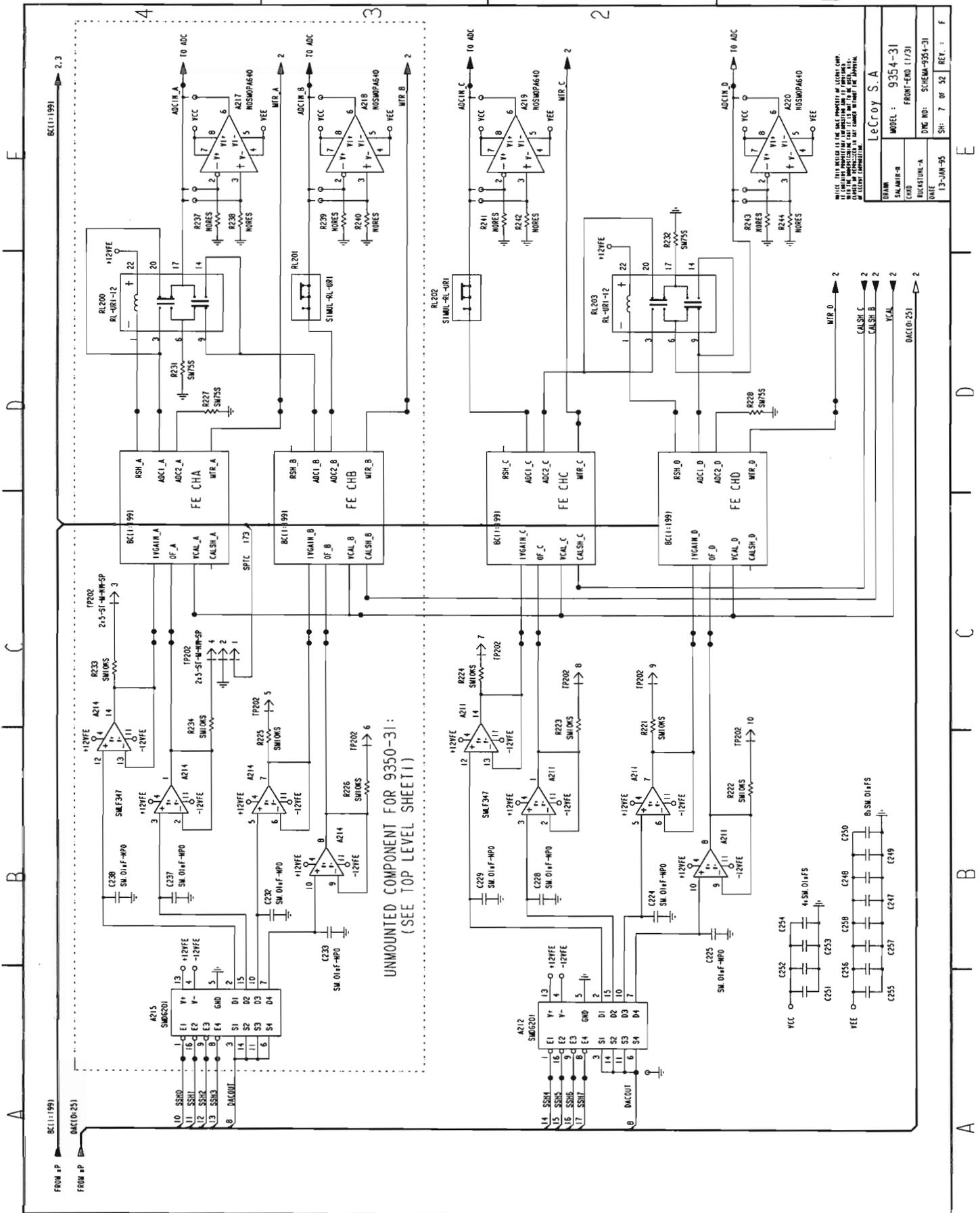
PLEASE REFER TO THE DATA SHEET FOR THE FULL SPECIFICATIONS OF THE MICROCONTROLLER. THE MICROCONTROLLER IS A REGISTERED TRADEMARK OF MICROCHIP CORPORATION. ALL OTHER TRADEMARKS ARE THE PROPERTY OF THEIR RESPECTIVE OWNERS.

LeCroy S.A.
MODEL: 9354-31
P.P. CONTROL 13/51
MANU-8
DATE: 13-JAN-95
SH: 4 OF 52
REV: F

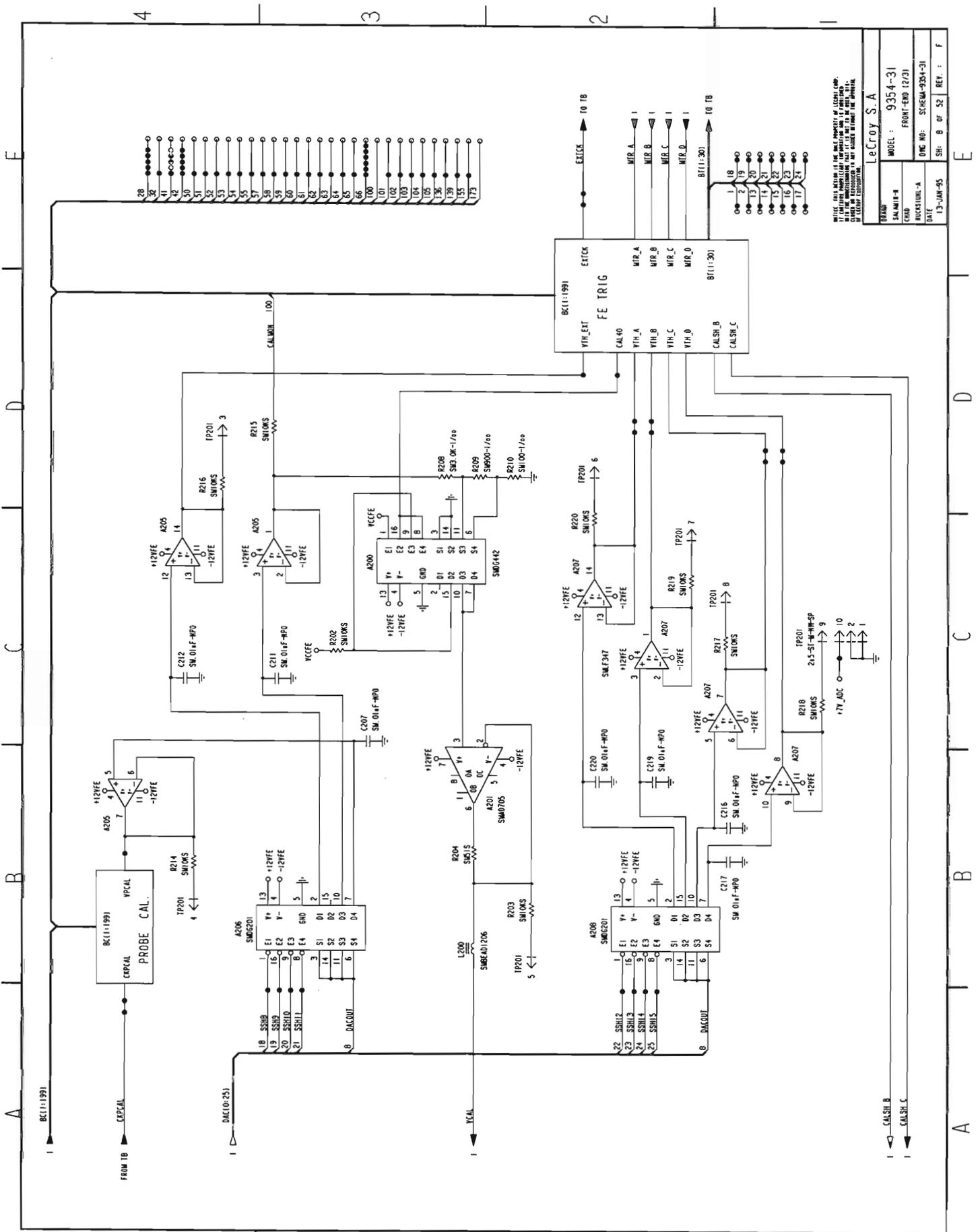
Section 8 Schematics, Layouts, Parts list



Section 8 Schematics, Layouts, Parts list



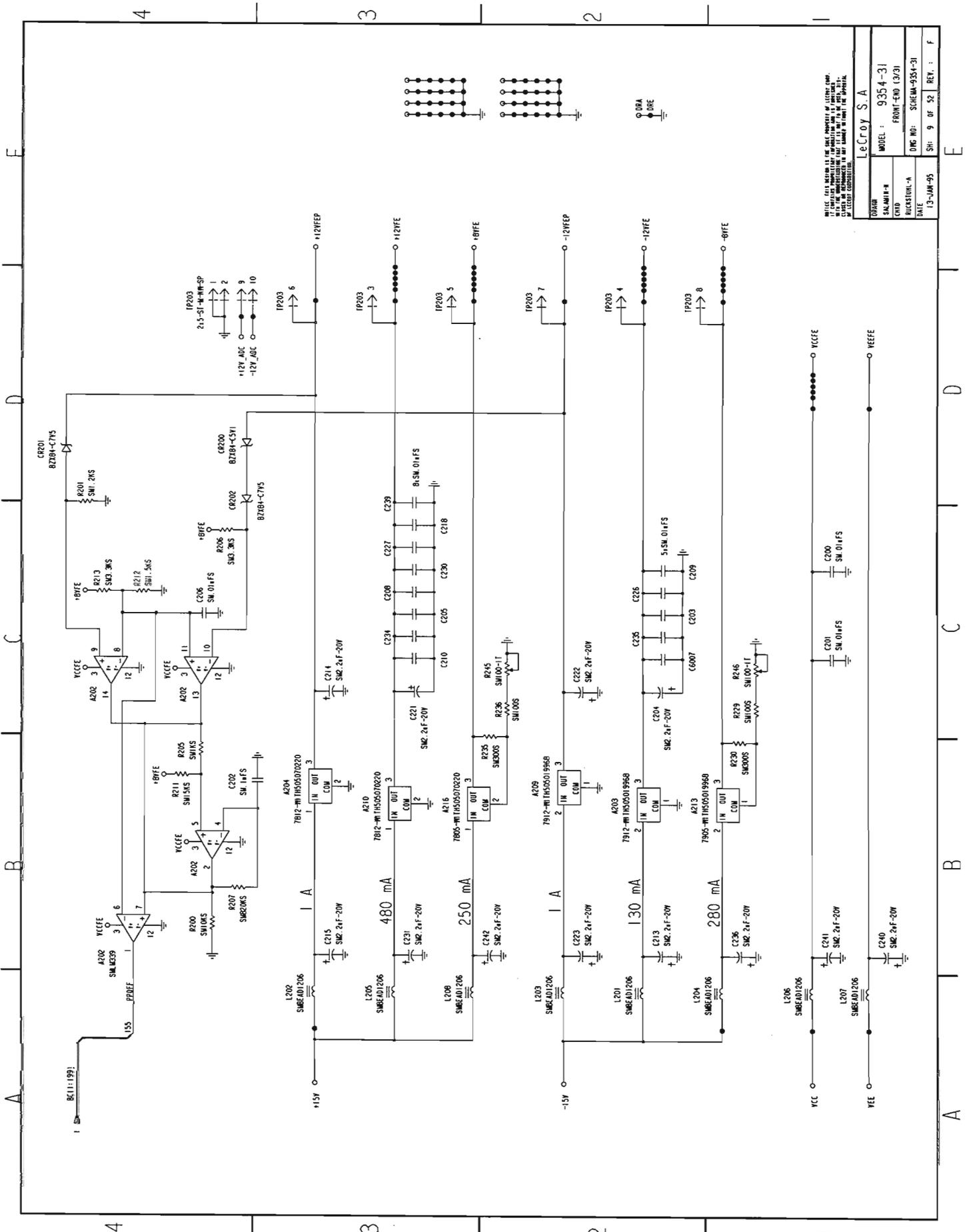
DRAMA	LeCroy, S.A
SN:AMIE-B	MODEL : 9354-31
CHD	FRONT-END (173)
BUCKSTOP-A	DWG NO: SCHEM-9354-31
DATE	13-JAN-95
	SH: 7 OF 52
	REV. : F



NOTICE: THIS DRAWING IS THE SOLE PROPERTY OF LEICOL COMPANY. IT IS TO BE USED FOR THE MANUFACTURE OF THE PRODUCT IDENTIFIED HEREIN. IT IS TO BE KEPT IN CONFIDENTIALITY AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF LEICOL COMPANY.

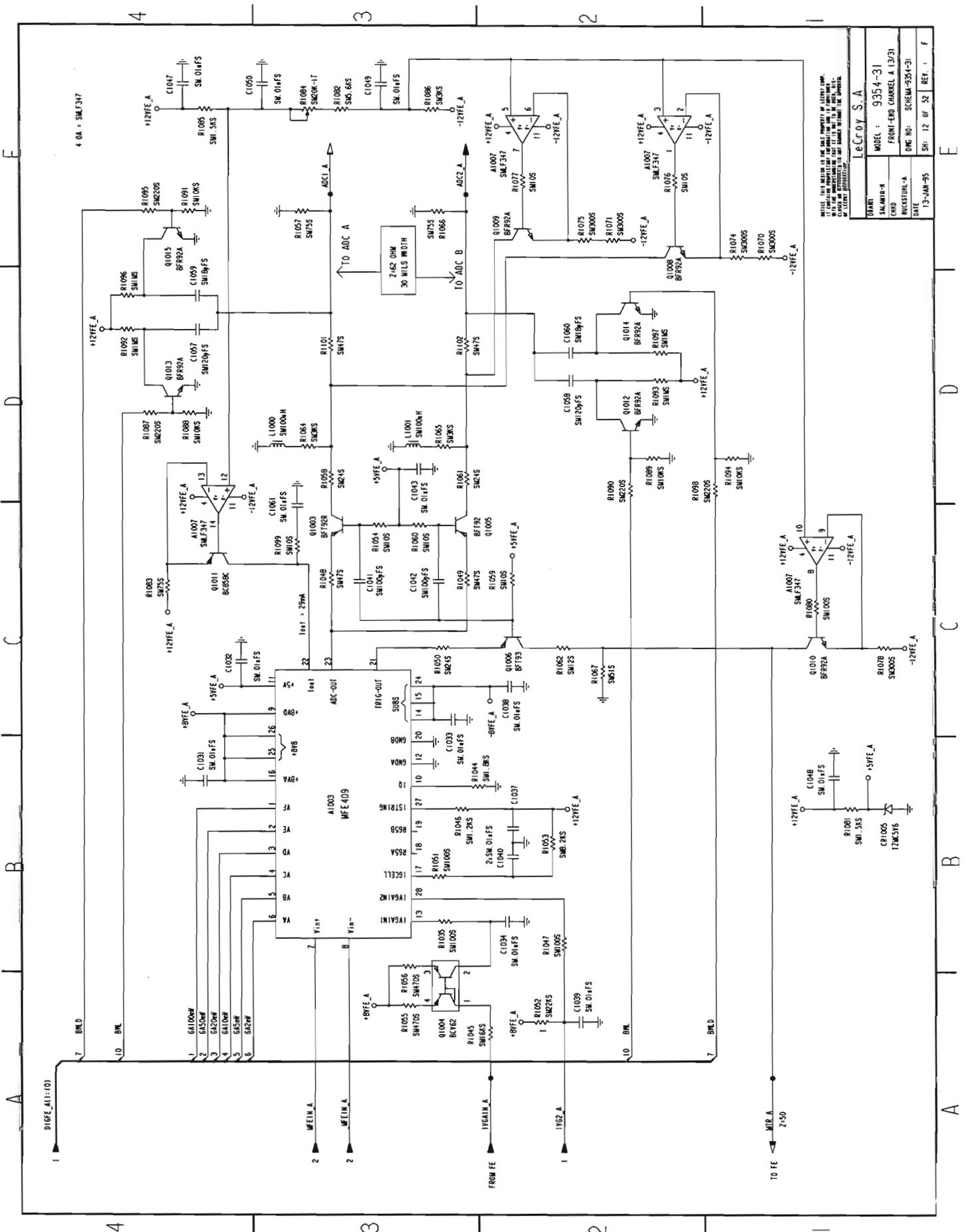
DATE	13-JUN-95
DESIGNER	LeCroy S.A
DWG NO:	SCHEM-9354-31
REV:	B of 52
MODEL:	9354-31
FRONT-END:	(2/2)
BUCKLEUP:	A

Section 8 Schematics, Layouts, Parts list

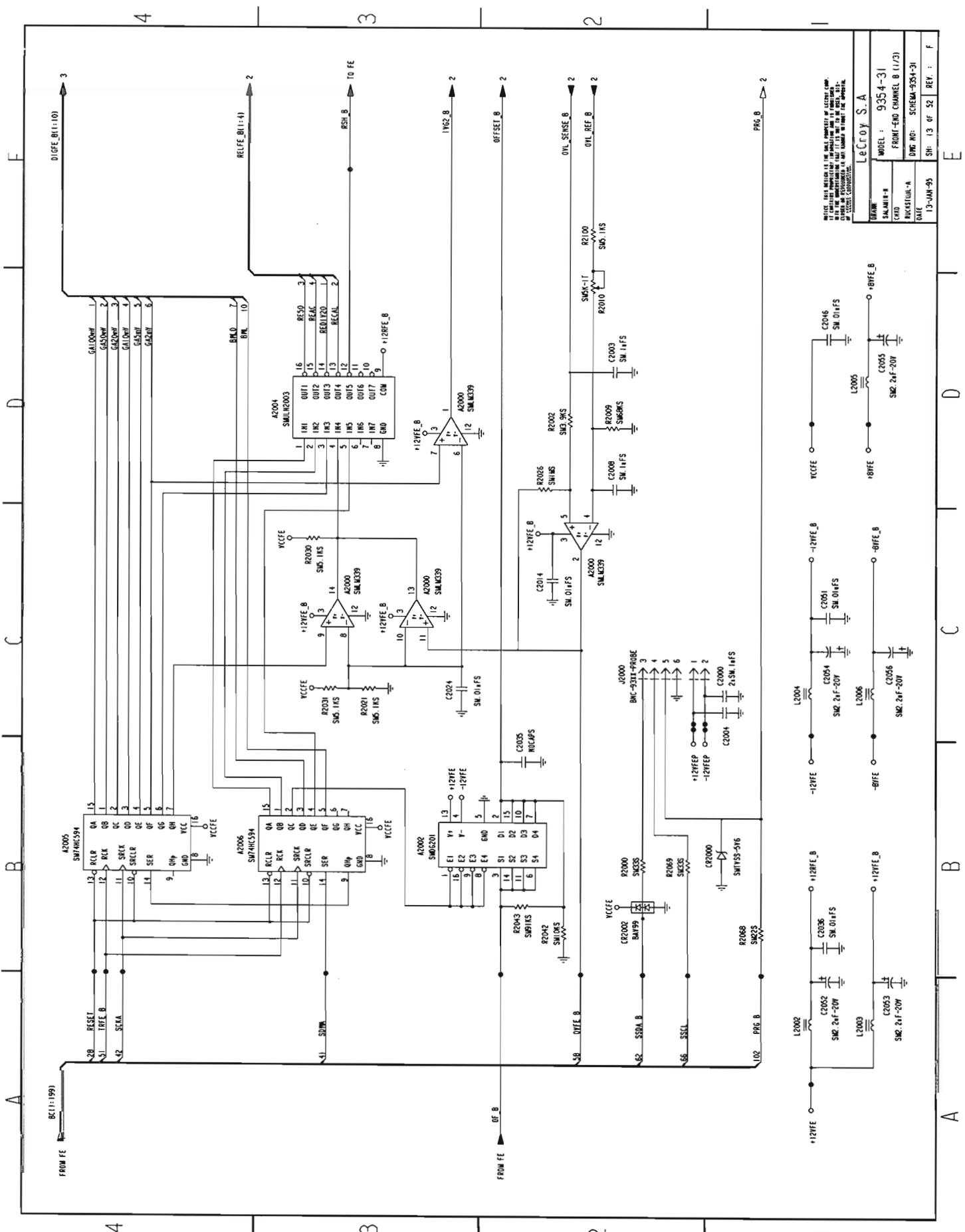


NOTICE: THIS DRAWING IS THE SOLE PROPERTY OF ALTECH CORP. NO PART OF THIS DRAWING IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF ALTECH CORP.

LeCroy S.A	
FORM	MODEL : 9354-31
SAN-MTH-N	FRONT-ENH (2/91)
COND	REVISION-N
DATE	DWG NO: SCHEM-9354-31
13-JAN-95	SHT: 9 OF 52 REV: F

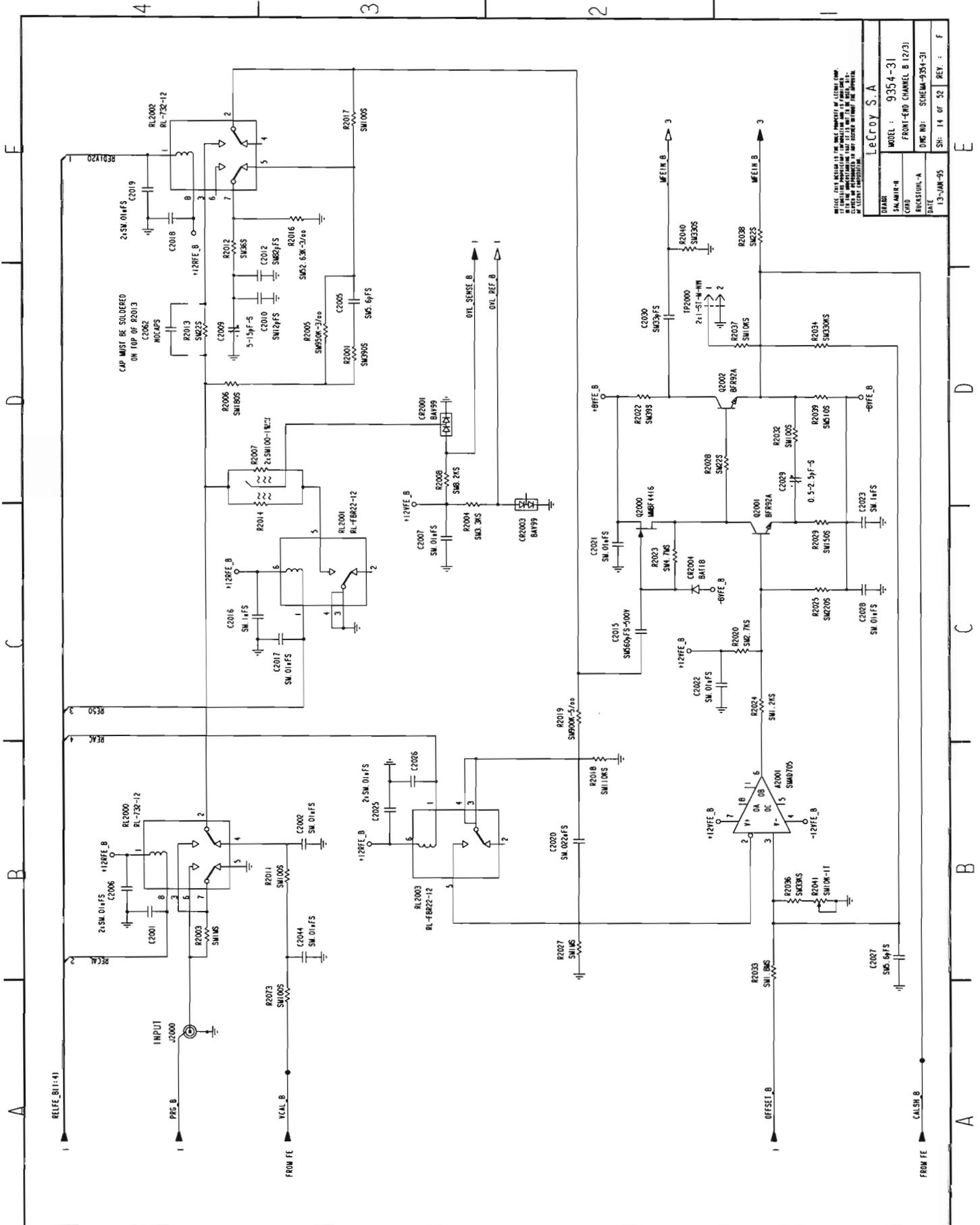


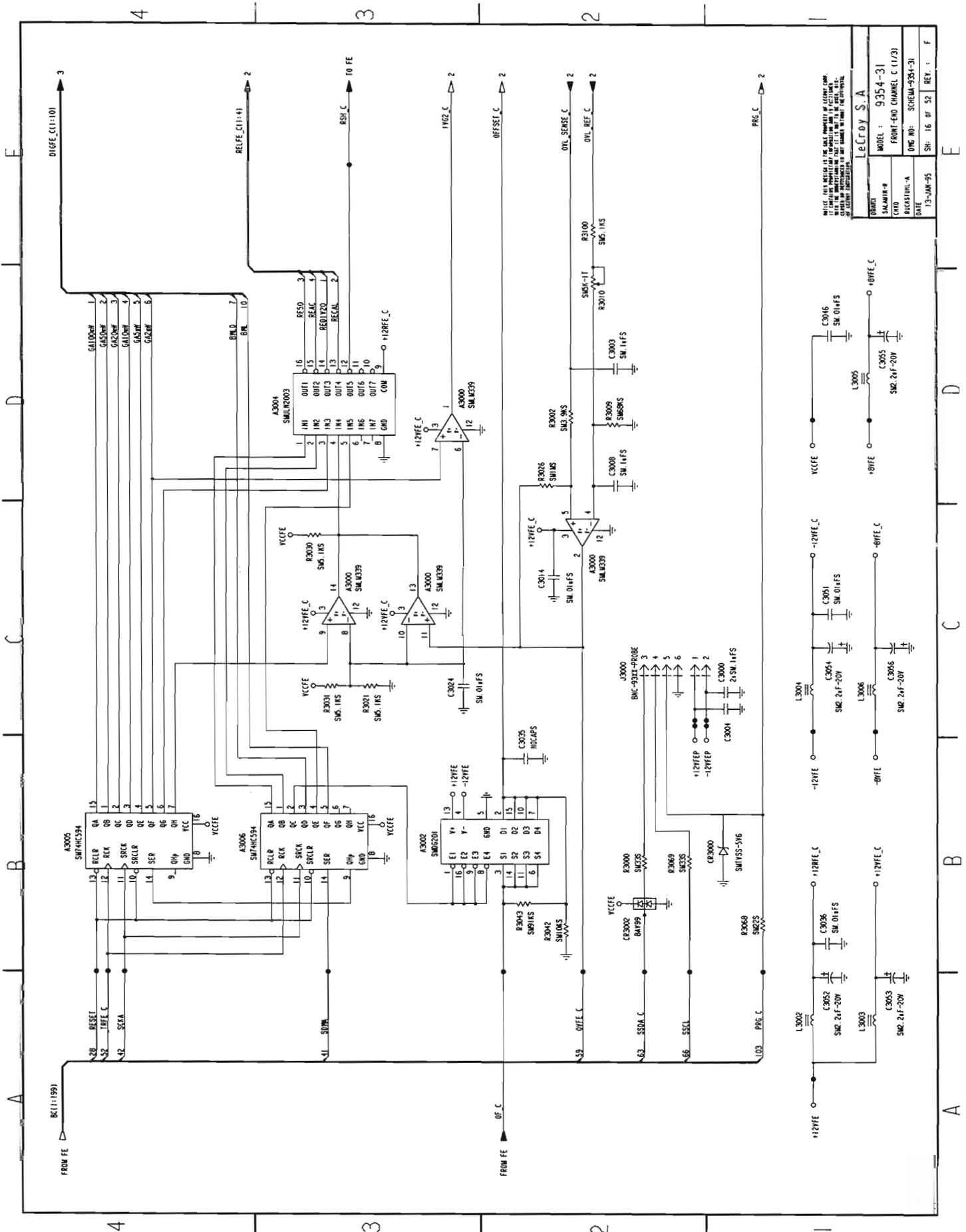
Section 8 Schematics, Layouts, Parts list



REV. THIS DRAWING IS THE FINAL REVISED DRAWING. ALL CHANGES INDICATED BY THE MANUFACTURER OF THE ORIGINAL DRAWING ARE INCORPORATED INTO THIS DRAWING. THIS DRAWING IS NOT TO BE USED FOR REVISIONS OR REVISIONS TO THE ORIGINAL DRAWING. ALL CHANGES TO THE ORIGINAL DRAWING MUST BE APPROVED BY THE ORIGINAL DRAWING ENGINEER.	
REV. NO.	13-JAN-95
DWG. NO.	SCHEM-9354-31
MODEL	9354-31
FRONT-END CHANNEL B (1/3)	
BACK-END CHANNEL A	
DATE	13-JAN-95
REV.	13 OF 52
REV.	F

LeCroy S.A.

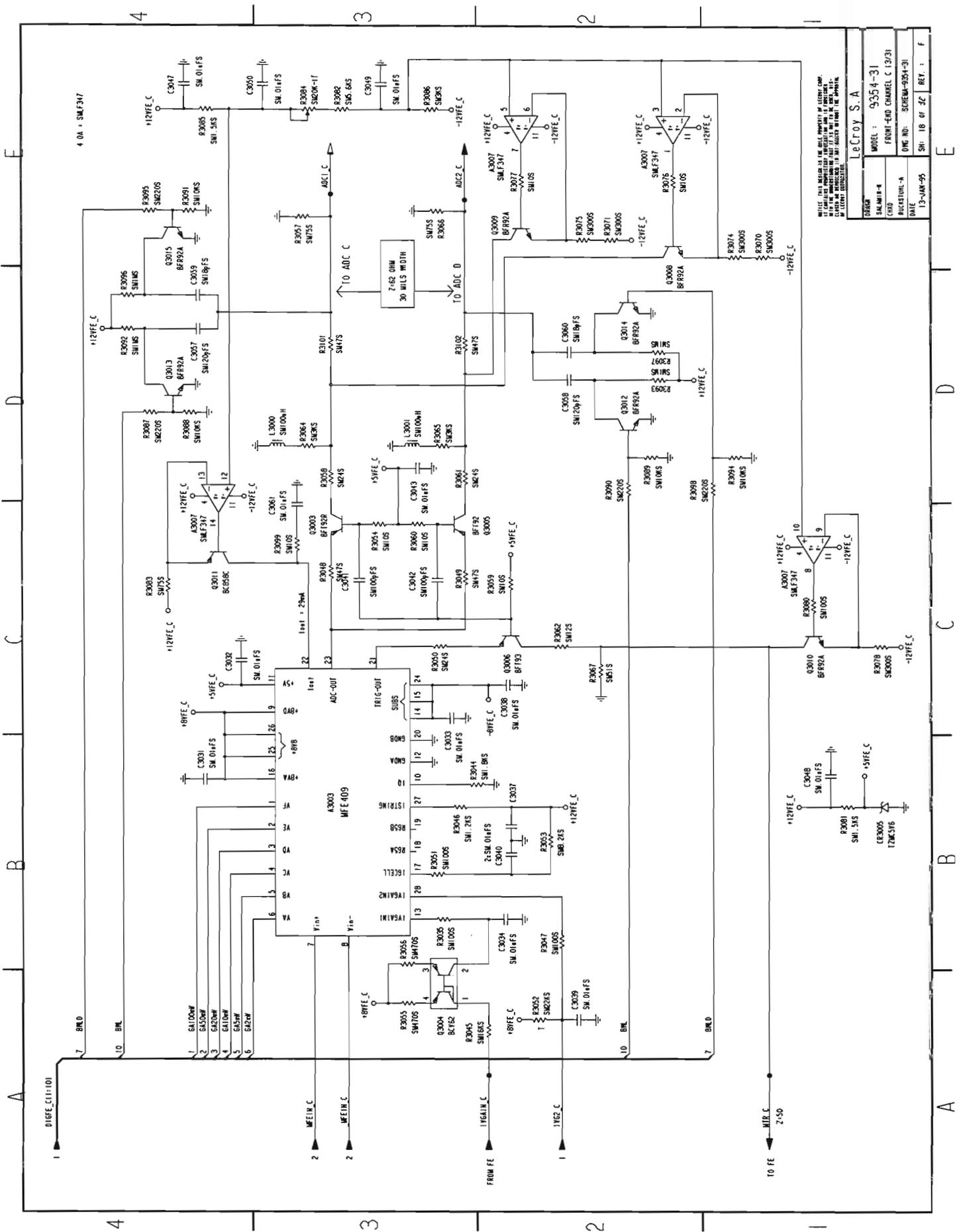




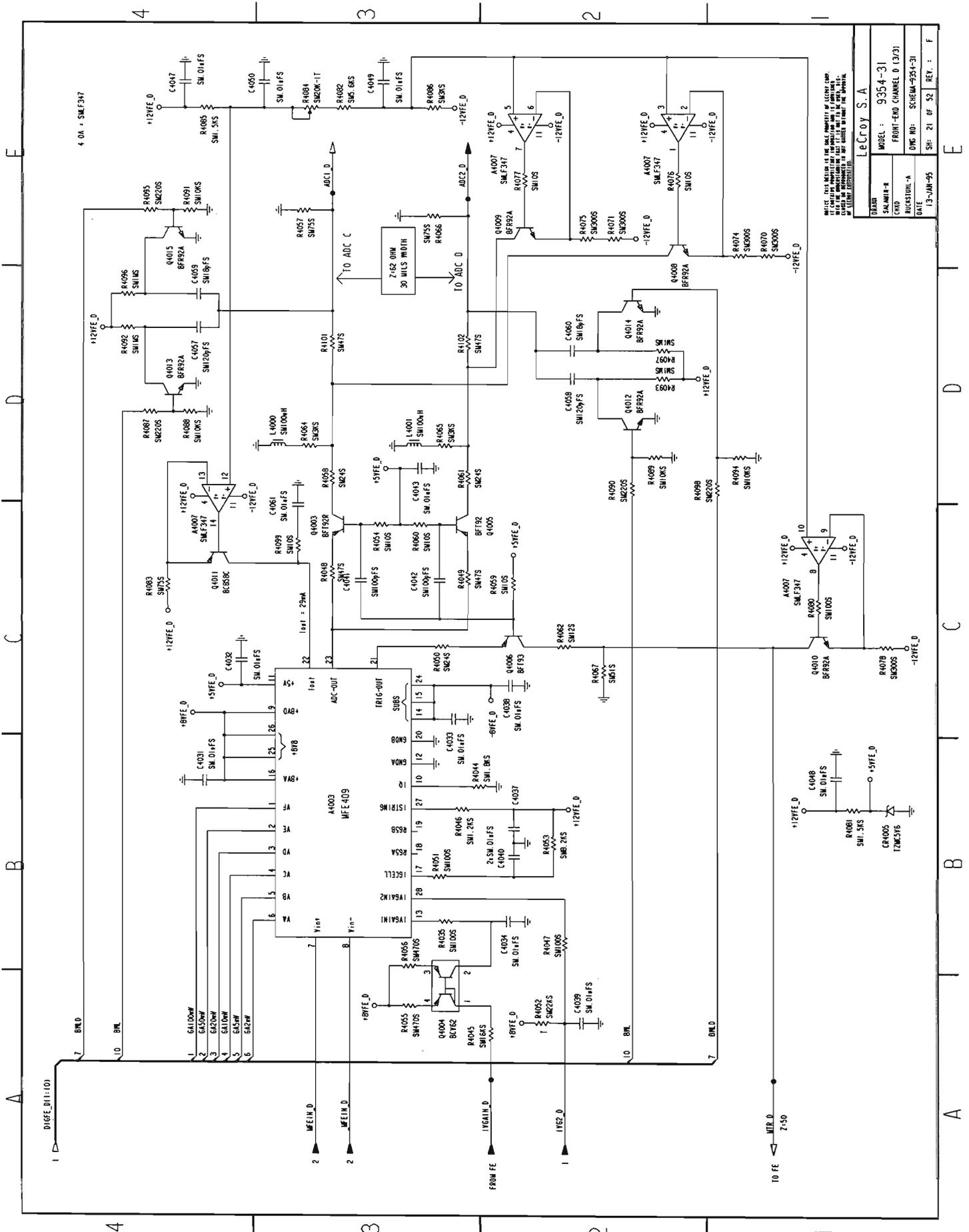
NOTE: THIS SCHEMATIC IS THE PROPERTY OF LEYBOLD COMP. IT IS TO BE USED ONLY FOR THE EQUIPMENT AND PARTS LISTED HEREIN. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

MODEL :	9354-31
FRONT-END CHANNEL C (1/3)	
DWG NO :	SCHEM-9354-31
DATE :	13-JAN-95
REV :	F

LeCroy S.A

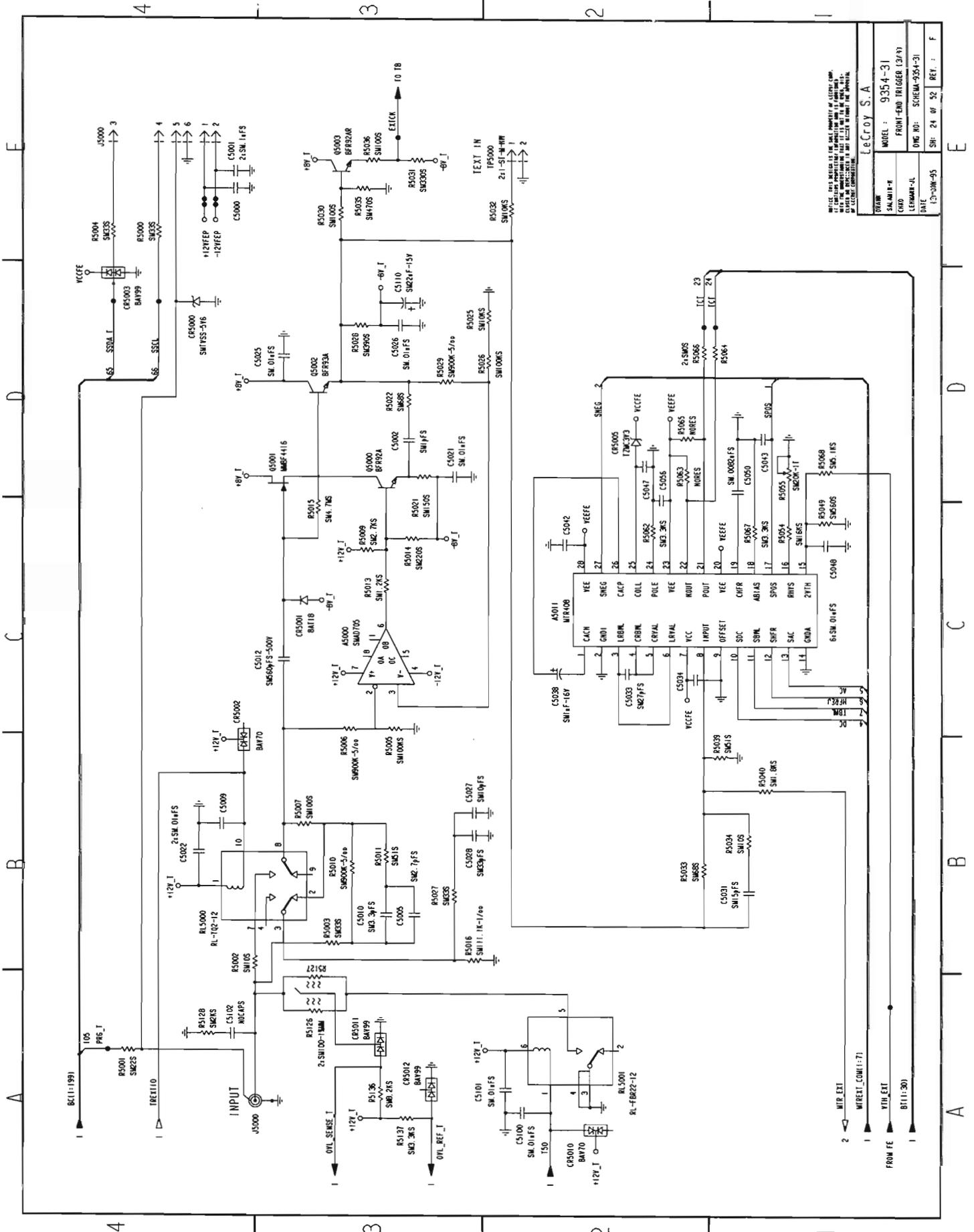


LeCroy S.A.	
MODEL :	9554-31
FRONT-END CHANNEL C13/31	
DATE :	13-JAN-95
REV :	F



NOTE: THIS MODEL IS THE SINGLE PROPERTY OF ALLEN-DAVIDSON. IT IS THE PROPERTY OF ALLEN-DAVIDSON AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

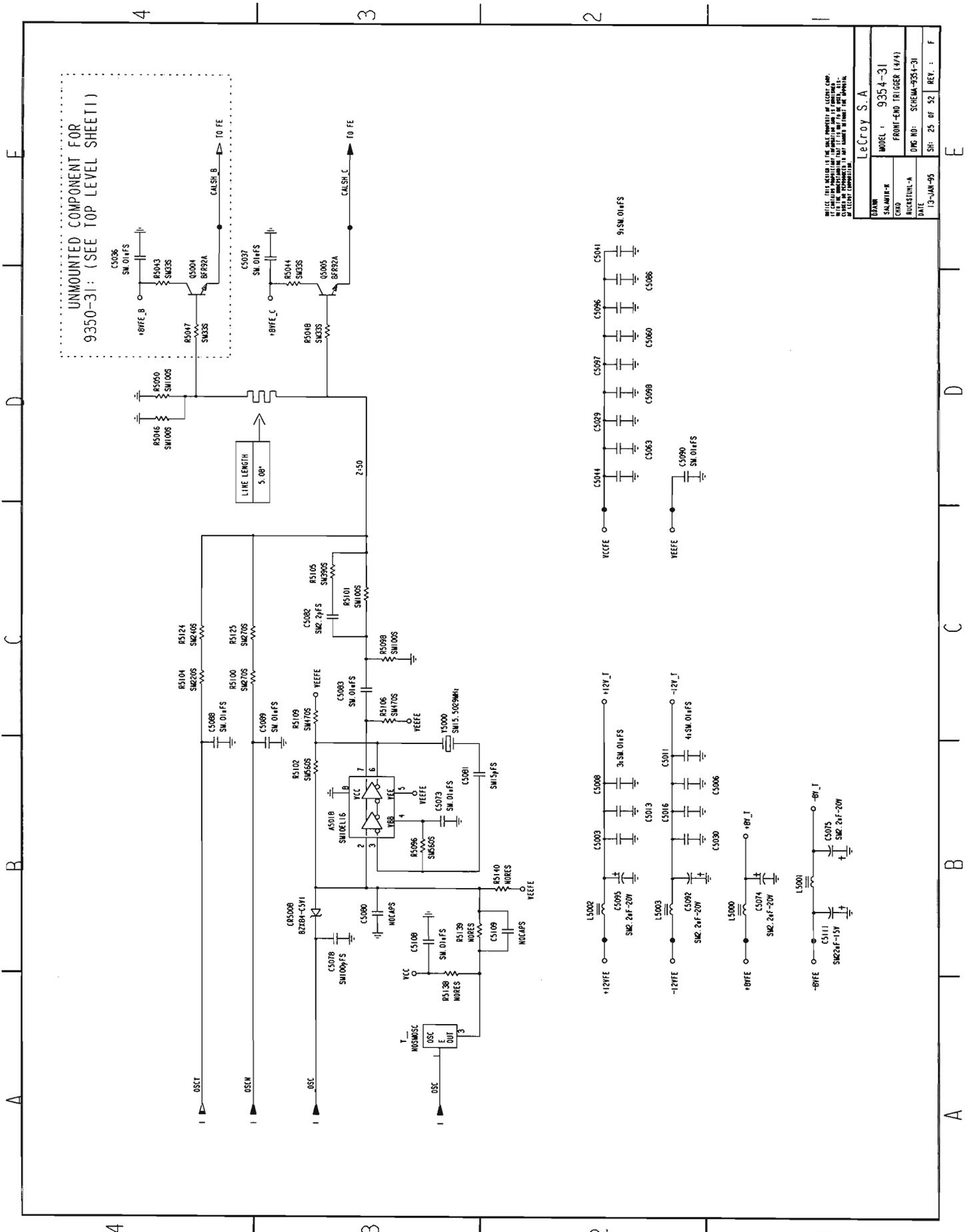
TRAINER	LeCroy S.A.
MODEL	9354-31
FRONT-END CHANNEL	D 13/31
DATE	13-JUN-95
REV.	F



PLEASE NOTE: THIS MANUAL IS THE SOLE PROPERTY OF LEICROY CORP. IT IS LOANED TO YOU FOR YOUR INFORMATION ONLY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

FORM	LeCroy S.A.
SALINER-P	MODEL: 9354-31
CRD	FRONT-END TRIGGER (3/78)
LEHMAN-JL	ONE NO: SCHEM-9354-31
DATE	SH: 24 OF 52 REV: F
	13-JUN-95

Section 8 Schematics, Layouts, Parts list

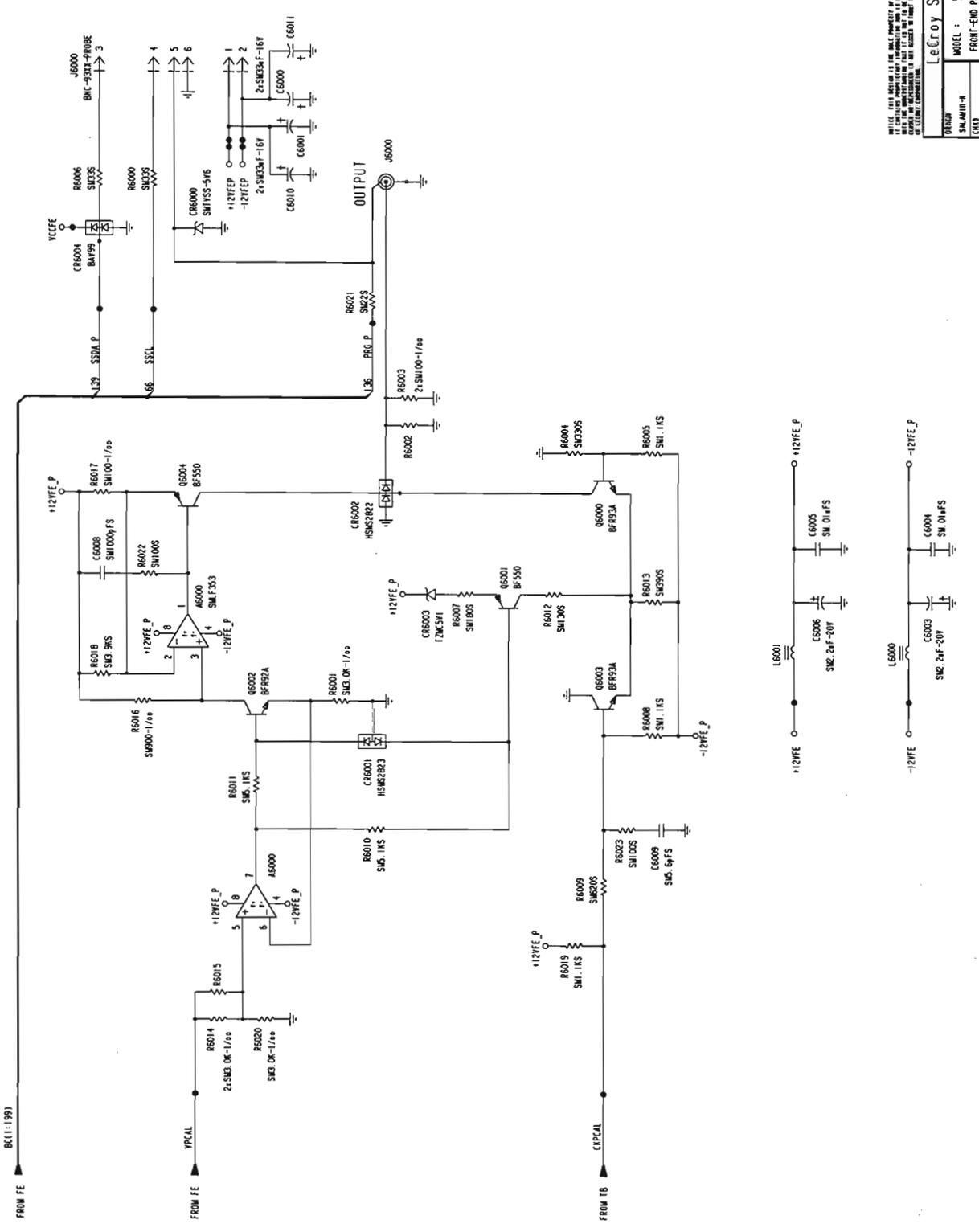


UNMOUNTED COMPONENT FOR 9350-31: (SEE TOP LEVEL SHEET)

PLEASE REFER TO THE TITLE PROPERTY OF THIS COMPANY. IT CAN BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM LeCroy S.A.

LeCroy S.A.	
MODEL :	9354-31
FRONT-END TRIGGER :	L474
REVISION :	A
DWG NO. :	SCHEM-9354-31
DATE :	13-JAN-95
SHEET :	25 OF 52
REV. :	F

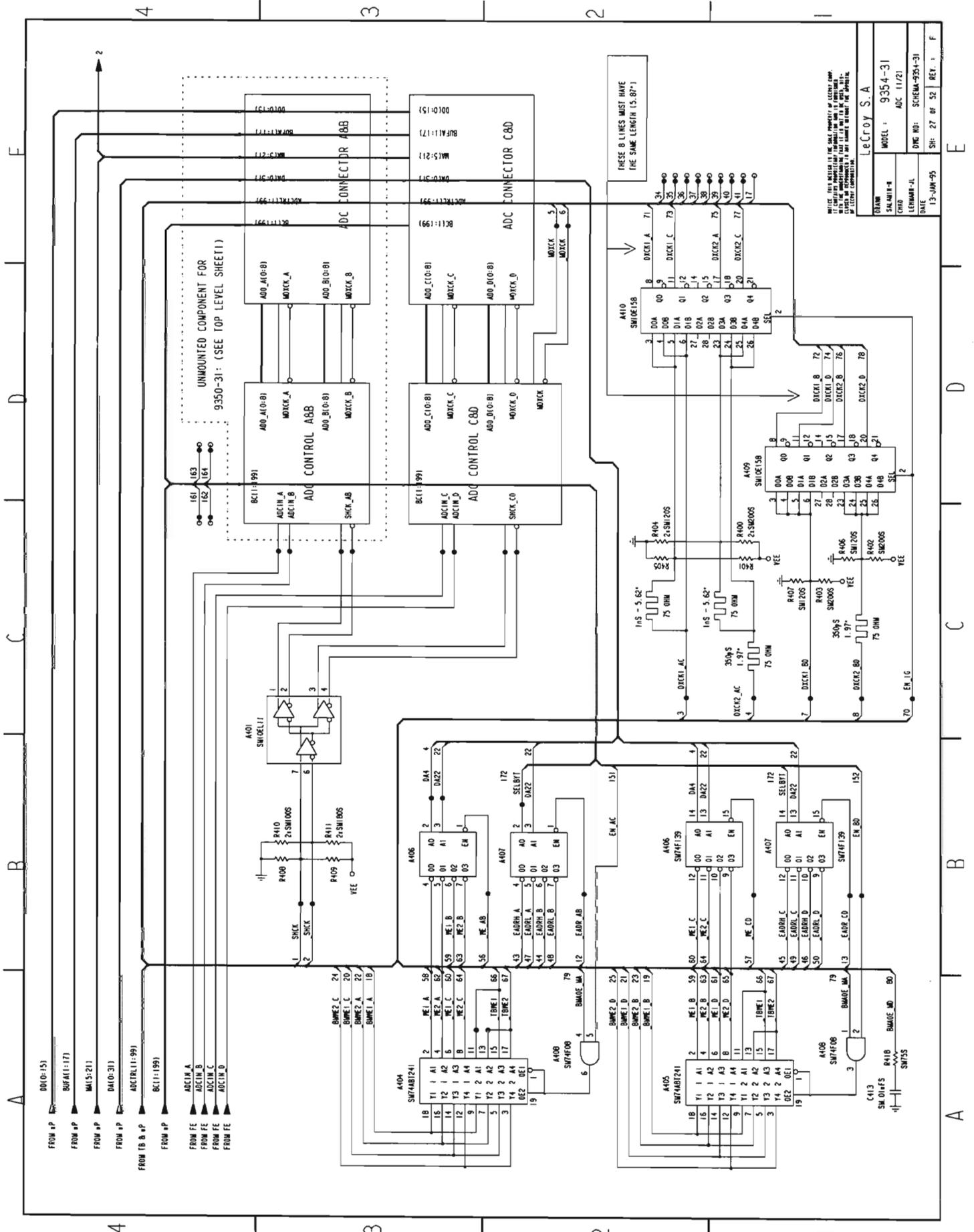
PROBE CALIBRATOR

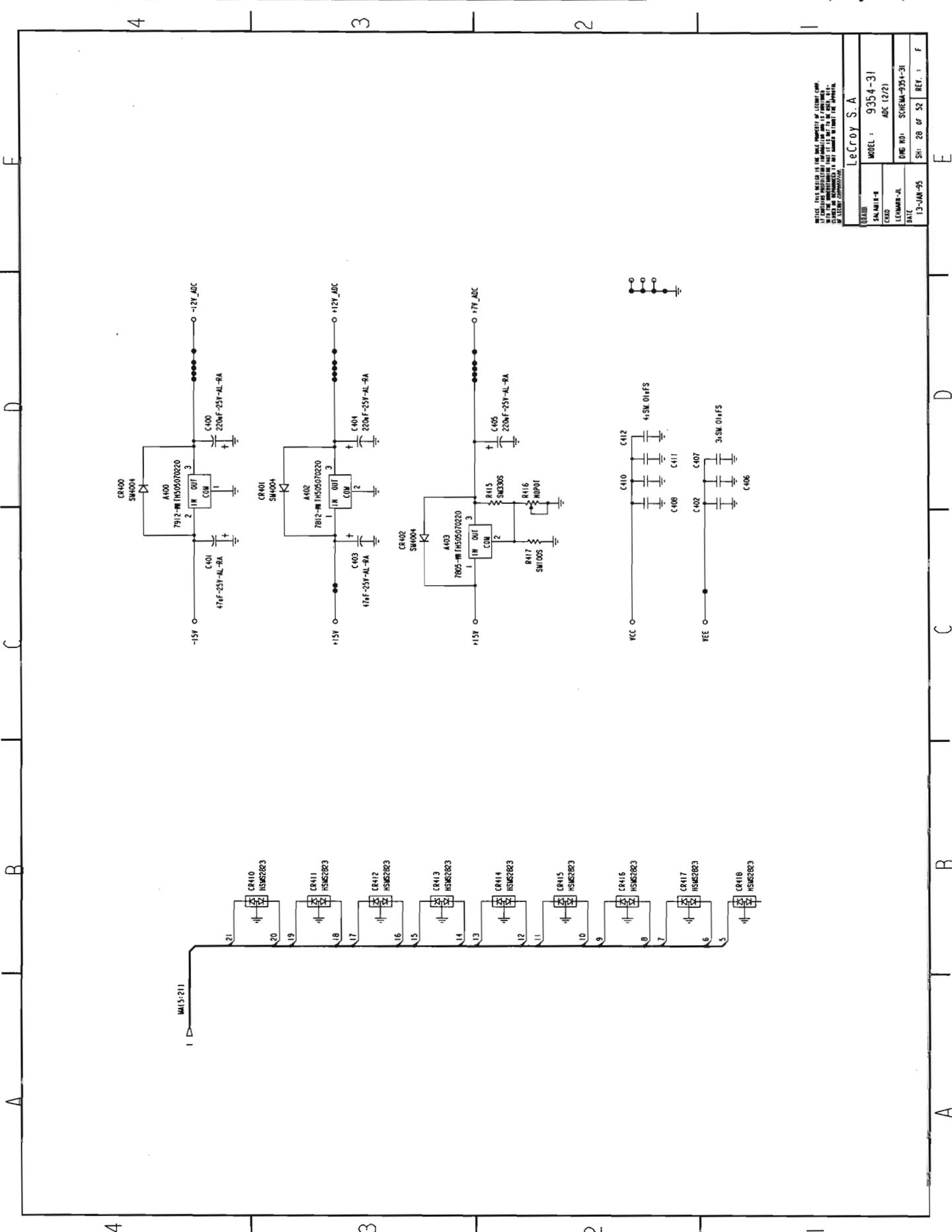


WHILE THIS SYSTEM IS THE PROPERTY OF LEICROY CORP. IT IS TO BE USED ONLY FOR THE PURPOSES INTENDED. NO PARTS OR MATERIALS ARE TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEICROY CORP.

LeCroy S.A.	
GROUP	MODEL : 9354-31
S/N:MMH-R	FRONT-END PROBE CAL. (1/1)
CNO	DWG NO: SCHEM-9354-31
BUCKSTAIR-A	DATE
13-JAN-95	SH: 26 BF 52 RET. : F

Section 8 Schematics, Layouts, Parts list

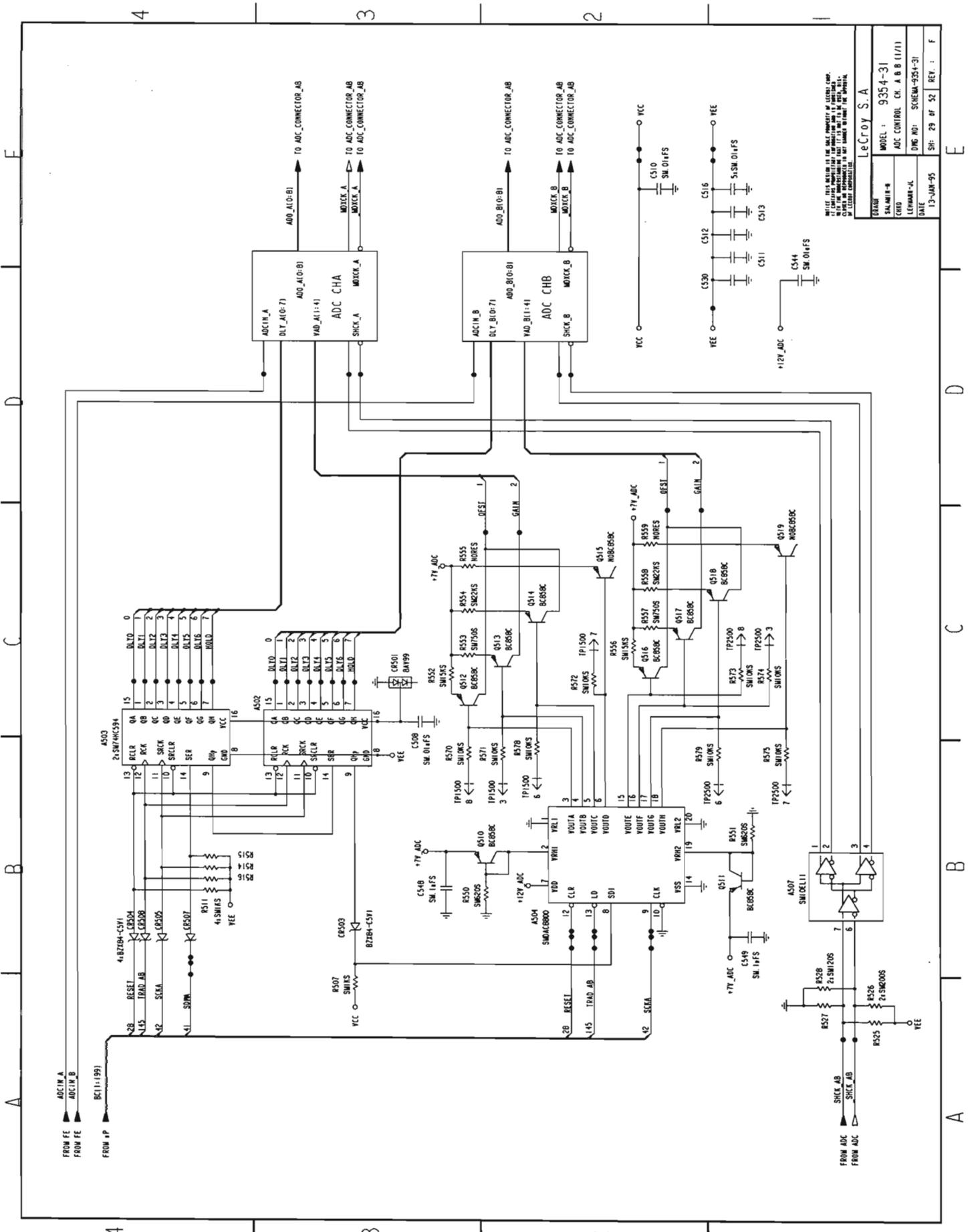


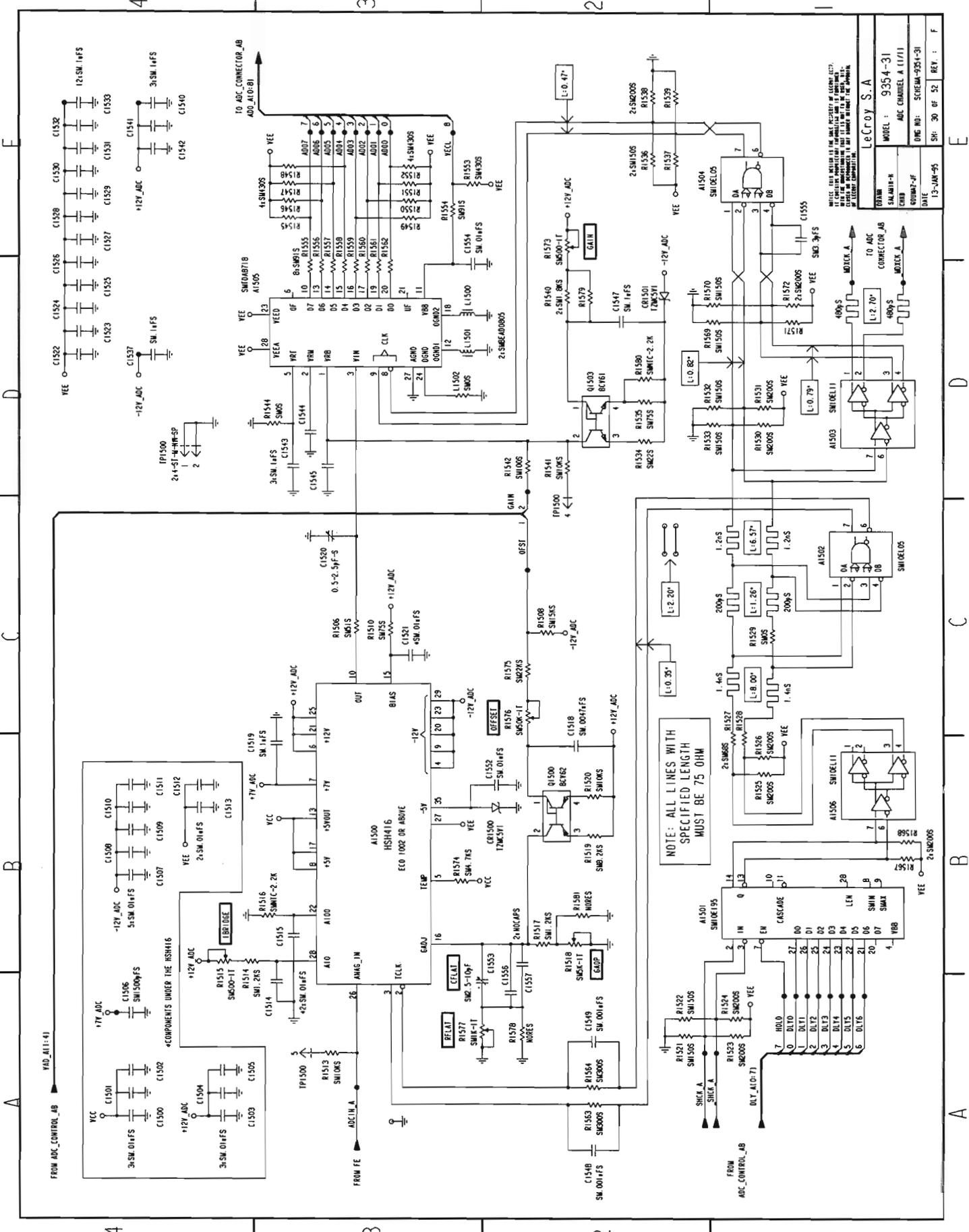


NOTICE: THIS DRAWING IS THE PROPERTY OF LECROY CORP. IT IS TO BE USED ONLY FOR THE MANUFACTURE OF LECROY EQUIPMENT. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF LECROY CORPORATION.

LeCroy S.A.	
MODEL :	9354-31
REV :	ABC (2/2)
DWG NO. :	SCHEMA-9354-31
DATE :	13-JUN-95
SHEET :	28 of 52
REF. :	F

Section 8 Schematics, Layouts, Parts list

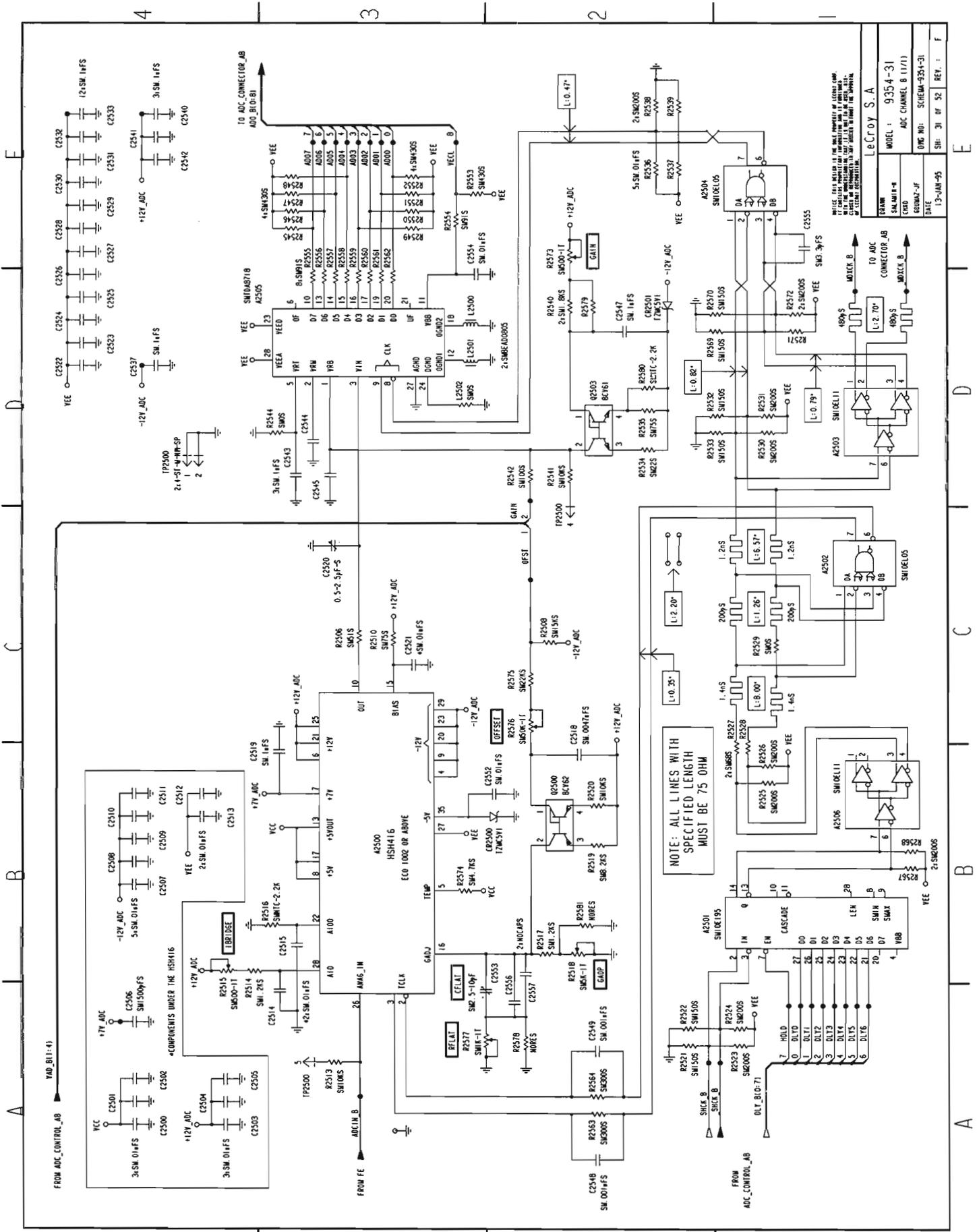




NOTE: THIS BOARD IS THE SAME EXCEPT FOR LEGEND 0277.
IT CARRIES AN ADDITIONAL 12-BIT ANALOG INPUT CHANNEL.
CHECK THE COMPONENTS IN THE BOARD FOR THE PARTS LIST.
USE THE COMPONENTS IN THE BOARD FOR THE PARTS LIST.

LeCroy S.A	
MODEL :	9354-31
SIN AMPL-H	ADC CHANNEL A (1/1)
FORM :	
REV :	000007-01
DATE :	13-JAN-95
SH :	30 OF 52
REV :	F

Section 8 Schematics, Layouts, Parts list

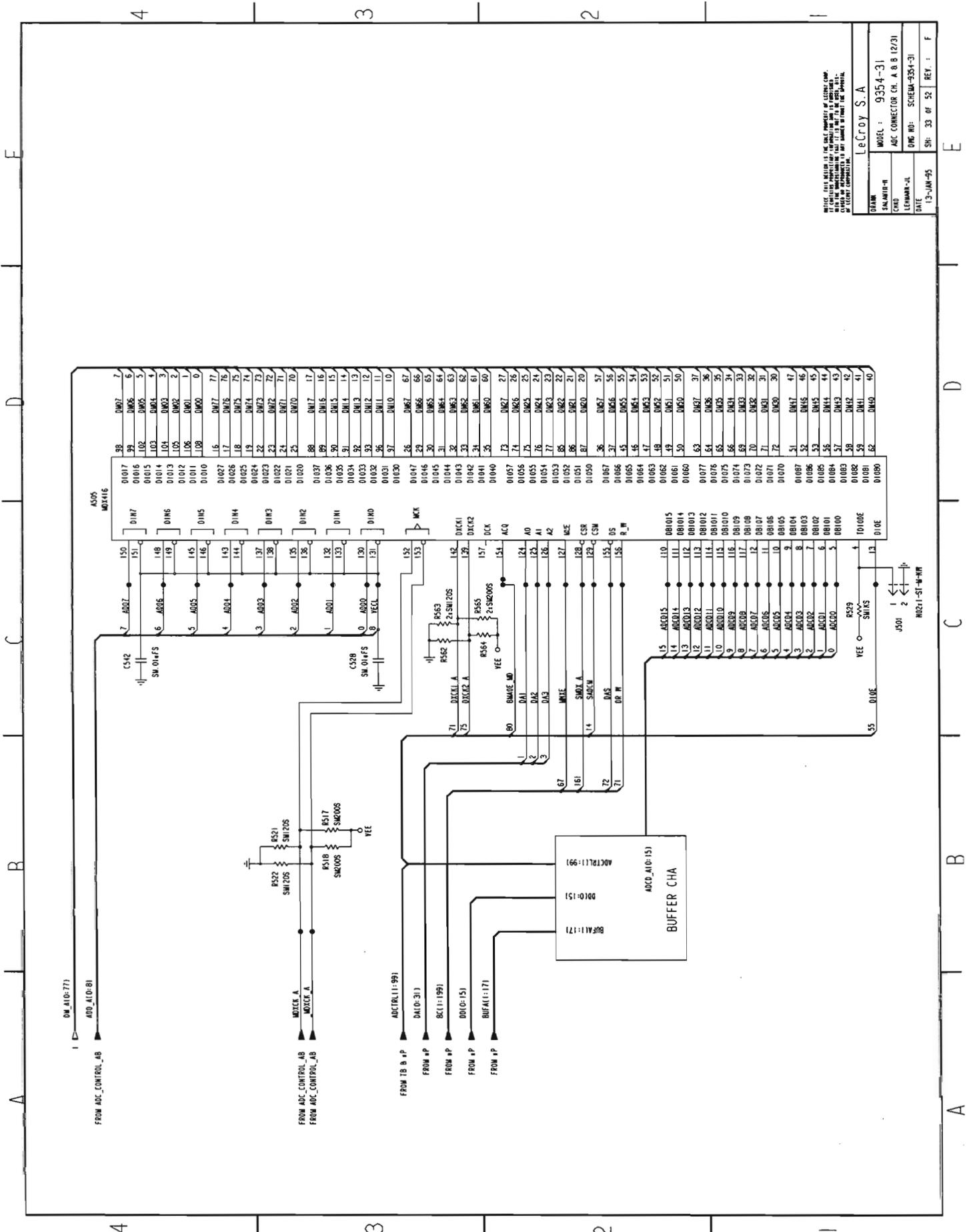


NOTE: THIS DRAWING IS THE WORK PRODUCT OF LEADERS CORP. IT IS THE PROPERTY OF LEADERS CORP. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEADERS CORP.

LeCroy S.A.
MODEL : 9354-31
ADC CHANNEL B (1/1)
REV : F
DATE : 13-JAN-95
SHEET : 31 OF 32

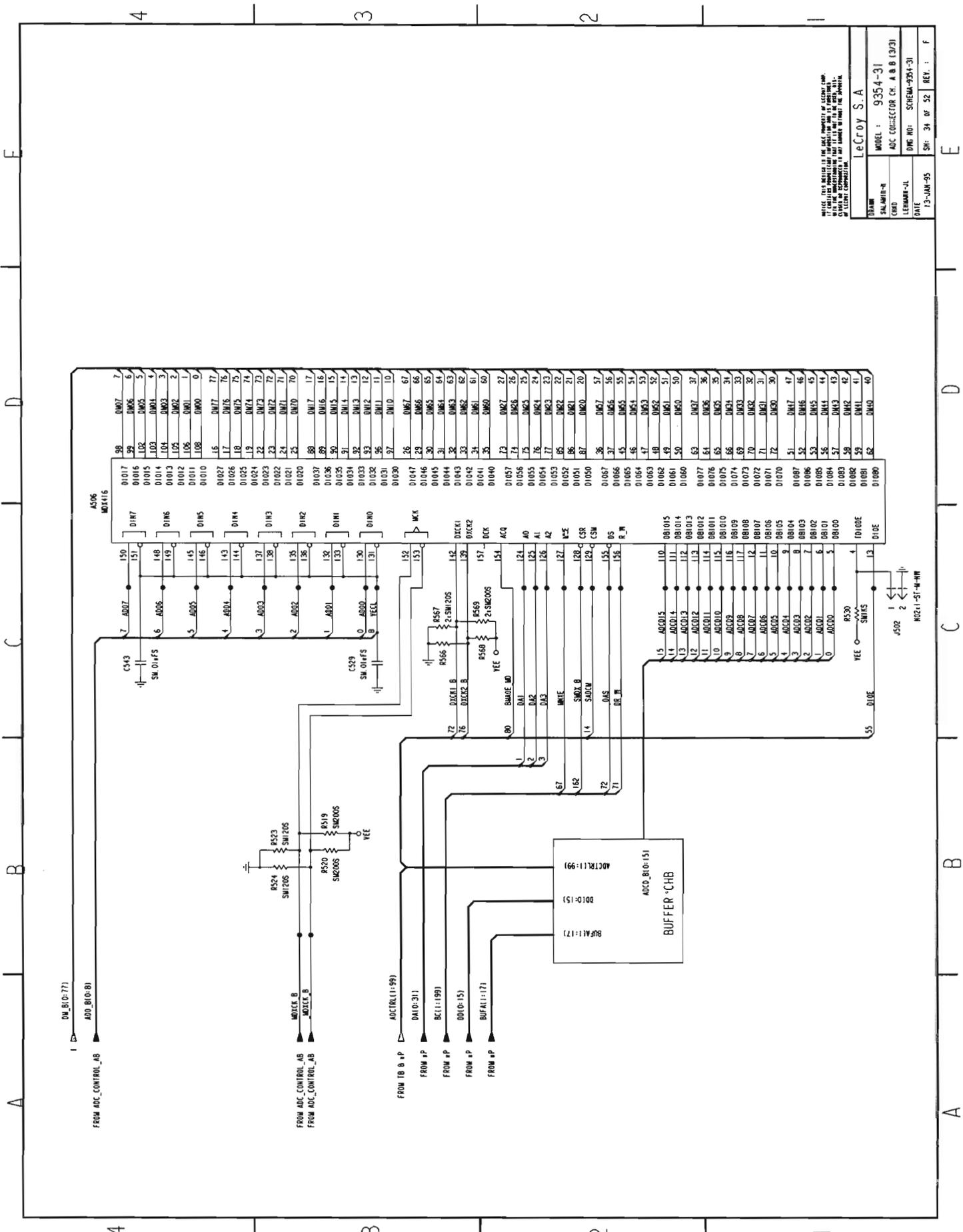
NOTE: ALL LINES WITH SPECIFIED LENGTH MUST BE 75 OHM

Section 8 Schematics, Layouts, Parts list

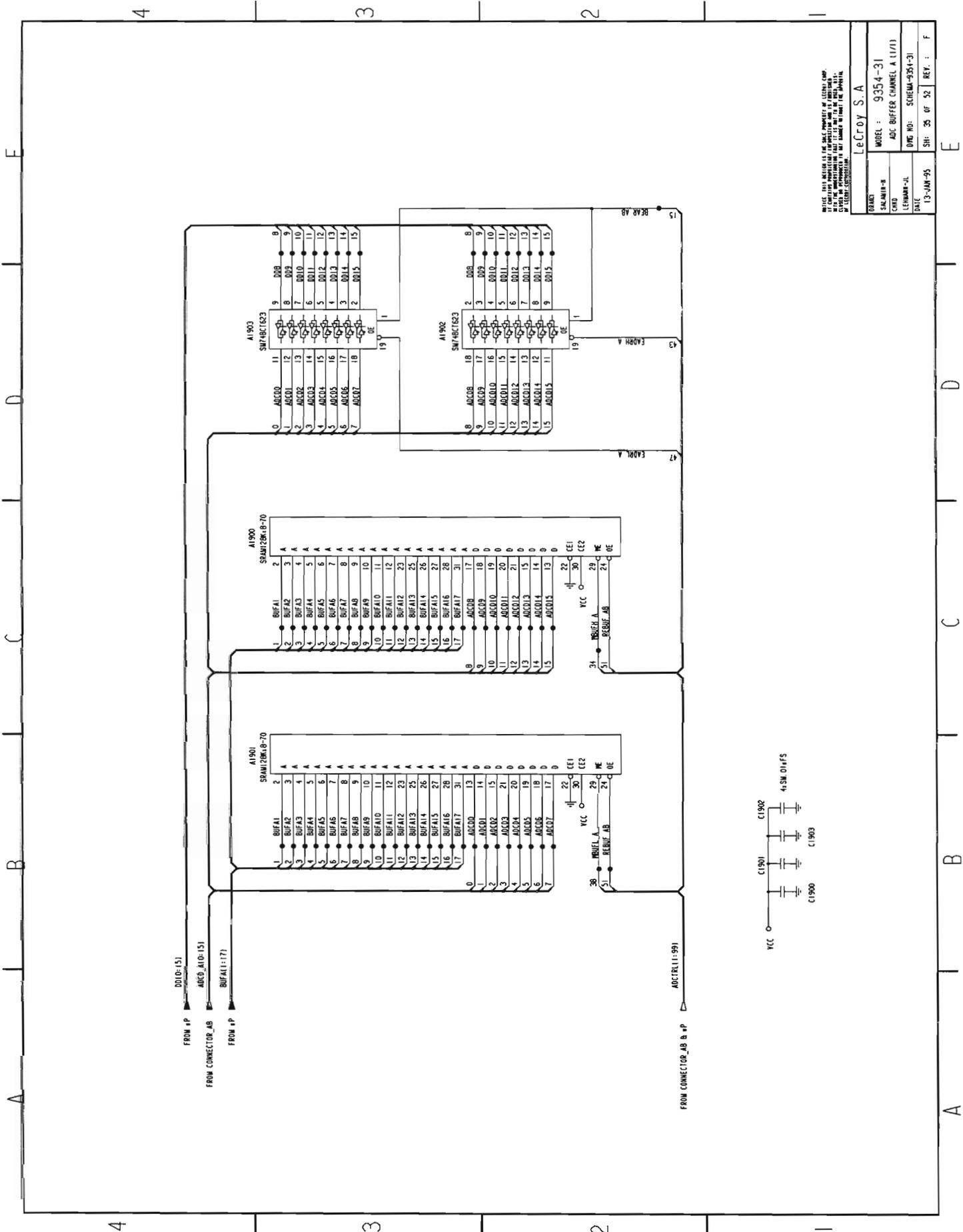


IF YOU ARE NOT SURE OF THE CORRECT PART NUMBER FOR YOUR BOARD, PLEASE CONTACT THE MANUFACTURER OF THE BOARD FOR THE CORRECT PART NUMBER.

DRAWN	LeCroy S.A.
MODEL	9354-31
ADC CONNECTOR	CH. A & B 12/31
DATE	13-JAN-95
REV.	F

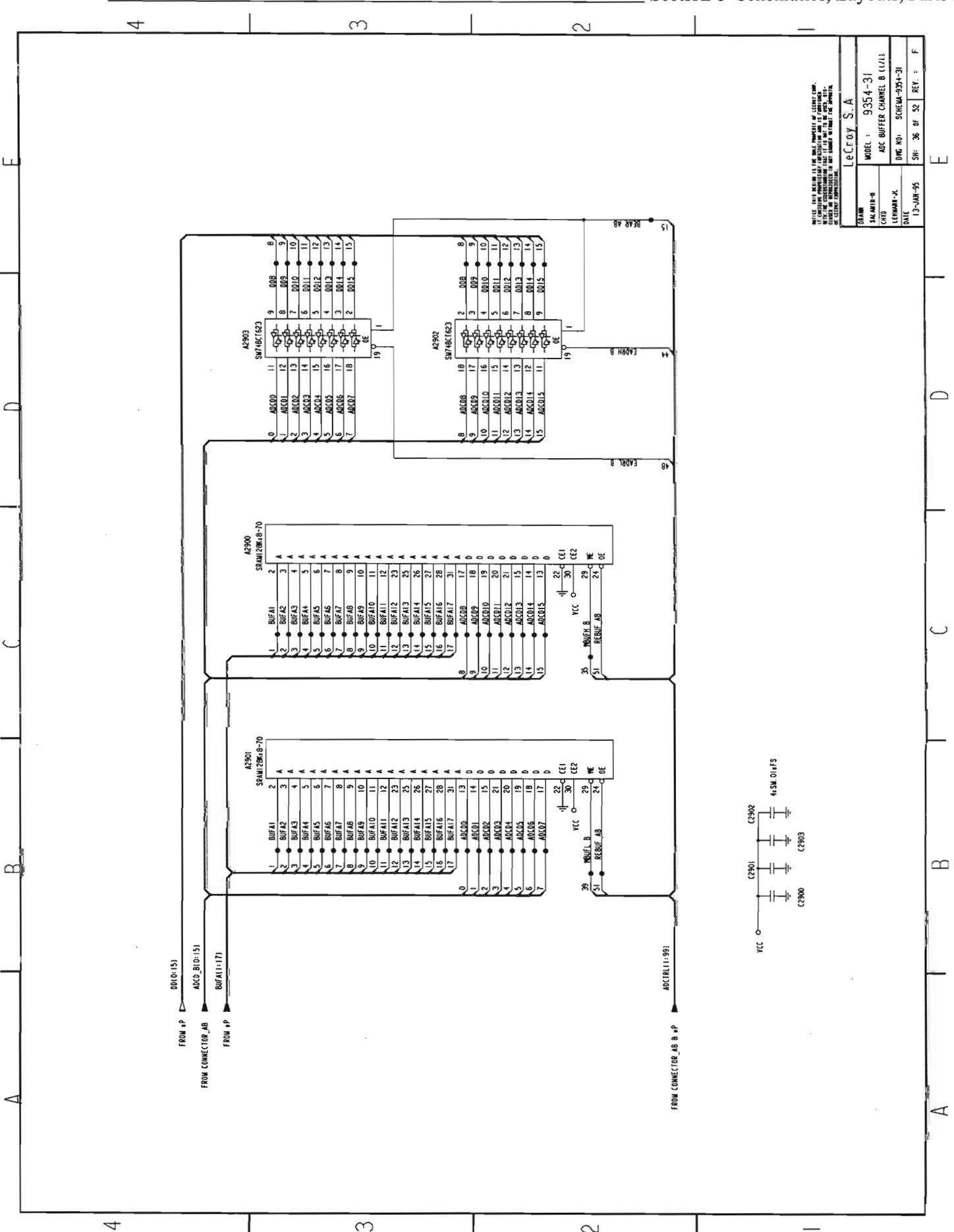


Section 8 Schematics, Layouts, Parts list

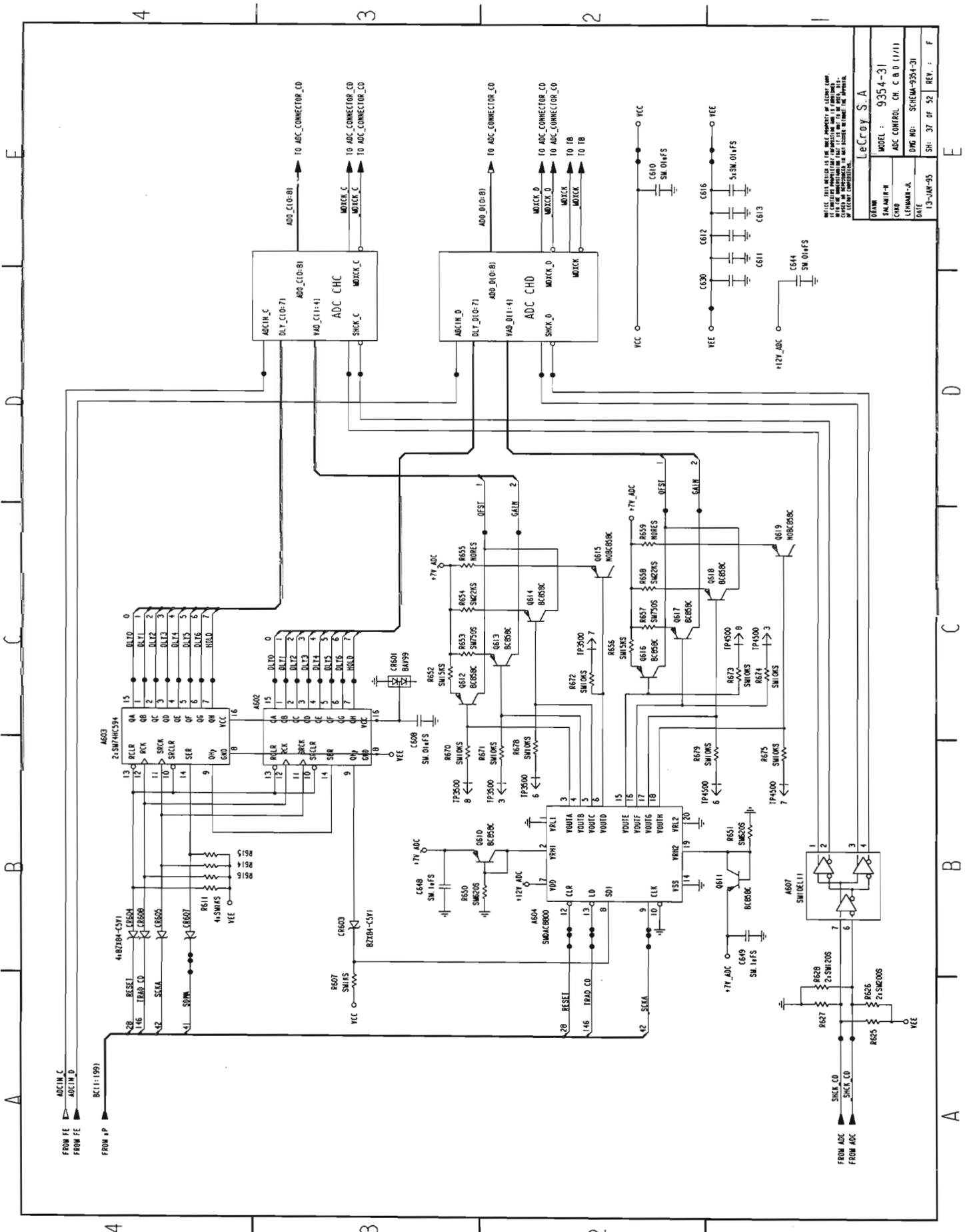


THIS DOCUMENT IS THE PROPERTY OF LEADERSHIP ELECTRONICS, INC. IT IS TO BE USED ONLY FOR THE PROJECT AND FOR THE CUSTOMER'S USE. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF LEADERSHIP ELECTRONICS, INC.

LeCroy S.A	
MODEL :	9354-31
ADIC BUFFER CHANNEL A (11/1)	
DATE :	13-JAN-95
REV :	F

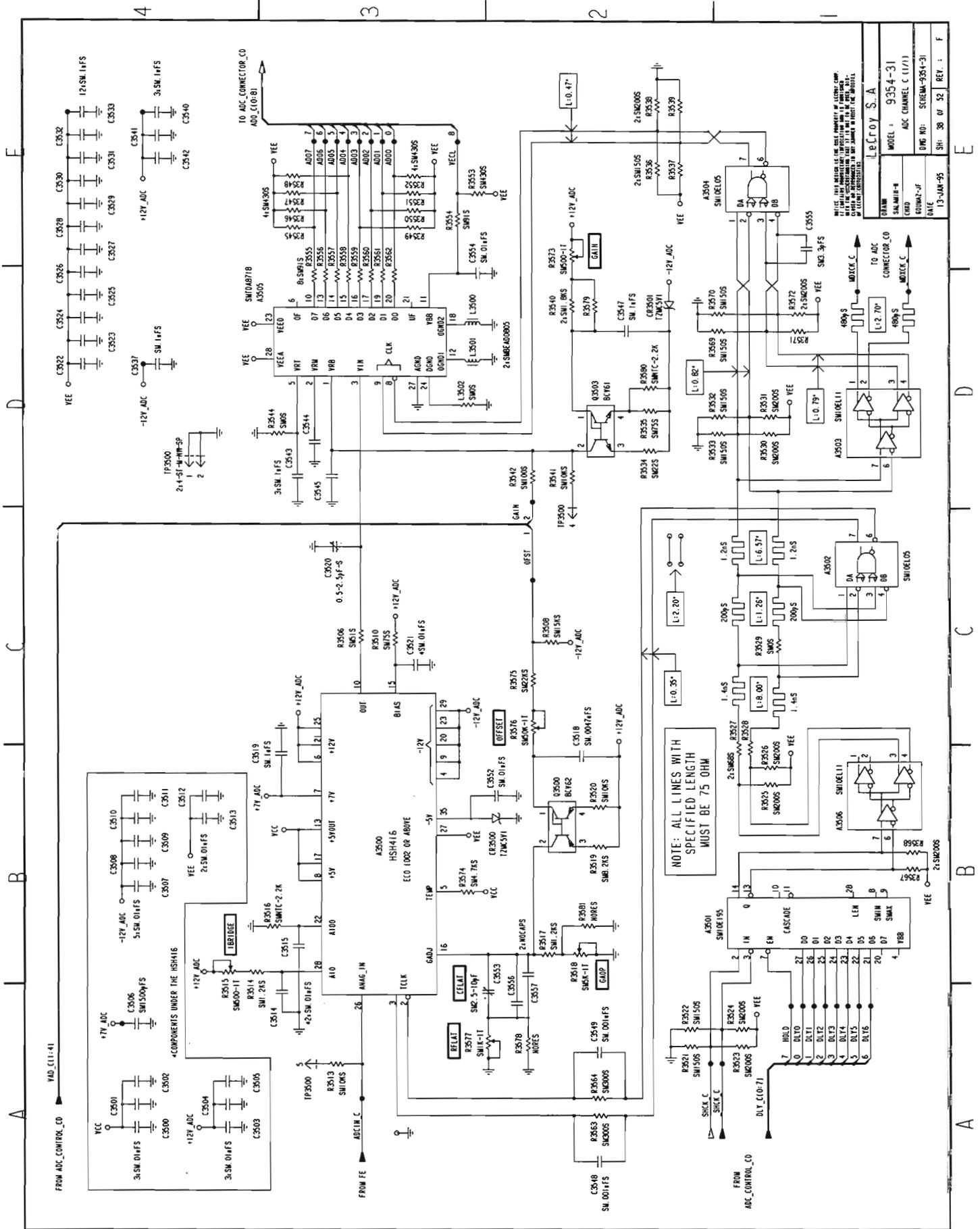


Section 8 Schematics, Layouts, Parts list

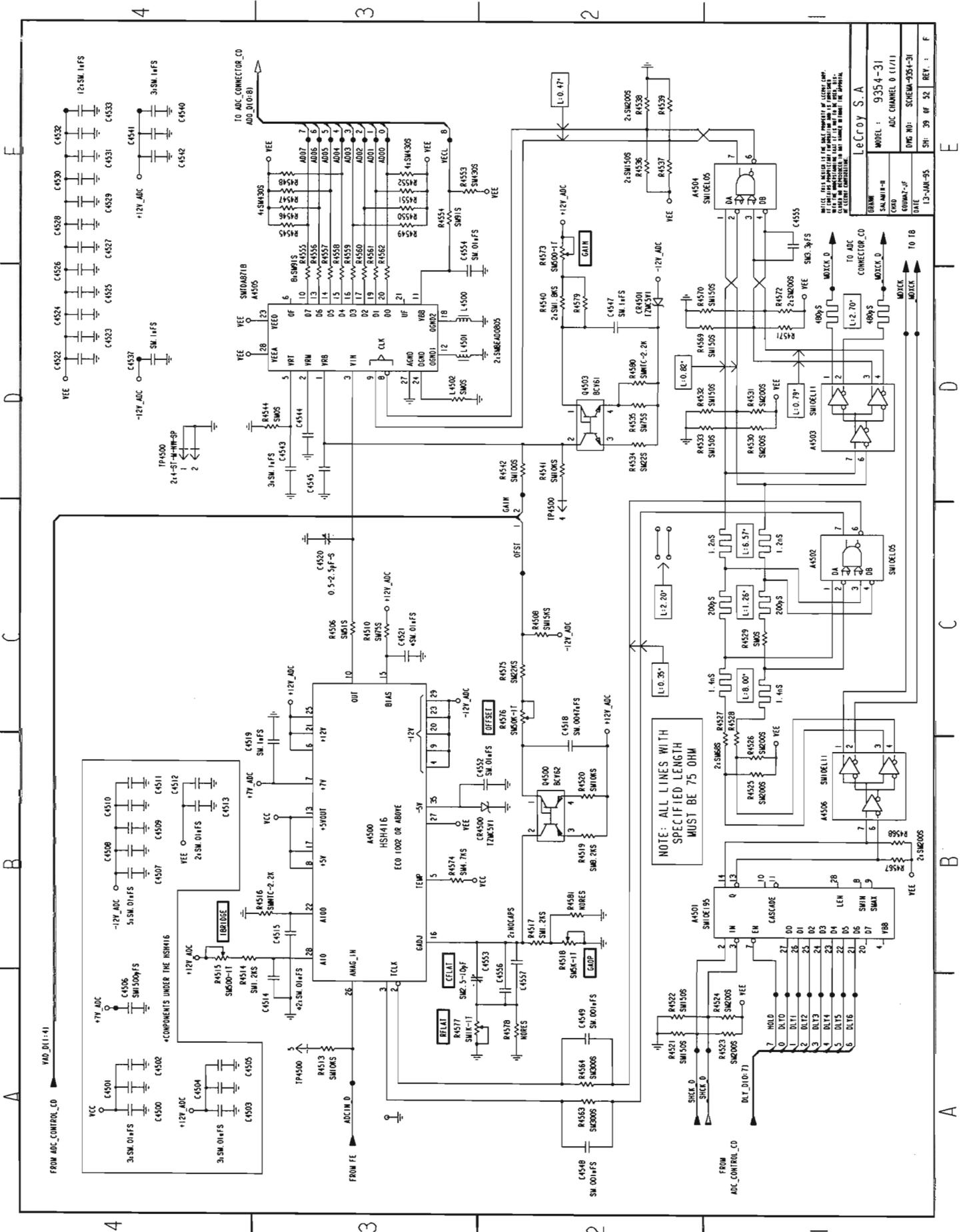


PLEASE NOTE: THIS SCHEMATIC IS THE PROPERTY OF LEICROY S.A. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEICROY S.A.

DRAWN	LeCroy S.A.
MODEL :	9354-31
ADC CONTROL CH. C B D 11/11	
DATE	13-JAN-95
REV. :	F



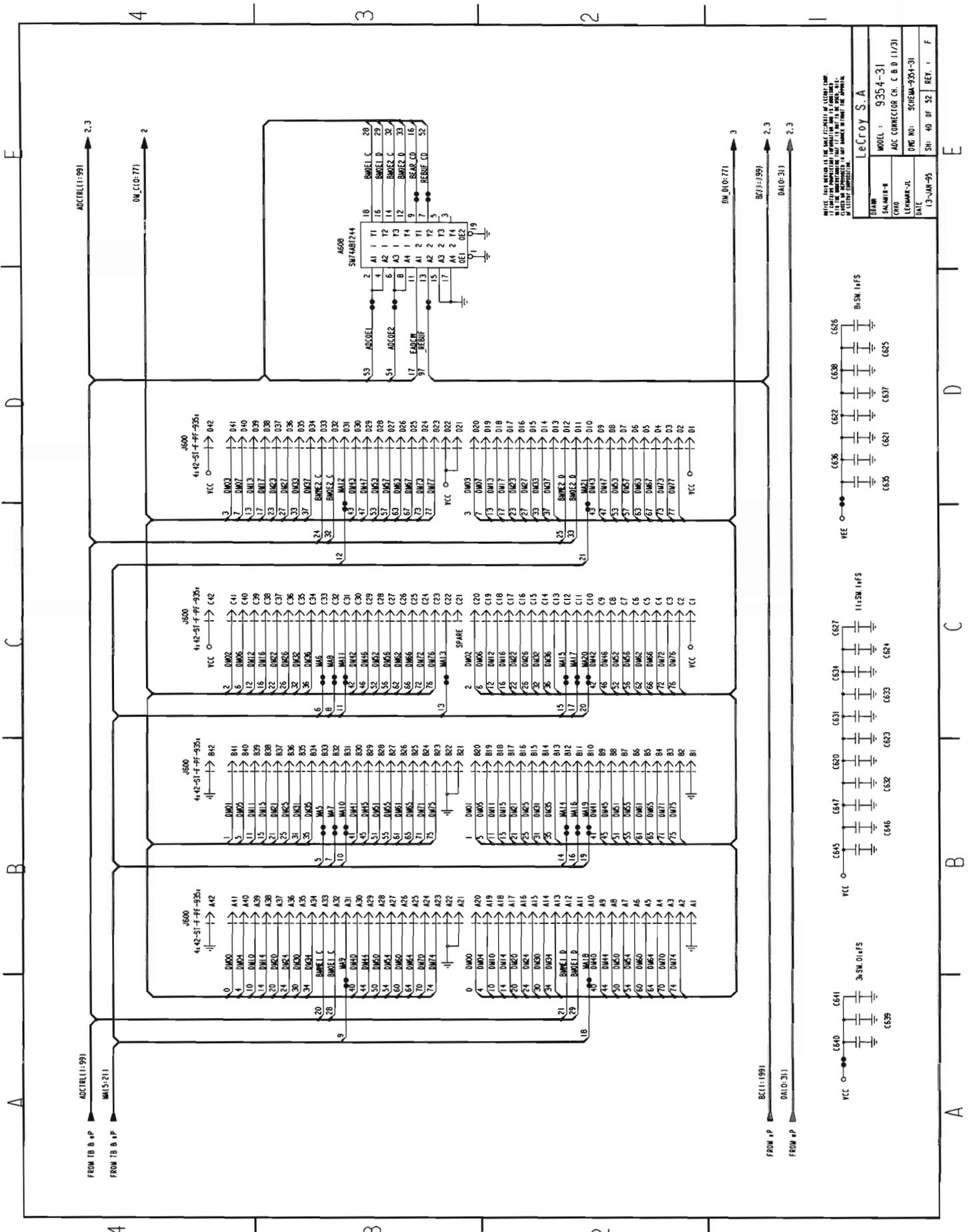
Section 8 Schematics, Layouts, Parts list



MODEL :	9354-31
ADC CHANNEL :	0 (1/1)
DATE :	13-JUN-95
REV :	F
SH :	39 OF 32
DWG NO :	SCHEM-9354-31
DESIGNED BY :	691047-JF
CHECKED BY :	
DATE :	
SCALE :	
DRWN :	LeCroy S.A

NOTE: THIS SCHEMATIC IS THE SOLE PROPERTY OF LEICROY. ANY REPRODUCTION OR TRANSMISSION OF THIS SCHEMATIC IN ANY FORM OR BY ANY MEANS IS STRICTLY PROHIBITED.

NOTE: ALL LINES WITH SPECIFIED LENGTH MUST BE 75 OHM



NOTE: THE NUMBER IN THE MULTIPLIER OF ORDER NO. IS THE NUMBER OF UNITS IN THE ORDER. THE NUMBER IN THE MULTIPLIER OF ORDER NO. IS THE NUMBER OF UNITS IN THE ORDER. THE NUMBER IN THE MULTIPLIER OF ORDER NO. IS THE NUMBER OF UNITS IN THE ORDER.

FORM	9354-31
REV	ADJ. CONNECTOR CH. C B D 11/23
DATE	13-JUN-95
DRG NO.	SOCEM-9354-31
SH.	40 OF 52
REV.	F

LeCroy S.A.

FORM	9354-31
REV	ADJ. CONNECTOR CH. C B D 11/23
DATE	13-JUN-95
DRG NO.	SOCEM-9354-31
SH.	40 OF 52
REV.	F

1600

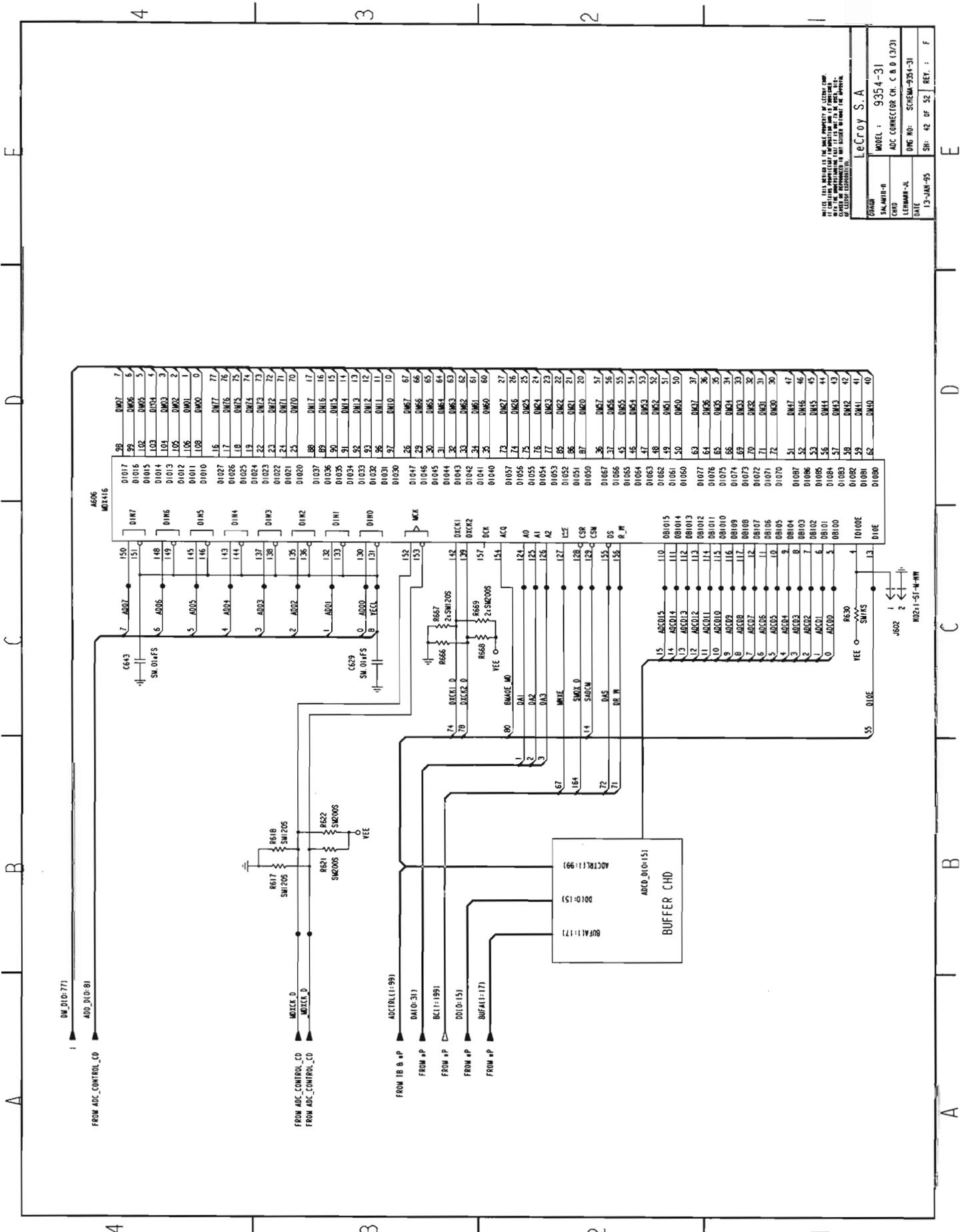
DM00	DM01	DM02	DM03	DM04	DM05	DM06	DM07	DM08	DM09	DM10	DM11	DM12	DM13	DM14	DM15
DA00	DA01	DA02	DA03	DA04	DA05	DA06	DA07	DA08	DA09	DA10	DA11	DA12	DA13	DA14	DA15

1600

DM00	DM01	DM02	DM03	DM04	DM05	DM06	DM07	DM08	DM09	DM10	DM11	DM12	DM13	DM14	DM15
DA00	DA01	DA02	DA03	DA04	DA05	DA06	DA07	DA08	DA09	DA10	DA11	DA12	DA13	DA14	DA15

1600

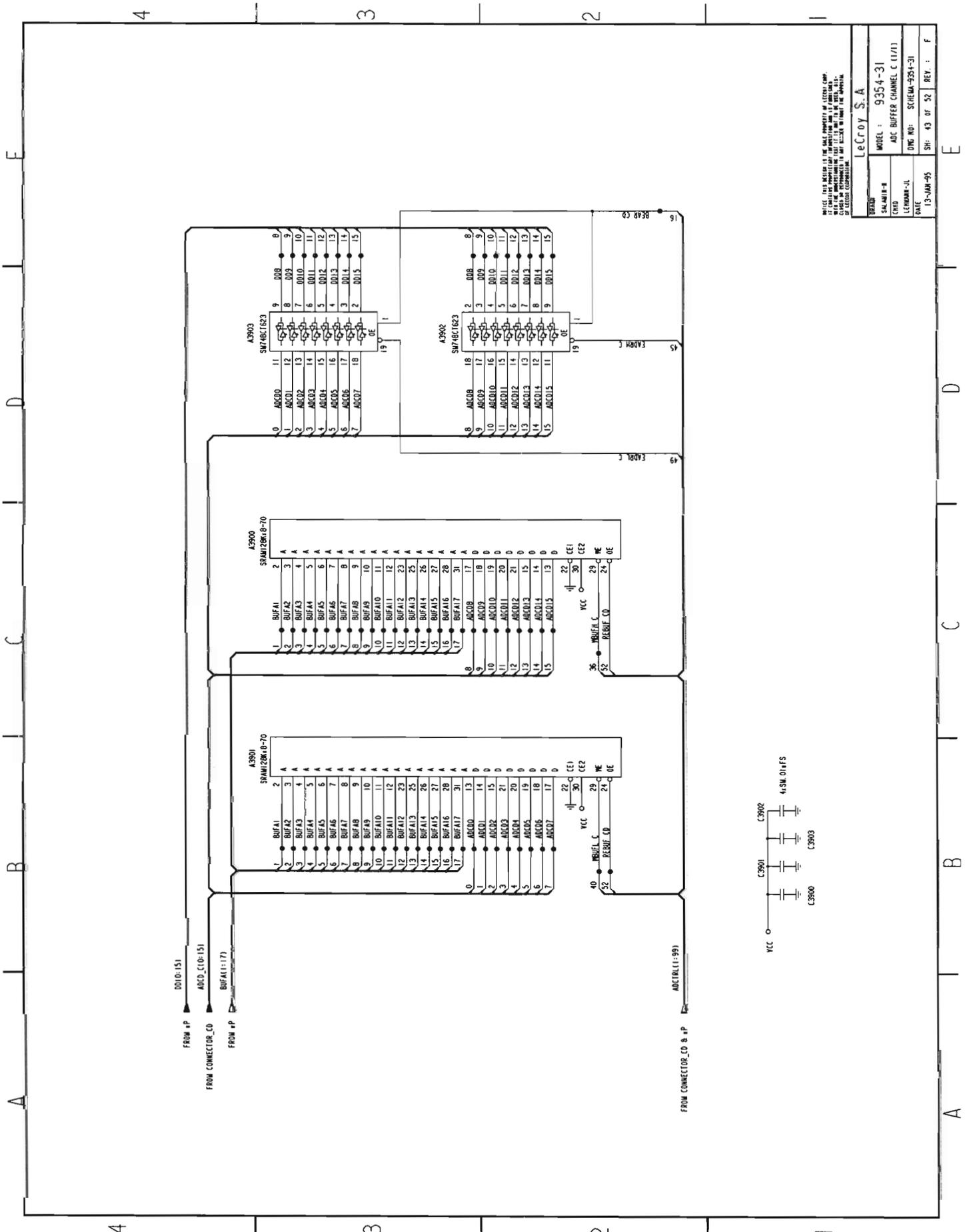
DM00	DM01	DM02	DM03	DM04	DM05	DM06	DM07	DM08	DM09	DM10	DM11	DM12	DM13	DM14	DM15
DA00	DA01	DA02	DA03	DA04	DA05	DA06	DA07	DA08	DA09	DA10	DA11	DA12	DA13	DA14	DA15



THIS DRAWING IS THE PROPERTY OF LITTON CORP.
IT IS TO BE USED ONLY FOR THE PURPOSES SPECIFIED.
OTHER USES WITHOUT THE WRITTEN CONSENT OF LITTON CORP. ARE PROHIBITED.
© 1995 LITTON CORP.

FIGURE	LeCroy S.A
MODEL	9354-31
ADC CONNECTOR CH.	C B D (3/3)
DATE	13-JAN-95
REV.	F

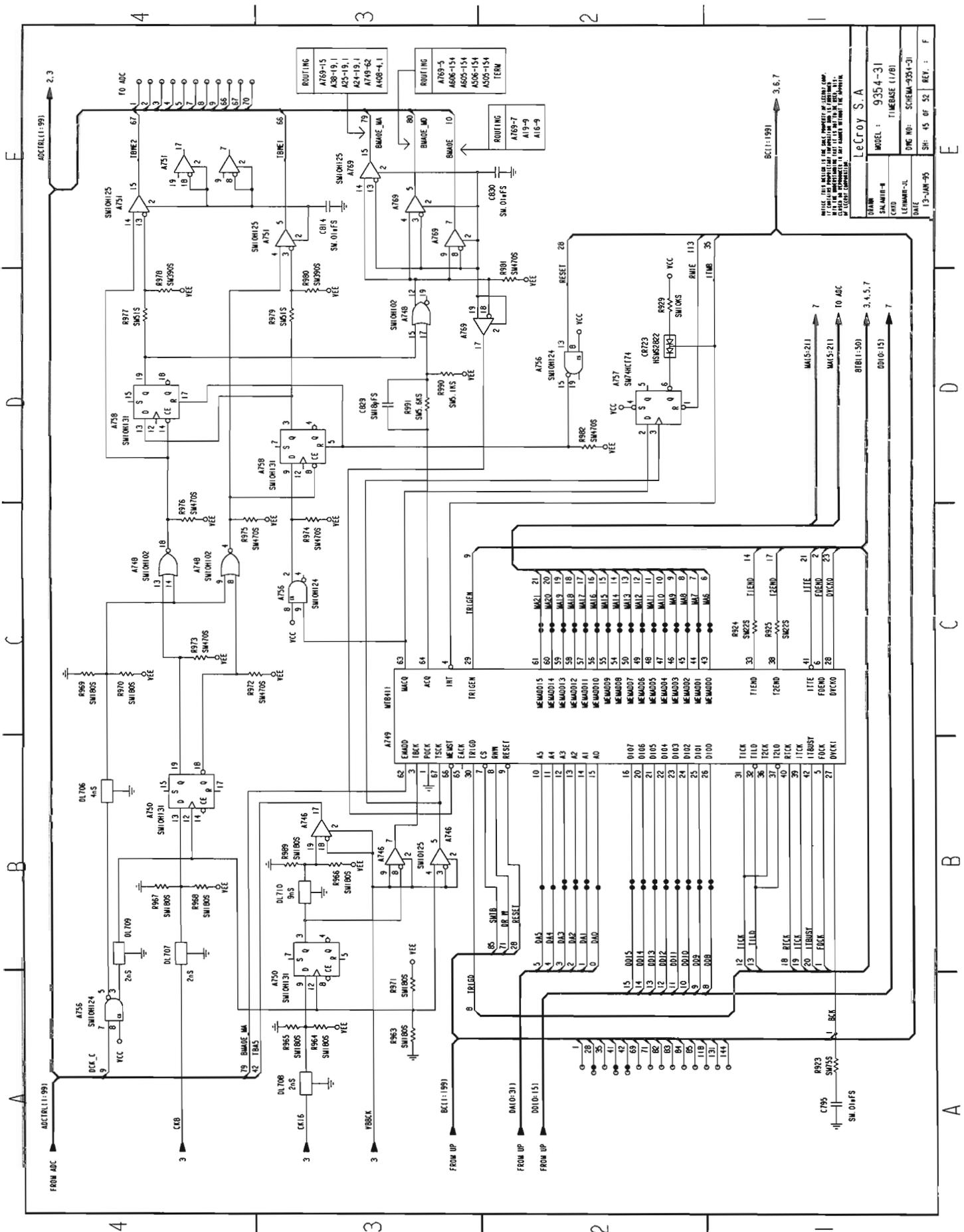
Section 8 Schematics, Layouts, Parts list



NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF ALTECH CORP. NO PART OF THIS DESIGN IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF ALTECH CORP.

LeCroy S.A.	
MODEL :	9354-31
ADC BUFFER CHANNEL C (1/1)	
DWG NO.:	SCHEM-9354-31
DATE	13-JUN-95
SH:	43 OF 32
REV :	F

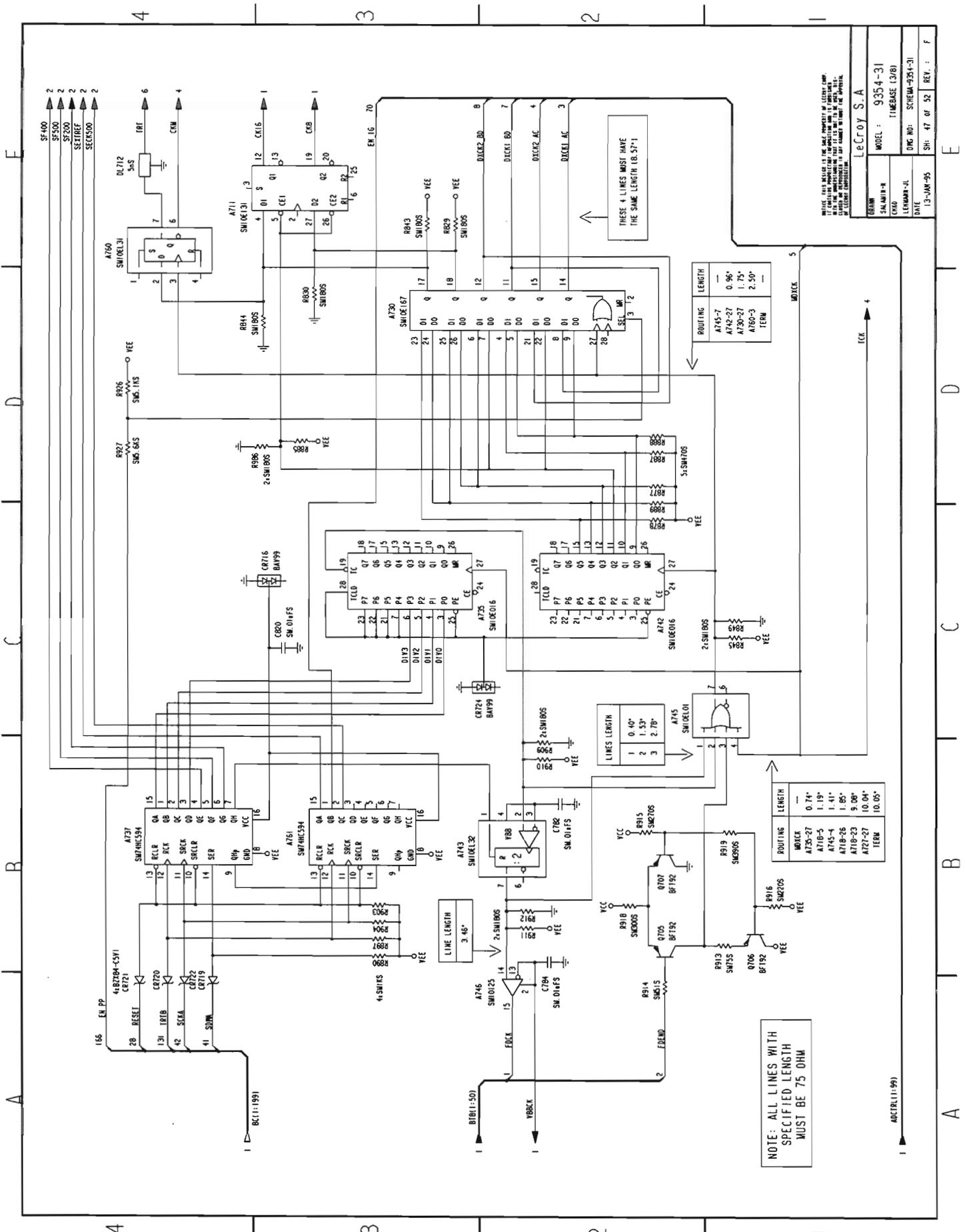
Section 8 Schematics, Layouts, Parts list



NOTICE: THIS DRAWING IS THE SOLE PROPERTY OF GLENN COMPANY. IT IS TO BE USED FOR THE PROJECT AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN PERMISSION OF GLENN COMPANY.

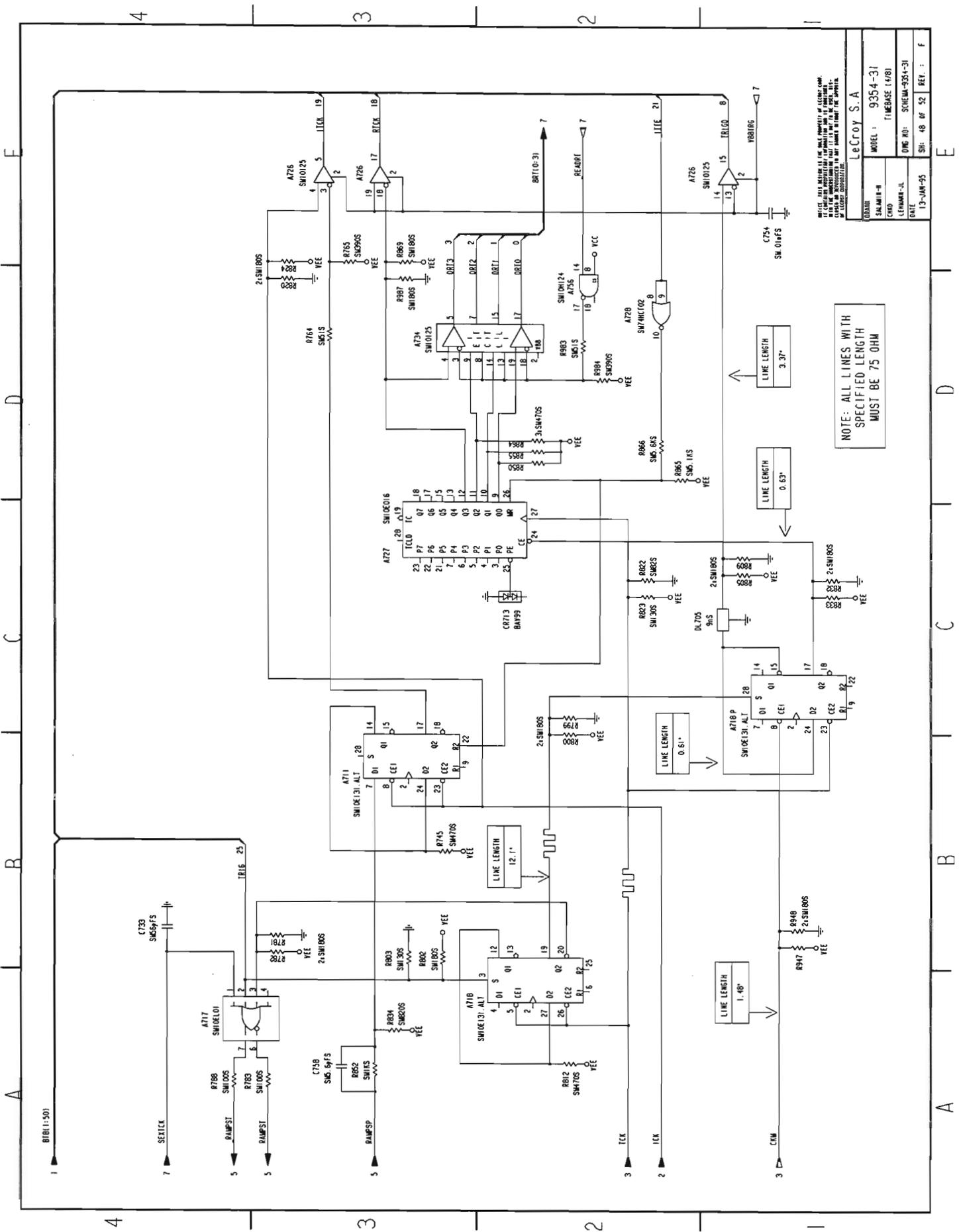
DESIGN	LEICROY S.A
MODEL	9354-31
TIMEBASE	(1/8)
DATE	13-JAN-95
REV.	45 OF 52
SCHEMATIC	SCHEM-9354-31

Section 8 Schematics, Layouts, Parts list

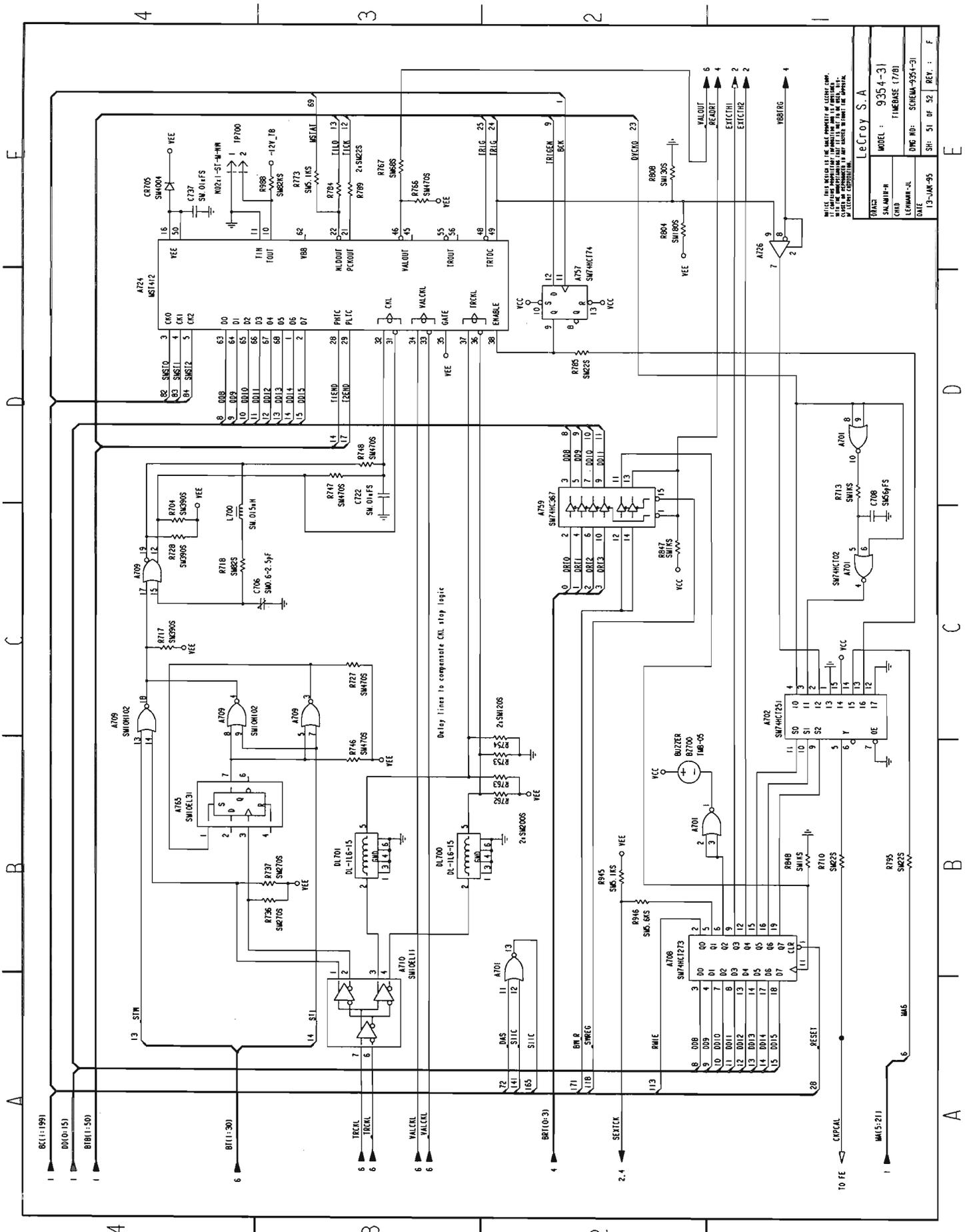


LeCroy S.A.
 MODEL : 9354-31
 TIMEBASE (50)
 DRAWING NO. : SCHEM-9354-31
 DATE : 13-JUN-95
 SH : 47 of 52
 REV. : F

NOTE: ALL LINES WITH SPECIFIED LENGTH MUST BE 75 OHM



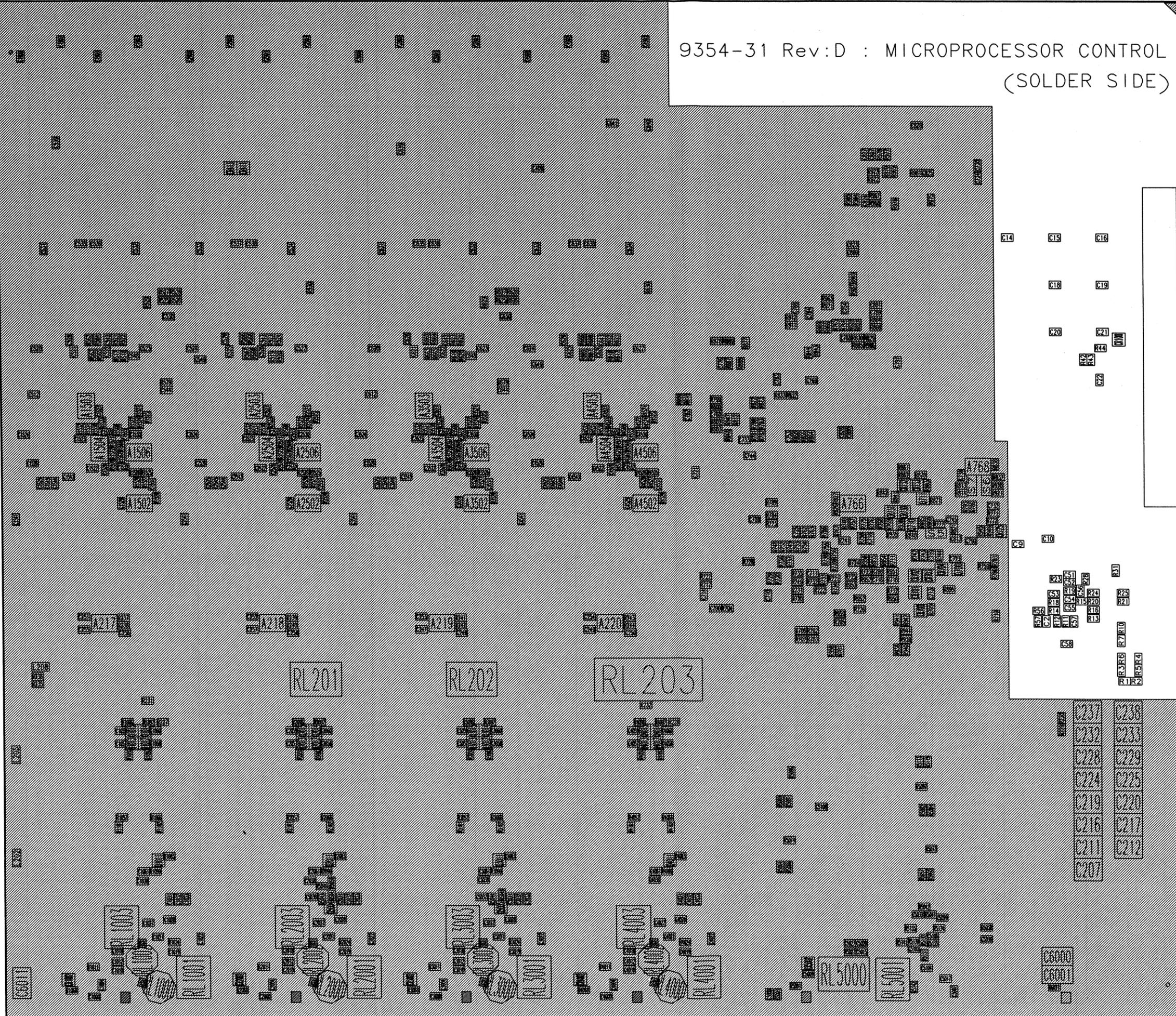
Section 8 Schematics, Layouts, Parts list

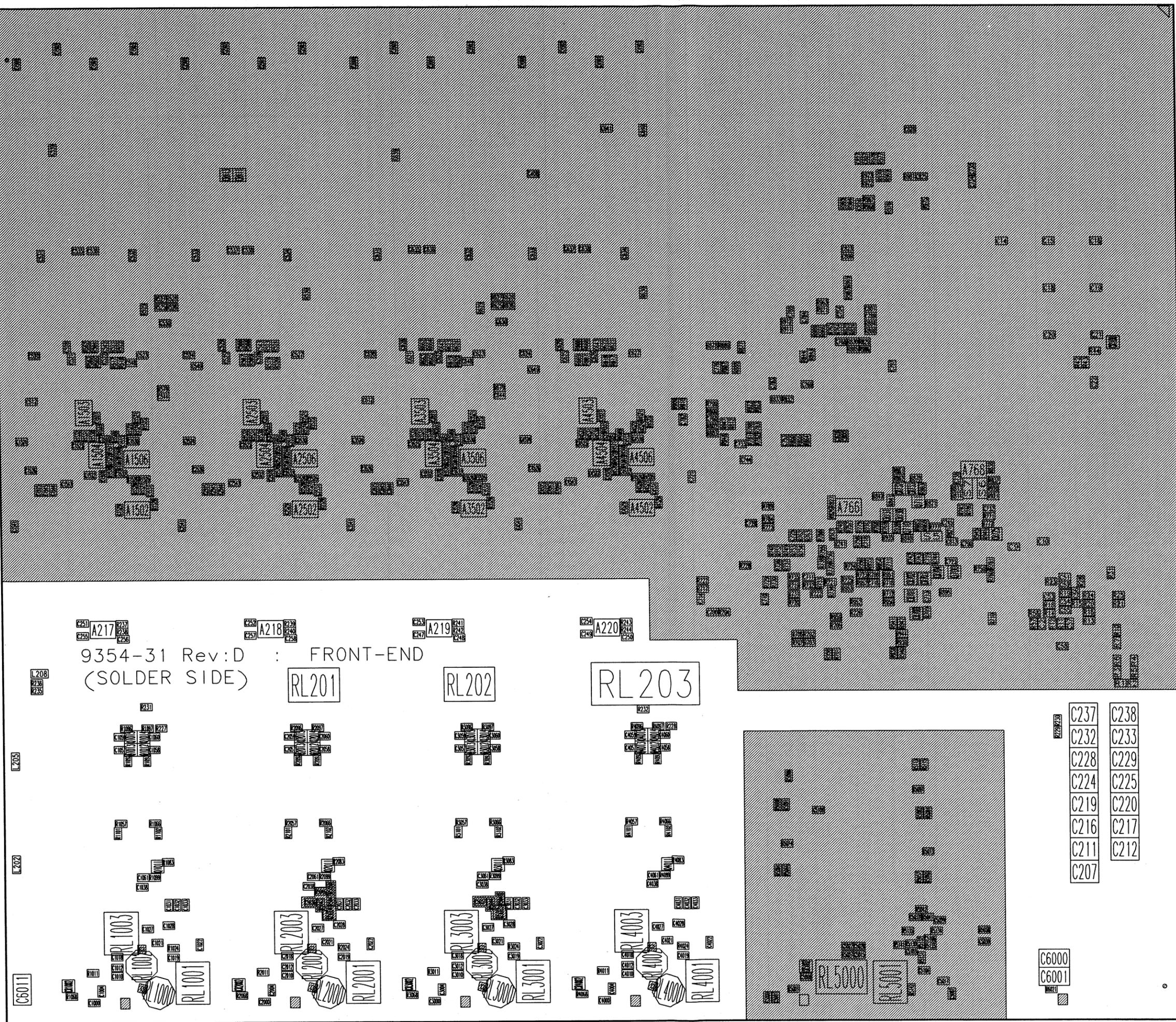


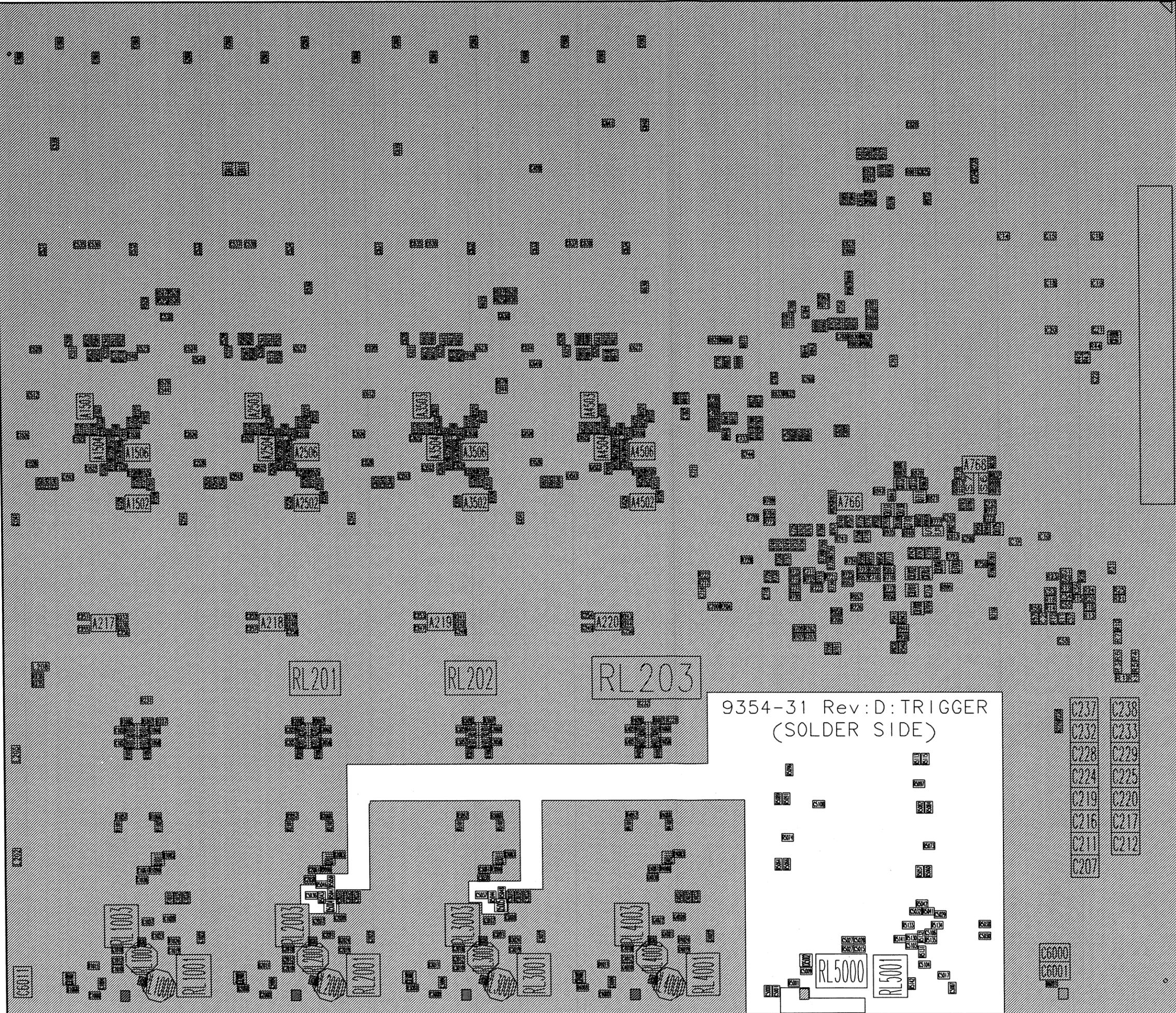
NOTE: THIS SCHEMATIC IS THE SOLE PROPERTY OF LEICROY S.A. ANY REPRODUCTION OR TRANSMISSION OF THIS SCHEMATIC WITHOUT THE WRITTEN PERMISSION OF LEICROY S.A. IS STRICTLY PROHIBITED. ANY VIOLATION WILL BE PROSECUTED TO THE FULL EXTENT OF THE LAW.

MODEL :	9354-31
DATE :	13-JUN-95
REV :	F
DESIGNER :	SCHEM-9354-31
CHECKER :	TIMEBASE (17/8)
DATE :	13-JUN-95
REV :	F

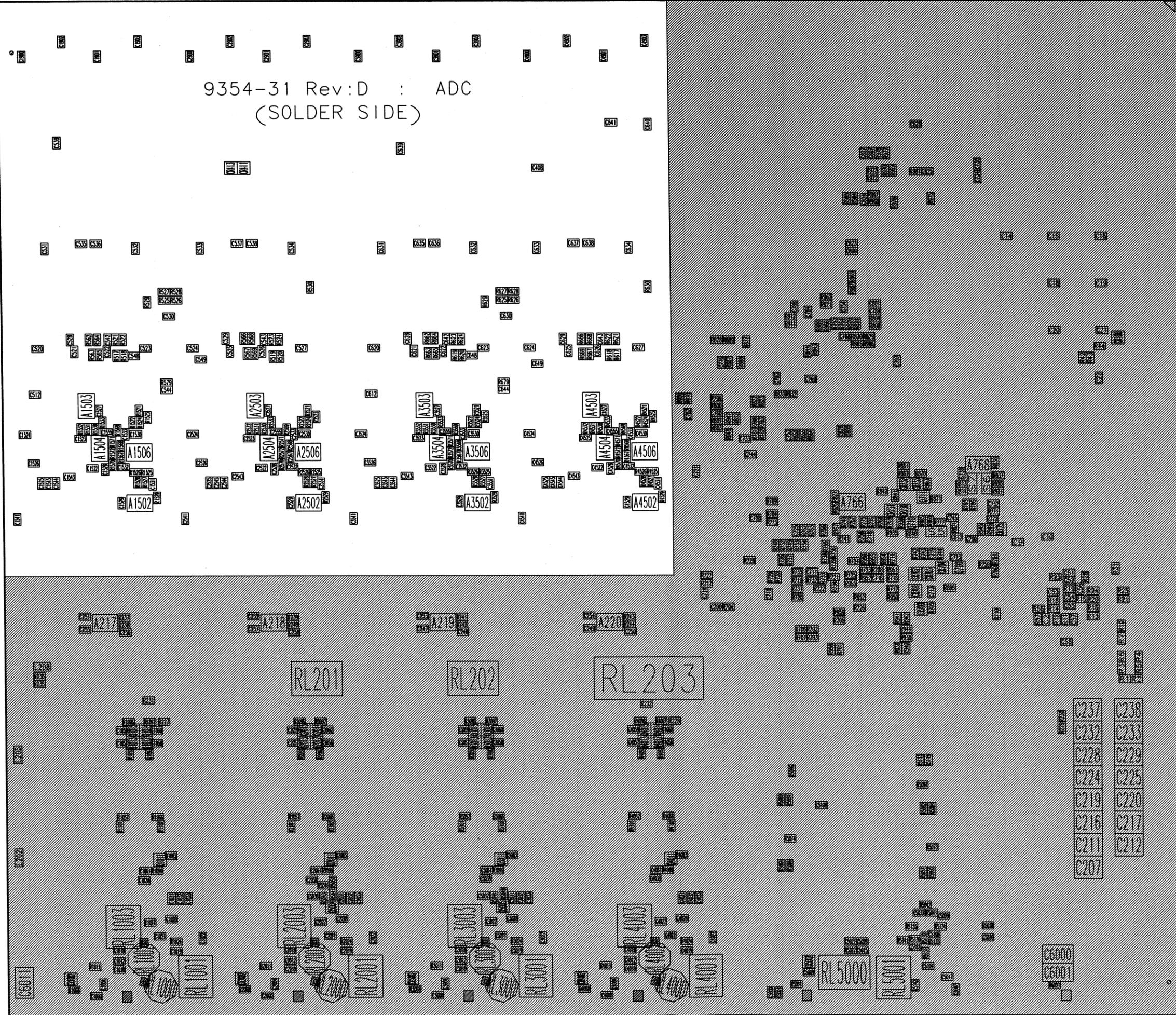
9354-31 Rev:D : MICROPROCESSOR CONTROL
(SOLDER SIDE)







9354-31 Rev:D : ADC
(SOLDER SIDE)



PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
A1	SM205618165	SM74HCT165	A200	SM207770442	SMDG442-PS
A2	SM200178138	SM74HCT138	A201	SM208470705	SMAD705
A3	SM200178030	SM74HCT30	A202	SM208870339	SMLM339
A4	SM200178138	SM74HCT138	A203	208124003	7912
A5	SM200178138	SM74HCT138	A204	208123002	7812
A6	SM206260858	SMADC0858	A205	SM208470347	SMLF347
A7	SM207970351	SM74HC4351	A206	SM207770201	SMDG201-PS
A8	SM206070584	SMPCD8584	A207	SM208470347	SMLF347
A9	SM207978251	SM74HCT251	A208	SM207770201	SMDG201-PS
A10	SM200178138	SM74HCT138	A209	208124003	7912
A11	SM205108002	SMPCF8582A	A210	208123002	7812
A12	SM206885245	SM74ABT245	A211	SM208470347	SMLF347
A13	SM200178000	SM74HCT00	A212	SM207770201	SMDG201-PS
A14	SM206885245	SM74ABT245	A213	208124002	7905
A15	SM207171244	SM74ABT244	A214	SM208470347	SMLF347
A16	SM205045357	CHEMIN-A	A215	SM207770201	SMDG201-PS
A17	SM205045358	ROUTE3-C	A216	208122002	7805
A18	SM205045355	RUELLE-A	A400	208124003	7912
A19	SM205045356	ARTERE-A	A401	SM201174011	SM10EL11
A20	SM205045354	AVENUE-A	A402	208123002	7812
A21	SM205045350	ROUTE1-A	A403	208122002	7805
A22	SM205045352	ROUTE2-B	A404	SM207172241	SM74ABT241
A23	SM205045351	ROUTE2-A	A405	SM207172241	SM74ABT241
A24	SM207171244	SM74ABT244	A406	SM207970139	SM74F139
A25	SM207171244	SM74ABT244	A407	SM207970139	SM74F139
A26	MCL404	MCL404	A408	SM200172008	SM74F08
A27	SM207171244	SM74ABT244	A409	SM207961158	SM10E158
A28	SM205045300	MIMOSA-A	A410	SM207961158	SM10E158
A29	SM207972157	SM74F157A	A502	SM205618594	SM74HC594-PS
A30	SM207280703	SMDAC703	A503	SM205618594	SM74HC594-PS
A31	SM200169191	SM74F191	A504	SM207288800	SMDAC8800
A32	SM200169191	SM74F191	A505	MDX416	MDX416
A33	SM200169191	SM74F191	A506	MDX416	MDX416
A34	SM200169191	SM74F191	A507	SM201174011	SM10EL11
A35	SM200169191	SM74F191	A508	SM207171244	SM74ABT244
A36	SM207970139	SM74F139	A602	SM205618594	SM74HC594-PS
A37	SM200278040	SM74HCT4040	A603	SM205618594	SM74HC594-PS
A38	SM207172241	SM74ABT241	A604	SM207288800	SMDAC8800
A39	SM206884623	SM74ABT623	A605	MDX416	MDX416
A40	SM206884623	SM74ABT623	A606	MDX416	MDX416
A41	SM207970139	SM74F139	A607	SM201174011	SM10EL11
A42	SM200178374	SM74HCT374	A608	SM207171244	SM74ABT244
A43	SM200178074	SM74HCT74	A700	SM205618594	SM74HC594-PS
A44	SM200178273	SM74HCT273	A701	SM200178002	SM74HCT02
A45	SM208570805	SM78L05	A702	SM207978251	SM74HCT251

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
A703	SM201274033	SM10EL33	A1000	SM208870339	SMLM339
A704	SM206970457	SM10E457	A1001	SM208470705	SMAD705
A705	SM206970457	SM10E457	A1002	SM207770201	SMDG201-PS
A706	SM201164104	SM10E104	A1003	MFE409	MFE409
A707	SM205618594	SM74HC594-PS	A1004	SM289772003	SMULN2003
A708	SM200178273	SM74HCT273	A1005	SM205618594	SM74HC594-PS
A709	SM200167102	SM10H102	A1006	SM205618594	SM74HC594-PS
A710	SM201174011	SM10EL11	A1007	SM208470347	SMLF347
A711	SM201164131	SM10E131	A1500	HSH416	HSH416
A712	SM207960157	SM10E157	A1501	SM201166195	SM10E195
A713	SM201570016	SM10EL16	A1502	SM201174005	SM10EL05
A714	SM200167164	SM10H164	A1503	SM201174011	SM10EL11
A716	SM206970457	SM10E457	A1504	SM201174005	SM10EL05
A717	SM201174001	SM10EL01	A1505	SM207260718	SMTDA8718
A718	SM201164131	SM10E131	A1506	SM201174011	SM10EL11
A723	SM201274032	SM10EL32	A1900	SM205701070	SRAM128Kx8-70
A724	MST412	MST412	A1901	SM205701070	SRAM128Kx8-70
A726	SM207360125	SM10125	A1902	SM206884623	SM74ABT623
A727	SM200169016	SM10E016	A1903	SM206884623	SM74ABT623
A728	SM200178002	SM74HCT02	A2000	SM208870339	SMLM339
A730	SM201164167	SM10E167	A2001	SM208470705	SMAD705
A734	SM207360125	SM10125	A2002	SM207770201	SMDG201-PS
A735	SM200169016	SM10E016	A2003	MFE409	MFE409
A736	SM208030245	SMSL3245	A2004	SM289772003	SMULN2003
A737	SM205618594	SM74HC594-PS	A2005	SM205618594	SM74HC594-PS
A739	SM208470353	SMLF353	A2006	SM205618594	SM74HC594-PS
A740	SM208570078	SM78L12	A2007	SM208470347	SMLF347
A741	SM201274032	SM10EL32	A2500	HSH416	HSH416
A742	SM200169016	SM10E016	A2501	SM201166195	SM10E195
A743	SM201274032	SM10EL32	A2502	SM201174005	SM10EL05
A744	SM208880079	SM79L12	A2503	SM201174011	SM10EL11
A745	SM201174001	SM10EL01	A2504	SM201174005	SM10EL05
A746	SM207360125	SM10125	A2505	SM207260718	SMTDA8718
A748	SM200167102	SM10H102	A2506	SM201174011	SM10EL11
A749	MTB411	MTB411	A2900	SM205701070	SRAM128Kx8-70
A750	SM200167131	SM10H131	A2901	SM205701070	SRAM128Kx8-70
A751	SM207367125	SM10H125	A2902	SM206884623	SM74ABT623
A756	SM207367124	SM10H124	A2903	SM206884623	SM74ABT623
A757	SM200178074	SM74HCT74	A3000	SM208870339	SMLM339
A758	SM200167131	SM10H131	A3001	SM208470705	SMAD705
A759	SM207170367	SM74HC367	A3002	SM207770201	SMDG201-PS
A760	SM201174031	SM10EL31	A3003	MFE409	MFE409
A761	SM205618594	SM74HC594-PS	A3004	SM289772003	SMULN2003
A765	SM201174031	SM10EL31	A3005	SM205618594	SM74HC594-PS
A769	SM207367125	SM10H125	A3006	SM205618594	SM74HC594-PS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
A3007	SM208470347	SMLF347	A5014	MTR408	MTR408
A3500	HSH416	HSH416	A5015	MTR408	MTR408
A3501	SM201166195	SM10E195	A5016	SM205618594	SM74HC594-PS
A3502	SM201174005	SM10EL05	A5017	MTR408	MTR408
A3503	SM201174011	SM10EL11	A5018	SM201570016	SM10EL16-PS
A3504	SM201174005	SM10EL05	A5019	SM205618594	SM74HC594-PS
A3505	SM207260718	SMTDA8718	A5020	SM205618594	SM74HC594-PS
A3506	SM201174011	SM10EL11	A5021	SM207978153	SM74HCT153-PS
A3900	SM205701070	SRAM128Kx8-70	A5022	SM208870339	SMLM339
A3901	SM205701070	SRAM128Kx8-70	A6000	SM208470353	SMLF353
A3902	SM206884623	SM74ABT623	C1	SM661207103	SM.01uFS
A3903	SM206884623	SM74ABT623	C2	SM661207104	SM.1uFS
A4000	SM208870339	SMLM339	C3	SM661207103	SM.01uFS
A4001	SM208470705	SMAD705	C4	SM661207103	SM.01uFS
A4002	SM207770201	SMDG201-PS	C5	SM661207103	SM.01uFS
A4003	MFE409	MFE409	C6	SM661255181	SM180pFS
A4004	SM289772003	SMULN2003	C7	SM661207104	SM.1uFS
A4005	SM205618594	SM74HC594-PS	C8	SM661207103	SM.01uFS
A4006	SM205618594	SM74HC594-PS	C9	SM661207103	SM.01uFS
A4007	SM208470347	SMLF347	C10	SM661207103	SM.01uFS
A4500	HSH416	HSH416	C11	SM661207103	SM.01uFS
A4501	SM201166195	SM10E195	C12	SM661207103	SM.01uFS
A4502	SM201174005	SM10EL05	C13	SM666247106	SM10uF-25V
A4503	SM201174011	SM10EL11	C14	SM661207103	SM.01uFS
A4504	SM201174005	SM10EL05	C15	SM661207103	SM.01uFS
A4505	SM207260718	SMTDA8718	C16	SM661207103	SM.01uFS
A4506	SM201174011	SM10EL11	C17	SM666247106	SM10uF-25V
A4900	SM205701070	SRAM128Kx8-70	C18	SM661207103	SM.01uFS
A4901	SM205701070	SRAM128Kx8-70	C19	SM661207103	SM.01uFS
A4902	SM206884623	SM74ABT623	C20	SM661207103	SM.01uFS
A4903	SM206884623	SM74ABT623	C21	SM661207103	SM.01uFS
A5000	SM208470705	SMAD705	C22	SM661207103	SM.01uFS
A5001	SM208971881	SMLM1881	C23	SM666377226	SM22uF-15V
A5002	SM208470037	SMOP37	C24	SM666377226	SM22uF-15V
A5003	SM208470351	SMLF351	C25	SM661207103	SM.01uFS
A5004	SM207770403	SMDG403-PS	C26	SM661207103	SM.01uFS
A5005	SM207970508	SMDG508-PS	C27	SM661207103	SM.01uFS
A5006	SM205618594	SM74HC594-PS	C28	SM661207103	SM.01uFS
A5007	SM207770442	SMDG442-PS	C29	SM661207103	SM.01uFS
A5008	SM205618594	SM74HC594-PS	C30	SM661207103	SM.01uFS
A5009	SM205618594	SM74HC594-PS	C31	SM661207103	SM.01uFS
A5010	MTR408	MTR408	C32	SM661207103	SM.01uFS
A5011	MTR408	MTR408	C33	SM661207103	SM.01uFS
A5012	SM205618594	SM74HC594-PS	C34	SM661207103	SM.01uFS
A5013	SM205618594	SM74HC594-PS	C35	SM661207103	SM.01uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C36	SM661207103	SM.01uFS	C221	SM666327225	SM2.2uF-20V
C37	SM661207103	SM.01uFS	C222	SM666327225	SM2.2uF-20V
C38	SM661207103	SM.01uFS	C223	SM666327225	SM2.2uF-20V
C39	SM661207103	SM.01uFS	C224	SM661726103	SM.01uF-NPO
C40	SM661207103	SM.01uFS	C225	SM661726103	SM.01uF-NPO
C41	SM661207104	SM.1uFS	C226	SM661207103	SM.01uFS
C42	SM661207103	SM.01uFS	C227	SM661207103	SM.01uFS
C43	SM661207103	SM.01uFS	C228	SM661726103	SM.01uF-NPO
C44	SM661207103	SM.01uFS	C229	SM661726103	SM.01uF-NPO
C45	SM661207104	SM.1uFS	C230	SM661207103	SM.01uFS
C46	146544471	470uF-25V	C231	SM666327225	SM2.2uF-20V
C47	SM666247106	SM10uF-25V	C232	SM661726103	SM.01uF-NPO
C48	SM666247106	SM10uF-25V	C233	SM661726103	SM.01uF-NPO
C49	SM661207103	SM.01uFS	C234	SM661207103	SM.01uFS
C50	SM666327225	SM2.2uF-20V	C235	SM661207103	SM.01uFS
C51	SM661207104	SM.1uFS	C236	SM666327225	SM2.2uF-20V
C52	SM661207104	SM.1uFS	C237	SM661726103	SM.01uF-NPO
C53	SM661207104	SM.1uFS	C238	SM661726103	SM.01uF-NPO
C54	SM661207104	SM.1uFS	C239	SM661207103	SM.01uFS
C55	SM661207104	SM.1uFS	C240	SM666327225	SM2.2uF-20V
C56	SM661207104	SM.1uFS	C241	SM666327225	SM2.2uF-20V
C57	SM661207104	SM.1uFS	C242	SM666327225	SM2.2uF-20V
C58	SM661207104	SM.1uFS	C247	SM661207103	SM.01uFS
C60	SM666327225	SM2.2uF-20V	C248	SM661207103	SM.01uFS
C200	SM661207103	SM.01uFS	C249	SM661207103	SM.01uFS
C201	SM661207103	SM.01uFS	C250	SM661207103	SM.01uFS
C202	SM661207104	SM.1uFS	C251	SM661207103	SM.01uFS
C203	SM661207103	SM.01uFS	C252	SM661207103	SM.01uFS
C204	SM666327225	SM2.2uF-20V	C253	SM661207103	SM.01uFS
C205	SM661207103	SM.01uFS	C254	SM661207103	SM.01uFS
C206	SM661207103	SM.01uFS	C255	SM661207103	SM.01uFS
C207	SM661726103	SM.01uF-NPO	C256	SM661207103	SM.01uFS
C208	SM661207103	SM.01uFS	C257	SM661207103	SM.01uFS
C209	SM661207103	SM.01uFS	C258	SM661207103	SM.01uFS
C210	SM661207103	SM.01uFS	C400	146574227	220uF-25V
C211	SM661726103	SM.01uF-NPO	C401	146554476	47uF-25V
C212	SM661726103	SM.01uF-NPO	C402	SM661207103	SM.01uFS
C213	SM666327225	SM2.2uF-20V	C403	146554476	47uF-25V
C214	SM666327225	SM2.2uF-20V	C404	146574227	220uF-25V
C215	SM666327225	SM2.2uF-20V	C405	146574227	220uF-25V
C216	SM661726103	SM.01uF-NPO	C406	SM661207103	SM.01uFS
C217	SM661726103	SM.01uF-NPO	C407	SM661207103	SM.01uFS
C218	SM661207103	SM.01uFS	C408	SM661207103	SM.01uFS
C219	SM661726103	SM.01uF-NPO	C410	SM661207103	SM.01uFS
C220	SM661726103	SM.01uF-NPO	C411	SM661207103	SM.01uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C412	SM661207103	SM.01uFS	C623	SM661207104	SM.1uFS
C413	SM661207103	SM.01uFS	C624	SM661207104	SM.1uFS
C508	SM661207103	SM.01uFS	C625	SM661207104	SM.1uFS
C510	SM661207103	SM.01uFS	C626	SM661207104	SM.1uFS
C511	SM661207103	SM.01uFS	C627	SM661207104	SM.1uFS
C512	SM661207103	SM.01uFS	C628	SM661207103	SM.01uFS
C513	SM661207103	SM.01uFS	C629	SM661207103	SM.01uFS
C516	SM661207103	SM.01uFS	C630	SM661207103	SM.01uFS
C520	SM661207104	SM.1uFS	C631	SM661207104	SM.1uFS
C521	SM661207104	SM.1uFS	C632	SM661207104	SM.1uFS
C522	SM661207104	SM.1uFS	C633	SM661207104	SM.1uFS
C523	SM661207104	SM.1uFS	C634	SM661207104	SM.1uFS
C524	SM661207104	SM.1uFS	C635	SM661207104	SM.1uFS
C525	SM661207104	SM.1uFS	C636	SM661207104	SM.1uFS
C526	SM661207104	SM.1uFS	C637	SM661207104	SM.1uFS
C527	SM661207104	SM.1uFS	C638	SM661207104	SM.1uFS
C528	SM661207103	SM.01uFS	C639	SM661207103	SM.01uFS
C529	SM661207103	SM.01uFS	C640	SM661207103	SM.01uFS
C530	SM661207103	SM.01uFS	C641	SM661207103	SM.01uFS
C531	SM661207104	SM.1uFS	C642	SM661207103	SM.01uFS
C532	SM661207104	SM.1uFS	C643	SM661207103	SM.01uFS
C533	SM661207104	SM.1uFS	C644	SM661207103	SM.01uFS
C534	SM661207104	SM.1uFS	C645	SM661207104	SM.1uFS
C535	SM661207104	SM.1uFS	C646	SM661207104	SM.1uFS
C536	SM661207104	SM.1uFS	C647	SM661207104	SM.1uFS
C537	SM661207104	SM.1uFS	C648	SM661207104	SM.1uFS
C538	SM661207104	SM.1uFS	C649	SM661207104	SM.1uFS
C539	SM661207103	SM.01uFS	C700	SM661207103	SM.01uFS
C542	SM661207103	SM.01uFS	C702	SM661207103	SM.01uFS
C543	SM661207103	SM.01uFS	C703	SM661207103	SM.01uFS
C544	SM661207103	SM.01uFS	C704	SM661207103	SM.01uFS
C545	SM661207104	SM.1uFS	C706	SM158240200	SM0.6-2.5pF
C546	SM661207104	SM.1uFS	C708	SM661255560	SM56pFS
C547	SM661207104	SM.1uFS	C710	SM661207103	SM.01uFS
C548	SM661207104	SM.1uFS	C711	SM661207103	SM.01uFS
C549	SM661207104	SM.1uFS	C713	SM661207103	SM.01uFS
C608	SM661207103	SM.01uFS	C714	SM661207103	SM.01uFS
C610	SM661207103	SM.01uFS	C716	SM661207103	SM.01uFS
C611	SM661207103	SM.01uFS	C718	SM661207103	SM.01uFS
C612	SM661207103	SM.01uFS	C719	SM661207103	SM.01uFS
C613	SM661207103	SM.01uFS	C720	SM661207103	SM.01uFS
C616	SM661207103	SM.01uFS	C721	SM661207103	SM.01uFS
C620	SM661207104	SM.1uFS	C722	SM661207103	SM.01uFS
C621	SM661207104	SM.1uFS	C723	SM661207103	SM.01uFS
C622	SM661207104	SM.1uFS	C724	SM661207103	SM.01uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C725	SM661207103	SM.01uFS	C799	SM661207103	SM.01uFS
C728	SM661207103	SM.01uFS	C800	SM661207103	SM.01uFS
C730	SM661207103	SM.01uFS	C801	SM661207103	SM.01uFS
C732	SM661207103	SM.01uFS	C802	SM661207103	SM.01uFS
C733	SM661255560	SM56pFS	C803	SM661207103	SM.01uFS
C734	SM661207103	SM.01uFS	C807	SM661207103	SM.01uFS
C735	SM661207103	SM.01uFS	C809	SM661207103	SM.01uFS
C737	SM661207103	SM.01uFS	C813	SM661207103	SM.01uFS
C738	SM661207103	SM.01uFS	C814	SM661207103	SM.01uFS
C739	SM661207103	SM.01uFS	C820	SM661207103	SM.01uFS
C744	SM661207103	SM.01uFS	C823	SM661207103	SM.01uFS
C745	SM661207103	SM.01uFS	C824	SM661207103	SM.01uFS
C752	SM661207103	SM.01uFS	C825	SM661207103	SM.01uFS
C753	SM661207103	SM.01uFS	C826	SM661207103	SM.01uFS
C754	SM661207103	SM.01uFS	C827	SM661207103	SM.01uFS
C756	SM661207103	SM.01uFS	C828	SM661207103	SM.01uFS
C758	SM661255056	SM5.6pFS	C829	SM661255180	SM18pFS
C760	SM661207103	SM.01uFS	C830	SM661207103	SM.01uFS
C761	SM661207103	SM.01uFS	C1000	SM661207104	SM.1uFS
C765	SM661255101	SM100pFS	C1001	SM661207103	SM.01uFS
C768	SM661207103	SM.01uFS	C1002	SM661207103	SM.01uFS
C769	SM661207103	SM.01uFS	C1003	SM661207104	SM.1uFS
C770	SM661207103	SM.01uFS	C1004	SM661207104	SM.1uFS
C771	SM661207103	SM.01uFS	C1005	SM661255056	SM5.6pFS
C773	SM661207103	SM.01uFS	C1006	SM661207103	SM.01uFS
C774	SM661207103	SM.01uFS	C1007	SM661207103	SM.01uFS
C776	SM661207103	SM.01uFS	C1008	SM661207104	SM.1uFS
C777	SM661207103	SM.01uFS	C1009	158849012	5-15pF-S
C778	SM661446474	SM.47uF	C1010	SM661256120	SM12pFS
C779	SM666327225	SM2.2uF-20V	C1012	SM661255820	SM82pFS
C780	SM661207103	SM.01uFS	C1014	SM661207103	SM.01uFS
C781	SM661207103	SM.01uFS	C1015	SM661495561	SM560pFS-500V
C782	SM661207103	SM.01uFS	C1016	SM661207104	SM.1uFS
C783	SM661207103	SM.01uFS	C1017	SM661207103	SM.01uFS
C784	SM661207103	SM.01uFS	C1018	SM661207103	SM.01uFS
C785	SM666327225	SM2.2uF-20V	C1019	SM661207103	SM.01uFS
C786	SM661446474	SM.47uF	C1020	SM661207223	SM.022uFS
C787	SM661207103	SM.01uFS	C1021	SM661207103	SM.01uFS
C788	SM661207103	SM.01uFS	C1022	SM661207103	SM.01uFS
C789	SM661207103	SM.01uFS	C1023	SM661207104	SM.1uFS
C790	SM661207103	SM.01uFS	C1024	SM661207103	SM.01uFS
C793	SM661207103	SM.01uFS	C1025	SM661207103	SM.01uFS
C795	SM661207103	SM.01uFS	C1026	SM661207103	SM.01uFS
C797	SM661207103	SM.01uFS	C1027	SM661255056	SM5.6pFS
C798	SM661207103	SM.01uFS	C1028	SM661207103	SM.01uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C1029	158849009	0.5-2.5pF-S	C1514	SM661207103	SM.01uFS
C1030	SM661255330	SM33pFS	C1515	SM661207103	SM.01uFS
C1031	SM661207103	SM.01uFS	C1518	SM661205472	SM.0047uFS
C1032	SM661207103	SM.01uFS	C1519	SM661207104	SM.1uFS
C1033	SM661207103	SM.01uFS	C1520	158849010	1-5pF-S
C1034	SM661207103	SM.01uFS	C1521	SM661207103	SM.01uFS
C1036	SM661207103	SM.01uFS	C1522	SM661207104	SM.1uFS
C1037	SM661207103	SM.01uFS	C1523	SM661207104	SM.1uFS
C1038	SM661207103	SM.01uFS	C1524	SM661207104	SM.1uFS
C1039	SM661207103	SM.01uFS	C1525	SM661207104	SM.1uFS
C1040	SM661207103	SM.01uFS	C1526	SM661207104	SM.1uFS
C1041	SM661255101	SM100pFS	C1527	SM661207104	SM.1uFS
C1042	SM661255101	SM100pFS	C1528	SM661207104	SM.1uFS
C1043	SM661207103	SM.01uFS	C1529	SM661207104	SM.1uFS
C1044	SM661207103	SM.01uFS	C1530	SM661207104	SM.1uFS
C1046	SM661207103	SM.01uFS	C1531	SM661207104	SM.1uFS
C1047	SM661207103	SM.01uFS	C1532	SM661207104	SM.1uFS
C1048	SM661207103	SM.01uFS	C1533	SM661207104	SM.1uFS
C1049	SM661207103	SM.01uFS	C1537	SM661207104	SM.1uFS
C1050	SM661207103	SM.01uFS	C1540	SM661207104	SM.1uFS
C1051	SM661207103	SM.01uFS	C1541	SM661207104	SM.1uFS
C1052	SM666327225	SM2.2uF-20V	C1542	SM661207104	SM.1uFS
C1053	SM666327225	SM2.2uF-20V	C1543	SM661207104	SM.1uFS
C1054	SM666327225	SM2.2uF-20V	C1544	SM661207104	SM.1uFS
C1055	SM666327225	SM2.2uF-20V	C1545	SM661207104	SM.1uFS
C1056	SM666327225	SM2.2uF-20V	C1547	SM661207104	SM.1uFS
C1057	SM661255121	SM120pFS	C1548	SM661207102	SM.001uFS
C1058	SM661255121	SM120pFS	C1549	SM661207102	SM.001uFS
C1059	SM661255180	SM18pFS	C1552	SM661207103	SM.01uFS
C1060	SM661255180	SM18pFS	C1553	SM158240202	SM2.5-10pF
C1061	SM661207103	SM.01uFS	C1554	SM661207103	SM.01uFS
C1500	SM661207103	SM.01uFS	C1555	SM661255033	SM3.3pFS
C1501	SM661207103	SM.01uFS	C1900	SM661207103	SM.01uFS
C1502	SM661207103	SM.01uFS	C1901	SM661207103	SM.01uFS
C1503	SM661207103	SM.01uFS	C1902	SM661207103	SM.01uFS
C1504	SM661207103	SM.01uFS	C1903	SM661207103	SM.01uFS
C1505	SM661207103	SM.01uFS	C2000	SM661207104	SM.1uFS
C1506	SM661255152	SM1500pFS	C2001	SM661207103	SM.01uFS
C1507	SM661207103	SM.01uFS	C2002	SM661207103	SM.01uFS
C1508	SM661207103	SM.01uFS	C2003	SM661207104	SM.1uFS
C1509	SM661207103	SM.01uFS	C2004	SM661207104	SM.1uFS
C1510	SM661207103	SM.01uFS	C2005	SM661255056	SM5.6pFS
C1511	SM661207103	SM.01uFS	C2006	SM661207103	SM.01uFS
C1512	SM661207103	SM.01uFS	C2007	SM661207103	SM.01uFS
C1513	SM661207103	SM.01uFS	C2008	SM661207104	SM.1uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C2009	158849012	5-15pF-S	C2058	SM661255121	SM120pFS
C2010	SM661256120	SM12pFS	C2059	SM661255180	SM18pFS
C2012	SM661255820	SM82pFS	C2060	SM661255180	SM18pFS
C2014	SM661207103	SM.01uFS	C2061	SM661207103	SM.01uFS
C2015	SM661495561	SM560pFS-500V	C2500	SM661207103	SM.01uFS
C2016	SM661207104	SM.1uFS	C2501	SM661207103	SM.01uFS
C2017	SM661207103	SM.01uFS	C2502	SM661207103	SM.01uFS
C2018	SM661207103	SM.01uFS	C2503	SM661207103	SM.01uFS
C2019	SM661207103	SM.01uFS	C2504	SM661207103	SM.01uFS
C2020	SM661207223	SM.022uFS	C2505	SM661207103	SM.01uFS
C2021	SM661207103	SM.01uFS	C2506	SM661255152	SM1500pFS
C2022	SM661207103	SM.01uFS	C2507	SM661207103	SM.01uFS
C2023	SM661207104	SM.1uFS	C2508	SM661207103	SM.01uFS
C2024	SM661207103	SM.01uFS	C2509	SM661207103	SM.01uFS
C2025	SM661207103	SM.01uFS	C2510	SM661207103	SM.01uFS
C2026	SM661207103	SM.01uFS	C2511	SM661207103	SM.01uFS
C2027	SM661255056	SM5.6pFS	C2512	SM661207103	SM.01uFS
C2028	SM661207103	SM.01uFS	C2513	SM661207103	SM.01uFS
C2029	158849009	0.5-2.5pF-S	C2514	SM661207103	SM.01uFS
C2030	SM661255330	SM33pFS	C2515	SM661207103	SM.01uFS
C2031	SM661207103	SM.01uFS	C2518	SM661205472	SM.0047uFS
C2032	SM661207103	SM.01uFS	C2519	SM661207104	SM.1uFS
C2033	SM661207103	SM.01uFS	C2520	158849010	1-5pF-S
C2034	SM661207103	SM.01uFS	C2521	SM661207103	SM.01uFS
C2036	SM661207103	SM.01uFS	C2522	SM661207104	SM.1uFS
C2037	SM661207103	SM.01uFS	C2523	SM661207104	SM.1uFS
C2038	SM661207103	SM.01uFS	C2524	SM661207104	SM.1uFS
C2039	SM661207103	SM.01uFS	C2525	SM661207104	SM.1uFS
C2040	SM661207103	SM.01uFS	C2526	SM661207104	SM.1uFS
C2041	SM661255101	SM100pFS	C2527	SM661207104	SM.1uFS
C2042	SM661255101	SM100pFS	C2528	SM661207104	SM.1uFS
C2043	SM661207103	SM.01uFS	C2529	SM661207104	SM.1uFS
C2044	SM661207103	SM.01uFS	C2530	SM661207104	SM.1uFS
C2046	SM661207103	SM.01uFS	C2531	SM661207104	SM.1uFS
C2047	SM661207103	SM.01uFS	C2532	SM661207104	SM.1uFS
C2048	SM661207103	SM.01uFS	C2533	SM661207104	SM.1uFS
C2049	SM661207103	SM.01uFS	C2537	SM661207104	SM.1uFS
C2050	SM661207103	SM.01uFS	C2540	SM661207104	SM.1uFS
C2051	SM661207103	SM.01uFS	C2541	SM661207104	SM.1uFS
C2052	SM666327225	SM2.2uF-20V	C2542	SM661207104	SM.1uFS
C2053	SM666327225	SM2.2uF-20V	C2543	SM661207104	SM.1uFS
C2054	SM666327225	SM2.2uF-20V	C2544	SM661207104	SM.1uFS
C2055	SM666327225	SM2.2uF-20V	C2545	SM661207104	SM.1uFS
C2056	SM666327225	SM2.2uF-20V	C2547	SM661207104	SM.1uFS
C2057	SM661255121	SM120pFS	C2548	SM661207102	SM.001uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C2549	SM661207102	SM.001uFS	C3039	SM661207103	SM.01uFS
C2552	SM661207103	SM.01uFS	C3040	SM661207103	SM.01uFS
C2553	SM158240202	SM2.5-10pF	C3041	SM661255101	SM100pFS
C2554	SM661207103	SM.01uFS	C3042	SM661255101	SM100pFS
C2555	SM661255033	SM3.3pFS	C3043	SM661207103	SM.01uFS
C2900	SM661207103	SM.01uFS	C3044	SM661207103	SM.01uFS
C2901	SM661207103	SM.01uFS	C3046	SM661207103	SM.01uFS
C2902	SM661207103	SM.01uFS	C3047	SM661207103	SM.01uFS
C2903	SM661207103	SM.01uFS	C3048	SM661207103	SM.01uFS
C3000	SM661207104	SM.1uFS	C3049	SM661207103	SM.01uFS
C3001	SM661207103	SM.01uFS	C3050	SM661207103	SM.01uFS
C3002	SM661207103	SM.01uFS	C3051	SM661207103	SM.01uFS
C3003	SM661207104	SM.1uFS	C3052	SM666327225	SM2.2uF-20V
C3004	SM661207104	SM.1uFS	C3053	SM666327225	SM2.2uF-20V
C3005	SM661255056	SM5.6pFS	C3054	SM666327225	SM2.2uF-20V
C3006	SM661207103	SM.01uFS	C3055	SM666327225	SM2.2uF-20V
C3007	SM661207103	SM.01uFS	C3056	SM666327225	SM2.2uF-20V
C3008	SM661207104	SM.1uFS	C3057	SM661255121	SM120pFS
C3009	158849012	5-15pF-S	C3058	SM661255121	SM120pFS
C3010	SM661256120	SM12pFS	C3059	SM661255180	SM18pFS
C3012	SM661255820	SM82pFS	C3060	SM661255180	SM18pFS
C3014	SM661207103	SM.01uFS	C3061	SM661207103	SM.01uFS
C3015	SM661495561	SM560pFS-500V	C3500	SM661207103	SM.01uFS
C3016	SM661207104	SM.1uFS	C3501	SM661207103	SM.01uFS
C3017	SM661207103	SM.01uFS	C3502	SM661207103	SM.01uFS
C3018	SM661207103	SM.01uFS	C3503	SM661207103	SM.01uFS
C3019	SM661207103	SM.01uFS	C3504	SM661207103	SM.01uFS
C3020	SM661207223	SM.022uFS	C3505	SM661207103	SM.01uFS
C3021	SM661207103	SM.01uFS	C3506	SM661255152	SM1500pFS
C3022	SM661207103	SM.01uFS	C3507	SM661207103	SM.01uFS
C3023	SM661207104	SM.1uFS	C3508	SM661207103	SM.01uFS
C3024	SM661207103	SM.01uFS	C3509	SM661207103	SM.01uFS
C3025	SM661207103	SM.01uFS	C3510	SM661207103	SM.01uFS
C3026	SM661207103	SM.01uFS	C3511	SM661207103	SM.01uFS
C3027	SM661255056	SM5.6pFS	C3512	SM661207103	SM.01uFS
C3028	SM661207103	SM.01uFS	C3513	SM661207103	SM.01uFS
C3029	158849009	0.5-2.5pF-S	C3514	SM661207103	SM.01uFS
C3030	SM661255330	SM33pFS	C3515	SM661207103	SM.01uFS
C3031	SM661207103	SM.01uFS	C3518	SM661205472	SM.0047uFS
C3032	SM661207103	SM.01uFS	C3519	SM661207104	SM.1uFS
C3033	SM661207103	SM.01uFS	C3520	158849010	1-5pF-S
C3034	SM661207103	SM.01uFS	C3521	SM661207103	SM.01uFS
C3036	SM661207103	SM.01uFS	C3522	SM661207104	SM.1uFS
C3037	SM661207103	SM.01uFS	C3523	SM661207104	SM.1uFS
C3038	SM661207103	SM.01uFS	C3524	SM661207104	SM.1uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C3525	SM661207104	SM.1uFS	C4020	SM661207223	SM.022uFS
C3526	SM661207104	SM.1uFS	C4021	SM661207103	SM.01uFS
C3527	SM661207104	SM.1uFS	C4022	SM661207103	SM.01uFS
C3528	SM661207104	SM.1uFS	C4023	SM661207104	SM.1uFS
C3529	SM661207104	SM.1uFS	C4024	SM661207103	SM.01uFS
C3530	SM661207104	SM.1uFS	C4025	SM661207103	SM.01uFS
C3531	SM661207104	SM.1uFS	C4026	SM661207103	SM.01uFS
C3532	SM661207104	SM.1uFS	C4027	SM661255056	SM5.6pFS
C3533	SM661207104	SM.1uFS	C4028	SM661207103	SM.01uFS
C3537	SM661207104	SM.1uFS	C4029	158849009	0.5-2.5pF-S
C3540	SM661207104	SM.1uFS	C4030	SM661255330	SM33pFS
C3541	SM661207104	SM.1uFS	C4031	SM661207103	SM.01uFS
C3542	SM661207104	SM.1uFS	C4032	SM661207103	SM.01uFS
C3543	SM661207104	SM.1uFS	C4033	SM661207103	SM.01uFS
C3544	SM661207104	SM.1uFS	C4034	SM661207103	SM.01uFS
C3545	SM661207104	SM.1uFS	C4036	SM661207103	SM.01uFS
C3547	SM661207104	SM.1uFS	C4037	SM661207103	SM.01uFS
C3548	SM661207102	SM.001uFS	C4038	SM661207103	SM.01uFS
C3549	SM661207102	SM.001uFS	C4039	SM661207103	SM.01uFS
C3552	SM661207103	SM.01uFS	C4040	SM661207103	SM.01uFS
C3553	SM158240202	SM2.5-10pF	C4041	SM661255101	SM100pFS
C3554	SM661207103	SM.01uFS	C4042	SM661255101	SM100pFS
C3555	SM661255033	SM3.3pFS	C4043	SM661207103	SM.01uFS
C3900	SM661207103	SM.01uFS	C4044	SM661207103	SM.01uFS
C3901	SM661207103	SM.01uFS	C4046	SM661207103	SM.01uFS
C3902	SM661207103	SM.01uFS	C4047	SM661207103	SM.01uFS
C3903	SM661207103	SM.01uFS	C4048	SM661207103	SM.01uFS
C4000	SM661207104	SM.1uFS	C4049	SM661207103	SM.01uFS
C4001	SM661207103	SM.01uFS	C4050	SM661207103	SM.01uFS
C4002	SM661207103	SM.01uFS	C4051	SM661207103	SM.01uFS
C4003	SM661207104	SM.1uFS	C4052	SM666327225	SM2.2uF-20V
C4004	SM661207104	SM.1uFS	C4053	SM666327225	SM2.2uF-20V
C4005	SM661255056	SM5.6pFS	C4054	SM666327225	SM2.2uF-20V
C4006	SM661207103	SM.01uFS	C4055	SM666327225	SM2.2uF-20V
C4007	SM661207103	SM.01uFS	C4056	SM666327225	SM2.2uF-20V
C4008	SM661207104	SM.1uFS	C4057	SM661255121	SM120pFS
C4009	158849012	5-15pF-S	C4058	SM661255121	SM120pFS
C4010	SM661256120	SM12pFS	C4059	SM661255180	SM18pFS
C4012	SM661255820	SM82pFS	C4060	SM661255180	SM18pFS
C4014	SM661207103	SM.01uFS	C4061	SM661207103	SM.01uFS
C4015	SM661495561	SM560pFS-500V	C4500	SM661207103	SM.01uFS
C4016	SM661207104	SM.1uFS	C4501	SM661207103	SM.01uFS
C4017	SM661207103	SM.01uFS	C4502	SM661207103	SM.01uFS
C4018	SM661207103	SM.01uFS	C4503	SM661207103	SM.01uFS
C4019	SM661207103	SM.01uFS	C4504	SM661207103	SM.01uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C4505	SM661207103	SM.01uFS	C5000	SM661207104	SM.1uFS
C4506	SM661255152	SM1500pFS	C5001	SM661207104	SM.1uFS
C4507	SM661207103	SM.01uFS	C5002	SM661255010	SM1pFS
C4508	SM661207103	SM.01uFS	C5003	SM661207103	SM.01uFS
C4509	SM661207103	SM.01uFS	C5004	SM661207103	SM.01uFS
C4510	SM661207103	SM.01uFS	C5005	SM661255027	SM2.7pFS
C4511	SM661207103	SM.01uFS	C5006	SM661207103	SM.01uFS
C4512	SM661207103	SM.01uFS	C5007	SM661207103	SM.01uFS
C4513	SM661207103	SM.01uFS	C5008	SM661207103	SM.01uFS
C4514	SM661207103	SM.01uFS	C5009	SM661207103	SM.01uFS
C4515	SM661207103	SM.01uFS	C5010	SM661255033	SM3.3pFS
C4518	SM661205472	SM.0047uFS	C5011	SM661207103	SM.01uFS
C4519	SM661207104	SM.1uFS	C5012	SM661495561	SM560pFS-500V
C4520	158849010	1-5pF-S	C5013	SM661207103	SM.01uFS
C4521	SM661207103	SM.01uFS	C5014	SM661207104	SM.1uFS
C4522	SM661207104	SM.1uFS	C5015	SM661207103	SM.01uFS
C4523	SM661207104	SM.1uFS	C5016	SM661207103	SM.01uFS
C4524	SM661207104	SM.1uFS	C5017	SM661207103	SM.01uFS
C4525	SM661207104	SM.1uFS	C5018	SM661255821	SM820pFS
C4526	SM661207104	SM.1uFS	C5019	SM666327225	SM2.2uF-20V
C4527	SM661207104	SM.1uFS	C5020	SM661207104	SM.1uFS
C4528	SM661207104	SM.1uFS	C5021	SM661207103	SM.01uFS
C4529	SM661207104	SM.1uFS	C5022	SM661207103	SM.01uFS
C4530	SM661207104	SM.1uFS	C5023	SM661207103	SM.01uFS
C4531	SM661207104	SM.1uFS	C5024	SM661207103	SM.01uFS
C4532	SM661207104	SM.1uFS	C5025	SM661207103	SM.01uFS
C4533	SM661207104	SM.1uFS	C5026	SM661207103	SM.01uFS
C4537	SM661207104	SM.1uFS	C5027	SM661255100	SM10pFS
C4540	SM661207104	SM.1uFS	C5028	SM661255330	SM33pFS
C4541	SM661207104	SM.1uFS	C5029	SM661207103	SM.01uFS
C4542	SM661207104	SM.1uFS	C5030	SM661207103	SM.01uFS
C4543	SM661207104	SM.1uFS	C5031	SM661255150	SM15pFS
C4544	SM661207104	SM.1uFS	C5032	SM661255270	SM27pFS
C4545	SM661207104	SM.1uFS	C5033	SM661255270	SM27pFS
C4547	SM661207104	SM.1uFS	C5034	SM661207103	SM.01uFS
C4548	SM661207102	SM.001uFS	C5035	SM666427105	SM1uF-16V
C4549	SM661207102	SM.001uFS	C5036	SM661207103	SM.01uFS
C4552	SM661207103	SM.01uFS	C5037	SM661207103	SM.01uFS
C4553	SM158240202	SM2.5-10pF	C5038	SM666427105	SM1uF-16V
C4554	SM661207103	SM.01uFS	C5039	SM661207103	SM.01uFS
C4555	SM661255033	SM3.3pFS	C5040	SM661207103	SM.01uFS
C4900	SM661207103	SM.01uFS	C5041	SM661207103	SM.01uFS
C4901	SM661207103	SM.01uFS	C5042	SM661207103	SM.01uFS
C4902	SM661207103	SM.01uFS	C5043	SM661207103	SM.01uFS
C4903	SM661207103	SM.01uFS	C5044	SM661207103	SM.01uFS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
C5045	SM661207103	SM.01uFS	C5091	SM661207103	SM.01uFS
C5046	SM661207103	SM.01uFS	C5092	SM666327225	SM2.2uF-20V
C5047	SM661207103	SM.01uFS	C5093	SM661205822	SM.0082uFS
C5048	SM661207103	SM.01uFS	C5094	SM661207103	SM.01uFS
C5049	SM661205822	SM.0082uFS	C5095	SM666327225	SM2.2uF-20V
C5050	SM661205822	SM.0082uFS	C5096	SM661207103	SM.01uFS
C5051	SM661255270	SM27pFS	C5097	SM661207103	SM.01uFS
C5052	SM661207103	SM.01uFS	C5098	SM661207103	SM.01uFS
C5053	SM661207103	SM.01uFS	C5100	SM661207103	SM.01uFS
C5054	SM661255270	SM27pFS	C5101	SM661207103	SM.01uFS
C5055	SM661207103	SM.01uFS	C5103	SM661207104	SM.1uFS
C5056	SM661207103	SM.01uFS	C5104	SM661207104	SM.1uFS
C5057	SM666427105	SM1uF-16V	C5106	SM661207103	SM.01uFS
C5058	SM666427105	SM1uF-16V	C5107	SM661255100	SM10pFS
C5059	SM661207103	SM.01uFS	C5108	SM661207103	SM.01uFS
C5060	SM661207103	SM.01uFS	C5110	SM666377226	SM22uF-15V
C5061	SM661207103	SM.01uFS	C5111	SM666377226	SM22uF-15V
C5062	SM661207103	SM.01uFS	C6000	SM666257336	SM33uF-16V
C5063	SM661207103	SM.01uFS	C6001	SM666257336	SM33uF-16V
C5064	SM661207103	SM.01uFS	C6003	SM666327225	SM2.2uF-20V
C5065	SM661207103	SM.01uFS	C6004	SM661207103	SM.01uFS
C5066	SM661207103	SM.01uFS	C6005	SM661207103	SM.01uFS
C5067	SM661207103	SM.01uFS	C6006	SM666327225	SM2.2uF-20V
C5068	SM661205822	SM.0082uFS	C6007	SM661207103	SM.01uFS
C5069	SM661207103	SM.01uFS	C6008	SM661255102	SM1000pFS
C5070	SM661205822	SM.0082uFS	C6009	SM661255056	SM5.6pFS
C5071	SM661207103	SM.01uFS	C6010	SM666257336	SM33uF-16V
C5072	SM661207103	SM.01uFS	C6011	SM666257336	SM33uF-16V
C5073	SM661207103	SM.01uFS	J1	454220096	3x32-ST-F-PF
C5074	SM666327225	SM2.2uF-20V	J2	454115014	1x14-ST-M-FLPN
C5075	SM666327225	SM2.2uF-20V	J3	454390002	1x2-ST-M-PL
C5076	SM661255270	SM27pFS	J500	454111024	4x42-ST-F-PF
C5077	SM661207103	SM.01uFS	J600	454111024	4x42-ST-F-PF
C5078	SM661255101	SM100pFS	J710	SM454120025	SM1x12-13-ST-F
C5079	SM666427105	SM1uF-16V	J1000	7093XXP01	21 BNC-93XX
C5081	SM661255150	SM15pFS	J2000	7093XXP01	21 BNC-93XX
C5082	SM661255022	SM2.2pFS	J3000	7093XXP01	21 BNC-93XX
C5083	SM661207103	SM.01uFS	J4000	7093XXP01	21 BNC-93XX
C5084	SM661207103	SM.01uFS	J5000	7093XXP01	21 BNC-93XX
C5085	SM661207103	SM.01uFS	J6000	7093XXP01	21 BNC-93XX
C5086	SM661207103	SM.01uFS	L200	SM301502001	SMBEAD1206
C5087	SM661207103	SM.01uFS	L201	SM301502001	SMBEAD1206
C5088	SM661207103	SM.01uFS	L202	SM301502001	SMBEAD1206
C5089	SM661207103	SM.01uFS	L203	SM301502001	SMBEAD1206
C5090	SM661207103	SM.01uFS	L204	SM301502001	SMBEAD1206

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
L205	SM301502001	SMBEAD1206	L5000	SM301502001	SMBEAD1206
L206	SM301502001	SMBEAD1206	L5001	SM301502001	SMBEAD1206
L207	SM301502001	SMBEAD1206	L5002	SM301502001	SMBEAD1206
L208	SM301502001	SMBEAD1206	L5003	SM301502001	SMBEAD1206
L700	SM300446150	SM.015uH	L6000	SM301502001	SMBEAD1206
L1000	SM300486104	SM100uH	L6001	SM301502001	SMBEAD1206
L1001	SM300486104	SM100uH	Q510	SM275330858	BC858C
L1002	SM301502001	SMBEAD1206	Q511	SM275330858	BC858C
L1003	SM301502001	SMBEAD1206	Q512	SM275330858	BC858C
L1004	SM301502001	SMBEAD1206	Q513	SM275330858	BC858C
L1005	SM301502001	SMBEAD1206	Q514	SM275330858	BC858C
L1006	SM301502001	SMBEAD1206	Q516	SM275330858	BC858C
L1500	SM669080181	SMBEAD0805	Q517	SM275330858	BC858C
L1501	SM669080181	SMBEAD0805	Q518	SM275330858	BC858C
L1502	SM654101000	SM0S	Q610	SM275330858	BC858C
L2000	SM300486104	SM100uH	Q611	SM275330858	BC858C
L2001	SM300486104	SM100uH	Q612	SM275330858	BC858C
L2002	SM301502001	SMBEAD1206	Q613	SM275330858	BC858C
L2003	SM301502001	SMBEAD1206	Q614	SM275330858	BC858C
L2004	SM301502001	SMBEAD1206	Q616	SM275330858	BC858C
L2005	SM301502001	SMBEAD1206	Q617	SM275330858	BC858C
L2006	SM301502001	SMBEAD1206	Q618	SM275330858	BC858C
L2500	SM669080181	SMBEAD0805	Q700	SM275030092	BFT92
L2501	SM669080181	SMBEAD0805	Q701	SM270030020	BFS20
L2502	SM654101000	SM0S	Q702	SM207130025	BFT25A
L3000	SM300486104	SM100uH	Q703	SM275330858	BC858C
L3001	SM300486104	SM100uH	Q704	SM275330858	BC858C
L3002	SM301502001	SMBEAD1206	Q705	SM275030092	BFT92
L3003	SM301502001	SMBEAD1206	Q706	SM275030092	BFT92
L3004	SM301502001	SMBEAD1206	Q707	SM275030092	BFT92
L3005	SM301502001	SMBEAD1206	Q1000	SM280120416	MMBF4416
L3006	SM301502001	SMBEAD1206	Q1001	SM270130092	BFR92A
L3500	SM669080181	SMBEAD0805	Q1002	SM270130092	BFR92A
L3501	SM669080181	SMBEAD0805	Q1003	SM275040092	BFT92R
L3502	SM654101000	SM0S	Q1004	SM289240062	BCV62
L4000	SM300486104	SM100uH	Q1005	SM275030092	BFT92
L4001	SM300486104	SM100uH	Q1006	SM275030093	BFT93
L4002	SM301502001	SMBEAD1206	Q1008	SM270130092	BFR92A
L4003	SM301502001	SMBEAD1206	Q1009	SM270130092	BFR92A
L4004	SM301502001	SMBEAD1206	Q1010	SM270130092	BFR92A
L4005	SM301502001	SMBEAD1206	Q1011	SM275330858	BC858C
L4006	SM301502001	SMBEAD1206	Q1012	SM270130092	BFR92A
L4500	SM669080181	SMBEAD0805	Q1013	SM270130092	BFR92A
L4501	SM669080181	SMBEAD0805	Q1014	SM270130092	BFR92A
L4502	SM654101000	SM0S	Q1015	SM270130092	BFR92A

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
Q1500	SM289240062	BCV62	Q4010	SM270130092	BFR92A
Q1503	SM289240061	BCV61	Q4011	SM275330858	BC858C
Q2000	SM280120416	MMBF4416	Q4012	SM270130092	BFR92A
Q2001	SM270130092	BFR92A	Q4013	SM270130092	BFR92A
Q2002	SM270130092	BFR92A	Q4014	SM270130092	BFR92A
Q2003	SM275040092	BFT92R	Q4015	SM270130092	BFR92A
Q2004	SM289240062	BCV62	Q4500	SM289240062	BCV62
Q2005	SM275030092	BFT92	Q4503	SM289240061	BCV61
Q2006	SM275030093	BFT93	Q5000	SM270130092	BFR92A
Q2008	SM270130092	BFR92A	Q5001	SM280120416	MMBF4416
Q2009	SM270130092	BFR92A	Q5002	SM270130093	BFR93A
Q2010	SM270130092	BFR92A	Q5003	SM270140092	BFR92AR
Q2011	SM275330858	BC858C	Q5004	SM270130092	BFR92A
Q2012	SM270130092	BFR92A	Q5005	SM270130092	BFR92A
Q2013	SM270130092	BFR92A	Q6000	SM270130093	BFR93A
Q2014	SM270130092	BFR92A	Q6001	SM275030550	BF550
Q2015	SM270130092	BFR92A	Q6002	SM270130092	BFR92A
Q2500	SM289240062	BCV62	Q6003	SM270130093	BFR93A
Q2503	SM289240061	BCV61	Q6004	SM275030550	BF550
Q3000	SM280120416	MMBF4416	R1	SM652101103	SM10KS
Q3001	SM270130092	BFR92A	R2	SM652101103	SM10KS
Q3002	SM270130092	BFR92A	R3	SM652101103	SM10KS
Q3003	SM275040092	BFT92R	R4	SM652101103	SM10KS
Q3004	SM289240062	BCV62	R5	SM652101103	SM10KS
Q3005	SM275030092	BFT92	R6	SM652101103	SM10KS
Q3006	SM275030093	BFT93	R7	SM652101103	SM10KS
Q3008	SM270130092	BFR92A	R8	169416473	NTC-DISC-47K
Q3009	SM270130092	BFR92A	R9	SM652101223	SM22KS
Q3010	SM270130092	BFR92A	R10	SM652101103	SM10KS
Q3011	SM275330858	BC858C	R11	SM652101103	SM10KS
Q3012	SM270130092	BFR92A	R12	SM652101512	SM5.1KS
Q3013	SM270130092	BFR92A	R13	SM652101102	SM1KS
Q3014	SM270130092	BFR92A	R14	SM652101332	SM3.3KS
Q3015	SM270130092	BFR92A	R15	SM652101332	SM3.3KS
Q3500	SM289240062	BCV62	R16	SM652101102	SM1KS
Q3503	SM289240061	BCV61	R17	SM652101102	SM1KS
Q4000	SM280120416	MMBF4416	R18	SM652101332	SM3.3KS
Q4001	SM270130092	BFR92A	R19	SM652101332	SM3.3KS
Q4002	SM270130092	BFR92A	R20	SM652101102	SM1KS
Q4003	SM275040092	BFT92R	R21	SM652101102	SM1KS
Q4004	SM289240062	BCV62	R22	SM652101102	SM1KS
Q4005	SM275030092	BFT92	R23	SM652101332	SM3.3KS
Q4006	SM275030093	BFT93	R24	SM652101102	SM1KS
Q4008	SM270130092	BFR92A	R25	SM652101102	SM1KS
Q4009	SM270130092	BFR92A	R26	SM652101302	SM3KS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R27	SM652101332	SM3.3KS	R218	SM652101103	SM10KS
R28	SM652101102	SM1KS	R219	SM652101103	SM10KS
R29	SM652101103	SM10KS	R220	SM652101103	SM10KS
R31	SM654101000	SM0S	R221	SM652101103	SM10KS
R32	SM652101102	SM1KS	R222	SM652101103	SM10KS
R33	SM652101102	SM1KS	R223	SM652101103	SM10KS
R34	SM652101103	SM10KS	R224	SM652101103	SM10KS
R35	SM652101102	SM1KS	R225	SM652101103	SM10KS
R36	SM652101102	SM1KS	R226	SM652101103	SM10KS
R37	SM652101220	SM22S	R227	SM652101750	SM75S
R38	SM652101103	SM10KS	R228	SM652101750	SM75S
R39	SM652101220	SM22S	R229	SM652101101	SM100S
R40	SM652101220	SM22S	R230	SM652101301	SM300S
R41	SM652101220	SM22S	R231	SM652101750	SM75S
R42	SM652101680	SM68S	R232	SM652101750	SM75S
R43	SM652101680	SM68S	R233	SM652101103	SM10KS
R44	SM652101680	SM68S	R234	SM652101103	SM10KS
R45	SM652101102	SM1KS	R235	SM652101301	SM300S
R46	SM652101103	SM10KS	R236	SM652101101	SM100S
R47	SM652101103	SM10KS	R245	SM185457101	SM100-1T
R48	SM652101103	SM10KS	R246	SM185457101	SM100-1T
R49	SM652101103	SM10KS	R400	SM652101201	SM200S
R52	SM652115062	SM6.2-1W	R401	SM652101201	SM200S
R54	SM652101103	SM10KS	R402	SM652101201	SM200S
R56	SM652101100	SM10S	R403	SM652101201	SM200S
R57	SM652101122	SM1.2KS	R404	SM652101121	SM120S
R58	SM652101220	SM22S	R405	SM652101121	SM120S
R200	SM652101103	SM10KS	R406	SM652101121	SM120S
R201	SM652101122	SM1.2KS	R407	SM652101121	SM120S
R202	SM652101103	SM10KS	R408	SM652101101	SM100S
R203	SM652101103	SM10KS	R409	SM652101181	SM180S
R204	SM652101510	SM51S	R410	SM652101101	SM100S
R205	SM652101102	SM1KS	R411	SM652101181	SM180S
R206	SM652101332	SM3.3KS	R415	SM652101331	SM330S
R207	SM652101824	SM820KS	R417	SM652101101	SM100S
R208	SM168659007	SM3.0K-1/oo	R418	SM652101750	SM75S
R209	SM168659004	SM900-1/oo	R507	SM652101102	SM1KS
R210	SM168659297	SM100-1/oo	R511	SM652101102	SM1KS
R211	SM652101153	SM15KS	R514	SM652101102	SM1KS
R212	SM652101152	SM1.5KS	R515	SM652101102	SM1KS
R213	SM652101332	SM3.3KS	R516	SM652101102	SM1KS
R214	SM652101103	SM10KS	R517	SM652101201	SM200S
R215	SM652101103	SM10KS	R518	SM652101201	SM200S
R216	SM652101103	SM10KS	R519	SM652101201	SM200S
R217	SM652101103	SM10KS	R520	SM652101201	SM200S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R521	SM652101121	SM120S	R623	SM652101121	SM120S
R522	SM652101121	SM120S	R624	SM652101121	SM120S
R523	SM652101121	SM120S	R625	SM652101201	SM200S
R524	SM652101121	SM120S	R626	SM652101201	SM200S
R525	SM652101201	SM200S	R627	SM652101121	SM120S
R526	SM652101201	SM200S	R628	SM652101121	SM120S
R527	SM652101121	SM120S	R629	SM652101102	SM1KS
R528	SM652101121	SM120S	R630	SM652101102	SM1KS
R529	SM652101102	SM1KS	R650	SM652101621	SM620S
R530	SM652101102	SM1KS	R651	SM652101621	SM620S
R550	SM652101621	SM620S	R652	SM652101153	SM15KS
R551	SM652101621	SM620S	R653	SM652101751	SM750S
R552	SM652101153	SM15KS	R654	SM652101223	SM22KS
R553	SM652101751	SM750S	R656	SM652101153	SM15KS
R554	SM652101223	SM22KS	R657	SM652101751	SM750S
R556	SM652101153	SM15KS	R658	SM652101223	SM22KS
R557	SM652101751	SM750S	R662	SM652101121	SM120S
R558	SM652101223	SM22KS	R663	SM652101121	SM120S
R562	SM652101121	SM120S	R664	SM652101201	SM200S
R563	SM652101121	SM120S	R665	SM652101201	SM200S
R564	SM652101201	SM200S	R666	SM652101121	SM120S
R565	SM652101201	SM200S	R667	SM652101121	SM120S
R566	SM652101121	SM120S	R668	SM652101201	SM200S
R567	SM652101121	SM120S	R669	SM652101201	SM200S
R568	SM652101201	SM200S	R670	SM652101103	SM10KS
R569	SM652101201	SM200S	R671	SM652101103	SM10KS
R570	SM652101103	SM10KS	R672	SM652101103	SM10KS
R571	SM652101103	SM10KS	R673	SM652101103	SM10KS
R572	SM652101103	SM10KS	R674	SM652101103	SM10KS
R573	SM652101103	SM10KS	R675	SM652101103	SM10KS
R574	SM652101103	SM10KS	R678	SM652101103	SM10KS
R575	SM652101103	SM10KS	R679	SM652101103	SM10KS
R578	SM652101103	SM10KS	R701	SM652101131	SM130S
R579	SM652101103	SM10KS	R702	SM652101181	SM180S
R607	SM652101102	SM1KS	R703	SM652101181	SM180S
R611	SM652101102	SM1KS	R704	SM652101391	SM390S
R614	SM652101102	SM1KS	R705	SM652101131	SM130S
R615	SM652101102	SM1KS	R706	SM652101181	SM180S
R616	SM652101102	SM1KS	R707	SM652101181	SM180S
R617	SM652101121	SM120S	R708	SM652101131	SM130S
R618	SM652101121	SM120S	R709	SM652101102	SM1KS
R619	SM652101201	SM200S	R710	SM652101220	SM22S
R620	SM652101201	SM200S	R711	SM652101131	SM130S
R621	SM652101201	SM200S	R712	SM652101131	SM130S
R622	SM652101201	SM200S	R713	SM652101102	SM1KS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R714	SM652101181	SM180S	R759	SM652101750	SM75S
R715	SM652101181	SM180S	R760	SM652101911	SM910S
R716	SM652101131	SM130S	R761	SM652101102	SM1KS
R717	SM652101391	SM390S	R762	SM652101201	SM200S
R718	SM652101820	SM82S	R763	SM652101201	SM200S
R719	SM652101181	SM180S	R764	SM652101510	SM51S
R720	SM652101181	SM180S	R765	SM652101391	SM390S
R721	SM652101181	SM180S	R766	SM652101471	SM470S
R722	SM652101181	SM180S	R767	SM652101680	SM68S
R723	SM652101131	SM130S	R768	SM652101181	SM180S
R724	SM652101131	SM130S	R769	SM652101181	SM180S
R725	SM652101131	SM130S	R770	SM652101181	SM180S
R726	SM652101131	SM130S	R771	SM652101181	SM180S
R727	SM652101471	SM470S	R772	SM652101181	SM180S
R728	SM652101391	SM390S	R773	SM652101512	SM5.1KS
R729	SM652101181	SM180S	R775	SM652101181	SM180S
R730	SM652101181	SM180S	R776	SM652101181	SM180S
R731	SM652101181	SM180S	R777	SM652101471	SM470S
R732	SM652101181	SM180S	R778	SM652101181	SM180S
R733	SM652101181	SM180S	R779	SM652101181	SM180S
R734	SM652101181	SM180S	R781	SM652101181	SM180S
R735	SM652101680	SM68S	R782	SM652101181	SM180S
R736	SM652101271	SM270S	R783	SM652101101	SM100S
R737	SM652101271	SM270S	R784	SM652101220	SM22S
R738	SM652101181	SM180S	R785	SM652101220	SM22S
R739	SM652101181	SM180S	R786	SM652101181	SM180S
R740	SM652101181	SM180S	R787	SM652101181	SM180S
R741	SM652101181	SM180S	R788	SM652101101	SM100S
R742	SM652101102	SM1KS	R789	SM652101220	SM22S
R743	SM652101102	SM1KS	R790	SM652101181	SM180S
R744	SM652101102	SM1KS	R791	SM652101181	SM180S
R745	SM652101471	SM470S	R792	SM652101181	SM180S
R746	SM652101471	SM470S	R793	SM652101181	SM180S
R747	SM652101471	SM470S	R794	SM652101181	SM180S
R748	SM652101471	SM470S	R795	SM652101220	SM22S
R749	SM652101181	SM180S	R797	SM652101181	SM180S
R750	SM652101181	SM180S	R799	SM652101181	SM180S
R751	SM652101181	SM180S	R800	SM652101181	SM180S
R752	SM652101181	SM180S	R801	SM652101181	SM180S
R753	SM652101121	SM120S	R802	SM652101181	SM180S
R754	SM652101121	SM120S	R803	SM652101131	SM130S
R755	SM652101181	SM180S	R804	SM652101181	SM180S
R756	SM652101181	SM180S	R805	SM652101181	SM180S
R757	SM652101181	SM180S	R806	SM652101181	SM180S
R758	SM652101181	SM180S	R807	SM652101181	SM180S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R808	SM652101131	SM130S	R870	SM652101112	SM1.1KS
R809	SM652101181	SM180S	R871	SM652101510	SM51S
R812	SM652101471	SM470S	R872	SM652101103	SM10KS
R813	SM652101181	SM180S	R873	SM652101510	SM51S
R814	SM652101181	SM180S	R874	SM652101181	SM180S
R820	SM652101181	SM180S	R877	SM652101471	SM470S
R821	SM652101202	SM2KS	R878	SM652101471	SM470S
R822	SM652101820	SM82S	R879	SM651104204	SM200K-25PPM
R823	SM652101131	SM130S	R880	SM652101751	SM750S
R824	SM652101181	SM180S	R881	SM652101152	SM1.5KS
R826	SM652101391	SM390S	R882	SM652101101	SM100S
R827	SM652101510	SM51S	R883	SM652101101	SM100S
R829	SM652101181	SM180S	R885	SM652101181	SM180S
R830	SM652101181	SM180S	R886	SM652101101	SM100S
R832	SM652101181	SM180S	R887	SM652101471	SM470S
R833	SM652101181	SM180S	R888	SM652101471	SM470S
R834	SM652101821	SM820S	R889	SM652101471	SM470S
R835	SM652101751	SM750S	R890	SM652101102	SM1KS
R836	SM652101181	SM180S	R891	SM652101152	SM1.5KS
R837	SM652101181	SM180S	R892	SM652101131	SM130S
R838	SM652101181	SM180S	R893	SM652101751	SM750S
R840	SM652101510	SM51S	R894	SM652101101	SM100S
R841	SM652101510	SM51S	R895	SM652101240	SM24S
R842	SM652101510	SM51S	R897	SM652101102	SM1KS
R843	SM652101181	SM180S	R898	SM651104241	SM240-25PPM
R844	SM652101181	SM180S	R899	SM651104392	SM3.9K-25PPM
R845	SM652101181	SM180S	R900	SM652101101	SM100S
R847	SM652101102	SM1KS	R901	SM652101751	SM750S
R848	SM652101102	SM1KS	R902	SM652101751	SM750S
R849	SM652101181	SM180S	R903	SM652101102	SM1KS
R850	SM652101471	SM470S	R904	SM652101102	SM1KS
R851	SM652101102	SM1KS	R905	SM651104183	SM18K-25PPM
R852	SM652101102	SM1KS	R906	SM651104182	SM1.8K-25PPM
R855	SM652101471	SM470S	R907	SM651104201	SM200-25PPM
R857	SM652101510	SM51S	R908	SM185457201	SM200-1T
R858	SM652101103	SM10KS	R909	SM652101181	SM180S
R859	SM652101510	SM51S	R910	SM652101181	SM180S
R861	SM652101510	SM51S	R911	SM652101181	SM180S
R862	SM652101510	SM51S	R912	SM652101181	SM180S
R863	SM652101510	SM51S	R913	SM652101750	SM75S
R864	SM652101471	SM470S	R914	SM652101510	SM51S
R865	SM652101512	SM5.1KS	R915	SM652101271	SM270S
R866	SM652101562	SM5.6KS	R916	SM652101221	SM220S
R867	SM652101510	SM51S	R918	SM652101301	SM300S
R869	SM652101181	SM180S	R919	SM652101391	SM390S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R920	SM652101181	SM180S	R975	SM652101471	SM470S
R921	SM652101181	SM180S	R976	SM652101471	SM470S
R923	SM652101750	SM75S	R977	SM652101510	SM51S
R924	SM652101220	SM22S	R978	SM652101391	SM390S
R925	SM652101220	SM22S	R979	SM652101510	SM51S
R926	SM652101512	SM5.1KS	R980	SM652101391	SM390S
R927	SM652101562	SM5.6KS	R981	SM652101471	SM470S
R929	SM652101103	SM10KS	R982	SM652101471	SM470S
R935	SM652101181	SM180S	R983	SM652101510	SM51S
R936	SM652101181	SM180S	R984	SM652101391	SM390S
R937	SM652101181	SM180S	R985	SM652101510	SM51S
R938	SM652101181	SM180S	R986	SM652101181	SM180S
R939	SM652101181	SM180S	R987	SM652101181	SM180S
R940	SM652101181	SM180S	R988	SM652101823	SM82KS
R941	SM652101181	SM180S	R989	SM652101181	SM180S
R942	SM652101181	SM180S	R990	SM652101512	SM5.1KS
R943	SM652101181	SM180S	R991	SM652101562	SM5.6KS
R944	SM652101181	SM180S	R1000	SM652101330	SM33S
R945	SM652101512	SM5.1KS	R1001	SM652101391	SM390S
R946	SM652101562	SM5.6KS	R1002	SM652101392	SM3.9KS
R947	SM652101181	SM180S	R1003	SM652101105	SM1MS
R948	SM652101181	SM180S	R1004	SM652101332	SM3.3KS
R950	SM652101221	SM220S	R1005	SM652113954	SM950K-3/oo
R951	SM652101221	SM220S	R1006	SM652101181	SM180S
R952	SM652101221	SM220S	R1007	SM168651297	SM100-1%MM
R953	SM652101221	SM220S	R1008	SM652101822	SM8.2KS
R954	SM652101221	SM220S	R1009	SM652101683	SM68KS
R955	SM652101221	SM220S	R1010	SM185457502	SM5K-1T
R956	SM652101221	SM220S	R1011	SM652101101	SM100S
R957	SM652101221	SM220S	R1012	SM652101360	SM36S
R958	SM652101221	SM220S	R1013	SM652101220	SM22S
R959	SM652101221	SM220S	R1014	SM168651297	SM100-1%MM
R960	SM652101112	SM1.1KS	R1016	SM652113523	SM52.63K-3/oo
R963	SM652101181	SM180S	R1017	SM652101101	SM100S
R964	SM652101181	SM180S	R1018	SM652101114	SM110KS
R965	SM652101181	SM180S	R1019	SM652110904	SM900K-5/oo
R966	SM652101181	SM180S	R1020	SM652101272	SM2.7KS
R967	SM652101181	SM180S	R1021	SM652101512	SM5.1KS
R968	SM652101181	SM180S	R1022	SM652101390	SM39S
R969	SM652101181	SM180S	R1023	SM652101475	SM4.7MS
R970	SM652101181	SM180S	R1024	SM652101122	SM1.2KS
R971	SM652101181	SM180S	R1025	SM652101221	SM220S
R972	SM652101471	SM470S	R1026	SM652101105	SM1MS
R973	SM652101471	SM470S	R1027	SM652101105	SM1MS
R974	SM652101471	SM470S	R1028	SM652101220	SM22S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R1029	SM652101151	SM150S	R1076	SM652101100	SM10S
R1030	SM652101512	SM5.1KS	R1077	SM652101100	SM10S
R1031	SM652101512	SM5.1KS	R1078	SM652101301	SM300S
R1032	SM652101101	SM100S	R1080	SM652101101	SM100S
R1033	SM652101185	SM1.8MS	R1081	SM652101152	SM1.5KS
R1034	SM652101334	SM330KS	R1082	SM652101562	SM5.6KS
R1035	SM652101101	SM100S	R1083	SM652101750	SM75S
R1036	SM652101333	SM33KS	R1084	SM185457203	SM20K-1T
R1037	SM652101103	SM10KS	R1085	SM652101152	SM1.5KS
R1038	SM652101220	SM22S	R1086	SM652101302	SM3KS
R1039	SM652101511	SM510S	R1087	SM652101221	SM220S
R1040	SM652101331	SM330S	R1088	SM652101103	SM10KS
R1041	SM185457103	SM10K-1T	R1089	SM652101103	SM10KS
R1042	SM652101103	SM10KS	R1090	SM652101221	SM220S
R1043	SM652101913	SM91KS	R1091	SM652101103	SM10KS
R1044	SM652101182	SM1.8KS	R1092	SM652101105	SM1MS
R1045	SM652101163	SM16KS	R1093	SM652101105	SM1MS
R1046	SM652101122	SM1.2KS	R1094	SM652101103	SM10KS
R1047	SM652101101	SM100S	R1095	SM652101221	SM220S
R1048	SM652101470	SM47S	R1096	SM652101105	SM1MS
R1049	SM652101470	SM47S	R1097	SM652101105	SM1MS
R1050	SM652101240	SM24S	R1098	SM652101221	SM220S
R1051	SM652101101	SM100S	R1099	SM652101100	SM10S
R1052	SM652101223	SM22KS	R1100	SM652101512	SM5.1KS
R1053	SM652101822	SM8.2KS	R1101	SM652101470	SM47S
R1054	SM652101100	SM10S	R1102	SM652101470	SM47S
R1055	SM652101471	SM470S	R1506	SM652101510	SM51S
R1056	SM652101471	SM470S	R1508	SM652101153	SM15KS
R1057	SM652101750	SM75S	R1510	SM652101750	SM75S
R1058	SM652101240	SM24S	R1513	SM652101103	SM10KS
R1059	SM652101100	SM10S	R1514	SM652101122	SM1.2KS
R1060	SM652101100	SM10S	R1515	SM185457501	SM500-1T
R1061	SM652101240	SM24S	R1516	SM653206222	SMNTC-2.2K
R1062	SM652101120	SM12S	R1517	SM652101122	SM1.2KS
R1064	SM652101302	SM3KS	R1518	SM185457502	SM5K-1T
R1065	SM652101302	SM3KS	R1519	SM652101822	SM8.2KS
R1066	SM652101750	SM75S	R1520	SM652101103	SM10KS
R1067	SM652101510	SM51S	R1521	SM652101151	SM150S
R1068	SM652101220	SM22S	R1522	SM652101151	SM150S
R1069	SM652101330	SM33S	R1523	SM652101201	SM200S
R1070	SM652101301	SM300S	R1524	SM652101201	SM200S
R1071	SM652101301	SM300S	R1525	SM652101201	SM200S
R1073	SM652101101	SM100S	R1526	SM652101201	SM200S
R1074	SM652101301	SM300S	R1527	SM652101680	SM68S
R1075	SM652101301	SM300S	R1528	SM652101680	SM68S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R1529	SM654101000	SM0S	R1577	SM185457102	SM1K-1T
R1530	SM652101201	SM200S	R1579	SM652101182	SM1.8KS
R1531	SM652101201	SM200S	R1580	SM653206222	SMNTC-2.2K
R1532	SM652101151	SM150S	R2000	SM652101330	SM33S
R1533	SM652101151	SM150S	R2001	SM652101391	SM390S
R1534	SM652101220	SM22S	R2002	SM652101392	SM3.9KS
R1535	SM652101750	SM75S	R2003	SM652101105	SM1MS
R1536	SM652101151	SM150S	R2004	SM652101332	SM3.3KS
R1537	SM652101151	SM150S	R2005	SM652113954	SM950K-3/oo
R1538	SM652101201	SM200S	R2006	SM652101181	SM180S
R1539	SM652101201	SM200S	R2007	SM168651297	SM100-1%MM
R1540	SM652101182	SM1.8KS	R2008	SM652101822	SM8.2KS
R1541	SM652101103	SM10KS	R2009	SM652101683	SM68KS
R1542	SM652101101	SM100S	R2010	SM185457502	SM5K-1T
R1544	SM654101000	SM0S	R2011	SM652101101	SM100S
R1545	SM652101431	SM430S	R2012	SM652101360	SM36S
R1546	SM652101431	SM430S	R2013	SM652101220	SM22S
R1547	SM652101431	SM430S	R2014	SM168651297	SM100-1%MM
R1548	SM652101431	SM430S	R2016	SM652113523	SM52.63K-3/oo
R1549	SM652101431	SM430S	R2017	SM652101101	SM100S
R1550	SM652101431	SM430S	R2018	SM652101114	SM110KS
R1551	SM652101431	SM430S	R2019	SM652110904	SM900K-5/oo
R1552	SM652101431	SM430S	R2020	SM652101272	SM2.7KS
R1553	SM652101431	SM430S	R2021	SM652101512	SM5.1KS
R1554	SM652101910	SM91S	R2022	SM652101390	SM39S
R1555	SM652101910	SM91S	R2023	SM652101475	SM4.7MS
R1556	SM652101910	SM91S	R2024	SM652101122	SM1.2KS
R1557	SM652101910	SM91S	R2025	SM652101221	SM220S
R1558	SM652101910	SM91S	R2026	SM652101105	SM1MS
R1559	SM652101910	SM91S	R2027	SM652101105	SM1MS
R1560	SM652101910	SM91S	R2028	SM652101220	SM22S
R1561	SM652101910	SM91S	R2029	SM652101151	SM150S
R1562	SM652101910	SM91S	R2030	SM652101512	SM5.1KS
R1563	SM652101301	SM300S	R2031	SM652101512	SM5.1KS
R1564	SM652101301	SM300S	R2032	SM652101101	SM100S
R1567	SM652101201	SM200S	R2033	SM652101185	SM1.8MS
R1568	SM652101201	SM200S	R2034	SM652101334	SM330KS
R1569	SM652101151	SM150S	R2035	SM652101101	SM100S
R1570	SM652101151	SM150S	R2036	SM652101333	SM33KS
R1571	SM652101201	SM200S	R2037	SM652101103	SM10KS
R1572	SM652101201	SM200S	R2038	SM652101220	SM22S
R1573	SM185457501	SM500-1T	R2039	SM652101511	SM510S
R1574	SM652101472	SM4.7KS	R2040	SM652101331	SM330S
R1575	SM652101223	SM22KS	R2041	SM185457103	SM10K-1T
R1576	SM185457503	SM50K-1T	R2042	SM652101103	SM10KS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R2043	SM652101913	SM91KS	R2091	SM652101103	SM10KS
R2044	SM652101182	SM1.8KS	R2092	SM652101105	SM1MS
R2045	SM652101163	SM16KS	R2093	SM652101105	SM1MS
R2046	SM652101122	SM1.2KS	R2094	SM652101103	SM10KS
R2047	SM652101101	SM100S	R2095	SM652101221	SM220S
R2048	SM652101470	SM47S	R2096	SM652101105	SM1MS
R2049	SM652101470	SM47S	R2097	SM652101105	SM1MS
R2050	SM652101240	SM24S	R2098	SM652101221	SM220S
R2051	SM652101101	SM100S	R2099	SM652101100	SM10S
R2052	SM652101223	SM22KS	R2100	SM652101512	SM5.1KS
R2053	SM652101822	SM8.2KS	R2101	SM652101470	SM47S
R2054	SM652101100	SM10S	R2102	SM652101470	SM47S
R2055	SM652101471	SM470S	R2506	SM652101510	SM51S
R2056	SM652101471	SM470S	R2508	SM652101153	SM15KS
R2057	SM652101750	SM75S	R2510	SM652101750	SM75S
R2058	SM652101240	SM24S	R2513	SM652101103	SM10KS
R2059	SM652101100	SM10S	R2514	SM652101122	SM1.2KS
R2060	SM652101100	SM10S	R2515	SM185457501	SM500-1T
R2061	SM652101240	SM24S	R2516	SM653206222	SMNTC-2.2K
R2062	SM652101120	SM12S	R2517	SM652101122	SM1.2KS
R2064	SM652101302	SM3KS	R2518	SM185457502	SM5K-1T
R2065	SM652101302	SM3KS	R2519	SM652101822	SM8.2KS
R2066	SM652101750	SM75S	R2520	SM652101103	SM10KS
R2067	SM652101510	SM51S	R2521	SM652101151	SM150S
R2068	SM652101220	SM22S	R2522	SM652101151	SM150S
R2069	SM652101330	SM33S	R2523	SM652101201	SM200S
R2070	SM652101301	SM300S	R2524	SM652101201	SM200S
R2071	SM652101301	SM300S	R2525	SM652101201	SM200S
R2073	SM652101101	SM100S	R2526	SM652101201	SM200S
R2074	SM652101301	SM300S	R2527	SM652101680	SM68S
R2075	SM652101301	SM300S	R2528	SM652101680	SM68S
R2076	SM652101100	SM10S	R2529	SM654101000	SM0S
R2077	SM652101100	SM10S	R2530	SM652101201	SM200S
R2078	SM652101301	SM300S	R2531	SM652101201	SM200S
R2080	SM652101101	SM100S	R2532	SM652101151	SM150S
R2081	SM652101152	SM1.5KS	R2533	SM652101151	SM150S
R2082	SM652101562	SM5.6KS	R2534	SM652101220	SM22S
R2083	SM652101750	SM75S	R2535	SM652101750	SM75S
R2084	SM185457203	SM20K-1T	R2536	SM652101151	SM150S
R2085	SM652101152	SM1.5KS	R2537	SM652101151	SM150S
R2086	SM652101302	SM3KS	R2538	SM652101201	SM200S
R2087	SM652101221	SM220S	R2539	SM652101201	SM200S
R2088	SM652101103	SM10KS	R2540	SM652101182	SM1.8KS
R2089	SM652101103	SM10KS	R2541	SM652101103	SM10KS
R2090	SM652101221	SM220S	R2542	SM652101101	SM100S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R2544	SM654101000	SM0S	R3011	SM652101101	SM100S
R2545	SM652101431	SM430S	R3012	SM652101360	SM36S
R2546	SM652101431	SM430S	R3013	SM652101220	SM22S
R2547	SM652101431	SM430S	R3014	SM168651297	SM100-1%MM
R2548	SM652101431	SM430S	R3016	SM652113523	SM52.63K-3/oo
R2549	SM652101431	SM430S	R3017	SM652101101	SM100S
R2550	SM652101431	SM430S	R3018	SM652101114	SM110KS
R2551	SM652101431	SM430S	R3019	SM652110904	SM900K-5/oo
R2552	SM652101431	SM430S	R3020	SM652101272	SM2.7KS
R2553	SM652101431	SM430S	R3021	SM652101512	SM5.1KS
R2554	SM652101910	SM91S	R3022	SM652101390	SM39S
R2555	SM652101910	SM91S	R3023	SM652101475	SM4.7MS
R2556	SM652101910	SM91S	R3024	SM652101122	SM1.2KS
R2557	SM652101910	SM91S	R3025	SM652101221	SM220S
R2558	SM652101910	SM91S	R3026	SM652101105	SM1MS
R2559	SM652101910	SM91S	R3027	SM652101105	SM1MS
R2560	SM652101910	SM91S	R3028	SM652101220	SM22S
R2561	SM652101910	SM91S	R3029	SM652101151	SM150S
R2562	SM652101910	SM91S	R3030	SM652101512	SM5.1KS
R2563	SM652101301	SM300S	R3031	SM652101512	SM5.1KS
R2564	SM652101301	SM300S	R3032	SM652101101	SM100S
R2567	SM652101201	SM200S	R3033	SM652101185	SM1.8MS
R2568	SM652101201	SM200S	R3034	SM652101334	SM330KS
R2569	SM652101151	SM150S	R3035	SM652101101	SM100S
R2570	SM652101151	SM150S	R3036	SM652101333	SM33KS
R2571	SM652101201	SM200S	R3037	SM652101103	SM10KS
R2572	SM652101201	SM200S	R3038	SM652101220	SM22S
R2573	SM185457501	SM500-1T	R3039	SM652101511	SM510S
R2574	SM652101472	SM4.7KS	R3040	SM652101331	SM330S
R2575	SM652101223	SM22KS	R3041	SM185457103	SM10K-1T
R2576	SM185457503	SM50K-1T	R3042	SM652101103	SM10KS
R2577	SM185457102	SM1K-1T	R3043	SM652101913	SM91KS
R2579	SM652101182	SM1.8KS	R3044	SM652101182	SM1.8KS
R2580	SM653206222	SMNTC-2.2K	R3045	SM652101163	SM16KS
R3000	SM652101330	SM33S	R3046	SM652101122	SM1.2KS
R3001	SM652101391	SM390S	R3047	SM652101101	SM100S
R3002	SM652101392	SM3.9KS	R3048	SM652101470	SM47S
R3003	SM652101105	SM1MS	R3049	SM652101470	SM47S
R3004	SM652101332	SM3.3KS	R3050	SM652101240	SM24S
R3005	SM652113954	SM950K-3/oo	R3051	SM652101101	SM100S
R3006	SM652101181	SM180S	R3052	SM652101223	SM22KS
R3007	SM168651297	SM100-1%MM	R3053	SM652101822	SM8.2KS
R3008	SM652101822	SM8.2KS	R3054	SM652101100	SM10S
R3009	SM652101683	SM68KS	R3055	SM652101471	SM470S
R3010	SM185457502	SM5K-1T	R3056	SM652101471	SM470S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R3057	SM652101750	SM75S	R3510	SM652101750	SM75S
R3058	SM652101240	SM24S	R3513	SM652101103	SM10KS
R3059	SM652101100	SM10S	R3514	SM652101122	SM1.2KS
R3060	SM652101100	SM10S	R3515	SM185457501	SM500-1T
R3061	SM652101240	SM24S	R3516	SM653206222	SMNTC-2.2K
R3062	SM652101120	SM12S	R3517	SM652101122	SM1.2KS
R3064	SM652101302	SM3KS	R3518	SM185457502	SM5K-1T
R3065	SM652101302	SM3KS	R3519	SM652101822	SM8.2KS
R3066	SM652101750	SM75S	R3520	SM652101103	SM10KS
R3067	SM652101510	SM51S	R3521	SM652101151	SM150S
R3068	SM652101220	SM22S	R3522	SM652101151	SM150S
R3069	SM652101330	SM33S	R3523	SM652101201	SM200S
R3070	SM652101301	SM300S	R3524	SM652101201	SM200S
R3071	SM652101301	SM300S	R3525	SM652101201	SM200S
R3073	SM652101101	SM100S	R3526	SM652101201	SM200S
R3074	SM652101301	SM300S	R3527	SM652101680	SM68S
R3075	SM652101301	SM300S	R3528	SM652101680	SM68S
R3076	SM652101100	SM10S	R3529	SM654101000	SM0S
R3077	SM652101100	SM10S	R3530	SM652101201	SM200S
R3078	SM652101301	SM300S	R3531	SM652101201	SM200S
R3080	SM652101101	SM100S	R3532	SM652101151	SM150S
R3081	SM652101152	SM1.5KS	R3533	SM652101151	SM150S
R3082	SM652101562	SM5.6KS	R3534	SM652101220	SM22S
R3083	SM652101750	SM75S	R3535	SM652101750	SM75S
R3084	SM185457203	SM20K-1T	R3536	SM652101151	SM150S
R3085	SM652101152	SM1.5KS	R3537	SM652101151	SM150S
R3086	SM652101302	SM3KS	R3538	SM652101201	SM200S
R3087	SM652101221	SM220S	R3539	SM652101201	SM200S
R3088	SM652101103	SM10KS	R3540	SM652101182	SM1.8KS
R3089	SM652101103	SM10KS	R3541	SM652101103	SM10KS
R3090	SM652101221	SM220S	R3542	SM652101101	SM100S
R3091	SM652101103	SM10KS	R3544	SM654101000	SM0S
R3092	SM652101105	SM1MS	R3545	SM652101431	SM430S
R3093	SM652101105	SM1MS	R3546	SM652101431	SM430S
R3094	SM652101103	SM10KS	R3547	SM652101431	SM430S
R3095	SM652101221	SM220S	R3548	SM652101431	SM430S
R3096	SM652101105	SM1MS	R3549	SM652101431	SM430S
R3097	SM652101105	SM1MS	R3550	SM652101431	SM430S
R3098	SM652101221	SM220S	R3551	SM652101431	SM430S
R3099	SM652101100	SM10S	R3552	SM652101431	SM430S
R3100	SM652101512	SM5.1KS	R3553	SM652101431	SM430S
R3101	SM652101470	SM47S	R3554	SM652101910	SM91S
R3102	SM652101470	SM47S	R3555	SM652101910	SM91S
R3506	SM652101510	SM51S	R3556	SM652101910	SM91S
R3508	SM652101153	SM15KS	R3557	SM652101910	SM91S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R3558	SM652101910	SM91S	R4026	SM652101105	SM1MS
R3559	SM652101910	SM91S	R4027	SM652101105	SM1MS
R3560	SM652101910	SM91S	R4028	SM652101220	SM22S
R3561	SM652101910	SM91S	R4029	SM652101151	SM150S
R3562	SM652101910	SM91S	R4030	SM652101512	SM5.1KS
R3563	SM652101301	SM300S	R4031	SM652101512	SM5.1KS
R3564	SM652101301	SM300S	R4032	SM652101101	SM100S
R3567	SM652101201	SM200S	R4033	SM652101185	SM1.8MS
R3568	SM652101201	SM200S	R4034	SM652101334	SM330KS
R3569	SM652101151	SM150S	R4035	SM652101101	SM100S
R3570	SM652101151	SM150S	R4036	SM652101333	SM33KS
R3571	SM652101201	SM200S	R4037	SM652101103	SM10KS
R3572	SM652101201	SM200S	R4038	SM652101220	SM22S
R3573	SM185457501	SM500-1T	R4039	SM652101511	SM510S
R3574	SM652101472	SM4.7KS	R4040	SM652101331	SM330S
R3575	SM652101223	SM22KS	R4041	SM185457103	SM10K-1T
R3576	SM185457503	SM50K-1T	R4042	SM652101103	SM10KS
R3577	SM185457102	SM1K-1T	R4043	SM652101913	SM91KS
R3579	SM652101182	SM1.8KS	R4044	SM652101182	SM1.8KS
R3580	SM653206222	SMNTC-2.2K	R4045	SM652101163	SM16KS
R4000	SM652101330	SM33S	R4046	SM652101122	SM1.2KS
R4001	SM652101391	SM390S	R4047	SM652101101	SM100S
R4002	SM652101392	SM3.9KS	R4048	SM652101470	SM47S
R4003	SM652101105	SM1MS	R4049	SM652101470	SM47S
R4004	SM652101332	SM3.3KS	R4050	SM652101240	SM24S
R4005	SM652113954	SM950K-3/oo	R4051	SM652101101	SM100S
R4006	SM652101181	SM180S	R4052	SM652101223	SM22KS
R4007	SM168651297	SM100-1%MM	R4053	SM652101822	SM8.2KS
R4008	SM652101822	SM8.2KS	R4054	SM652101100	SM10S
R4009	SM652101683	SM68KS	R4055	SM652101471	SM470S
R4010	SM185457502	SM5K-1T	R4056	SM652101471	SM470S
R4011	SM652101101	SM100S	R4057	SM652101750	SM75S
R4012	SM652101360	SM36S	R4058	SM652101240	SM24S
R4013	SM652101220	SM22S	R4059	SM652101100	SM10S
R4014	SM168651297	SM100-1%MM	R4060	SM652101100	SM10S
R4016	SM652113523	SM52.63K-3/oo	R4061	SM652101240	SM24S
R4017	SM652101101	SM100S	R4062	SM652101120	SM12S
R4018	SM652101114	SM110KS	R4064	SM652101302	SM3KS
R4019	SM652110904	SM900K-5/oo	R4065	SM652101302	SM3KS
R4020	SM652101272	SM2.7KS	R4066	SM652101750	SM75S
R4021	SM652101512	SM5.1KS	R4067	SM652101510	SM51S
R4022	SM652101390	SM39S	R4068	SM652101220	SM22S
R4023	SM652101475	SM4.7MS	R4069	SM652101330	SM33S
R4024	SM652101122	SM1.2KS	R4070	SM652101301	SM300S
R4025	SM652101221	SM220S	R4071	SM652101301	SM300S

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R4073	SM652101101	SM100S	R4526	SM652101201	SM200S
R4074	SM652101301	SM300S	R4527	SM652101680	SM68S
R4075	SM652101301	SM300S	R4528	SM652101680	SM68S
R4076	SM652101100	SM10S	R4529	SM654101000	SM0S
R4077	SM652101100	SM10S	R4530	SM652101201	SM200S
R4078	SM652101301	SM300S	R4531	SM652101201	SM200S
R4080	SM652101101	SM100S	R4532	SM652101151	SM150S
R4081	SM652101152	SM1.5KS	R4533	SM652101151	SM150S
R4082	SM652101562	SM5.6KS	R4534	SM652101220	SM22S
R4083	SM652101750	SM75S	R4535	SM652101750	SM75S
R4084	SM185457203	SM20K-1T	R4536	SM652101151	SM150S
R4085	SM652101152	SM1.5KS	R4537	SM652101151	SM150S
R4086	SM652101302	SM3KS	R4538	SM652101201	SM200S
R4087	SM652101221	SM220S	R4539	SM652101201	SM200S
R4088	SM652101103	SM10KS	R4540	SM652101182	SM1.8KS
R4089	SM652101103	SM10KS	R4541	SM652101103	SM10KS
R4090	SM652101221	SM220S	R4542	SM652101101	SM100S
R4091	SM652101103	SM10KS	R4544	SM654101000	SM0S
R4092	SM652101105	SM1MS	R4545	SM652101431	SM430S
R4093	SM652101105	SM1MS	R4546	SM652101431	SM430S
R4094	SM652101103	SM10KS	R4547	SM652101431	SM430S
R4095	SM652101221	SM220S	R4548	SM652101431	SM430S
R4096	SM652101105	SM1MS	R4549	SM652101431	SM430S
R4097	SM652101105	SM1MS	R4550	SM652101431	SM430S
R4098	SM652101221	SM220S	R4551	SM652101431	SM430S
R4099	SM652101100	SM10S	R4552	SM652101431	SM430S
R4100	SM652101512	SM5.1KS	R4553	SM652101431	SM430S
R4101	SM652101470	SM47S	R4554	SM652101910	SM91S
R4102	SM652101470	SM47S	R4555	SM652101910	SM91S
R4506	SM652101510	SM51S	R4556	SM652101910	SM91S
R4508	SM652101153	SM15KS	R4557	SM652101910	SM91S
R4510	SM652101750	SM75S	R4558	SM652101910	SM91S
R4513	SM652101103	SM10KS	R4559	SM652101910	SM91S
R4514	SM652101122	SM1.2KS	R4560	SM652101910	SM91S
R4515	SM185457501	SM500-1T	R4561	SM652101910	SM91S
R4516	SM653206222	SMNTC-2.2K	R4562	SM652101910	SM91S
R4517	SM652101122	SM1.2KS	R4563	SM652101301	SM300S
R4518	SM185457502	SM5K-1T	R4564	SM652101301	SM300S
R4519	SM652101822	SM8.2KS	R4567	SM652101201	SM200S
R4520	SM652101103	SM10KS	R4568	SM652101201	SM200S
R4521	SM652101151	SM150S	R4569	SM652101151	SM150S
R4522	SM652101151	SM150S	R4570	SM652101151	SM150S
R4523	SM652101201	SM200S	R4571	SM652101201	SM200S
R4524	SM652101201	SM200S	R4572	SM652101201	SM200S
R4525	SM652101201	SM200S	R4573	SM185457501	SM500-1T

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R4574	SM652101472	SM4.7KS	R5040	SM652101182	SM1.8KS
R4575	SM652101223	SM22KS	R5041	SM652101510	SM51S
R4576	SM185457503	SM50K-1T	R5042	SM652101182	SM1.8KS
R4577	SM185457102	SM1K-1T	R5043	SM652101330	SM33S
R4579	SM652101182	SM1.8KS	R5044	SM652101330	SM33S
R4580	SM653206222	SMNTC-2.2K	R5045	SM652101561	SM560S
R5000	SM652101330	SM33S	R5046	SM652101101	SM100S
R5001	SM652101220	SM22S	R5047	SM652101330	SM33S
R5002	SM652101100	SM10S	R5048	SM652101330	SM33S
R5003	SM652101330	SM33S	R5049	SM652101561	SM560S
R5004	SM652101330	SM33S	R5050	SM652101101	SM100S
R5005	SM652101104	SM100KS	R5051	SM652101512	SM5.1KS
R5006	SM652110904	SM900K-5/oo	R5052	SM652101163	SM16KS
R5007	SM652101101	SM100S	R5053	SM185457203	SM20K-1T
R5008	SM652101182	SM1.8KS	R5054	SM652101163	SM16KS
R5009	SM652101272	SM2.7KS	R5055	SM185457203	SM20K-1T
R5010	SM652110904	SM900K-5/oo	R5056	SM652101332	SM3.3KS
R5011	SM652101510	SM51S	R5057	SM654101000	SM0S
R5012	SM652101182	SM1.8KS	R5060	SM654101000	SM0S
R5013	SM652101122	SM1.2KS	R5061	SM652101332	SM3.3KS
R5014	SM652101221	SM220S	R5062	SM652101332	SM3.3KS
R5015	SM652101475	SM4.7MS	R5064	SM654101000	SM0S
R5016	SM168659006	SM111.1K-1/oo	R5066	SM654101000	SM0S
R5017	SM652101153	SM15KS	R5067	SM652101332	SM3.3KS
R5018	SM652101183	SM18KS	R5068	SM652101512	SM5.1KS
R5019	SM185457201	SM200-1T	R5071	SM652101510	SM51S
R5020	SM652101101	SM100S	R5072	SM652101510	SM51S
R5021	SM652101151	SM150S	R5073	SM652101182	SM1.8KS
R5022	SM652101680	SM68S	R5074	SM652101182	SM1.8KS
R5023	SM652101474	SM470KS	R5075	SM652101561	SM560S
R5024	SM652101684	SM680KS	R5076	SM652101561	SM560S
R5025	SM652101103	SM10KS	R5077	SM652101163	SM16KS
R5026	SM652101104	SM100KS	R5078	SM185457203	SM20K-1T
R5027	SM652101330	SM33S	R5079	SM652101163	SM16KS
R5028	SM652101391	SM390S	R5080	SM185457203	SM20K-1T
R5029	SM652110904	SM900K-5/oo	R5081	SM652101332	SM3.3KS
R5030	SM652101101	SM100S	R5082	SM654101000	SM0S
R5031	SM652101331	SM330S	R5084	SM654101000	SM0S
R5032	SM652101103	SM10KS	R5086	SM652101332	SM3.3KS
R5033	SM652101680	SM68S	R5087	SM652101512	SM5.1KS
R5034	SM652101100	SM10S	R5088	SM652101332	SM3.3KS
R5035	SM652101471	SM470S	R5089	SM654101000	SM0S
R5036	SM652101101	SM100S	R5091	SM654101000	SM0S
R5038	SM652101824	SM820KS	R5093	SM652101332	SM3.3KS
R5039	SM652101510	SM51S	R5094	SM652101512	SM5.1KS

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
R5095	SM652101510	SM51S	R6002	SM168659297	SM100-1/oo
R5096	SM652101561	SM560S	R6003	SM168659297	SM100-1/oo
R5097	SM652101182	SM1.8KS	R6004	SM652101331	SM330S
R5098	SM652101101	SM100S	R6005	SM652101112	SM1.1KS
R5099	SM652101561	SM560S	R6006	SM652101330	SM33S
R5100	SM652101271	SM270S	R6007	SM652101181	SM180S
R5101	SM652101101	SM100S	R6008	SM652101112	SM1.1KS
R5102	SM652101561	SM560S	R6009	SM652101621	SM620S
R5103	SM652101163	SM16KS	R6010	SM652101512	SM5.1KS
R5104	SM652101221	SM220S	R6011	SM652101512	SM5.1KS
R5105	SM652101391	SM390S	R6012	SM652101131	SM130S
R5106	SM652101471	SM470S	R6013	SM652101391	SM390S
R5107	SM652101512	SM5.1KS	R6014	SM168659007	SM3.0K-1/oo
R5108	SM185457203	SM20K-1T	R6015	SM168659007	SM3.0K-1/oo
R5109	SM652101471	SM470S	R6016	SM168659004	SM900-1/oo
R5110	SM652101512	SM5.1KS	R6017	SM168659297	SM100-1/oo
R5111	SM652101512	SM5.1KS	R6018	SM652101392	SM3.9KS
R5112	SM652101332	SM3.3KS	R6019	SM652101112	SM1.1KS
R5113	SM654101000	SM0S	R6020	SM168659007	SM3.0K-1/oo
R5115	SM654101000	SM0S	R6021	SM652101220	SM22S
R5117	SM652101332	SM3.3KS	R6022	SM652101101	SM100S
R5118	SM652101512	SM5.1KS	R6023	SM652101101	SM100S
R5119	SM652101562	SM5.6KS	S1	SM654101000	SM0S-2P
R5120	SM652101562	SM5.6KS	S5	SM654101000	SM0S-2P
R5121	SM652101512	SM5.1KS	S6	SM654101000	SM0S-2P
R5122	SM652101562	SM5.6KS	S7	SM654101000	SM0S-2P
R5123	SM652101562	SM5.6KS	Y700	311210000	OSC-18D-10MHz
R5124	SM652101241	SM240S	Y5000	SM310900015	SM15.5029MHz
R5125	SM652101271	SM270S	BZ700	530040007	TMB-05
R5126	SM168651297	SM100-1%MM	CR1	SM236030099	BAV99
R5127	SM168651297	SM100-1%MM	CR2	SM232120070	BAV70
R5128	SM652101202	SM2KS	CR100	SM253032823	HSMS2823
R5129	SM185457502	SM5K-1T	CR200	SM240218451	BZX84-C5V1
R5130	SM652101683	SM68KS	CR201	SM240218475	BZX84-C7V5
R5131	SM652101392	SM3.9KS	CR202	SM240218475	BZX84-C7V5
R5132	SM652101105	SM1MS	CR400	SM236654004	SM4004
R5133	SM652101512	SM5.1KS	CR401	SM236654004	SM4004
R5134	SM652101512	SM5.1KS	CR402	SM236654004	SM4004
R5135	SM652101512	SM5.1KS	CR410	SM253032823	HSMS2823
R5136	SM652101822	SM8.2KS	CR411	SM253032823	HSMS2823
R5137	SM652101332	SM3.3KS	CR412	SM253032823	HSMS2823
R5141	SM652101512	SM5.1KS	CR413	SM253032823	HSMS2823
R5142	SM652101512	SM5.1KS	CR414	SM253032823	HSMS2823
R6000	SM652101330	SM33S	CR415	SM253032823	HSMS2823
R6001	SM168659007	SM3.0K-1/oo	CR416	SM253032823	HSMS2823

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
CR417	SM253032823	HSMS2823	CR1501	SM240050051	TZMC5V1
CR418	SM253032823	HSMS2823	CR2000	SM229020150	SMTVSS-5V6
CR501	SM236030099	BAV99	CR2001	SM236030099	BAV99
CR503	SM240218451	BZX84-C5V1	CR2002	SM236030099	BAV99
CR504	SM240218451	BZX84-C5V1	CR2003	SM236030099	BAV99
CR505	SM240218451	BZX84-C5V1	CR2004	SM252023018	BAT18
CR507	SM240218451	BZX84-C5V1	CR2005	SM240050056	TZMC5V6
CR508	SM240218451	BZX84-C5V1	CR2500	SM240050051	TZMC5V1
CR601	SM236030099	BAV99	CR2501	SM240050051	TZMC5V1
CR603	SM240218451	BZX84-C5V1	CR3000	SM229020150	SMTVSS-5V6
CR604	SM240218451	BZX84-C5V1	CR3001	SM236030099	BAV99
CR605	SM240218451	BZX84-C5V1	CR3002	SM236030099	BAV99
CR607	SM240218451	BZX84-C5V1	CR3003	SM236030099	BAV99
CR608	SM240218451	BZX84-C5V1	CR3004	SM252023018	BAT18
CR700	SM240218451	BZX84-C5V1	CR3005	SM240050056	TZMC5V6
CR701	SM236030099	BAV99	CR3500	SM240050051	TZMC5V1
CR702	SM240218451	BZX84-C5V1	CR3501	SM240050051	TZMC5V1
CR703	SM240218451	BZX84-C5V1	CR4000	SM229020150	SMTVSS-5V6
CR704	SM240218451	BZX84-C5V1	CR4001	SM236030099	BAV99
CR705	SM236654004	SM4004	CR4002	SM236030099	BAV99
CR707	SM252080682	BA682	CR4003	SM236030099	BAV99
CR708	SM252080682	BA682	CR4004	SM252023018	BAT18
CR710	SM252080682	BA682	CR4005	SM240050056	TZMC5V6
CR713	SM236030099	BAV99	CR4500	SM240050051	TZMC5V1
CR716	SM236030099	BAV99	CR4501	SM240050051	TZMC5V1
CR717	SM252080682	BA682	CR5000	SM229020150	SMTVSS-5V6
CR718	SM252080682	BA682	CR5001	SM252023018	BAT18
CR719	SM240218451	BZX84-C5V1	CR5002	SM232120070	BAV70
CR720	SM240218451	BZX84-C5V1	CR5003	SM236030099	BAV99
CR721	SM240218451	BZX84-C5V1	CR5004	SM240050033	TZMC3V3
CR722	SM240218451	BZX84-C5V1	CR5005	SM240050033	TZMC3V3
CR723	SM232022822	HSMS2822	CR5006	SM240050033	TZMC3V3
CR724	SM236030099	BAV99	CR5007	SM240050033	TZMC3V3
CR725	SM232022822	HSMS2822	CR5008	SM240218451	BZX84-C5V1
CR730	SM236030099	BAV99	CR5009	SM240050033	TZMC3V3
CR731	SM236030099	BAV99	CR5010	SM232120070	BAV70
CR732	SM236030099	BAV99	CR5011	SM236030099	BAV99
CR733	SM236030099	BAV99	CR5012	SM236030099	BAV99
CR1000	SM229020150	SMTVSS-5V6	CR6000	SM229020150	SMTVSS-5V6
CR1001	SM236030099	BAV99	CR6001	SM253032823	HSMS2823
CR1002	SM236030099	BAV99	CR6002	SM232022822	HSMS2822
CR1003	SM236030099	BAV99	CR6003	SM240050051	TZMC5V1
CR1004	SM252023018	BAT18	CR6004	SM236030099	BAV99
CR1005	SM240050056	TZMC5V6	DL700	290199015	DL-1L6-15
CR1500	SM240050051	TZMC5V1	DL701	290199015	DL-1L6-15

PART: F9354-31 DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

Location	Part Number	Description	Location	Part Number	Description
DL705	290120009	9nS	RL3001	430430002	RL-FBR22-12
DL706	290120004	4nS	RL3002	430441732	RL-732-12
DL707	290120002	2nS	RL3003	430430002	RL-FBR22-12
DL708	290120002	2nS	RL4000	430441732	RL-732-12
DL709	290120002	2nS	RL4001	430430002	RL-FBR22-12
DL710	290120009	9nS	RL4002	430441732	RL-732-12
DL711	290120002	2nS	RL4003	430430002	RL-FBR22-12
DL712	290120005	5nS	RL5000	430490003	RL-TQ2-12
RL200	430490750	RL-UR1-12	RL5001	430430002	RL-FBR22-12
RL201	SIMUL	SIMUL-RL-UR1	TP201	454313010	2x5-ST-M-NW-SP
RL202	SIMUL	SIMUL-RL-UR1	TP202	454313010	2x5-ST-M-NW-SP
RL203	430490750	RL-UR1-12	TP203	454313010	2x5-ST-M-NW-SP
RL1000	430441732	RL-732-12	TP1000	454340002	2x1-ST-M-NW
RL1001	430430002	RL-FBR22-12	TP1500	454311008	2x4-ST-M-NW
RL1002	430441732	RL-732-12	TP2000	454340002	2x1-ST-M-NW
RL1003	430430002	RL-FBR22-12	TP2500	454311008	2x4-ST-M-NW
RL2000	430441732	RL-732-12	TP3000	454340002	2x1-ST-M-NW
RL2001	430430002	RL-FBR22-12	TP3500	454311008	2x4-ST-M-NW
RL2002	430441732	RL-732-12	TP4000	454340002	2x1-ST-M-NW
RL2003	430430002	RL-FBR22-12	TP4500	454311008	2x4-ST-M-NW
RL3000	430441732	RL-732-12	TP5000	454340002	2x1-ST-M-NW

PART: F9354-31**DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T**

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
146544471	CAP MINI ALUM 20% 470UF	1
146554476	CAP MINI ALUM 20% 47 UF	2
146574227	CAP MINI ALUM 20% 220 UF	3
158849009	CAP VARIABLE .5 - 2.5 PF	8
158849012	CAP VARIABLE 5.0-15 PF	4
169416473	RESISTOR DISC NTC 47 K	1
208122002	IC VOLT REG POS UA7805	2
208123002	IC +12 VOLT REG LM340T-12	3
208124002	IC VOLT REG -5V UA7905UC	1
208124003	IC VOLT REG NEG LM320T-12	3
290120002	DELAY LINE 2 N-SEC	4
290120004	DELAY LINE 4 NS	1
290120005	DELAY LINE 5NS	1
290120009	DELAY LINE 9 N-SEC	2
290199015	DELAY LINE 1.5 NS	2
311210000	CRYSTAL OSCILLATOR 3PPM 10	1
430430002	RELAY 1 FORM C SPDT	9
430441732	RELAY 2 FORM CDPDT	8
430490003	RELAY 2 FORM C DPDT	1

PART: F9354-31

DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
-----	-----	-----
430490750	RELAY HF DPDT 75 OHMS	2
454111024	HDR 2MM PRESSFIT TO FEM 4X	14
454115014	HDR FRICTION LOCK 14-PIN	1
454220096	HDR PRESSFIT TO FEM 96	1
454313010	HDR DIP SOLD TO PCB 2X5	3
454315008	HDR DIP SOLD TO PCB 2X4	4
454340002	HDR MALE PIN TO WW 02	5
454390002	HDR FRICTION LOCK 2-PIN	1
505019968	HEAT SINK VERTICAL MTG	3
505070220	HEAT SINK + TAG FOR TO220	6
505132001	HEATSINK (DIAMETER 19MM)	4
505368202	HEATSINK FOR 68 PIN PGA	4
520001020	SELF LOCK FRAME GROUND.SPA	2
530009002	SHIELD (RFI/EMI) FINGER ST	4
530040007	BUZZER 85DB 5V SMALL	1
554416000	NAIL RIVET 1.6X6	2
554425003	SCREW S/TAP PHIL M2.5X6 BL	6
709354331	BASE SHIELD	1
709354351	SHIELD LOWER PARTITION	5
709354361	SHIELD LEFT LOWER PARTITIO	1
709354411	9354-4 OCILLATOR SHIELD	1
7093XXP01	RIGHT ANGLE RECEPT. CONNEC	6
7093XXP21	BULKHEAD RECEPTACLE FEMALE	6
7093XXP41	PROBE HOLDER	6
7093XXP91	PROBE RING CONTACT	6
709450321	HEAT SINK FOR FADC	1
719354313	PC BD PREASS'Y 9354-31	1
CH599043022	HEAT SINK EPOXY	0
F9354-4	400-500MHZ PLL OSCILLATOR	1
FP9354-3	MAIN CARD PANEL 9354-3	1
HSH416	HYB 500MS/S SAMPLE & HOLD	4
MCL404	IC MEM GATE ARRAY MCL404	1
MDX416	IC DEMUX/MINMAX GATE ARRAY	4
MFE409	MONOL. DSO FRONT END (500M	4
MST412	IC SMART TRIGGER GATE-ARRA	1
MTB411	IC TIME BASE GATE-ARRAY	1
MTR408	TRIGGER COUPLING & COMPARA	5
SM158240200	CAP VARIABLE .6 - 2.5 PF	1
SM158240202	CAP VARIABLE 2.5 - 10 PF	4
SM168651297	RES METAL FILM 1% 100 OHMS	10
SM168659004	RES METAL FILM .1% 900 OHM	2
SM168659006	RES METAL FILM .1% 111.1 K	1
SM168659007	RES METAL FILM .1% 3.00K	5
SM168659297	RES METAL FILM .1% 100 OHM	4
SM185457101	RES VARI CERMET 100 OHMS	2

PART: F9354-31 DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
SM185457102	RES VARI CERMET 1 K	4
SM185457103	RES VARI CERMET 10 K	4
SM185457201	RES VARI CERMET 200 OHMS	2
SM185457203	RES VARI CERMET 20 K	9
SM185457501	RES VARI CERMET 500 OHMS	8
SM185457502	RES VARI CERMET 5 K	9
SM185457503	RES VARI CERMET 50 K	4
SM200167102	IC NOR GATE 10H102	2
SM200167131	IC M-S TYP D FLOP 10H131	2
SM200167164	IC 8 TO 1 MPLX 10H164	1
SM200169016	IC BINARY UP COUNTER 10E01	3
SM200169191	IC UP-DOWN BIN COUNTER 74F	5
SM200172008	IC AND GATE 74F08	1
SM200178000	IC 2-INPUT NAND HCT00	1
SM200178002	IC 2-INPUT NOR HCT02	2
SM200178030	IC 8-IN NAND HCT30	1
SM200178074	IC D-TYP FLOP 74HCT74	2
SM200178138	IC 3-8 LINE DECOD HCT 138	4
SM200178273	IC D-TYP FLOP 74HCT273	2
SM200178374	IC D-TYP FLOP 74HCT374	1
SM200278040	IC COUNTER HCT4040	1
SM201164104	IC QUIET 2-IN AND/NAND	1
SM201164131	IC M/S D-TYP FLOP 10E131	3
SM201164167	IC 6-BIT 2:1 MUX REGISTER	1
SM201166195	IC ECL PROG DELAY 2NS 10E1	4
SM201174001	IC ECL 4 IN OR/NOR 10EL01D	2
SM201174005	IC ECL 2-IN DIF AND/NAND	8
SM201174011	IC ECL 1:2 DIF CLOCK DRVR	12
SM201174031	IC ECL FLIP/FLOP SET/RES	2
SM201274032	IC ECL DIV:2 10EL32D	3
SM201274033	IC ECL DIV:4 10EL33D	1
SM201570016	IC ECL DIF RECEIVER 10EL16	2
SM205045300	PROGRAMMED GAL MIMOSA-A	1
SM205045350	PROGRAMMED GAL ROUTE1-A	1
SM205045351	PROGRAMMED GAL ROUTE2-A	1
SM205045352	PROGRAMMED GAL ROUTE2-B	1
SM205045354	PROGRAMMED GAL AVENUE-A	1
SM205045355	PROGRAMMED GAL RUELLE-A	1
SM205045357	PROGRAMMED GAL CHEMIN-A	1
SM205045358	PROGRAMMED GAL ROUTE3-C	1
SM205045359	PROGRAMMED GAL ARTERE-B	1
SM205108002	IC EEPROM 2K BIT IIC BUS	1
SM205618165	IC 8-BIT SHIFT REG 74HCT16	1
SM205618594	IC 8-BIT SHIFT REG 74HC594	24
SM205701070	IC 128KX8 STAT RAM 70 NS	8

PART: F9354-31 DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
-----	-----	-----
SM206070584	IC BUS CONTROLLER PCF8584T	1
SM206260858	IC OCT 8-BIT ADC0858	1
SM206884623	IC OCTAL BUS TRANSCVR ABT6	10
SM206885245	IC BUS TRANSCVR ABT245	2
SM206970457	IC 3 DIF 2:1 MUX MC10E457	3
SM207130025	TRANSISTOR NPN BFT25A	1
SM207170367	IC HEX BUFFER 74HC367	1
SM207171244	IC OCTAL BUFFER ABT244	6
SM207172241	IC OCTAL BUFFER ABT241	3
SM207260718	IC 8-BIT ADC 8718	4
SM207280703	IC 16-BIT DAC 703	1
SM207288800	IC OCTAL 8-BIT CMOS D/A CO	2
SM207360125	IC TRANSLATO MC10125	3
SM207367124	IC TRANSLATOR 10H124	1
SM207367125	IC TRANSLATOR 10H125	2
SM207770201	IC ANALOG SWITCH DG201	8
SM207770403	IC ANALOG SWITCH DG403	1
SM207770442	IC ANALOG SWITCH DG442	2
SM207960157	IC QUAD 2:1 MULTIPLEX 10E1	1
SM207961158	IC 5 BIT 2:1 MUX 10E158	2
SM207970139	IC DECODER/DEMUX 74F139	4
SM207970351	IC OCTAL ANALOG MUX/DEMUX	1
SM207970508	IC ANALOG MULT PLX 8-1 DG5	1
SM207972157	IC DATA SEL/MUX 74F157A	1
SM207978153	IC 4-INPUT MUX HCT153	1
SM207978251	IC 8-IN MUX 3-ST 74HCT251	2
SM208030245	IC TRANS ARRAY NPNX6 SL324	1
SM208470037	IC OP AMP 37GS	1
SM208470347	IC J-FET OP AMP 347	8
SM208470351	IC J-FET OP AMP 351	1
SM208470353	IC DUAL OP AMP 353	2
SM208470705	IC OP AMP PICOAMP INPUT AD	6
SM208570078	IC LOW POWER REG +12V 78L1	1
SM208570805	IC POS VOLT REG 78L05	1
SM208870339	IC VOLT COMPARATOR 339	6
SM208880079	IC LOW POWER REG -12V 79L1	1
SM208971881	IC VIDEO SYNC SEPARATOR LM	1
SM229020150	MLC TR.VOLT SUP.VC08050561	6
SM232022822	DIODE ARRAY SCHTTKY 2822	3
SM232120070	DIODE ARRAY BAV70	3
SM236030099	DIODE SO-PKG BAV99	27
SM236654004	DIODE RECTIFIER 4004	4
SM240050033	DIODE ZENER TZM-C-3V3	5
SM240050051	DIODE ZENER TZM-C-5V1	9
SM240050056	DIODE ZENER TZM-C-5V6	4

PART: F9354-31 DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
SM240218451	DIODE ZENER BZX84C5V1	20
SM240218475	DIODE ZENER BZX84C7V5	2
SM252023018	DIODE PIN BAT 18	5
SM252080682	DIODE PIN BA682	5
SM253032823	DIODE SCHOTTKY 2823	11
SM270030020	TRANSISTOR NPN BFS20	1
SM270130092	TRANSISTOR NPN BFR92A	40
SM270130093	TRANSISTOR NPN BFR93A	3
SM270140092	TRANSISTOR NPN BFR92AR	1
SM275030092	TRANSISTOR PNP BFT92	8
SM275030093	TRANSISTOR PNP BFT93	4
SM275030550	TRANSISTOR PNP BF550	2
SM275040092	TRANSISTOR PNP BFT92R	4
SM275330858	TRANSISTOR PNP BC858C	22
SM280120416	TRANSISTOR JFET N MMBF4416	5
SM289240061	TRANSISTOR NPN BCV61	4
SM289240062	TRANSISTOR ARRAY BCV62	8
SM289772003	TRANSISTOR ARRAY 2003	4
SM300446150	INDUCTOR .015UH	1
SM300486104	INDUCTOR WOUND 100uH	8
SM301502001	BEAD (FERRITE CHIP)	35
SM310900015	CRYSTAL 15.5029MHZ	1
SM454120025	CONN 1MM FEMALE 25	1
SM651104182	RES CHIP 1% 25PPM 1.8K	1
SM651104183	RES CHIP 1% 25PPM 18 K	1
SM651104201	RES CHIP 1% 25PPM 200 OHM	1
SM651104204	RES CHIP 1% 25PPM 200 K	1
SM651104241	RES CHIP 1% 25PPM 240 OHM	1
SM651104392	RES CHIP 1% 25PPM 3.9K	1
SM652101100	RES CHIP (E24) 1% 10 OHMS	27
SM652101101	RES CHIP (E24) 1% 100 OHM	58
SM652101102	RES CHIP (E24) 1% 1 K	43
SM652101103	RES CHIP (E24) 1% 10 K	92
SM652101104	RES CHIP (E24) 1% 100 K	2
SM652101105	RES CHIP (E24) 1% 1 M	29
SM652101112	RES CHIP (E24) 1% 1.1 K	5
SM652101114	RES CHIP (E24) 1% 110 K	4
SM652101120	RES CHIP (E24) 1% 12 OHMS	4
SM652101121	RES CHIP (E24) 1% 120 OHM	26
SM652101122	RES CHIP (E24) 1% 1.2 K	19
SM652101131	RES CHIP (E24) 1% 130 OHM	17
SM652101151	RES CHIP (E24) 1% 150 OHM	37
SM652101152	RES CHIP (E24) 1% 1.5 K	11
SM652101153	RES CHIP (E24) 1% 15 K	10
SM652101163	RES CHIP (E24) 1% 16 K	9

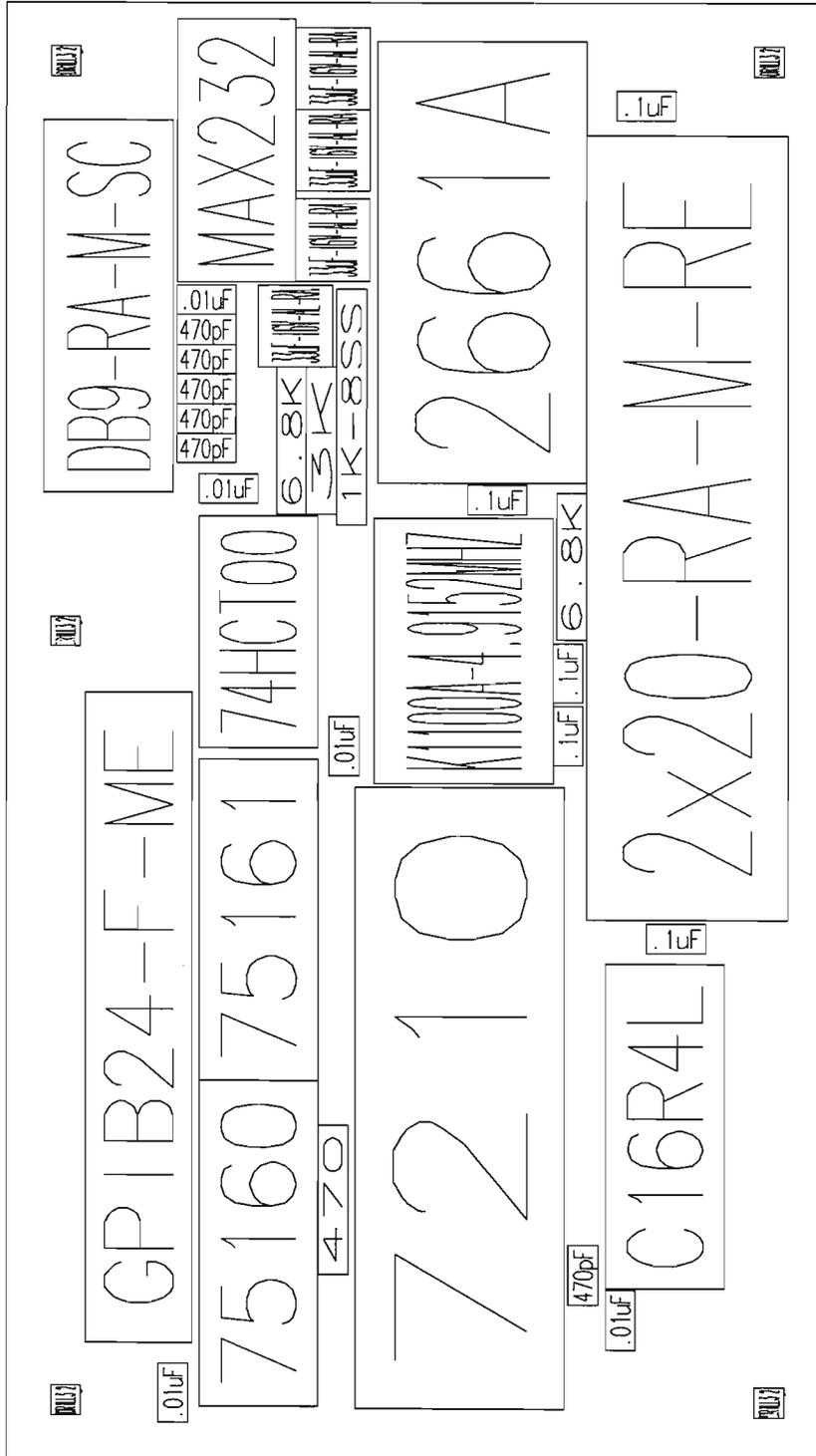
PART: F9354-31

DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
-----	-----	-----
SM652101181	RES CHIP (E24) 1% 180 OHM	107
SM652101182	RES CHIP (E24) 1% 1.8 K	19
SM652101183	RES CHIP (E24) 1% 18 K	1
SM652101185	RES CHIP (E24) 1% 1.8 M	4
SM652101201	RES CHIP (E24) 1% 200 OHM	74
SM652101202	RES CHIP (E24) 1% 2 K	2
SM652101220	RES CHIP (E24) 1% 22 OHMS	34
SM652101221	RES CHIP (E24) 1% 220 OHM	33
SM652101223	RES CHIP (E24) 1% 22 K	13
SM652101240	RES CHIP (E24) 1% 24 OHMS	13
SM652101241	RES CHIP (E24) 1% 240 OHM	1
SM652101271	RES CHIP (E24) 1% 270 OHM	5
SM652101272	RES CHIP (E24) 1% 2.7 K	5
SM652101301	RES CHIP (E24) 1% 300 OHM	31
SM652101302	RES CHIP (E24) 1% 3 K	13
SM652101330	RES CHIP (E24) 1% 33 OHMS	18
SM652101331	RES CHIP (E24) 1% 330 OHM	7
SM652101332	RES CHIP (E24) 1% 3.3 K	23
SM652101333	RES CHIP (E24) 1% 33 K	4
SM652101334	RES CHIP (E24) 1% 330 K	4
SM652101360	RES CHIP (E24) 1 % 36 OHM	4
SM652101390	RES CHIP (E24) 1% 39 OHMS	4
SM652101391	RES CHIP (E24) 1% 390 OHM	16
SM652101392	RES CHIP (E24) 1% 3.9 K	6
SM652101431	RES CHIP (E24) 1% 430 OHM	36
SM652101470	RES CHIP (E24) 47 OHMS	16
SM652101471	RES CHIP (E24) 1% 470 OHM	34
SM652101472	RES CHIP (E24) 1% 4.7 K	4
SM652101474	RES CHIP (E24) 1% 470 K	1
SM652101475	RES CHIP (E24) 1% 4.7 M	5
SM652101510	RES CHIP (E24) 1% 51 OHMS	33
SM652101511	RES CHIP (E24) 1% 510 OHM	4
SM652101512	RES CHIP (E24) 1% 5.1 K	38
SM652101561	RES CHIP (E24) 1% 560 OHM	8
SM652101562	RES CHIP (E24) 1% 5.6 K	12
SM652101621	RES CHIP (E24) 1% 620 OHM	5
SM652101680	RES CHIP (E24) 1% 68 OHMS	15
SM652101683	RES CHIP (E24) 1% 68 K	5
SM652101684	RES CHIP (E24) 1% 680 K	1
SM652101750	RES CHIP (E24) 1% 75 OHMS	28
SM652101751	RES CHIP (E24) 1% 750 OHM	8
SM652101820	RES CHIP (E24) 1% 82 OHMS	4
SM652101821	RES CHIP (E24) 1% 820 OHM	1
SM652101822	RES CHIP (E24) 1% 8.2 K	13
SM652101823	RES CHIP (E24) 1% 82 K	1

PART: F9354-31**DESC: DESC: MAIN CARD (FRONT END, ADC, TDC) FOR 9354A/T**

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
SM652101824	RES CHIP (E24) 1% 820 K	2
SM652101910	RES CHIP (E24) 1% 91 OHMS	36
SM652101911	RES CHIP (E24) 1% 910 OHM	1
SM652101913	RES CHIP (E24) 1% 91 K	4
SM652110904	RES CHIP 900K 0.5%	7
SM652113523	RES CHIP (24) 0.3% 52.63 K	4
SM652113954	RES CHIP (E24) 0.3% 950 K	4
SM652115062	RES CHIP (E24) 5% 6.2 OHMS	1
SM653206222	RESISTOR NTC 10% 2.2K OHM	8
SM654101000	CHIP JUMPER ZERO OHMS	27
SM661205472	CAP CERA CHIP 5% 4700 PF	4
SM661205822	CAP CERA CHIP 8200PF	5
SM661207102	CAP CERA CHIP 10% .001UF	8
SM661207103	CAP CERA CHIP 20% .01UF (0	457
SM661207104	CAP CERA CHIP 20% .1 UF	169
SM661207223	CAP CERA CHIP 20% .022 UF	4
SM661255010	CAP CERA CHIP 1.0 PF	1
SM661255022	CAP CERA CHIP 2.2 PF	1
SM661255027	CAP CERA CHIP 2.7 PF	1
SM661255033	CAP CERA CHIP 3.3 PF	5
SM661255056	CAP CERA CHIP 5.6 PF	10
SM661255100	CAP CERA CHIP 10PF	2
SM661255101	CAP CERA CHIP 5% 100 PF	10
SM661255102	CAP CERA CHIP 5% 1000 PF	1
SM661255121	CAP CERA CHIP 5% 120 PF	8
SM661255150	CAP CERA CHIP 5% 15 PF	2
SM661255152	CAP CERA CHIP 5% 1500 PF	4
SM661255180	CAP CERA CHIP 5% 18PF	9
SM661255181	CAP CERA CHIP 5% 180 PF	1
SM661255270	CAP CERA CHIP 27PF	5
SM661255330	CAP CERA CHIP 5% 33 PF	5
SM661255560	CAP CERA CHIP 56PF	2
SM661255820	CAP CERA CHIP 5% 82 PF	4
SM661255821	CAP CERA CHIP 5% 820 PF	1
SM661256120	CAP CERA CHIP 10% 12 PF	4
SM661446474	CAP CERA CHIP 10% .47 UF	2
SM661495561	CAP CERA CHIP 5% 560 PF	5
SM661726103	CAP CERA CHIP 10% .01UF (2	15
SM666247106	CAP MOLD TANT CHIP 10 UF	4
SM666257336	CAP MOLD TANT CHIP 33 UF	4
SM666327225	CAP MOLD TANT CHIP 2.2 UF	43
SM666377226	CAP MOLD TANT CHIP 22 UF	4
SM666427105	CAP MOLD TANT CHIP 1 UF	5
SM669080181	CHIP FERRITE BEAD	8



9300-4 REV:D

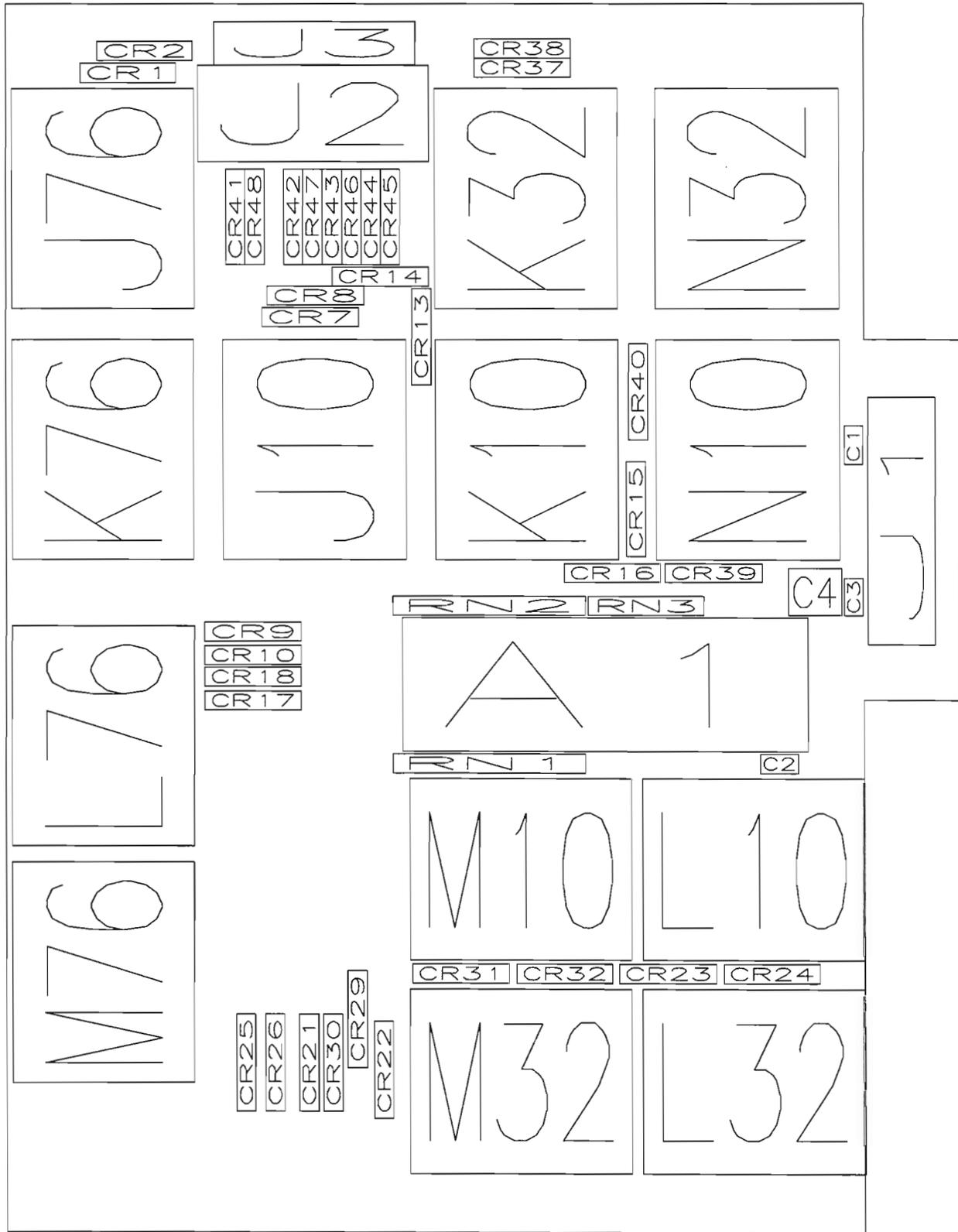
PART: F9300-4

DESC: GPIB + RS232 INTERFACE CARD

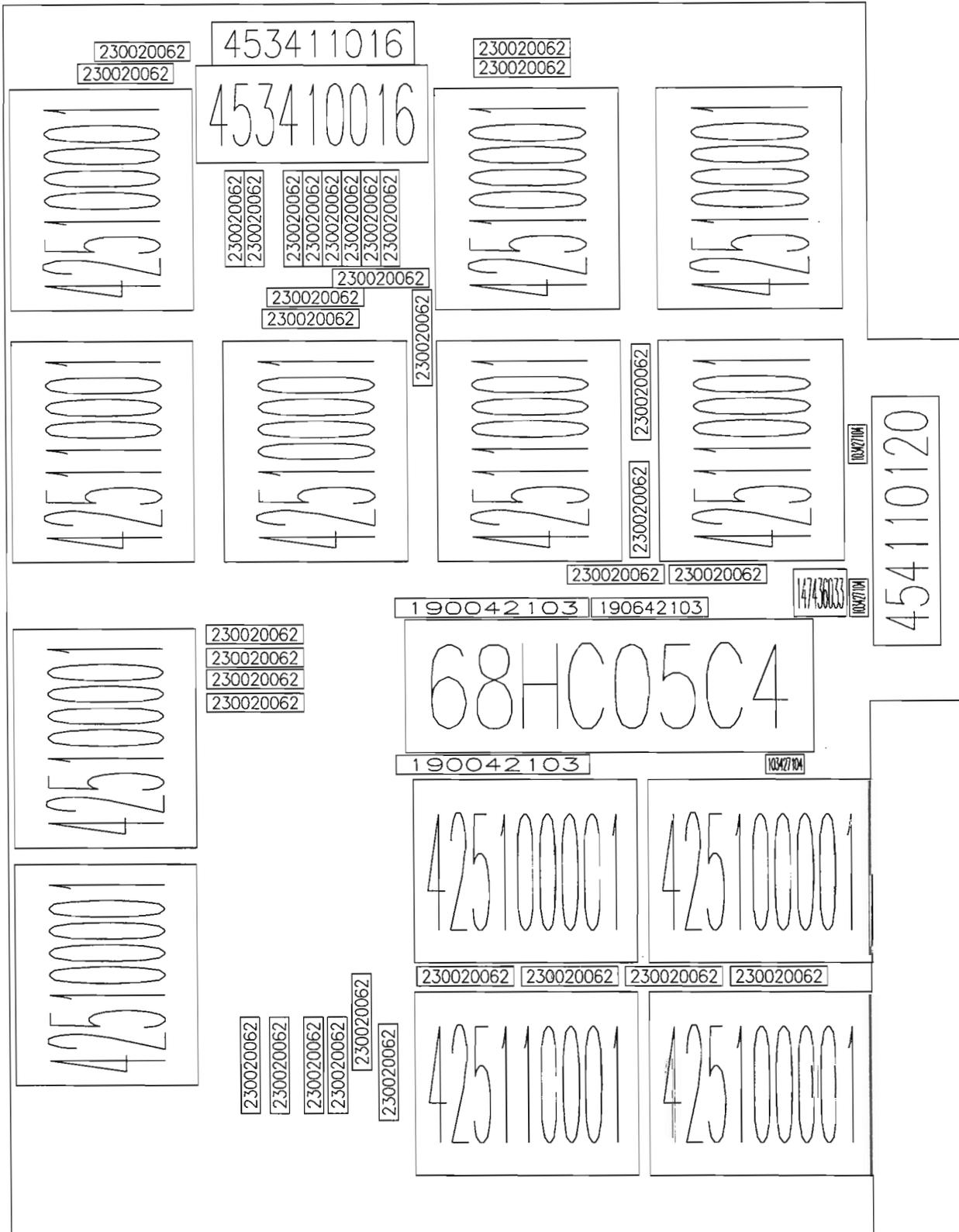
Location	Part Number	Description
-----	-----	-----
A1	207440232	MAX232
A2	200333000	74HCT00
A3	207470161	75161
A4	207470160	75160
A5	207552661	2661A
A6	207197210	7210
A7	205750000	C16R4L
C1	103327103	.01uF
C2	102484471	470pF
C3	102484471	470pF
C4	102484471	470pF
C5	102484471	470pF
C6	102484471	470pF
C7	103327103	.01uF
C8	103327103	.01uF
C9	147436033	33uF-16V-AL-RA
C10	147436033	33uF-16V-AL-RA
C11	147436033	33uF-16V-AL-RA
C12	147436033	33uF-16V-AL-RA
C13	103327103	.01uF
C14	103427104	.1uF
C15	103427104	.1uF
C16	103427104	.1uF
C17	102484471	470pF
C18	103427104	.1uF
C19	103327103	.01uF
C20	103427104	.1uF
J5	454511040	2x20-RA-M-RE
J6	455413009	DB9-RA-M-SC
J8	453521024	GPIB24-F-ME
R1	161225682	6.8K
R2	161225302	3K
R3	161225471	470
R5	161225682	6.8K
RN1	190832102	1K-8SS
Y1	309040005	K1100A-4.9152MHZ

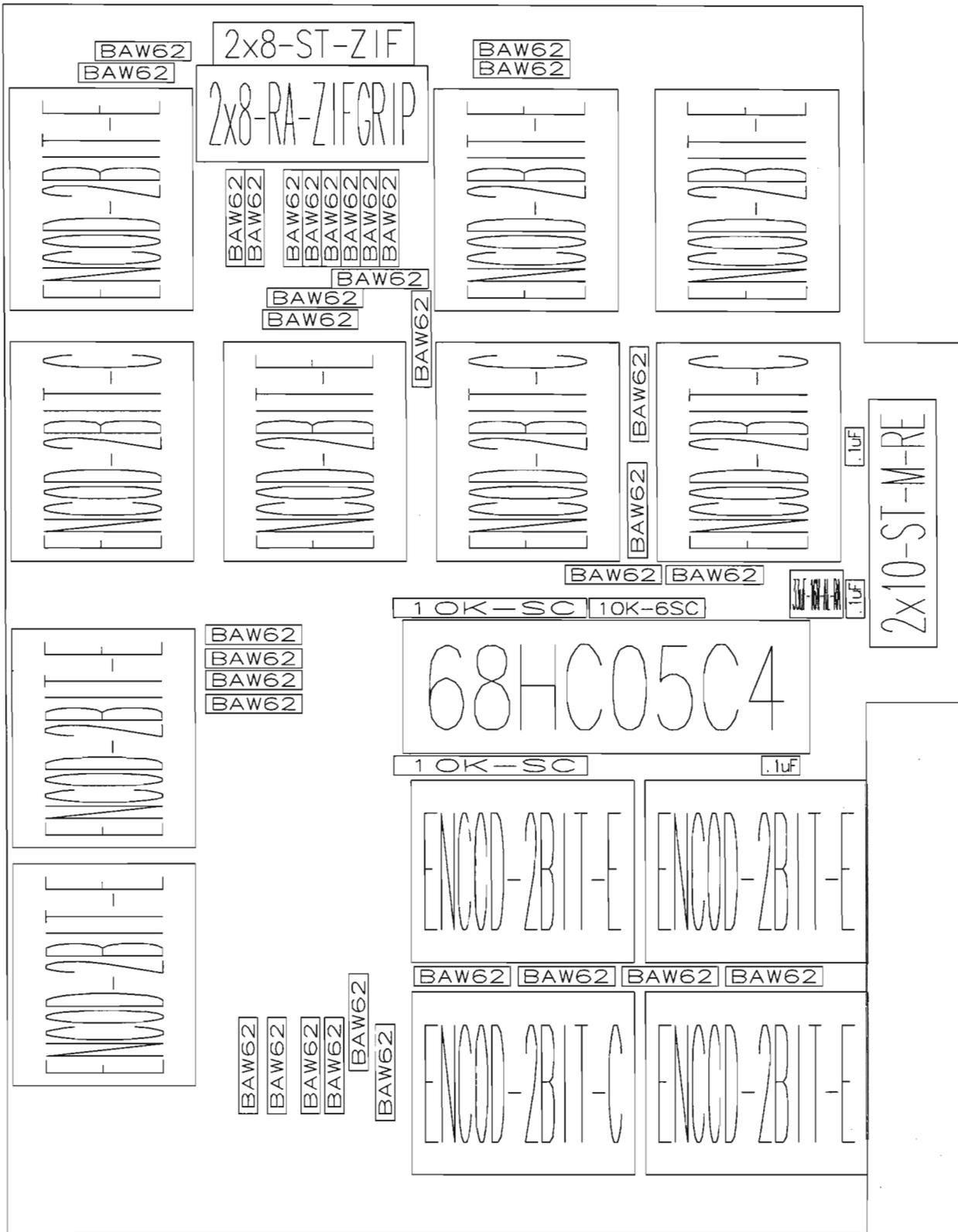
PART: F9300-4**DESC: GPIB +RS232 INTERFACE CARD**

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
102484471	CAP CERA DISC 100V 470 PF	6
103327103	CAP CERA MONO 50V .01 UF	5
103427104	CAP CERA MONO 100V .1 UF	5
147436033	CAP ALUM METAL CAN 33 UF	4
161225302	RES COMP 1/8W 5% 3 K	1
161225471	RES COMP 1/8W 5% 470 OHMS	1
161225682	RES CARBON FILM 6.8 K	2
190832102	RES NETWORK 1 K	1
200333000	IC QUAD 2-IN NAND HCT00	1
205750000	IC AND-OR GATE ARRAY 16V8	1
207197210	IC BUS INTERF CONTR 7210	1
207440232	IC XMTR/RCVR MAX 232	1
207470160	IC OCTAL BUS XCVR 75160A	1
207470161	IC OCTL BUS XCEIR 75161A	1
207552661	IC INTERFACE 2661A	1
309040005	CRYSTAL OSCIL. 4.9152MHZ	1
453521024	CONN RT ANGLE IEEE FEM 24	1
454511040	HDR SOLD TAIL/MALE/40/RT	1
455413009	CONN RT ANGLE MALE 9 S-CLIP	1
455980002	MOUNTING HDW FOR CONN SHELL	2
550130108	SCREW CYL HD M3X8	2
550430106	SCREW CYL HD PHIL M3X6	1
551430400	WASHER SHAKEPROOF M3	1
709300411	GPIB-RS232 INTERFACE BRACKET D	1
709300421	LABEL RS232-IEEE488-2 A	1
719300403	PC BD PREASS'Y 9300-4 D	1



9300-5 Rev : B



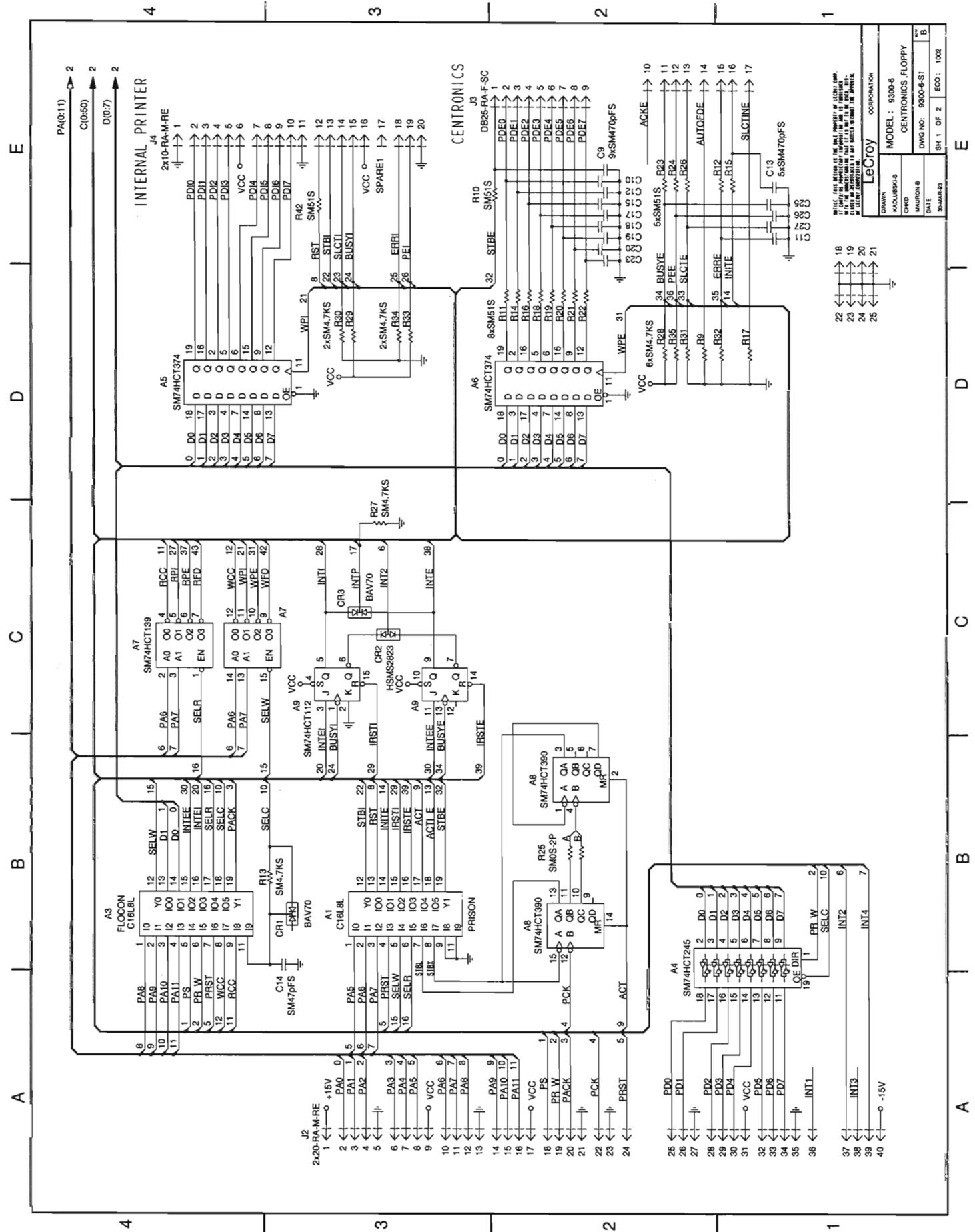


9300-5 Rev : B

PART: F9354-5**DESC : Quad Channel Front Panel**

Location	Part Number	Description	Location	Part Number	Description
A1	68HC05C4	68HC05C4	CR15	230020062	BAW62
C1,2,3	103427104	.1uF	CR16	230020062	BAW62
C4	147436033	33uF-16V	CR17	230020062	BAW62
J1	454110120	2x10-ST-M-RE	CR18	230020062	BAW62
J2	453410016	2x8-RA-ZIFGRIP	CR21	230020062	BAW62
J3	453411016	2x8-ST-ZIF	CR22	230020062	BAW62
J10	425100001	ENCOD-2BIT-E	CR23	230020062	BAW62
J76	425100001	ENCOD-2BIT-E	CR24	230020062	BAW62
K10	425110001	ENCOD-2BIT-C	CR25	230020062	BAW62
K32	425100001	ENCOD-2BIT-E	CR26	230020062	BAW62
K76	425110001	ENCOD-2BIT-C	CR29	230020062	BAW62
L10	425100001	ENCOD-2BIT-E	CR30	230020062	BAW62
L32	425100001	ENCOD-2BIT-E	CR31	230020062	BAW62
L76	425100001	ENCOD-2BIT-E	CR32	230020062	BAW62
M10	425100001	ENCOD-2BIT-E	CR37	230020062	BAW62
M32	425110001	ENCOD-2BIT-C	CR38	230020062	BAW62
M76	425100001	ENCOD-2BIT-E	CR39	230020062	BAW62
N10	425110001	ENCOD-2BIT-C	CR40	230020062	BAW62
N32	425100001	ENCOD-2BIT-E	CR41	230020062	BAW62
CR1	230020062	BAW62	CR42	230020062	BAW62
CR2	230020062	BAW62	CR43	230020062	BAW62
CR7	230020062	BAW62	CR44	230020062	BAW62
CR8	230020062	BAW62	CR45	230020062	BAW62
CR9	230020062	BAW62	CR46	230020062	BAW62
CR10	230020062	BAW62	CR47	230020062	BAW62
CR13	230020062	BAW62	CR48	230020062	BAW62
CR14	230020062	BAW62	RN1,2,3	190042103	10K-SC

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
103427104	CAP CERA MONO 100V .1 UF	3
147436033	CAP ALUM METAL CAN 33 UF	1
190042103	RESISTOR NETWORK 10 K	2
190642103	RESISTOR NETWORK 10 K	1
230020062	DIODE SWITCHING BAW62	34
425100001	ENCODER DIGITAL 24 POS	8
425110001	ENCODER DIGITAL 24 POS	3
453410016	CONN FLEX CIRCUIT 16-POS	1
454110120	HDR SLD TAIL/MALE/20/STRAIGHT	1
554435004	SCREW PT PHIL KA35X10	1
7093XX511	KNOB 10MM DIAMETRE	7
7093XX521	KNOB 14MM DIAMETRE	4
719300503	PC BD PREASS'Y 9300-5	1
729354513	FP KEYBOARD ASS'Y 9354-5	1
MFP414	IC FRT PANEL PROCESSOR MFP414	1

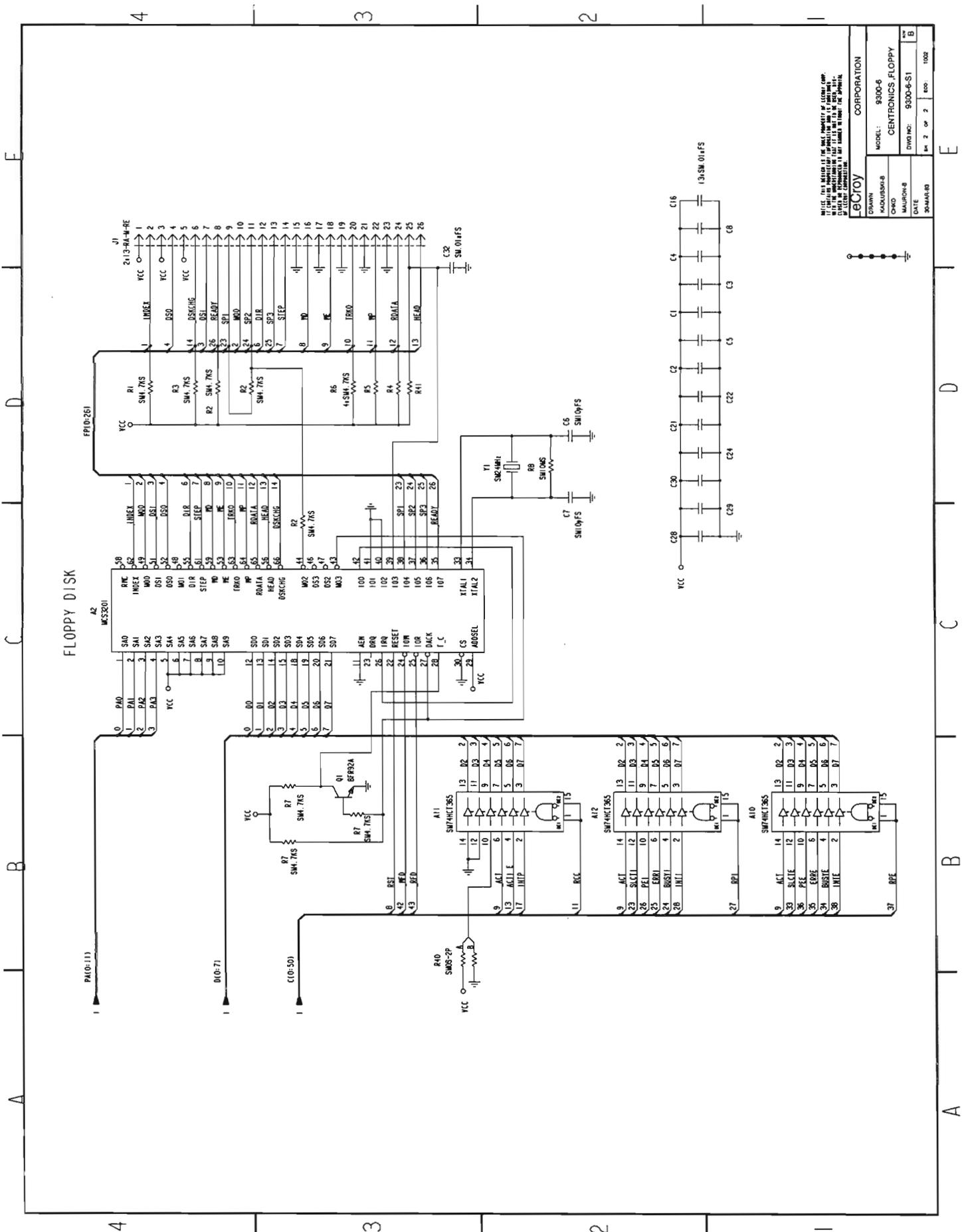


NOTE: THE NUMBER IN THE CIRCLE OF EACH COMPONENT IS THE PART NUMBER OF THE COMPONENT. THE PART NUMBER OF THE COMPONENT IS THE PART NUMBER OF THE COMPONENT. THE PART NUMBER OF THE COMPONENT IS THE PART NUMBER OF THE COMPONENT.

DRAWN	KADUSUBA
CHKD	MAURON
DATE	3/28/85
DESIGNED BY	3/28/85
MODEL	9300-5
CENTRONICS_FLOPPY	
DWG NO.	9300-6-S1
REV	B
SH 1 OF 2	ECC: 1002

22	←	18
23	←	19
24	←	20
25	←	21

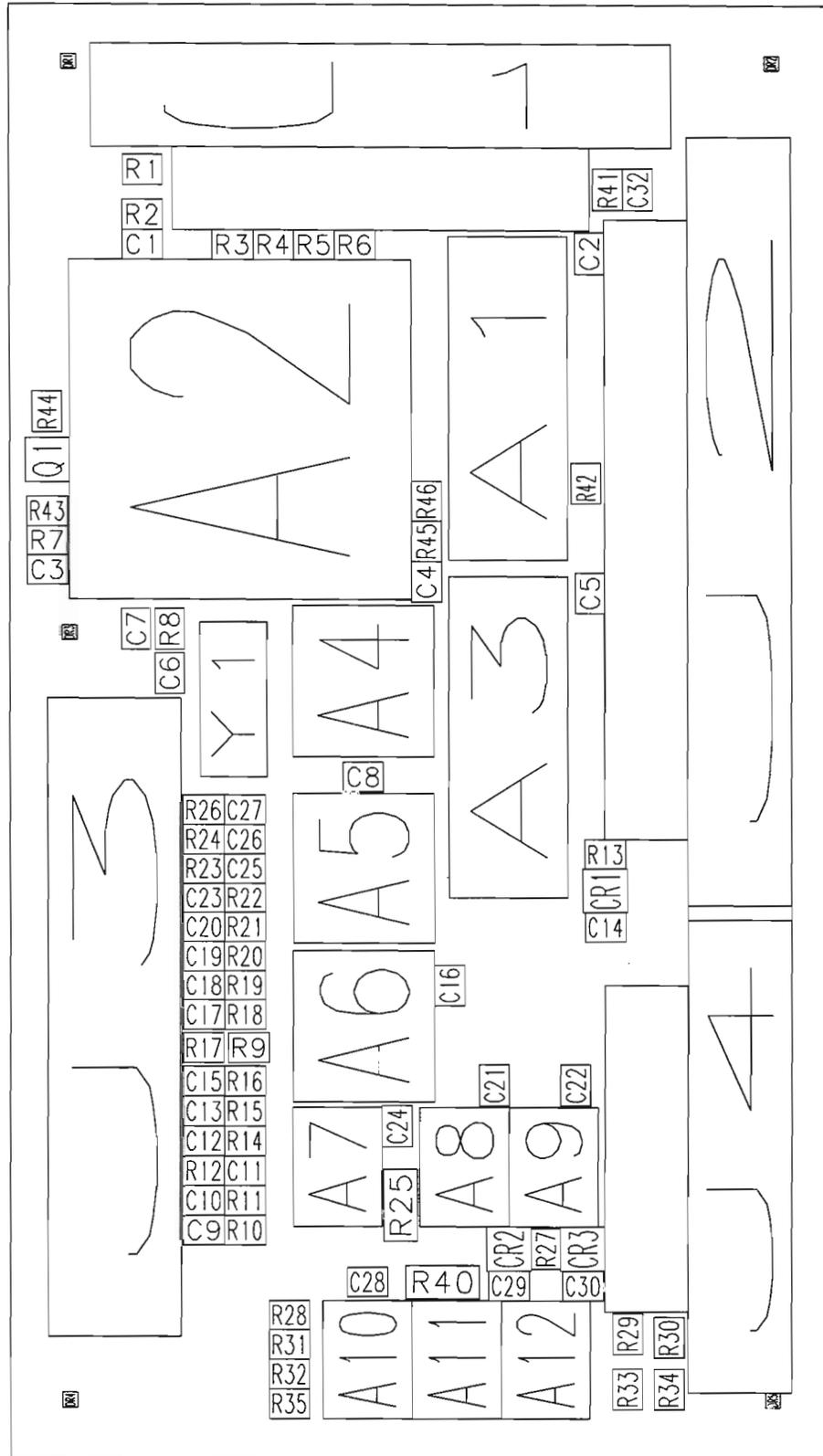
Section 8 Schematics, Layouts, Parts list



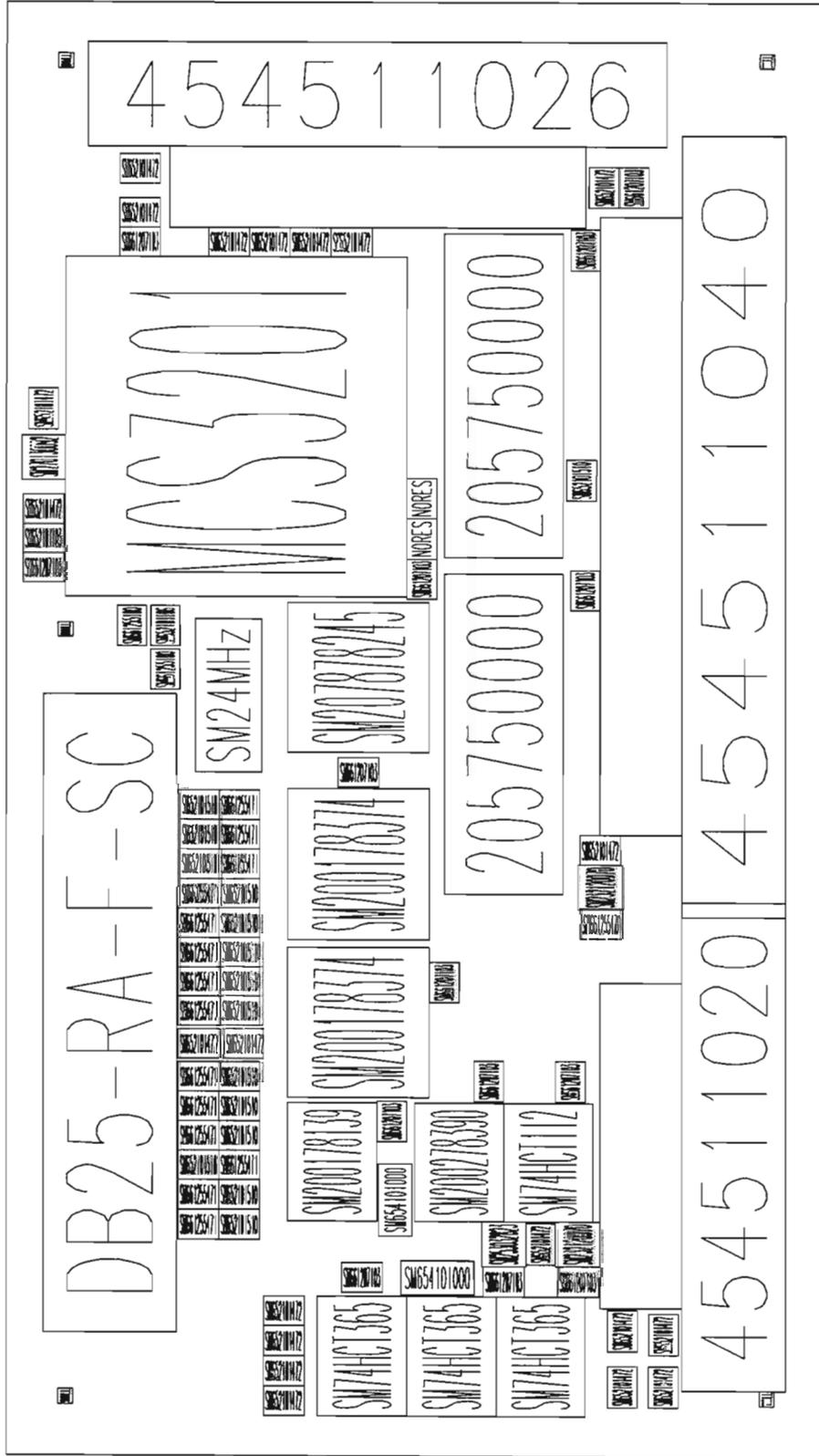
NOTICE: THIS MANUAL IS THE PROPERTY OF ECCOY CORP. IT IS TO BE USED ONLY BY THE PERSONS TO WHOM IT IS LOANED. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM ECCOY CORPORATION.

ECCOY CORPORATION	
DRAWN: MAURON-8	MODEL: 9300-6
CHECKED: MAURON-8	CENTRONICS_FLOPPY
DATE: 9-30-81	DIVISION: 9300-6-S1
SHEET NO: 2	TOTAL SHEETS: 2
ECO: 1002	

9300-6 Rev:C



9300-6 Rev:C



PART: F9300-6**DESC: CENTRONICS, FLOPPY AND PRINTER INTERFACE**

Location	Part Number	Description	Location	Part Number	Description
A1	205750000	C16L8L	CR2	SM253032823	HSMS2823
A2	SM227063201	MCS3201	CR3	SM232120070	BAV70
A3	205750000	C16L8L	J1	454511026	2x13-RA-M-RE
A4	SM207878245	SM74HCT245	J2	454511040	2x20-RA-M-RE
A5	SM200178374	SM74HCT374	J3	454520025	DB25-RA-F-SC
A6	SM200178374	SM74HCT374	J4	454511020	2x10-RA-M-RE
A7	SM200178139	SM74HCT139	Q1	SM270130092	BFR92A
A8	SM200278390	SM74HCT390	R1	SM652101472	SM4.7KS
A9	SM201170112	SM74HCT112	R2	SM652101472	SM4.7KS
A10	SM207170036	SM74HCT365	R3	SM652101472	SM4.7KS
A11	SM207170036	SM74HCT365	R4	SM652101472	SM4.7KS
A12	SM207170036	SM74HCT365	R5	SM652101472	SM4.7KS
C1	SM661207103	SM.01uF	R6	SM652101472	SM4.7KS
C2	SM661207103	SM.01uF	R7	SM652101103	SM10KS
C3	SM661207103	SM.01uF	R8	SM652101106	SM10MS
C4	SM661207103	SM.01uF	R9	SM652101472	SM4.7KS
C5	SM661207103	SM.01uF	R10	SM652101510	SM51S
C6	SM661255100	SM10pF	R11	SM652101510	SM51S
C7	SM661255100	SM10pF	R12	SM652101510	SM51S
C8	SM661207103	SM.01uF	R13	SM652101472	SM4.7KS
C9	SM661255471	SM470pF	R14	SM652101510	SM51S
C10	SM661255471	SM470pF	R15	SM652101510	SM51S
C11	SM661255471	SM470pF	R16	SM652101510	SM51S
C12	SM661255471	SM470pF	R17	SM652101472	SM4.7KS
C13	SM661255471	SM470pF	R18	SM652101510	SM51S
C14	SM661255470	SM47pF	R19	SM652101510	SM51S
C15	SM661255471	SM470pF	R20	SM652101510	SM51S
C16	SM661207103	SM.01uF	R21	SM652101510	SM51S
C17	SM661255471	SM470pF	R22	SM652101510	SM51S
C18	SM661255471	SM470pF	R23	SM652101510	SM51S
C19	SM661255471	SM470pF	R24	SM652101510	SM51S
C20	SM661255471	SM470pF	R25	SM654101000	SM0S-2P
C21	SM661207103	SM.01uF	R26	SM652101510	SM51S
C22	SM661207103	SM.01uF	R27	SM652101472	SM4.7KS
C23	SM661255471	SM470pF	R28	SM652101472	SM4.7KS
C24	SM661207103	SM.01uF	R29	SM652101472	SM4.7KS
C25	SM661255471	SM470pF	R30	SM652101472	SM4.7KS
C26	SM661255471	SM470pF	R31	SM652101472	SM4.7KS
C27	SM661255471	SM470pF	R32	SM652101472	SM4.7KS
C28	SM661207103	SM.01uF	R33	SM652101472	SM4.7KS
C29	SM661207103	SM.01uF	R34	SM652101472	SM4.7KS
C30	SM661207103	SM.01uF	R35	SM652101472	SM4.7KS
C32	SM661207103	SM.01uF	R40	SM654101000	SM0S-2P
CR1	SM232120070	BAV70	R41	SM652101472	SM4.7KS

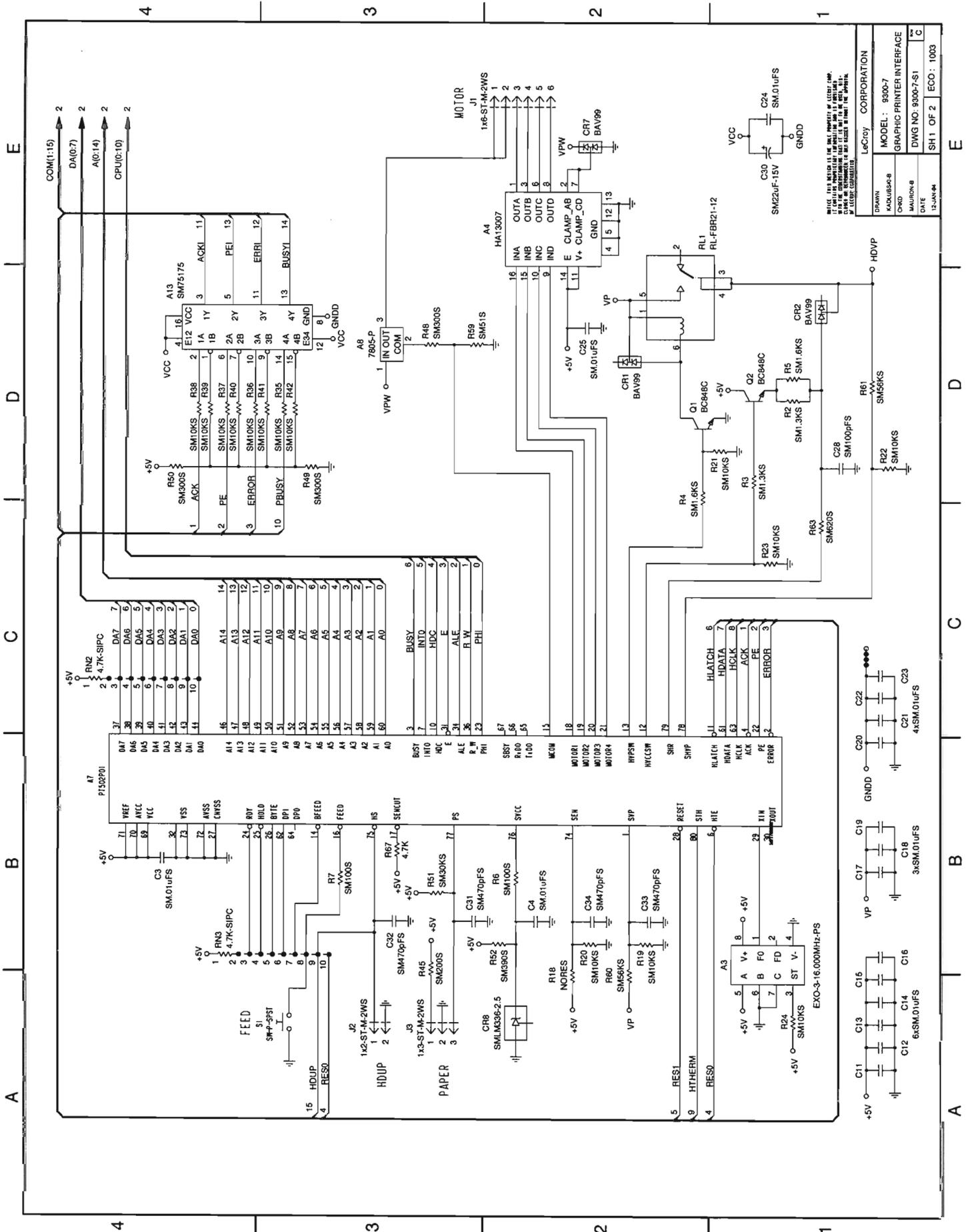
PART: F9300-6 DESC: CENTRONICS/FLOPPY/PRINTER INTERFACE

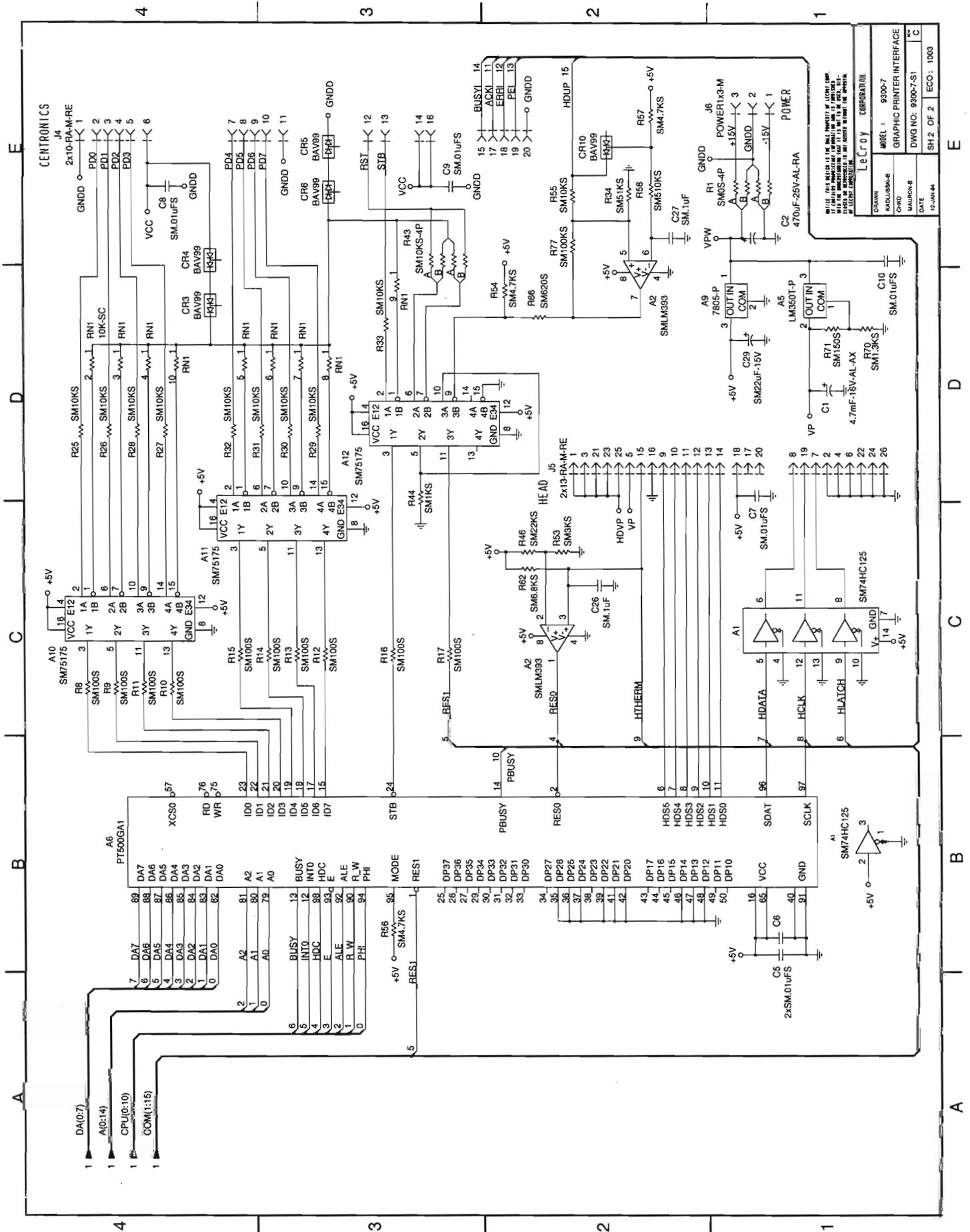
Location -----	Part Number -----	Description -----
R42	SM652101510	SM51S
R43	SM652101472	SM4.7KS
R44	SM652101472	SM4.7KS
Y1	SM310900024	SM24MHz

PART: F9300-6 DESC: CENTRONICS/FLOPPY/PRINTER INTERFACE

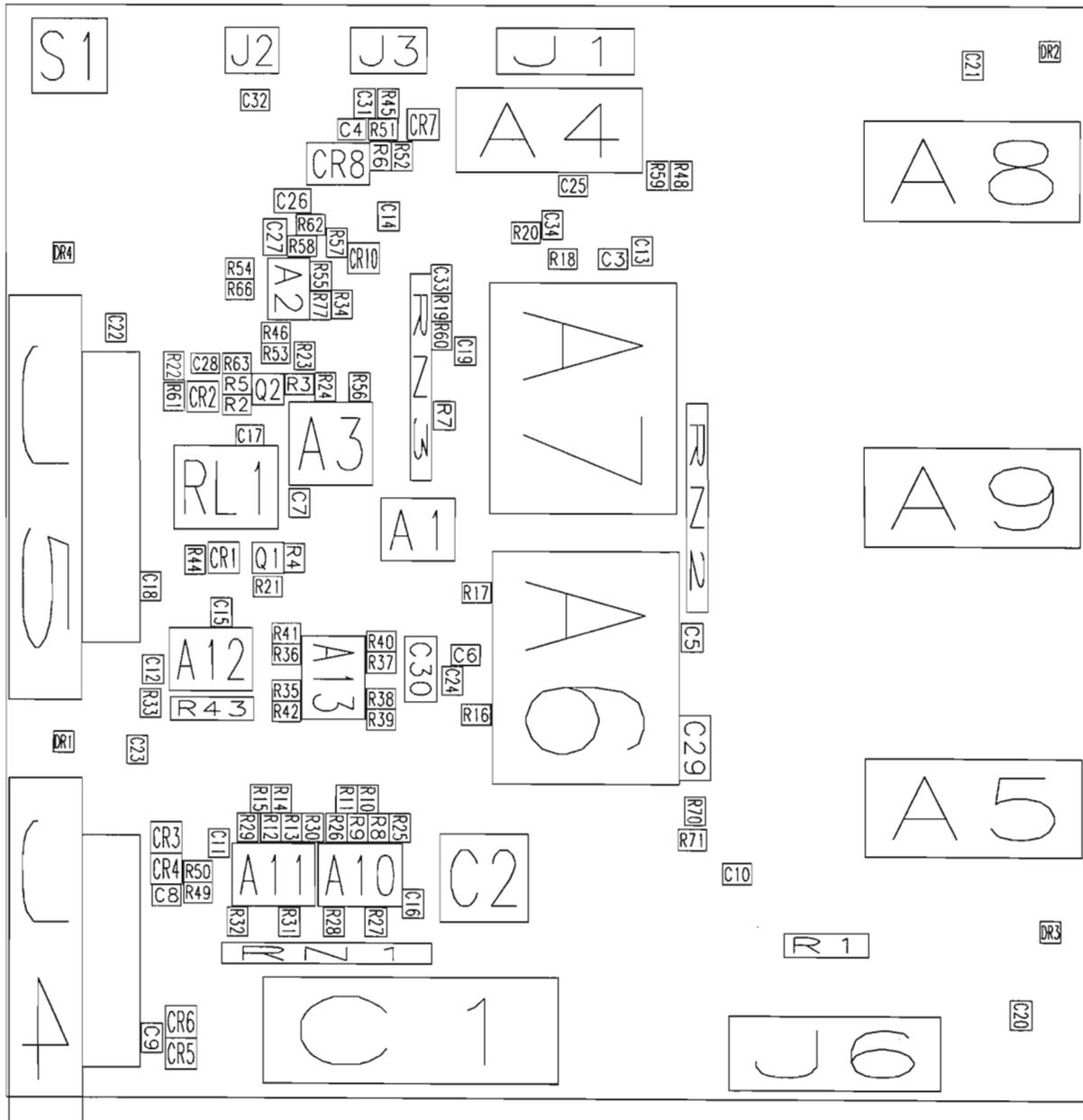
Component -----	Part Description -----	Qty Per Assembly -----
205750000	IC AND-OR GATE ARRAY 16V8	2
454511020	HDR SOLD TAIL/MALE 20	1
454511026	HDR SOLD TAIL/MALE 26	1
454511040	HDR SOLD TAIL/MALE/40/RT	1
454520025	CONN RT ANGLE FEM 25 S-CLIP	1
455980002	MOUNTING HDW FOR CONN SHELL	2
550430106	SCREW CYL HD PHIL M3X6	4
551430400	WASHER SHAKEPROOF M3	4
709300611	CENTR. FLOPPY INTERF. BRACKET B	1
709300621	LABEL PARA-INTERF. CENTRONICS A	1
719300603	PC 3D PREASS'Y 9300-6 C	1
SM200178139	IC 2-TO-4-LINE DEC HCT139	1
SM200178374	IC D-TYP FLOP 74HCT374	2
SM200278390	IC 4-BIT RIPPLE COUNTER	1
SM201170112	IC DUAL JK FF WITH SET-RESET	1
SM207170036	IC HEX BUFFER 3-STATE	3
SM207878245	IC BUS TRANSCVR HCT 245	1
SM227063201	IC IBM PC FLOPPY DISK CONTR.	1
SM232120070	DIODE ARRAY BAV70	1
SM253032823	DIODE SCHOTTKY 2823	1
SM270130092	TRANSISTOR NPN BFR92A	1
SM310900024	CRYSTAL 24 MHZ SMD	1
SM652101103	RES CHIP (E24) 1% 10 K	1
SM652101106	RES CHIP (E24) 1% 10 MEG	1
SM652101472	RES CHIP (E24) 1% 4.7 K	21
SM652101510	RES CHIP (E24) 1% 51 OHMS	15
SM654101000	CHIP JUMPER ZERO OHMS	2
SM661207103	CAP CERA CHIP 20% .01UF	14
SM661255100	CAP CERA CHIP 10PF	2
SM661255470	CAP CERA CHIP 47PF	1
SM661255471	CAP CERA CHIP 5% 470 PF	14

Section 8 Schematics, Layouts, Parts list

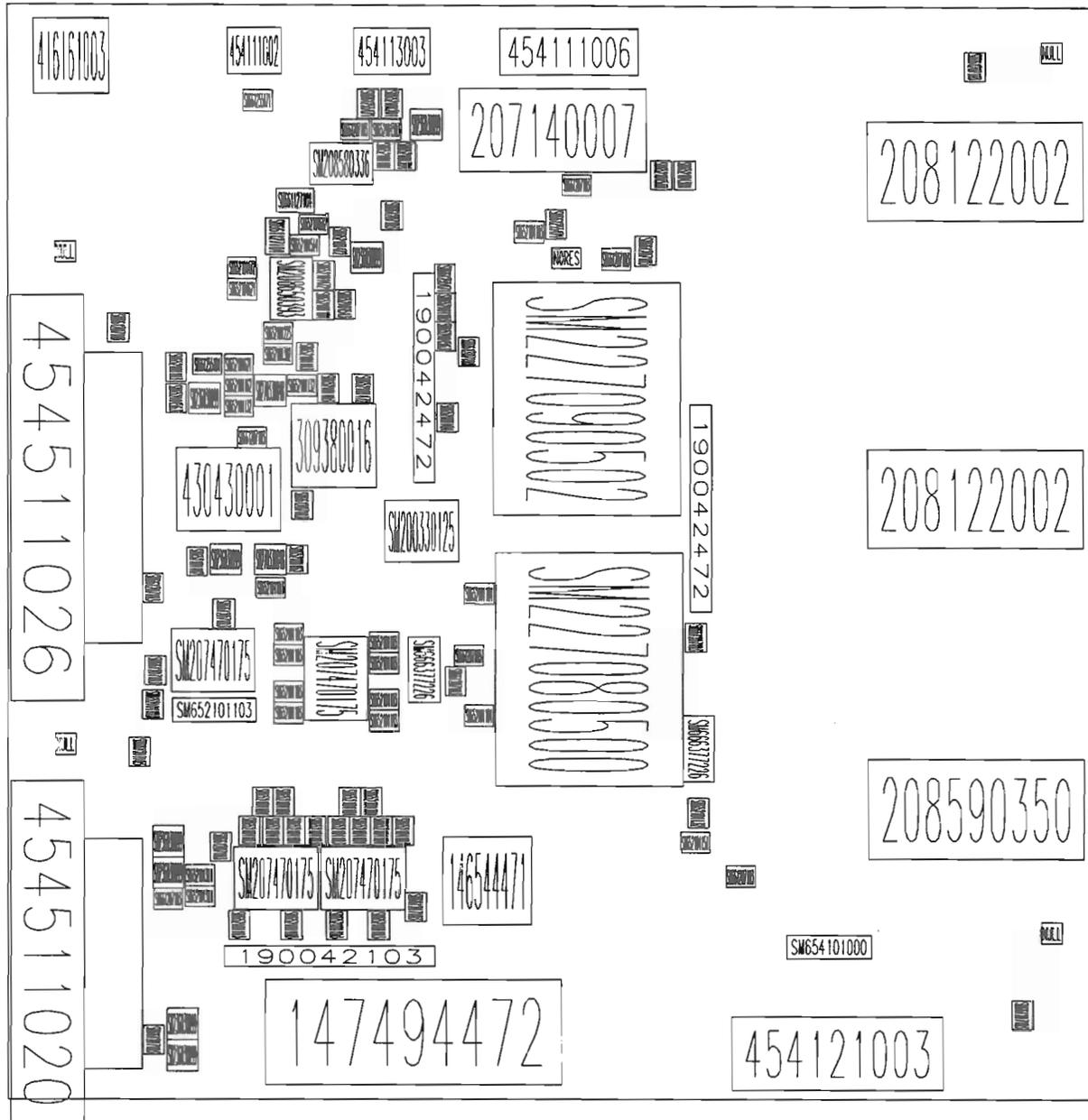




LeCroy CORPORATION
 MODEL : 9300-7
 GRAPHIC PRINTER INTERFACE
 DWG NO: 9300-7-S1
 DATE : 12-JAN-84
 SH 2 OF 2 ECO : 1000



9300-7 Rev:C



9300-7 Rev: C

PART: F9300-7

DESC: LTP 5446 PRINTER CONTROLLER

Location	Part Number	Description	Location	Part Number	Description
-----	-----	-----	-----	-----	-----
A1	SM200330125	SM74HC125	C32	SM661255471	SM470pF
A2	SM208650393	SMLM393	C33	SM661255471	SM470pF
A3	309380016	16.000MHZ	C34	SM661255471	SM470pF
A4	207140007	HA13007	CR1	SM236030099	BAV99
A5	208590350	LM350T-P	CR2	SM236030099	BAV99
A6	SM227080500	PT500GA1	CR3	SM236030099	BAV99
A7	SM227090501	PT501P01	CR4	SM236030099	BAV99
A8	208122002	7805-P	CR5	SM236030099	BAV99
A9	208122002	7805-P	CR6	SM236030099	BAV99
A10	SM207470175	SM75175	CR7	SM236030099	BAV99
A11	SM207470175	SM75175	CR8	SM208580336	SMLM336-2.5
A12	SM207470175	SM75175	CR10	SM236030099	BAV99
A13	SM207470175	SM75175	J1	454111006	1x6-ST-M-2WS
C1	147494472	4.7mF-16V	J2	454111002	1x2-ST-M-2WS
C2	146544471	470uF-25V	J3	454113003	1x3-ST-M-2WS
C3	SM661207103	SM.01uF	J4	454511020	2x10-RA-M-RE
C4	SM661207103	SM.01uF	J5	454511026	2x13-RA-M-RE
C5	SM661207103	SM.01uF	J6	454121003	POWER1x3-M
C6	SM661207103	SM.01uF	Q1	SM270330848	BC848C
C7	SM661207103	SM.01uF	Q2	SM270330848	BC848C
C8	SM661207103	SM.01uF	R1	SM654101000	SM0S-4P
C9	SM661207103	SM.01uF	R2	SM652101132	SM1.3KS
C10	SM661207103	SM.01uF	R3	SM652101132	SM1.3KS
C11	SM661207103	SM.01uF	R4	SM652101162	SM1.6KS
C12	SM661207103	SM.01uF	R5	SM652101162	SM1.6KS
C13	SM661207103	SM.01uF	R6	SM652101101	SM100S
C14	SM661207103	SM.01uF	R7	SM652101101	SM100S
C15	SM661207103	SM.01uF	R8	SM652101101	SM100S
C16	SM661207103	SM.01uF	R9	SM652101101	SM100S
C17	SM661207103	SM.01uF	R10	SM652101101	SM100S
C18	SM661207103	SM.01uF	R11	SM652101101	SM100S
C19	SM661207103	SM.01uF	R12	SM652101101	SM100S
C20	SM661207103	SM.01uF	R13	SM652101101	SM100S
C21	SM661207103	SM.01uF	R14	SM652101101	SM100S
C22	SM661207103	SM.01uF	R15	SM652101101	SM100S
C23	SM661207103	SM.01uF	R16	SM652101101	SM100S
C24	SM661207103	SM.01uF	R17	SM652101101	SM100S
C25	SM661207103	SM.01uF	R19	SM652101103	SM10KS
C26	SM661127104	SM.1uF	R20	SM652101103	SM10KS
C27	SM661127104	SM.1uF	R21	SM652101103	SM10KS
C28	SM661255101	SM100pF	R22	SM652101103	SM10KS
C29	SM666377226	SM22uF-15V	R23	SM652101103	SM10KS
C30	SM666377226	SM22uF-15V	R24	SM652101103	SM10KS
C31	SM661255471	SM470pF	R25	SM652101103	SM10KS

Section 8 Schematics, Layouts, Parts list

PART: F9300-7**DESC: LTP 5446 PRINTER CONTROLLER**

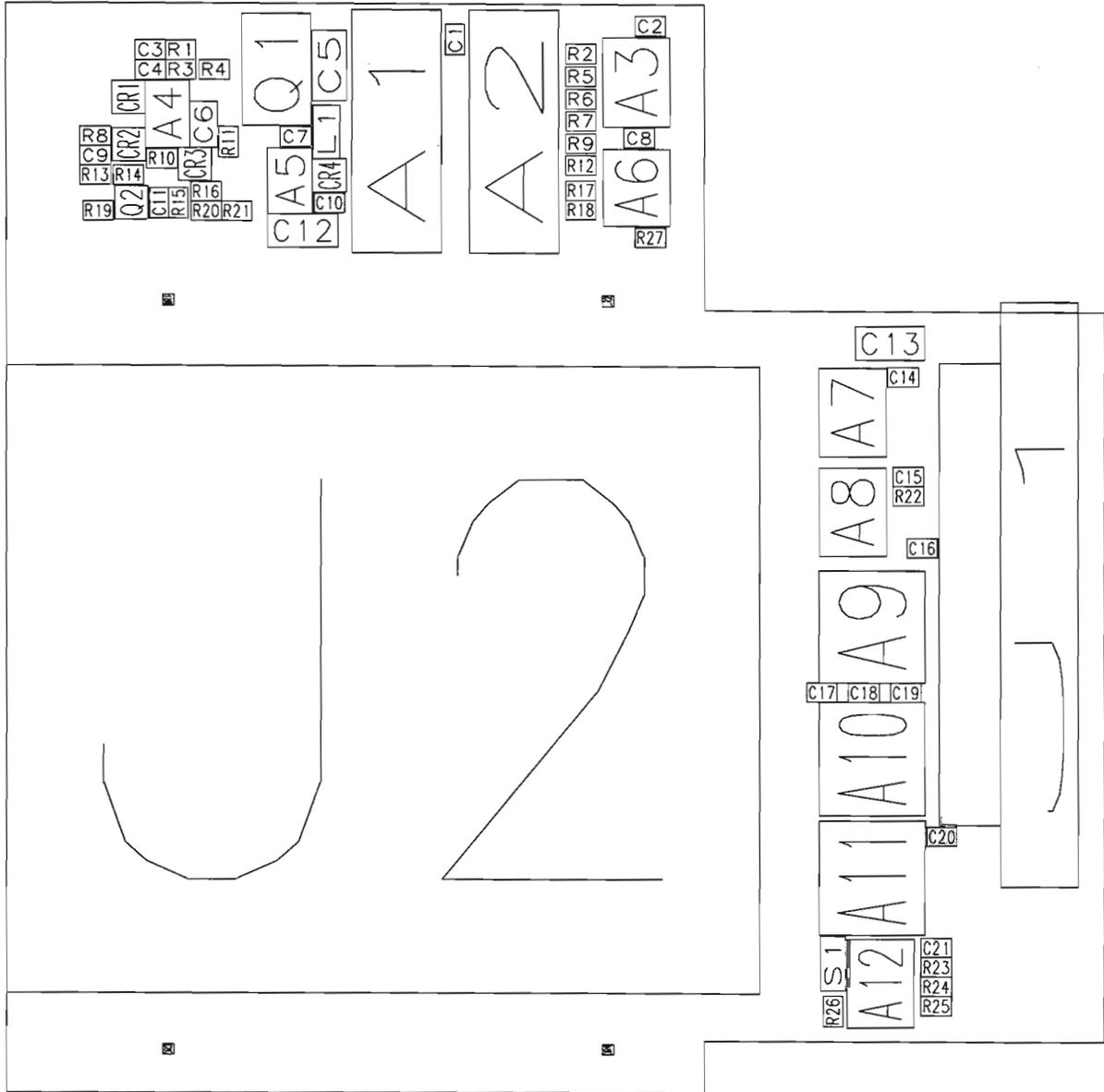
Location	Part Number	Description	Location	Part Number	Description
R26	SM652101103	SM10KS	R50	SM652101301	SM300S
R27	SM652101103	SM10KS	R51	SM652101303	SM30KS
R28	SM652101103	SM10KS	R52	SM652101391	SM390S
R29	SM652101103	SM10KS	R53	SM652101302	SM3KS
R30	SM652101103	SM10KS	R54	SM652101472	SM4.7KS
R31	SM652101103	SM10KS	R55	SM652101103	SM10KS
R32	SM652101103	SM10KS	R56	SM652101472	SM4.7KS
R33	SM652101103	SM10KS	R57	SM652101472	SM4.7KS
R34	SM652101513	SM51KS	R58	SM652101514	SM510KS
R35	SM652101103	SM10KS	R59	SM652101510	SM51S
R36	SM652101103	SM10KS	R60	SM652101563	SM56KS
R37	SM652101103	SM10KS	R61	SM652101563	SM56KS
R38	SM652101103	SM10KS	R62	SM652101682	SM6.8KS
R39	SM652101103	SM10KS	R63	SM652101621	SM620S
R40	SM652101103	SM10KS	R66	SM652101621	SM620S
R41	SM652101103	SM10KS	R70	SM652101132	SM1.3KS
R42	SM652101103	SM10KS	R71	SM652101151	SM150S
R43	SM652101103	SM10KS-4P	R77	SM652101104	SM100KS
R44	SM652101102	SM1KS	RL1	430430001	RL-FBR21-12
R45	SM652101201	SM200S	RN1	190042103	10K-SC
R46	SM652101223	SM22KS	RN2	190042472	4.7K-SIPC
R48	SM652101301	SM300S	RN3	190042472	4.7K-SIPC
R49	SM652101301	SM300S	S1	416161003	SW-P-SPST

PART: F9300-7**DESC: LTP 5446 PRINTER CONTROLLER**

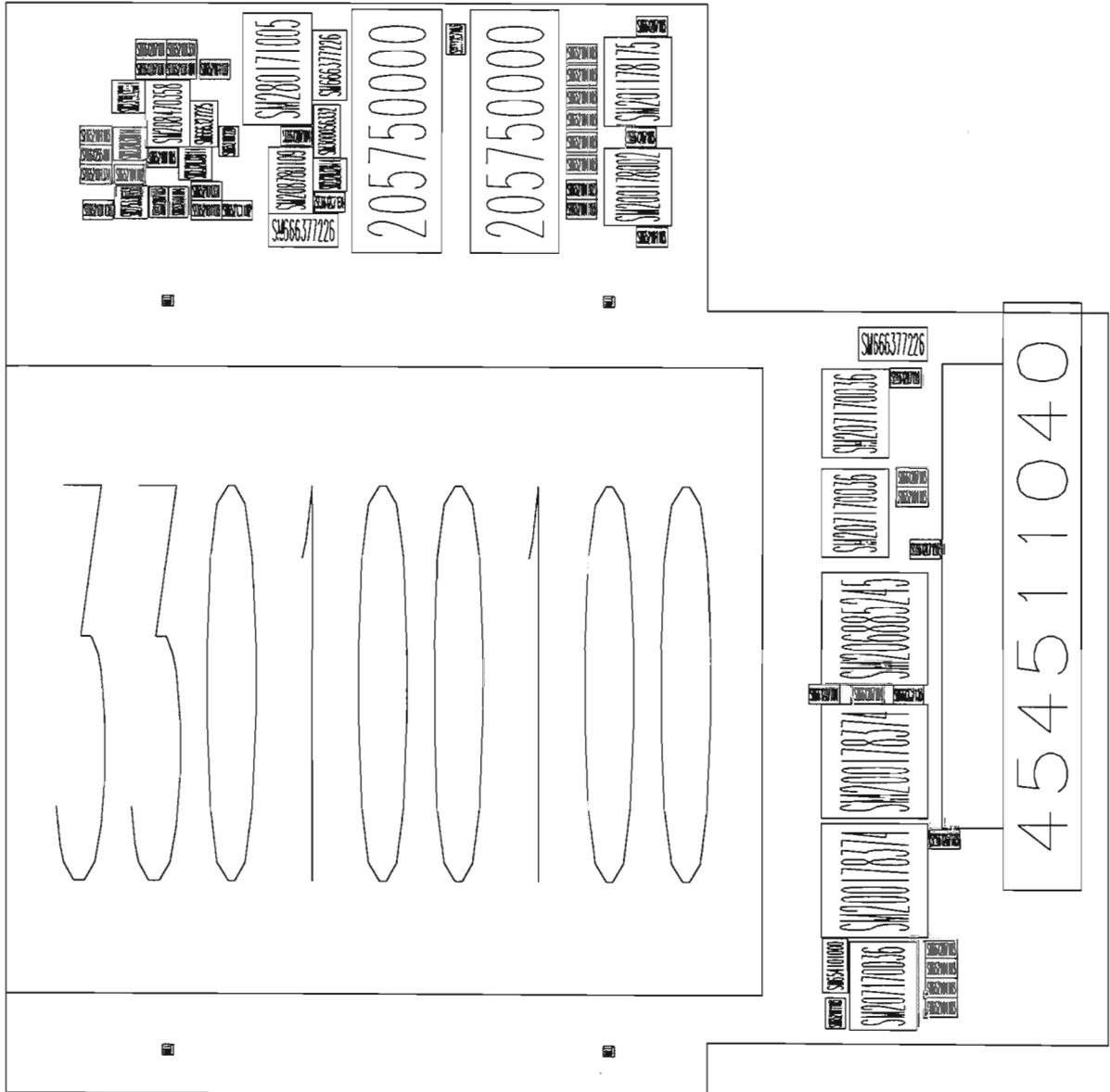
Component	Part Description	Qty Per Assembly
146544471	CAP MINI ALUM 20% 470UF	1
147494472	CAP ALU COMPACT AXIAL 4700 UF	1
190042103	RESISTOR NETWORK 10 K	1
190042472	RESISTOR NETWORK 4.7 K	2
207140007	IC QUAD STEP MOTOR DRIVER	1
208122002	IC VOLT REG POS UA7805	2
208590350	IC ADJ POWER REG 3A LM350	1
309380016	CRYSTAL OSC (PROGR) 16 MHZ	1
416161003	SWITCH PUSHBUTTON SPST	1
430430002	RELAY 1 FORM C SPDT	1
454111002	HEADER STRAIGHT 2-PINS	1
454111006	HEADER STRAIGHT 6-PINS	1
454113003	HEADER STRAIGHT 3-PINS	1
454121003	BLOC FOR SOCKETS 3-PIN	1
454511020	HDR SOLD TAIL/MALE 20	1

PART: F9300-7**DESC: LTP 5446 PRINTER CONTROLLER**

Component -----	Part Description -----	Qty Per Assembly -----
454511026	HDR SOLD TAIL/MALE 26	1
554435401	RIVET "RIVSCREW" M 3.5	3
719300703	PC BD PREASS'Y 9300-7	1
SM200330125	IC QUAD BUFFER 74HC125	1
SM207470175	IC QUAD DIFF LINE RECEIVER	4
SM208580336	IC REF DIODE LM336-2.5V	1
SM208650393	IC DUAL VOLT COMP LM393M	1
SM227080500	IC THERM PRINTER GATE ARRAY	1
SM227090501	IC THERM PRINTER CPU	1
SM236030099	DIODE SO-PKG BAV99	8
SM270330848	TRANSISTOR NPN BC848C	2
SM652101101	RES CHIP (E24) 1% 100 OHM	12
SM652101102	RES CHIP (E24) 1% 1 K	1
SM652101103	RES CHIP (E24) 1% 10 K	25
SM652101104	RES CHIP (E24) 1% 100 K	1
SM652101132	RES CHIP (E24) 1% 1.3 K	3
SM652101151	RES CHIP (E24) 1% 150 OHM	1
SM652101162	RES CHIP (E24) 1% 1.6 K	2
SM652101201	RES CHIP (E24) 1% 200 OHM	1
SM652101223	RES CHIP (E24) 1% 22 K	1
SM652101301	RES CHIP (E24) 1% 300 OHM	3
SM652101302	RES CHIP (E24) 1% 3 K	1
SM652101303	RES CHIP (E24) 1% 30 K	1
SM652101391	RES CHIP (E24) 1% 390 OHM	1
SM652101472	RES CHIP (E24) 1% 4.7 K	3
SM652101510	RES CHIP (E24) 1% 51 OHMS	1
SM652101513	RES CHIP (E24) 1% 51 K	1
SM652101514	RES CHIP (E24) 1% 510 K	1
SM652101563	RES CHIP (E24) 1% 56 K	2
SM652101621	RES CHIP (E24) 1% 620 OHM	2
SM652101682	RES CHIP (E24) 1% 6.8 K	1
SM654101000	CHIP JUMPER ZERO OHMS	1
SM661127104	CAP CERA CHIP 20% .1 UF	2
SM661207103	CAP CERA CHIP 20% .01UF	23
SM661255101	CAP CERA CHIP 5% 100 PF	1
SM661255471	CAP CERA CHIP 5% 470 PF	4
SM666377226	CAP MOLD TANT CHIP 22 UF	2



9300-8 Rev : B



9300-8 Rev : B

PART: F9300-8**DESC: PCMCIA 3 HARD DISK CONTROLLER**

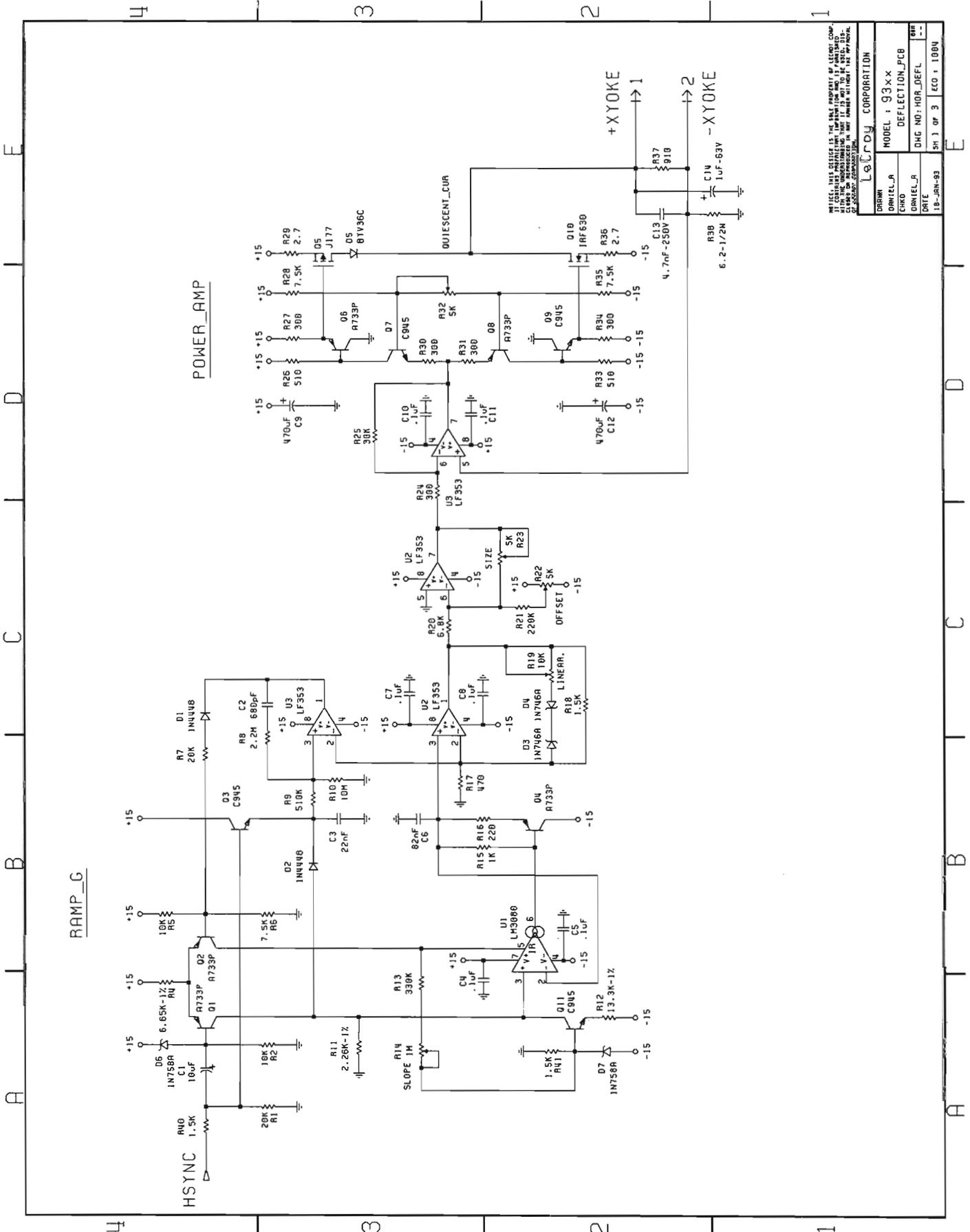
Location	Part Number	Description	Location	Part Number	Description
-----	-----	-----	-----	-----	-----
A1	205750000	C16R4L	L1	SM300056332	SM33uH
A2	205750000	C16L8L	Q1	SM280171005	MTD10N05E
A3	SM201178175	SM74HCT175	Q2	SM275330858	BC858C
A4	SM208470358	SMLM358	R1	SM652101334	SM330KS
A5	SM208780109	SM1109-12	R2	SM652101103	SM10KS
A6	SM200178002	SM74HCT02	R3	SM652101104	SM100KS
A7	SM207170036	SM74HCT365	R4	SM652101102	SM1KS
A8	SM207170036	SM74HCT365	R5	SM652101103	SM10KS
A9	SM206885245	SM74ABT245	R6	SM652101103	SM10KS
A10	SM200178374	SM74HCT374	R7	SM652101103	SM10KS
A11	SM200178374	SM74HCT374	R8	SM652101103	SM10KS
A12	SM207170036	SM74HCT365	R9	SM652101103	SM10KS
C1	SM661207103	SM.01uFS	R10	SM652101103	SM10KS
C2	SM661207103	SM.01uFS	R11	SM652101220	SM22S
C3	SM661207104	SM.1uFS	R12	SM652101103	SM10KS
C4	SM661207104	SM.1uFS	R13	SM652101334	SM330KS
C5	SM666377226	SM22uF-15V	R14	SM652101102	SM1KS
C6	SM666327225	SM2.2uF-20V	R15	SM652101104	SM100KS
C7	SM661207104	SM.1uFS	R16	SM652101334	SM330KS
C8	SM661207103	SM.01uFS	R17	SM652101103	SM10KS
C9	SM661255101	SM100pFS	R18	SM652101103	SM10KS
C10	SM661207104	SM.1uFS	R19	SM652101103	SM10KS
C11	SM661207103	SM.01uFS	R20	SM652101103	SM10KS
C12	SM666377226	SM22uF-15V	R21	SM652101102	SM1KS
C13	SM666377226	SM22uF-15V	R22	SM652101103	SM10KS
C14	SM661207103	SM.01uFS	R23	SM652101103	SM10KS
C15	SM661207103	SM.01uFS	R24	SM652101103	SM10KS
C16	SM661207103	SM.01uFS	R25	SM652101103	SM10KS
C17	SM661207104	SM.1uFS	R26	SM652101103	SM10KS
C18	SM661207104	SM.1uFS	R27	SM652101103	SM10KS
C19	SM661207103	SM.01uFS	S1	SM654101000	SM0S-2P
C20	SM661207103	SM.01uFS	CR1	SM232032814	HSMS2814
C21	SM661207103	SM.01uFS	CR2	SM232032814	HSMS2814
J1	454511040	2x20-RA-M-RE	CR3	SM232032814	HSMS2814
J2	330100100	2x34-RA-CGE	CR4	SM232032814	HSMS2814

PART: F9300-8

DESC: PCMCIA III HARD DISK CONTROLLER

Component -----	Part Description -----	Qty Per Assembly -----
205750000	IC AND-OR GATE ARRAY 16V8	2
330100100	PCMCIA HEADER ASS'Y TOP/LEFT	1
389340009	AUTO-ADHES. RUBBER BAND	1
454511040	HDR SOLD TAIL/MALE/40/RT	1
550120606	SCREW OVAL HD PHIL M2X6	4
550430106	SCREW CYL HD PHIL M3X6	4
551430400	WASHER SHAKEPROOF M3	4
552120100	NUT HEX M2X0.5D	4
594230002	CABLE CLIP ADHESIVE BACK	1
709300811	9300-8 PCMCIA III CONT.BRACKET	1
709300821	9300-8 PCMCIA III CONT. COVER	1
709300831	9300-8 PCMCIA III CONTR. LABEL	1
719300803	PC BD PREASS'Y 9300-8	1
SM200178002	IC 2-INPUT NOR HCT02	1
SM200178374	IC D-TYP FLOP 74HCT374	2
SM201178175	IC QUAD D FLIP/FLOP 74HCT175	1
SM206885245	IC BUS TRANSCVR ABT245	1
SM207170036	IC HEX BUFFER 3-ST. PC74HCT365	3
SM208470358	IC DUAL OP AMP 358D	1
SM208780109	IC MICROPOWER DC-DC CONV.	1
SM232032814	DIODE 2814	4
SM275330858	TRANSISTOR PNP BC858C	1
SM280171005	TRANS POWER MOSFET MTD10N05E	1
SM300056332	INDUCTOR WOUND 33 UH	1
SM652101102	RES CHIP (E24) 1% 1 K	3
SM652101103	RES CHIP (E24) 1% 10 K	18
SM652101104	RES CHIP (E24) 1% 100 K	2
SM652101220	RES CHIP (E24) 1% 22 OHMS	1
SM652101334	RES CHIP (E24) 1% 330 K	3
SM654101000	CHIP JUMPER ZERO OHMS	1
SM661207103	CAP CERA CHIP 20% .01UF (0805)	10
SM661207104	CAP CERA CHIP 20% .1 UF	6
SM661255101	CAP CERA CHIP 5% 100 PF	1
SM666327225	CAP MOLD TANT CHIP 2.2 UF	1
SM666377226	CAP MOLD TANT CHIP 22 UF	3

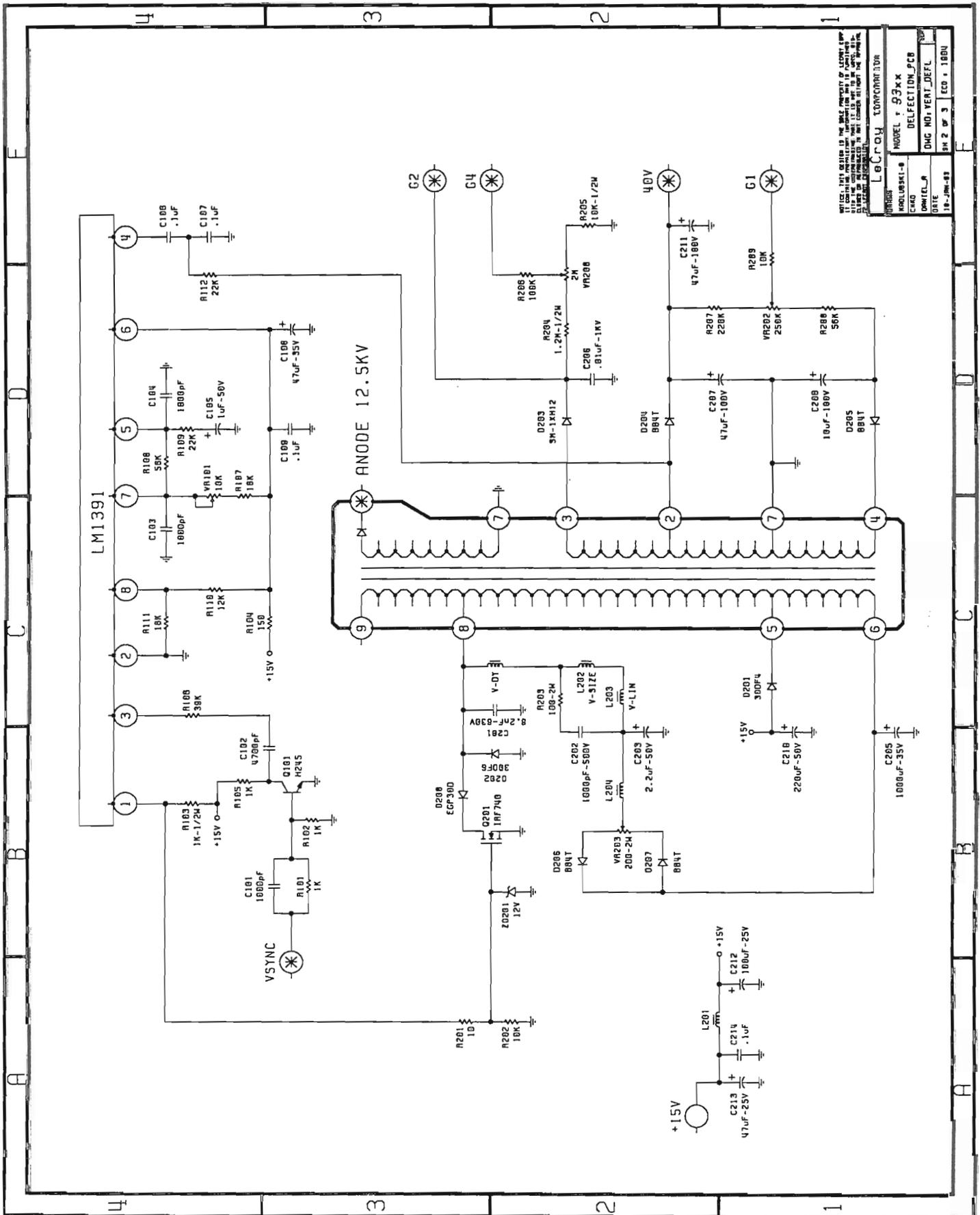
Section 8 Schematics, Layouts, Parts list



NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF LEXDY CORP. IT CONTAINS TRADE SECRETS. THE RIGHT TO MAKE, USE, REPRODUCE, OR TRANSMIT THIS DESIGN OR ANY INFORMATION CONTAINED HEREIN IS RESERVED BY LEXDY CORP. WITHOUT LIMITATION.

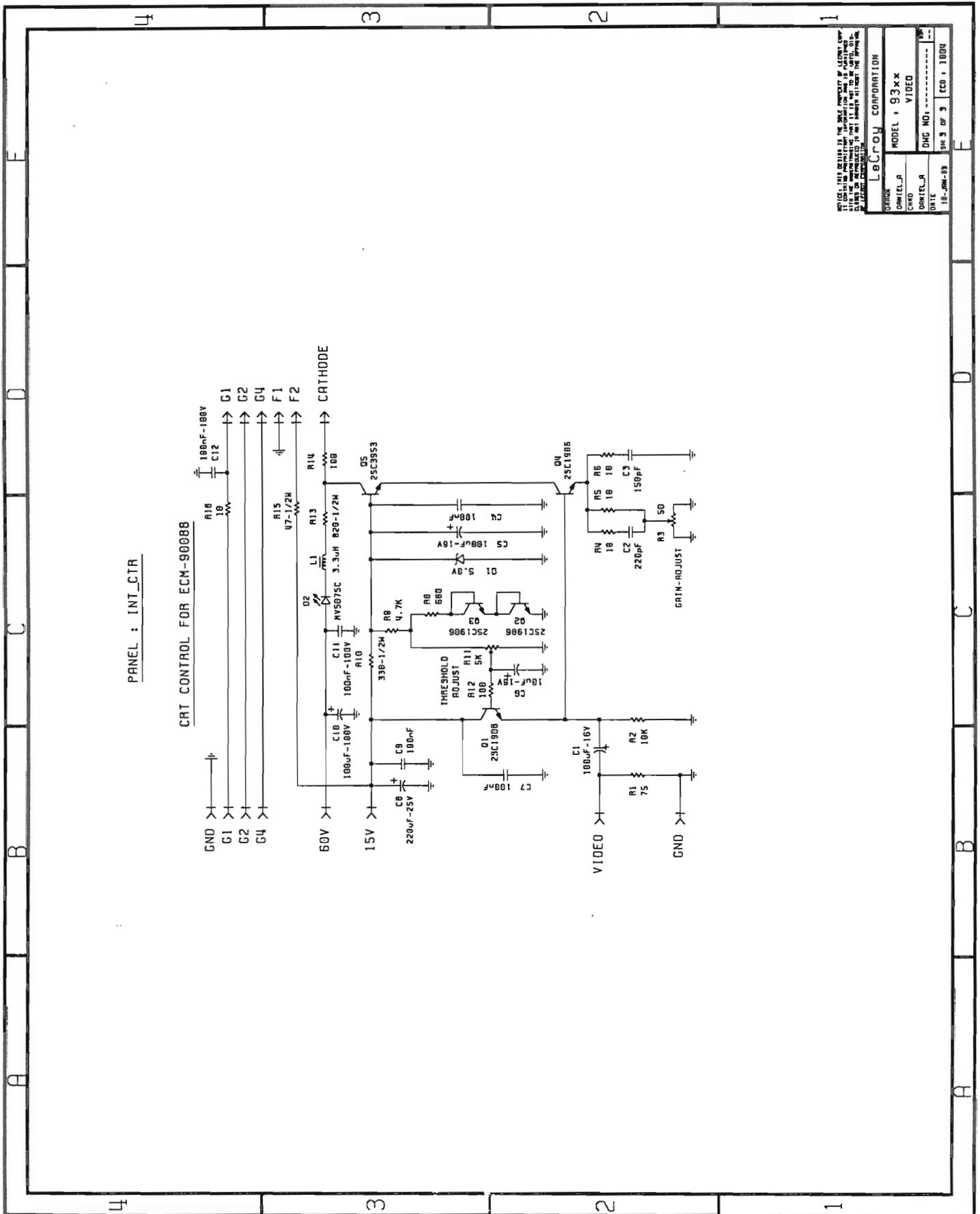
DRAWN	DANIEL_A
CHKD	DANIEL_A
DATE	18-JAN-93
MODEL	93XX
DEFLECTION_PCB	
DWG NO: HDP_DEFLE	
REV	
ECO	ECO + 1004

LEXDY CORPORATION



LEADER INFORMATION			
MODEL :	93KX	DEFLECTION PCB	
DATE :	071E	DMG MOD. VERT. DEFL.	
REV :	3N 2 OF 3	ECD :	180N

Section 8 Schematics, Layouts, Parts list



PART : F93XX-DEFLECTION

Location	Description	Location	Description
-----	-----	-----	-----
C1	10uF	D202	30DF6
C2	680pF	D203	SM-1XH12
C3	22nF	D204	B34T
C4	.1uF	D205	BB4T
C5	.1uF	D206	BB4T
C6	82nF	D207	BB4T
C7	.1uF	L201	5nH
C8	.1uF	V-DY	V-DY
C9	470uF	L202	V-SIZE
C10	.1uF	L203	V-LIN
C11	.1uF	L204	5nH
C12	470uF	Q1	A733P
C13	4.7nF250V	Q2	A733P
C14	1uF-63V	Q3	C945
C101	1000pF	Q4	A733P
C102	4700pF	Q5	J177
C103	1000pF	Q6	A733P
C104	1000pF	Q7	C945
C105	1uF-50V	Q8	A733P
C106	.1uF	Q9	C945
C107	.1uF	Q10	IRF630
C108	47uF-35V	Q11	C945
C109	.1uF	Q101	H245
C201	8.2nF-630V	Q201	IRF740
C202	1000pF-500V	R1	20K
C203	2.2uF-50V	R2	10K
C205	1000uF-35V	R4	6.65K-1%
C206	.01uF-1KV	R5	10K
C207	47uF-100V	R6	7.5K
C208	10uF-100V	R7	20K
C210	220uF-50V	R8	2.2M
C211	47uF-100V	R9	510K
C212	100uF-25V	R10	10M
C213	47uF-25V	R11	2.26K-1%
C214	.1uF	R12	13.3K-1%
D1	1N4448	R13	510K
D2	1N4448	R14	1M
D3	1N746A	R15	1K
D4	1N746A	R16	220
D5	BYV36C	R17	470
D6	1N758D	R18	1.5K
D7	1N758D	R19	10K
D8	1N5245B	R20	6.8K
D201	30DF4	R21	220K

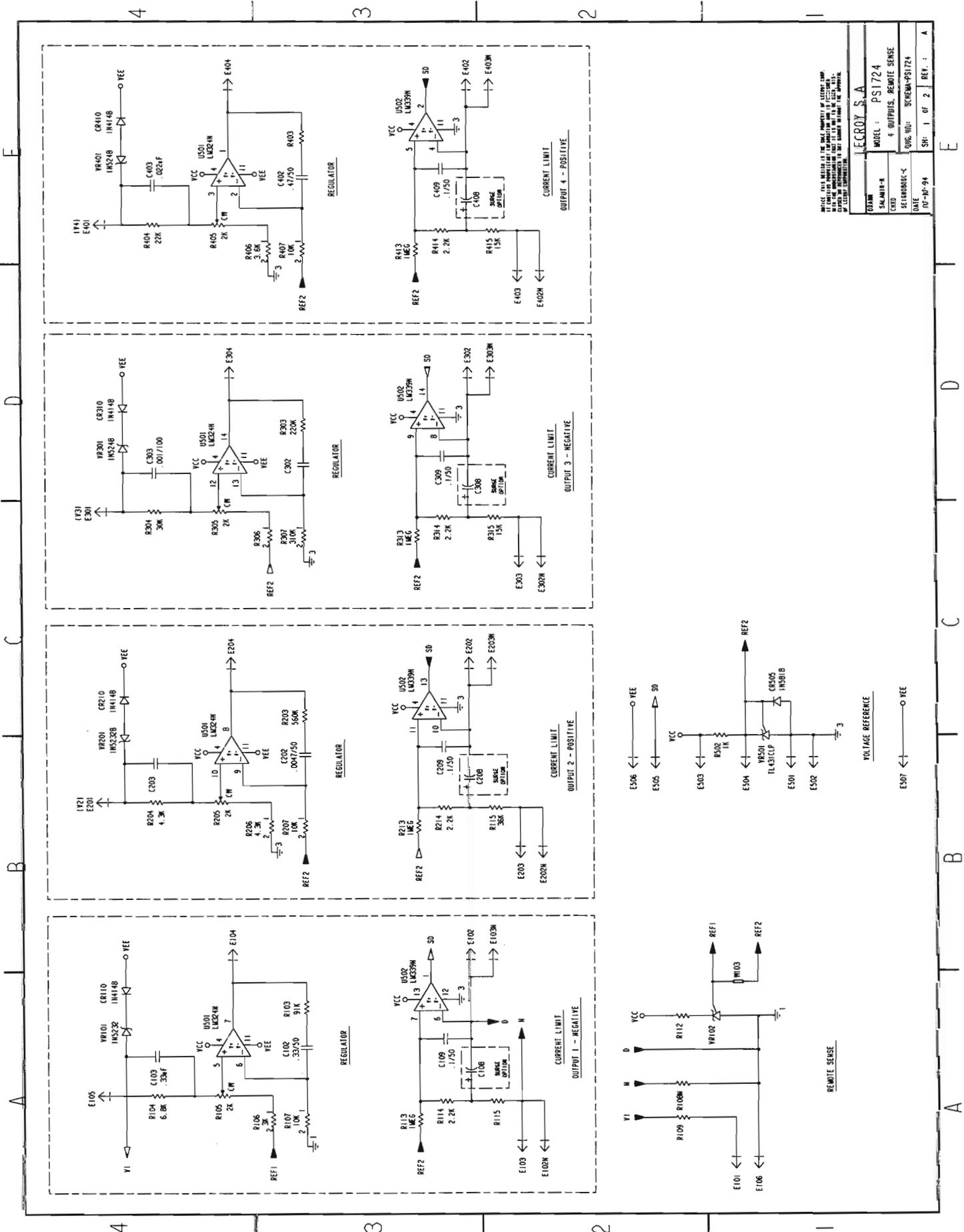
PART : F93XX-DEFLECTION

Location	Description
-----	-----
R22	5K
R23	5K
R24	300
R25	30K
R26	510
R27	300
R28	7.5K
R29	2.7
R30	300
R31	300
R32	5K
R33	510
R34	300
R35	7.5K
R36	2.7
R37	910
R38	6.2-1/2W
R40	1.5K
R41	1.5K
R42	7.5K
R101	1K
R102	1K
R103	1K-1/2W
R104	150
R105	1K
R106	39K
R107	18K
R108	56K
R109	22K
R110	12K
R111	18K
R112	22K
R201	10
R202	10K
R203	100-2W
R204	1.2M-1/2W
R205	10K-1/2W
R206	100K
R207	220K
R208	56K
R209	10K
T201	HT
U1	LM3080
U2	LF353
U3	LF353

Location	Description
-----	-----
VR101	10K
VR202	250K
VR203	200-2W
VR206	2M
ZD201	12V

PART : F93XX-VIDEO

Location	Description
-----	-----
C1	100uF-16V
C2	220pF
C3	150pF
C4	100nF
C5	100uF-16V
C6	10uF-16V
C7	100nF
C8	220uF-25V
C9	100nF
C10	100uF-100V
C11	100nF-100V
C12	100nF-100V
D1	5.0V
D2	MV5075C
L1	3.3uH
Q1	2SC1906
Q2	2SC1906
Q3	2SC1906
Q4	2SC1906
Q5	2SC3953
R1	75
R2	10K
R3	50
R4	10
R5	10
R6	10
R8	680
R9	4.7K
R10	330-1/2W
R11	5K
R12	100
R13	820-1/2W
R14	100
R15	47-1/2W
R16	10

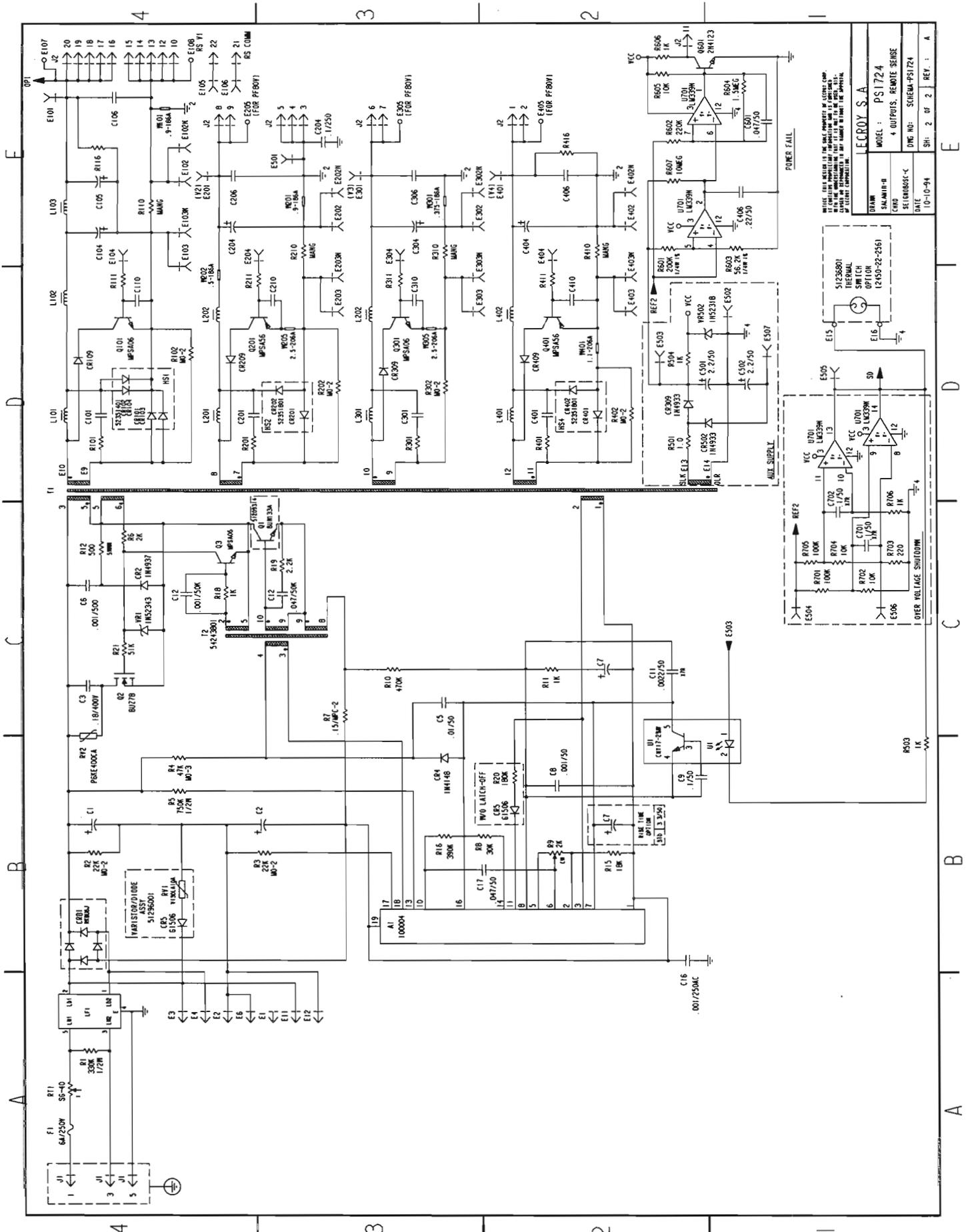


NOTICE: THIS DRAWING IS THE SOLE PROPERTY OF ELECTRO-COMP. IN THE EVENT OF DISCREPANCY BETWEEN THIS DRAWING AND THE PART, THE PART SHALL BE THE BASIS FOR REVISION.

DATE	10-10-94	SH	1 of 2	REF.	A
DESIGN	SCHEMATIC	MODEL	PS1724		
PROD	SETPOINT	OUTPUTS	REMOTE SENSE		
DATE	10-10-94	QWG	NO: SCHEMATIC-PS1724		

ELECTRO-COMP
MODEL: PS1724
OUTPUTS: REMOTE SENSE

Section 8 Schematics, Layouts, Parts list



PART: M935X

DESC: MECHANICAL FOR 9354A/T

COMPONENT	PART DESCRIPTION	QTY PER ASSEMBLY
-----	-----	-----
315910006	COMBI FILTER WITH FUSES - 6AMP	1
377051005	LABEL "DANGER-----ONLY"	1
377131001	LABEL (GROUND SYMBOL)	1
433162630	FUSE SLO-BLO 250V 6.3AMP	2
485023462	FOOT BUMPON GREY	4
485123001	BUMPER (FOOT) SQUARE GREY RUB	2
530301009	BLK HANDLE W/2 BLACK END CAPS	1
550430106	SCREW CYL HD PHIL M3X6	11
550430116	SCREW CYL HD PHIL M3X16	6
550430120	SCREW CYL HD PHIL M3X20	10
550430508	SCREW FLAT HD PHIL M3X8	2
550430706	SCREW ECO-FIX M3X6	7
550440605	SCREW OVAL HD PHIL M4X5	8
550440608	SCREW OVAL PHIL M4X8	7
551430400	WASHER SHAKEPROOF M3	6
551450400	WASHER SHAKEPROOF M5	2
554030101	NUT BANC-LOK TYPE MV M3	7
554035101	CLIP-ON NUT DIAM. 3.5	4
554425003	SCREW S/TAP PHIL M2.5X6 BLACK	6
554435003	SCREW PT PHIL KA35X20	4
554435004	SCREW PT PHIL KA35X10	4
554435005	SCREW CYL HD PHIL 3.5X9.5	4
554440001	SCREW PT PHIL KA 40 X 12	4
554440202	FLAT WASHER M4	4
560032008	SCREW PHILIPS 10-32X1/2	2
594120003	TIEWRAP	1
709300911	LABEL CE	1
7093XX041	FOOT SUPPORT 93XX	2
7093XX051	FOOT 93XX	2
7093XX091	FRONT FRAME BRACKET 93XX	4
7093XX321	MAIN CARD STANDOFF 12MM	2
7093XX902	FAN 93XX-9 ASSEMBLY	1
7093XX931	INTERF. HOLE CLOSURE 93XX-9	2
709424096	INSERTION GUIDE FOR MC	1
780661104	FLAT CABLE 2X7 (4 CM)	1
780671110	FLAT CABLE 2X20 (10 CM)	1
780721105	FLAT CABLE 2X10 (5,5CM)	1
780834509	GROUND CABLE YELLOW/GREEN	1
93XX-DISPLAY	RASTER MONITOR KIT	1
FF93X1	FRONT FRAME DSO 93XX	1
LC93X1	LOWER COVER DSO 93XX	1
PS9351	POWER SUPPLY	1
RP9354-9	REAR PANEL 9354-9	1
UC93X1	UPPER COVER DSO 93XX	1
US9354-3	UPPER SHIELD ASSEMBLY	1

PART: ACCESSORIES-9354 DESC: ACCESSORIES FOR 9354A/T

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
407099008	PLUG FOR AC LINE - ENGLAND	1
433162630	FUSE SLO-BLO 250V 6.3AMP	2
589202200	AC CORD/PLUG FOR GERMANY	1
589203100	AC CORD/"SEV-ASE" PLUG	1
589203218	AC CORD/US-CANADA PLUG	1
597930001	CARTON FOR 93XX	1
597930002	ETHAFOAM FOR 93XX	2
597940014	PLASTIC BAG FOR 94XX & 93XX	2
597940015	MANUAL/ACCESSORY CTN 9400	2
7093XX061	FRONT COVER 93XX	1
931X-RCM-E	931X SERIES REMOTE CONTROL MAN 1	
935X-OM-E	9350/54 OPERATOR'S MANUAL ENG.	1
PP002	PASSIVE PROBE 10 MOHM 10:1	4
PP092	2GS/s ADAPTOR FOR 9354	1

PART: 93XX-FDGP DESC: GRAPHIC PRINTER & FLOPPY DISK

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
334000402	THERMAL PAPER FOR SEIKO PRINT	1
334000832	THERMAL PRINTER UNIT	1
335023203	FLOPPY DISK DRIVE 31/2"	1
530040005	SLIDE LATCH TAB STYLE	2
550425104	SCREW CYL HD PHIL M2,5X4	4
550430106	SCREW CYL HD PHIL M3X6	6
551430100	FLAT WASHER M3	3
551430400	WASHER SHAKEPROOF M3	4
552430300	NUT OPEN-END ACORN M3	3
554030101	NUT BANC-LOK TYPE MV M3	2
554430002	SCREW S/TAP PHIL M3X5	10
594120003	TIE WRAP	2
709450523	PUSH SWITCH EXTENDER	1
70FD01021	FLOPPY DISK DRIVE SUPPORT	1
70FD01031	FLOPPY DISK DRIVE FRAME	1
70GP01031	GRAPHIC PRINTER FRAME	1
70GP01041	GRAPHIC PRINTER COVER AXLE	1
70GP01051	GRAPHIC PRINTER CUTTER	1
70GP01061	GRAPHIC PRINTER SWITCH BUTTON	1
780210030	DISPLAY POWER CABLE	1
780721022	FLAT CABLE 2X10 (22CM)	1
780791604	FLAT CABLE 2X13 (4CM)	1
780791630	FLAT CABLE 2X13 (30CM)	1
780801015	FLAT CABLE 2X20 (3 CONNECT.)	1
BOX-GP01	GP01 GRAPHIC PRINTER BOX	1
COVER-GP01	GP01 GRAPHIC PRINTER COVER	1
CUP-FD01	FD01 FLOPPY DISK DRIVE CUP	1
F9300-6	CENTRONICS/FLOPPY/PRINTER INT	1
F9300-7	LTP 5446 PRINTER CONTROLLER	1
UC93X1-FDGP	UPPER COVER FOR FD/GP OPTIONS	1

PART: 93XX-FD01 DESC: FLOPPY DISK

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
335023203	FLOPPY DISK DRIVE 31/2"	1
550425104	SCREW CYL HD PHIL M2,5X4	4
550430106	SCREW CYL HD PHIL M3X6	4
551430400	WASHER SHAKEPROOF M3	2
551430400	WASHER SHAKEPROOF M3	2
554030101	NUT BANC-LOCK TYPE MV M3	2
554430002	SCREW S/TAP PHIL M3X5	4
70FD01021	FLOPPY DISK DRIVE SUPPORT	1
70FD01031	FLOPPY DISK DRIVE FRAME	1
780791630	FLAT CABLE 2X13 (30CM)	1
780801015	FLAT CABLE 2X20 (3 CONNECT.)	1
CUP-FD01	FD01 FLOPPY DISK DRIVE CUP	1
F9300-6	CENTRONICS/FLOPPY/PRINTER INT. B	1
UC93X1-FD01	UPPER COVER FOR FD01 OPTION	1

PART: 93XX-GP01 DESC: GRAPHIC PRINTER

COMPONENT -----	PART DESCRIPTION -----	QTY PER ASSEMBLY -----
340000402	THERMAL PAPER FOR SEIKO PRINT	1
334000832	THERMAL PRINTER UNIT	1
530040005	SLIDE LATCH TAB STYLE	2
550430106	SCREW CYL HD PHIL M3X6	4
551430100	FLAT WASHER M3	3
551430400	WASHER SHAKEPROOF M3	4
552430300	NUT OPEN-END ACORN M3	3
554430002	SCREW S/TAP PHIL M3X5	6
594120003	TIE WRAP	2
709450523	PUSH SWITCH EXTENDER	1
70GP01031	GRAPHIC PRINTER FRAME	1
70GP01041	GRAPHIC PRINTER COVER AXLE	1
70GP01051	GRAPHIC PRINTER CUTTER	1
70GP01061	GRAPHIC PRINTER SWITCH BUTTON	1
780210030	DISPLAY POWER CABLE	1
780721022	FLAT CABLE 2X10 (22CM)	1
780791604	FLAT CABLE 2X13 (4CM)	1
780801015	FLAT CABLE 2X20 (3 CONNECT.)	1
BOX-GP01	GP01 GRAPHIC PRINTER BOX	1
COVER-GP01	GP01 GRAPHIC PRINTER COVER	1
F9300-6	CENTRONICS/FLOPPY/PRINTER INT	1
F9300-7	LTP 5446 PRINTER CONTROLLER	1
UC93X1-GP01	UPPER COVER FOR GP01 OPTION	1

SECTION 9 MECHANICAL PARTS

9354A, 9354AM, 9354AL, 9354T & 9354TM

Digital Storage Oscilloscope

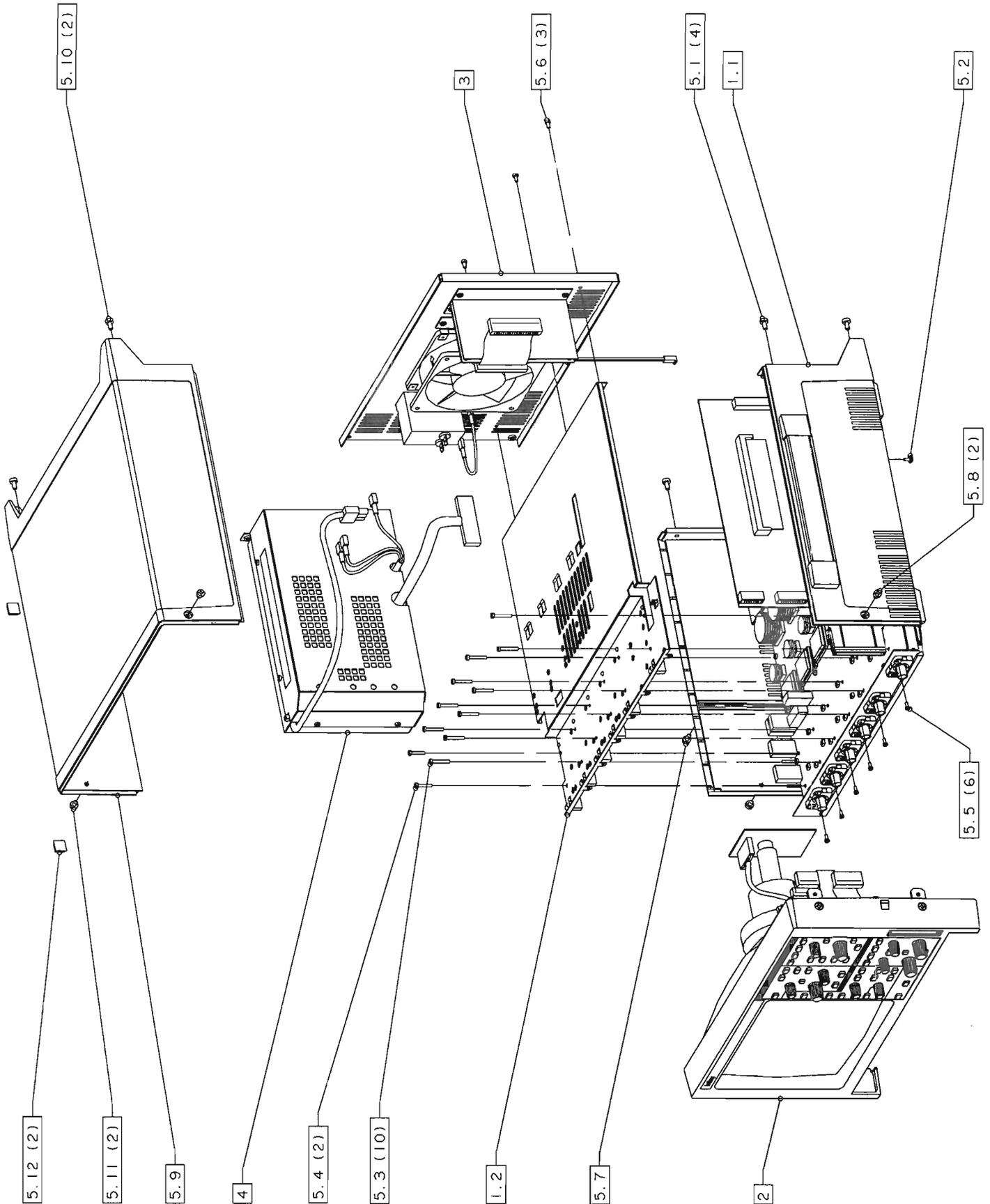


Figure 9.1 : 9354A/T DSO Exploded View

9.1.1	9354A/T Assembly	Part Description	Quantity per Assembly

1.1	9354A/T lower cover assembly	LC93X1	1
1.2	9354A/T upper shield assembly	US9354-3	1
2.	9354A/T front frame assembly		1
3.	9354A/T Rear panel assembly		1
4.	PS9351Power supply	PS9351	1
5.1	Screw oval head M4x8	550 440 608	4
5.2	Screw eco fix M3x6	550 430 706	1
5.3	Screw cyl head M3x20	550 430 120	10
5.4	Screw M3x16	550 430 116	2
5.5	Self tapping screw M2.5x6	554 425 003	6
5.6	Screw M3x6	554 430 706	3
5.7	Screw oval head M4x8	550 440 608	1
5.8	Screw M4x5	550 440 605	2
5.9	9354A/T Upper cover	UC 93X1	1
5.10	Screw oval head M4x8	550 440 608	2
5.11	Screw M4x5	550 440 605	2
5.12	Foot bumpon grey 6 mm	485 023 462	2

Section 9 Mechanical Parts

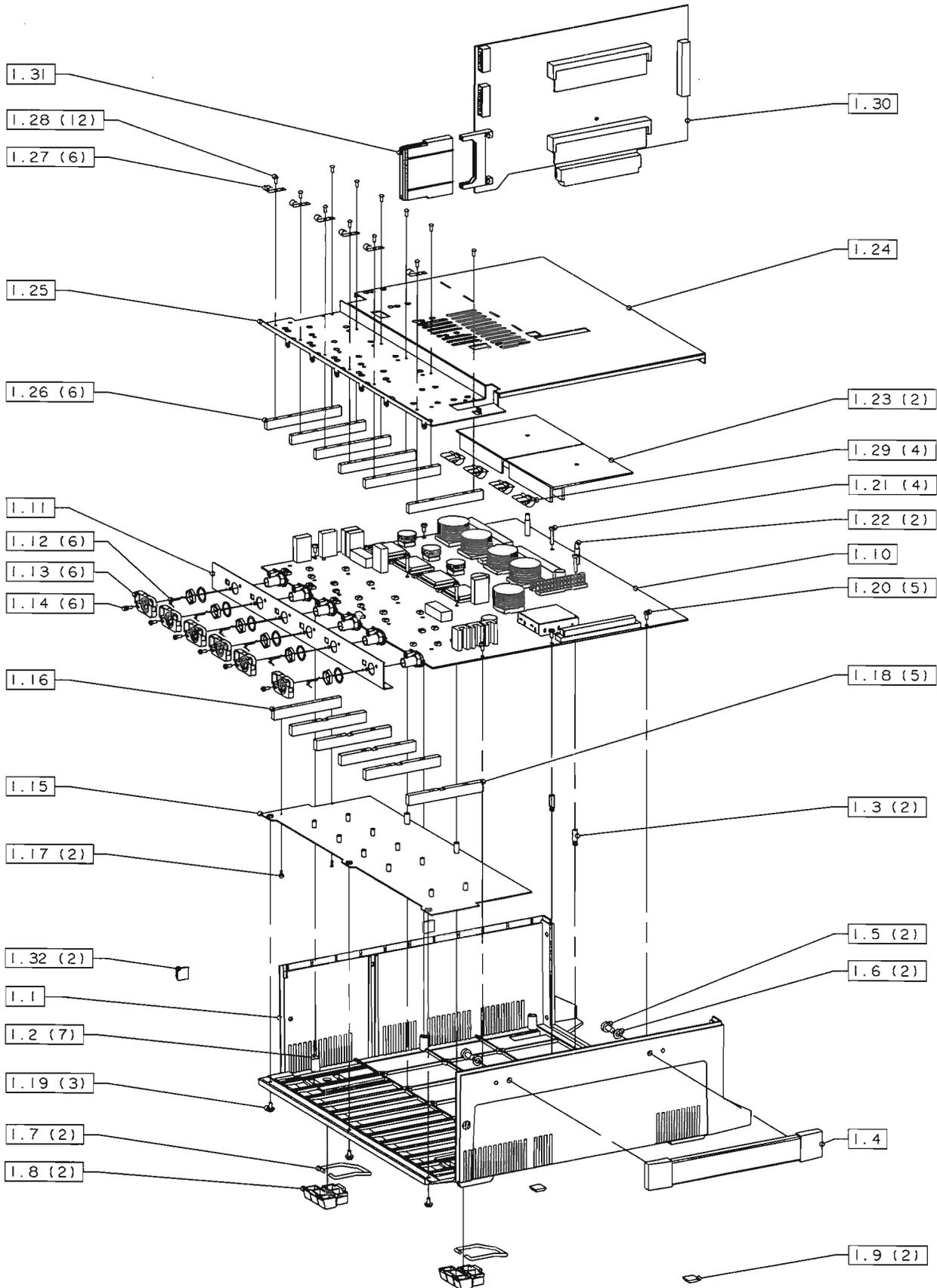


Figure 9.2 : 9354A/T Lower Cover Exploded View

9.2.1	9354A/T Lower Cover Assembly	Part Description	Quantity per Assembly
1.1	Lower cover	LC 93X1	1
1.2	Nut Banc-Lock M3	554 030 101	7
1.3	Main card standoff 12 mm M3	709 3XX 321	2
1.4	Handle with caps	530 301 009	1
1.5	Screw cyl head 10-32 x 1/2	560 032 008	2
1.6	Lockwasher M5	551 450 400	2
1.7	Foot	709 3XX 051	2
1.8	Foot support	709 3XX 041	2
1.9	Foot bumpon grey 3 mm	485 123 001	2
1.10	Main board 9354A/T	F9354-31	1
1.11	Main board panel 9354A/T	FP9354-3	1
1.12	Probe ring contact	709 3XX P91	6
1.13	Probe holder	709 3XX P41	6
1.14	Self tapping screw M2,5x6	554 425 003	6
1.15	9354A/T base shield	709 354 331	1
1.16	Left lower partition	709 354 361	1
1.17	Nail rivet 1.6x6	554 416 000	2
1.18	Lower partition	709 354 351	5
1.19	Screw eco-fix M3x6	550 430 706	3
1.20	Screw cyl head M3x6	550 430 106	5
1.21	Screw cyl head M3x16	550 430 116	4
1.22	Self locking nylon spacer	520 000 118	2
1.23	9354A Acquisition memory card	F9350-21	2
	9354AM Acquisition memory card	F9350M-21	2
	9354AL Acquisition memory card	F9350L-2	2
	9354T Acquisition memory card	F9350T-21	2
	9354TM Acquisition memory card	F9350TM-21	2
1.24	Upper shield assembly	US9354-3	1
1.25	Upper shield	709 354 321	1
1.26	Upper partition shield	709 354 341	6
1.27	Shield contact	709 3XX 371	6
1.28	Nail rivet M2,5x6	554 425 004	12
1.29	Shield finger stock	530 009 002	4
1.30	9354A & 9354T Processor card	F9302-1-4	1
	9354AM & 9354TM Processor	F9302-1-8	1
	9354AL Processor card	F9302-1-16	1
1.31	Memory card insertion guide	709 424 096	1
1.32	Self adhesive foot	485 023 462	2

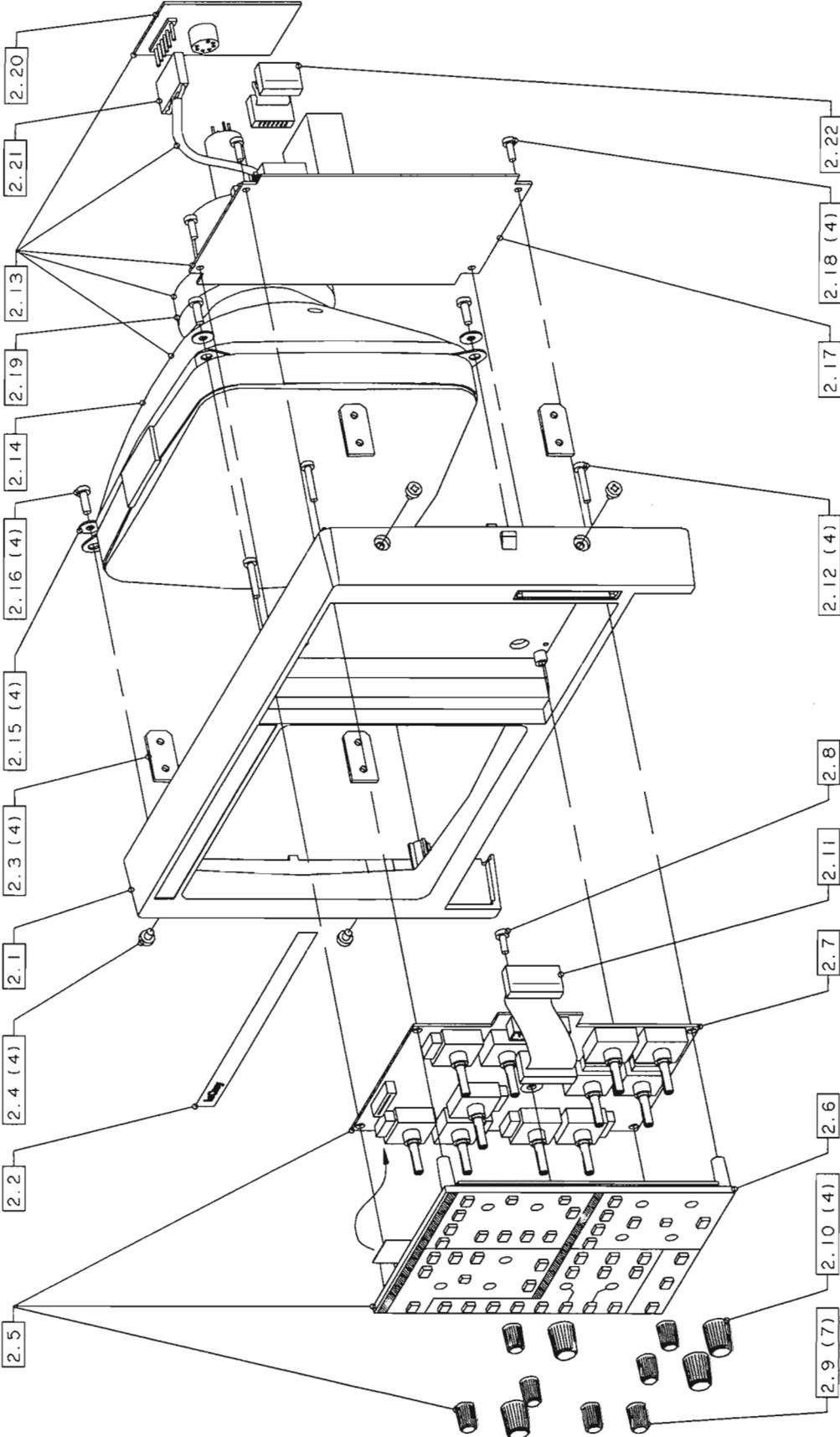


Figure 9.3 : 9354A/T Front Frame Exploded View

9.3.1 9354A/T Front Panel Assembly	Part Description	Quantity per Assembly	
2.1	Front frame	FF 93X1	1
2.2	Front label 9354A	709 354 A16	1
	Front label 9354AM	709 354 AM16	1
	Front label 9354AL	709 354 AL16	1
	Front label 9354T	709 354 T16	1
	Front label 9354TM	709 354 TM16	1
2.3	Front frame bracket	709 3XX 091	4
2.4	Screw oval head M4x5	550 440 605	4
2.5	Front panel assembly	F9354-5	1
2.6	Front panel keyboard ass'y	729 354 513	1
2.7	Front panel pcb ass'y	9354-5	1
2.8	Screw PT KA 35x10	554 435 004	1
2.9	Knob diameter 10mm	709 3XX 511	7
2.10	Knob diameter 14mm	709 3XX 521	4
2.11	20 lines flat cable	780 721 105	1
2.12	Screw PT KA 35x20	554 435 003	4
2.13	Raster monitor kit	93XX-Display	1
2.14	9 inch CRT	93XX-CRT	1
2.15	Flat washer M4	554 440 202	4
2.16	Screw PT KA 40x12	554 440 001	4
2.17	Deflection board	93XX-Deflection	1
2.18	Screw PT KA 35x10	554 435 004	4
2.19	Deflection yoke	93XX-Yoke	1
2.20	Video board	93XX-Video	1
2.21	Monitor cable		1
2.22	14 lines flat cable	780 661 104	1

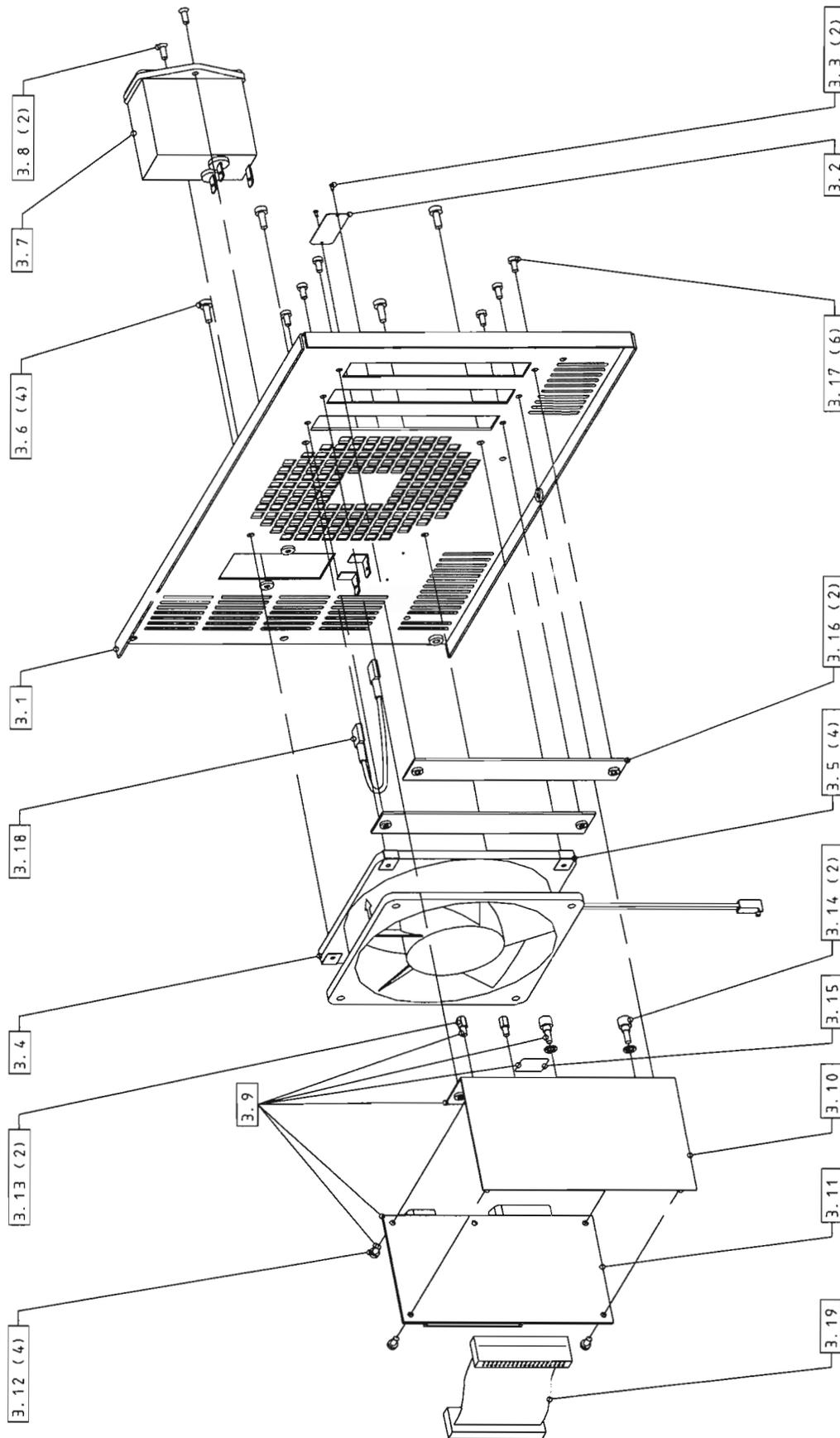


Figure 9.4 : 9354A/T Rear Panel Exploded View

9.4.1	9354A/T Rear Panel Assembly	Part Description	Quantity per Assembly

3.1	Rear panel	RP 9354-9	1
3.2	Serial number plate	709 354 913	1
3.3	Taping screw	554 500 001	2
3.4	Fan assembly	709 3XX 902	1
3.5	Clip on nut 3.5	554 035 101	4
3.6	Screw 3.5 X 9.5	554 435 005	4
3.7	Line input module	315 910 006	1
	Fuse holder		1
	Fuse 6.3A / 250 V	433 162 630	2
3.8	Screw flat head M3x8	550 430 508	2
3.9	RS232/GPIB interface assembly	F9300-4	1
3.10	Interface card bracket	709 300 411	1
3.11	Interface card	9300-4	1
3.12	Screw cyl head M3x6	550 430 106	4
	Washer Shakeproof M3	551 430 400	4
3.13	Mounting hardware	455 980 002	2
3.14	Connector kit	435 521 024	2
3.15	Label " RS232C "	709 300 421	1
3.16	Interface hole closure	709 3XX 931	1
3.17	Screw cyl head M3x6	550 430 106	4
	Washer shakeproof M3	551 430 400	1
3.18	Ground wire cable	780 834 509	1
3.19	40 lines flat cable	780 671 110	1

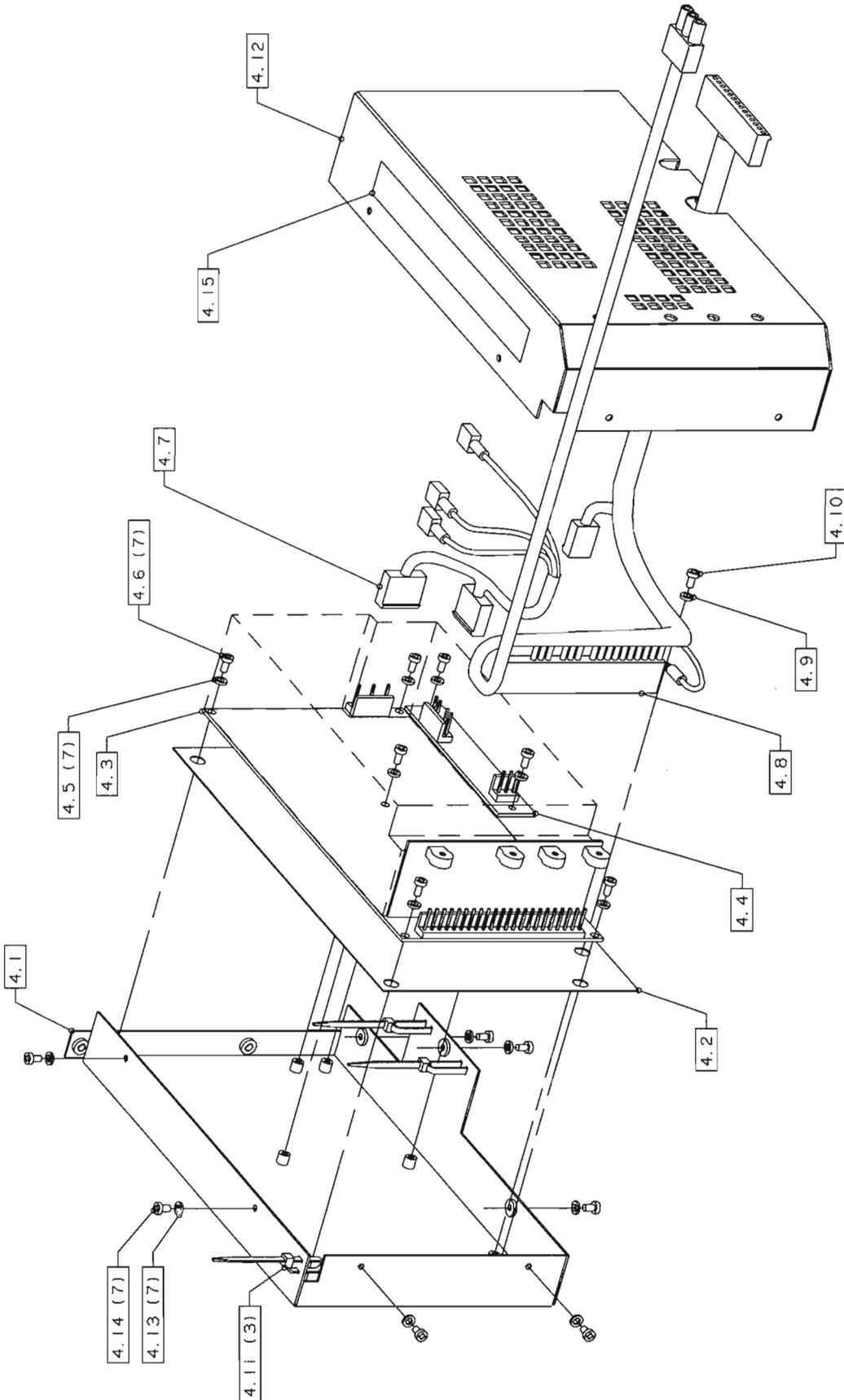


Figure 9.5 : PS9351 Power Supply Exploded View

9.5.1	Power supply PS9351	Part Description	Quantity per Assembly
-----	-----	-----	-----
4.1	Power supply bracket	709 351 041	1
4.2	Power supply insulator	709 351 031	1
4.3	Power supply board	PS 1724	1
4.4	Power supply line sync card	FPS9351-2	1
4.5	Lockwasher M3	551 430 400	7
4.6	Screw cyl head M3x6	550 430 106	7
4.7	Power supply input cable	780 811 622	1
4.8	Power supply output cable	780 872 972	1
4.9	Lockwasher M3	551 430 400	1
4.10	Screw cyl head M3x6	550 430 106	1
4.11	Tie wrap	594 120 006	3
4.12	Power supply cover	709 351 051	1
4.13	Lockwasher M3	551 430 400	7
4.14	Screw cyl head M3x5	550 430 105	7
4.15	Label " Danger....only "	377 051 005	1

Section 9 Mechanical Parts

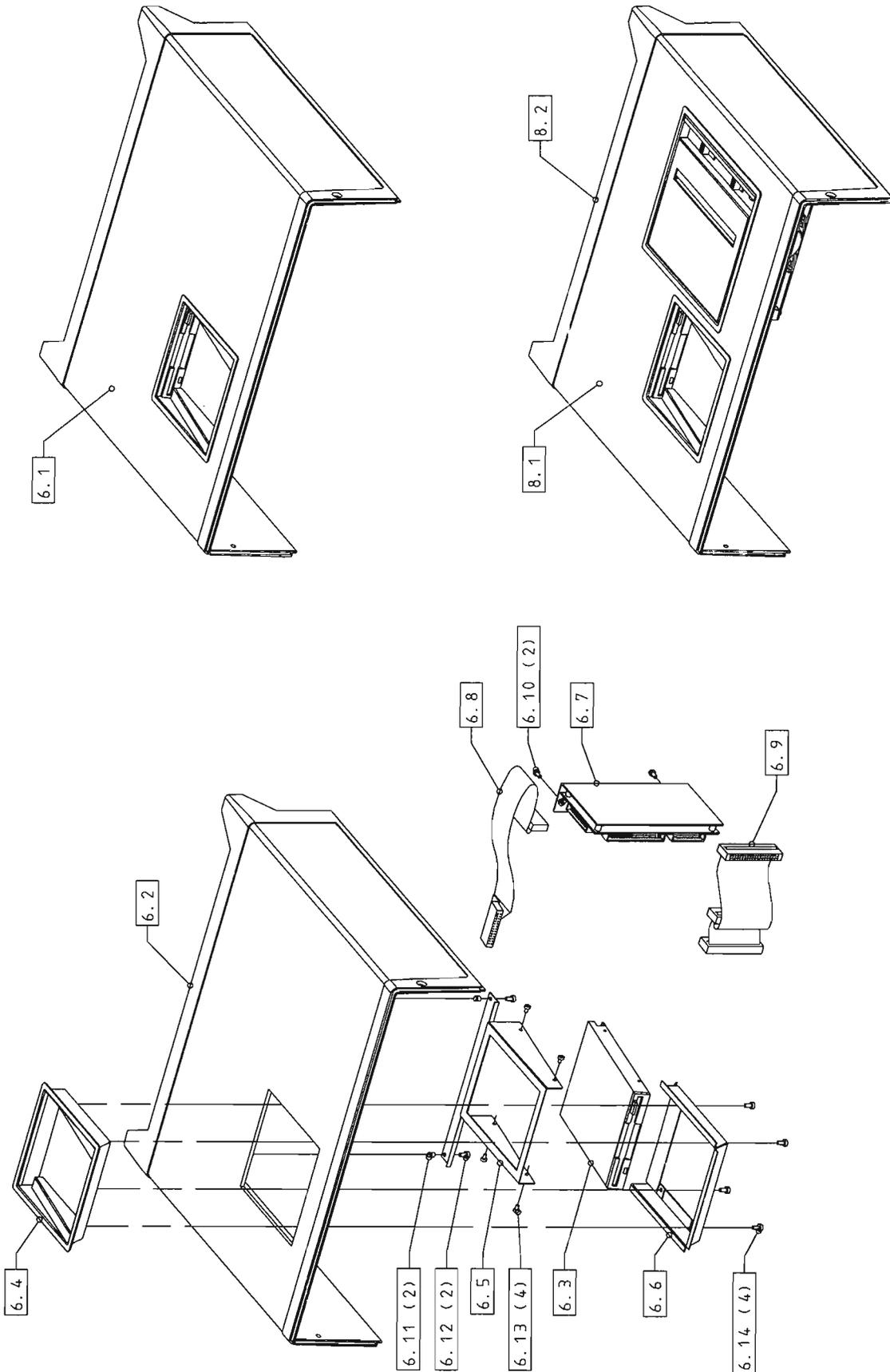


Figure 9.6 : FD01 Floppy Option

9.6.1	FD01 Floppy Option	Part Description	Quantity per Assembly
-----	-----	-----	-----
6.1	Floppy drive option	93XX-FD01	1
6.2	Upper cover	UC93X1-FD01	1
6.3	Floppy drive	335 023 203	1
6.4	Cup	CUP-FD01	1
6.5	Support	70FD01021	1
6.6	Frame	70FD01031	1
6.7	Floppy/Printer/Cent interface	F9300-6	1
6.8	Flat cable 26 P	780 791 630	1
6.9	Flat cable 40 P	780 801 015	1
6.10	Screw M3x6	550 430 106	2
	Washer M3	551 430 400	2
6.11	Nut banc lock M3	554 030 101	2
6.12	Screw M3x6	550 430 106	2
6.13	Screw M2.5x4	550 425 014	4
6.14	Screw self tapping M3x5	554 430 002	4
8.1	Floppy and Printer options	93XX-FDGP	1
8.2	Floppy&Printer Upper cover	UC93X1-FDGP	1

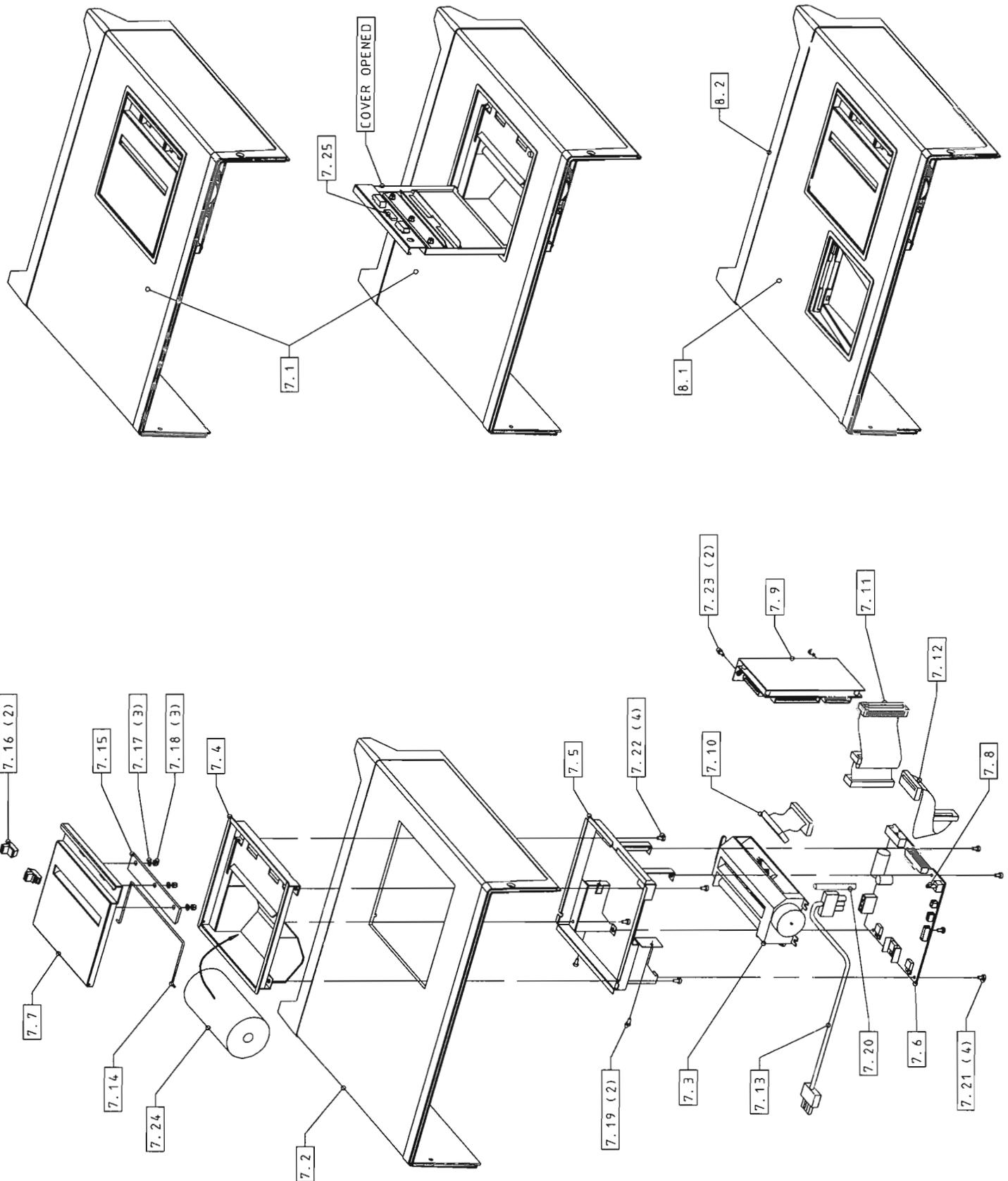


Figure 9.7 : GP01 Printer Option

9.7.1	GP01 Printer Option	Part Description	Quantity per Assembly
7.1	Graphic printer option	93XX-GP01	1
7.2	Upper cover	UC93X1-GP01	1
7.3	Graphic printer	334 000 832	1
7.4	Box	BOX-GP01	1
7.5	Frame	70GP01031	1
7.6	Printer interface card	F9300-7	1
7.7	Cover	COVER-GP01	1
7.8	Switch push button	709 450 523	1
7.9	Floppy/Printer/Cent interface	F9300-6	1
7.10	Flat cable 26 P	780 791 604	1
7.11	Flat cable 40 P	780 801 015	1
7.12	Flat cable 20 P	780 721 022	1
7.13	Power supply cable	780 210 030	1 not used
7.14	Cover Axle	70GP01041	1
7.15	Cutter	70GP01051	1
7.16	Slide latch	530 040 005	2
7.17	Flat washer M3	551 430 100	3
7.18	Nut acorn M3	552 430 300	3
7.19	Screw self tapping M3x5	554 430 002	2
7.20	Push switch extender	70GP01061	1
7.21	Screw M3x6	550 430 106	4
	Washer M3	551 430 400	4
7.22	Screw M3x5	554 430 002	4
7.23	Screw M3x6	550 430 106	2
	Washer M3	551 430 400	2
7.24	Thermal paper roll	344 000 042	1
7.25	Auto adhesive rubber band		1
8.1	Floppy and Printer options	93XX-FDGP	1
8.2	Floppy&Printer Upper cover	UC93X1-FDGP	1

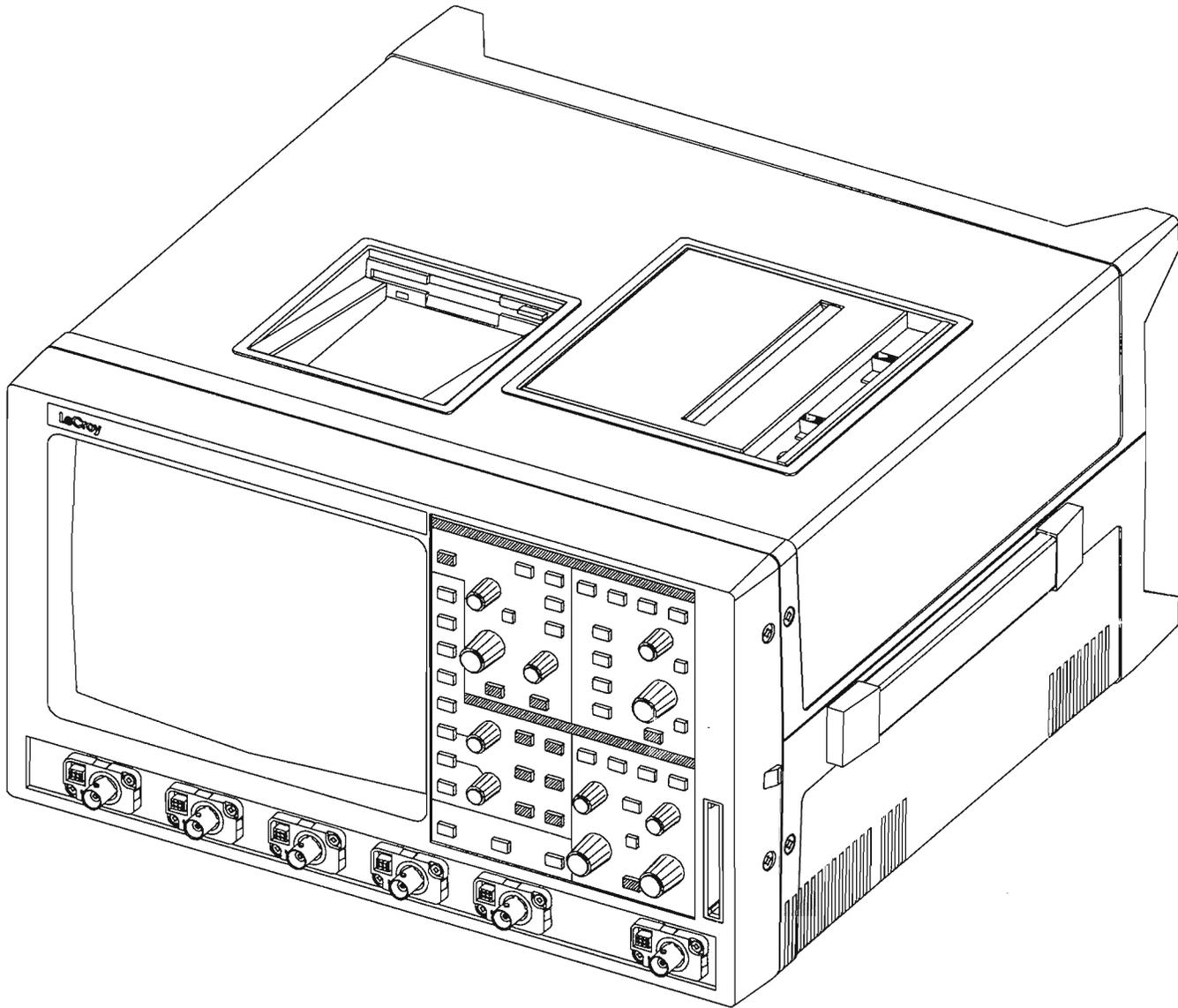


Figure 9.8 : 9354A/T DSO Front View

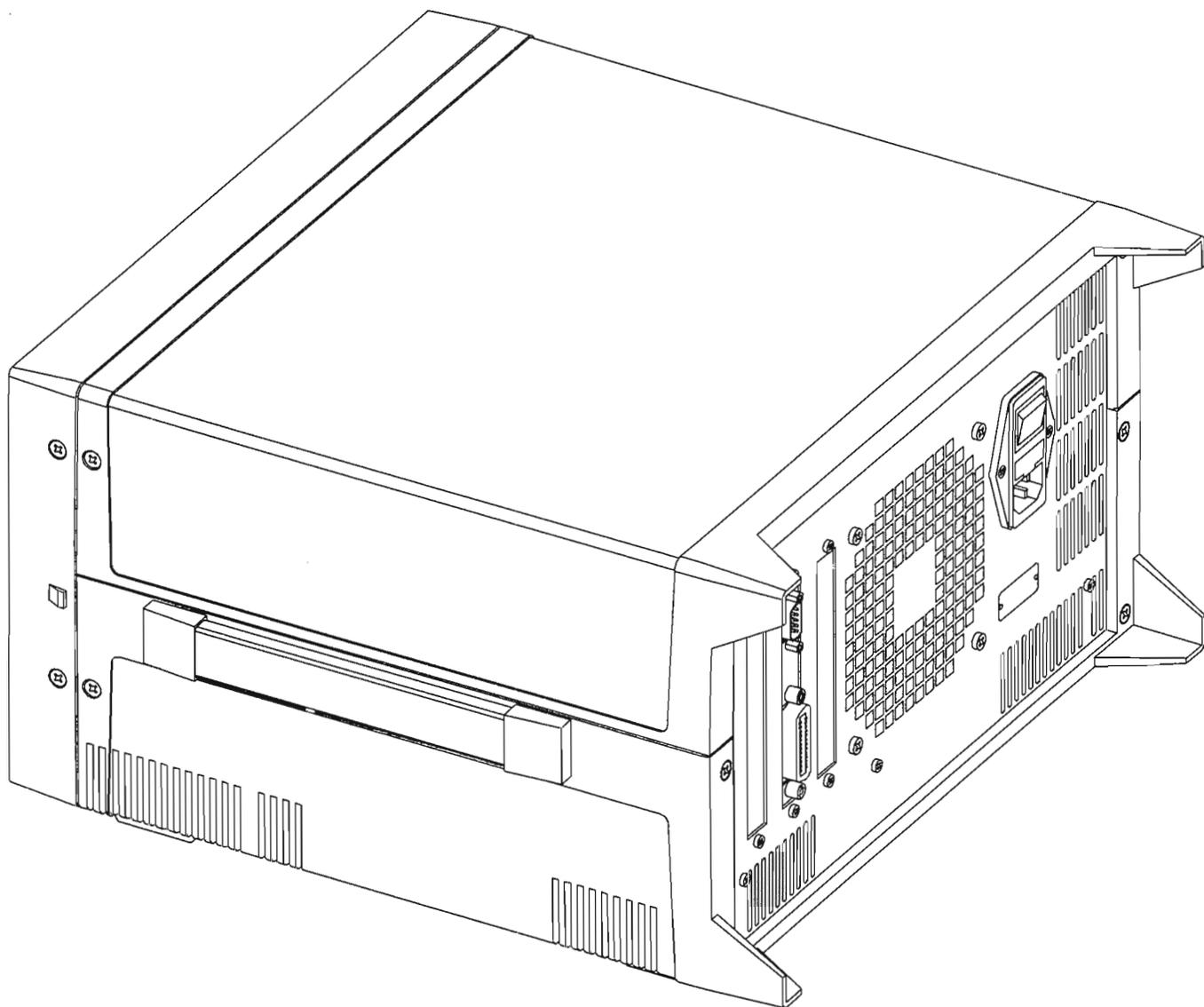
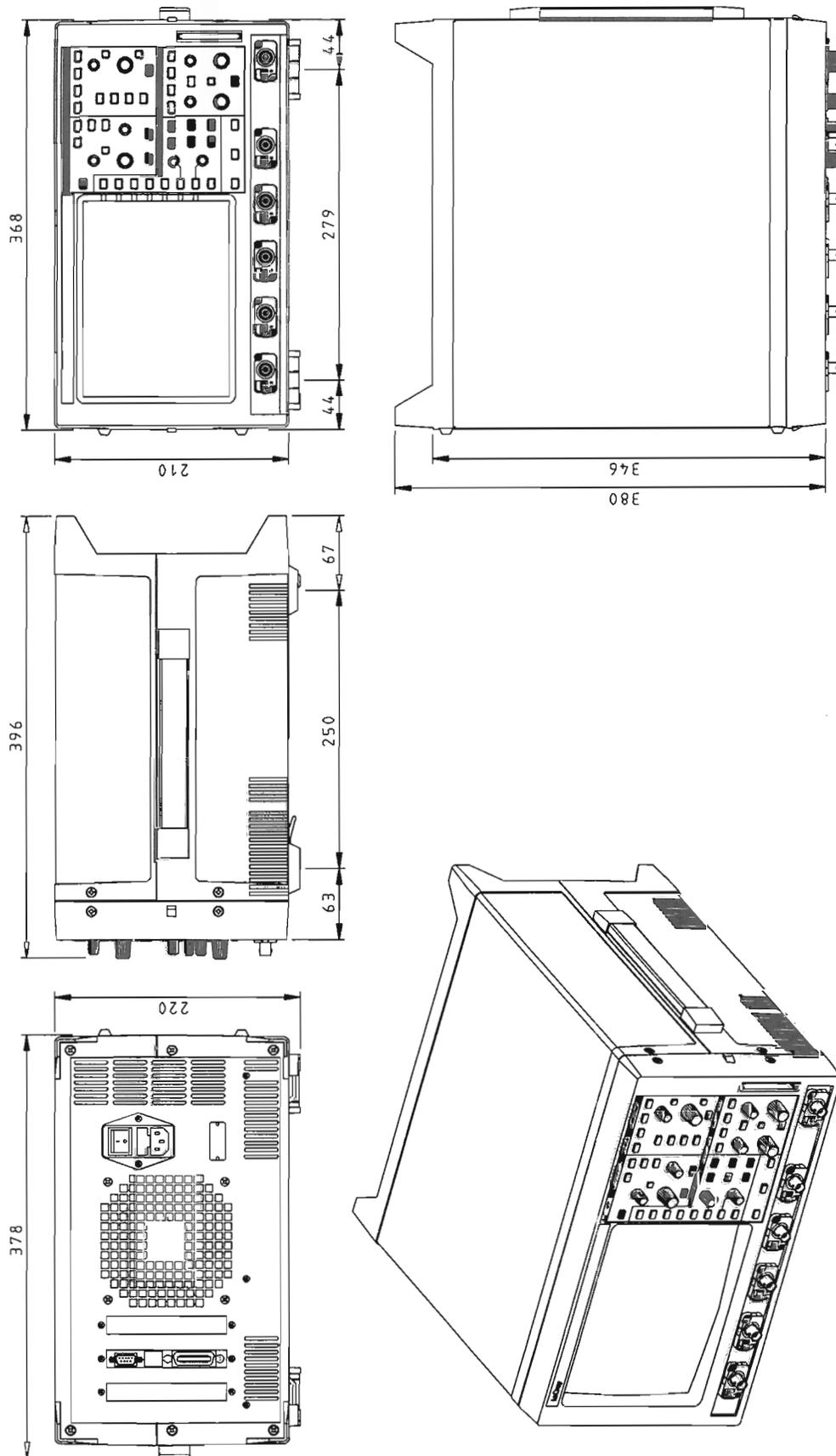


Figure 9.9 : 9354A/T DSO Rear View



ALL DIMENSIONS ARE IN mm
WEIGHT 11.5 kg

Figure 9.10 : 9354A/T DSO Dimensions

SECTION 10 CONNECTING the 9354A/T to a PLOTTER or a PRINTER

10.1 Introduction

LeCroy oscilloscopes are supplied with a list of plotters and printers known to work with them.

This list is not final, so any suggestions are welcome.

HP plotter responses to some RS-232 configuration commands have been evolved. Consequently, the 9354A/T generation DSO support HP plotters of two types, 7470A and 7550A. The only difference lies in the RS-232 initialization codes. They may however, despite these changes, work with HPGL compatible plotters from other manufacturers. If the HPGL data is used as input for a CAD or word processing system, it might be necessary to remove the data preceding the in command. Before connecting a plotter to a 9354A/T, do not forget to select the appropriate settings in the printer setup menu and the GPIB & RS-232 setup menu.

GPIB & RS232

Remote Control from
GPIB **RS232**

RS232 Mode
7-bit
8-bit

Parity
none
odd even

Stop bits
1 2

Baud Rate
300 1200
2400 4800
9600 19200

GPIB Device
Talk Only

HARDCOPY

output to
Card
Disk
GPIB
RS232
Centronics

page feed
OFF On

protocol
HP 7470
HP 7550
TIFF
TIFF compr.
BMP

RS-232 connection

The following settings are assumed for the scope.

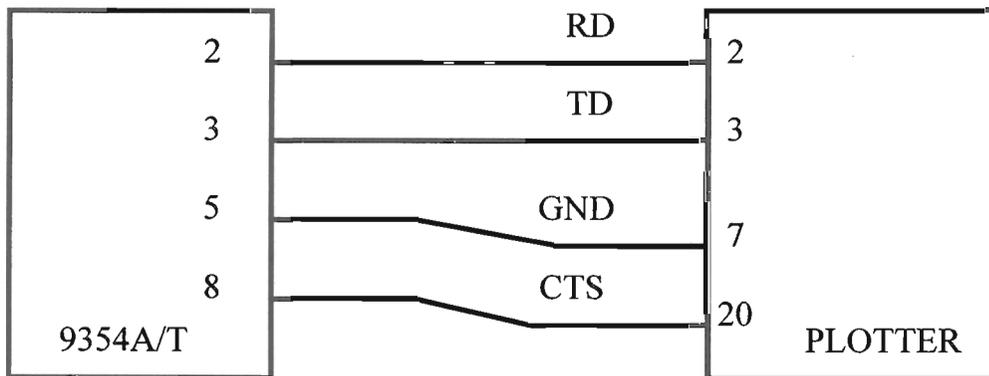
Baud rate : 9600
 Character : 8 bits
 Parity : none
 Stop bits : 1

Any exceptions will be mentioned.

RS 232 interface

Pin 1 : DCD
 2 : RD
 3 : TD
 4 : DTR
 5 : GND
 6 : DSR
 7 : RTS
 8 : CTS
 9 : RI

A cable with the following pinout can be used in almost every case:



The cable has D25 connector with male pins on the plotter side, and a D9 connector with female pins on the 9354A/T oscilloscope side.

GPIB Connection

To have a plot done through GPIB initiated with the front panel screen dump push button, you must set the 9354A/T in talk only mode by selecting remote control from RS-232, and the plotter in listen only mode.

If a computer controls the GPIB Bus, both the scope and the plotter must be set in addressed mode (remote control from GPIB).

Remark: the listen only mode does not work on some old HP plotters such as HP7585B or HP7475. The plotter must be set to listener before being able to receive any commands, which is a violation of the GPIB standard.

10.2 Plotters

10.2.1 HP 7470A Plotter

Switch settings:

- RS-232 Connection:
S1 and S2 : 0 0
Y/D : D
A4/US : User selectable
B4 to B1 : 1 0 1 0

- GPIB listen only:
A4/US : User selectable
16 to 1 : 1 1 1 1 1

- GPIB Addressed:
A4/US : User selectable
16 to 1 : 0 0 1 1 1

10.2.2 HP 7550A Plotter

Responses to some ESC characters commands are not the same in this plotter as in older HP models like the 7470A. In fact, ESC sequences of commands which give excellent results in the 7470A can prevent any handshake in RS-232. Problems of this kind have been reported in the case of ESC.R and ESC.@ commands. When combined with ESC.I and ESC.N, ESC.@ breaks up all handshakes.

RS-232 configuration:

- Enter into display 5 (HP-IB MONITOR...).
- Select STANDARD OF STANDARD/ENHANCED.
- Enter into SERIAL sub-menu (display 6)
- For DATA_FLOW, select REMOTE. Either STANDALONE or EAVESDROP may be chosen.
- Enter into display 7 (DUPLEX, PARITY, BAUD).
- Select FULL duplex.
- Configuration PARITY and BAUD rate to the same values as on the DSO.

A standard cable may be used.

Do not start a plot while a sheet of paper is being loaded!

GPIB configuration:

If the scope is in TALK ONLY, the plotter must be in LISTEN ONLY. Selection will be done at display 5.

Note : It seems that the plotter must be powered off, then on again, to take any configuration change into account.

10.2.3 Hitachi 672 Graph Plotter (or NSA 672)

As this plotter is compatible with the 7470A, select this mode on the plotter menu page.
Switch settings

- RS-232 Connection:

Sw. A, 1 and 2 : 1 1 (ISO A3) or (ISO A4).
Sw. A, 3 to 8 : 1 0 1 1 0 1
Sw. B : 1 1 1 1

Note : When switches are set to ISO A4, the pen must be manually repositioned at the top of the page (or plotter reset by powering it off and on) before loading a new sheet of paper.

10.3 Printers

Interfacing is possible through RS-232, GPIB directly, and in option through Centronics. The parallel interface F9300-6 (Centronics) is an option, see section 4.5.

10.3.1 Centronics Printers

Most printers use a Centronics parallel connection which makes direct connection possible if the 9354A/T is equipped with the optional Centronics interface F9300-6 board. If the printer has a Centronics connector then it's a parallel printer, and the F9300-6 board is required or a serial to parallel converter.

If a serial to parallel converter is used, in the printer setup menu select device type Epson, and remote control from RS-232.

RS-232 Remote control port settings:

Baud rate : 9600 or 19200
Characters length (bits) : 8
Parity : none
Number of stop bits : 1

The following printers and printer switch positions have been tested via serial to parallel adapter.

	Switch 1	Switch 2
1. Epson LQ-1000	1, 2, 3, 4 : ON	2, 6, 7 : ON
2. Diconix 150P	1: ON	2, 6, 7 : ON
3. HP-ThinkJet 2225C	2, 4, 5 : ON	
4. HP-DeskJet 550 C	all down	6 up for 19200 bauds

Note: all Epson and Epson Compatible printers are likely to work if the switches are set properly, (Some experimentation may be required).

Some available serial to parallel converters need power through the RS-232 lines. Do not use them, as we do not guarantee that the serial port is able to furnish enough power.

10.3.2 RS-232 Printers

10.3.2.1 Epson FX80

It is possible to use the standard RS-232 cable. Such a printer has the optional RS-232 interface " #8143 " installed. The configuration that follows is valid for the default scope setting. The standard cable is usable.

In the particular case of an FX850:

- the main switches SW1 SW2 remain at the factory configuration

SW1	:	1	2	3	4	5	6	7	8
		OFF	OFF	ON	OFF	OFF	ON	ON	ON

SW2	:	1	2	3	4
		ON	OFF	OFF	OFF

- the 8143 switches are set to:

1	2	3	4	5	6	7	8
ON	OFF	OFF	OFF	n/a	OFF	OFF	ON

- the 8143 jumpers remain at the factory settings:

J1	J2	J3	J4	J5	JC	JNOR	JRVE	JF	JX
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

Note: Epson printers only support XON/XOFF support handshake if they have a print buffer. Such printer are : FX, FX+, JX-80, LQ-800/1000, EX-800 and LQ-25000.

Otherwise, use DTR/RTS handshake.

10.3.2.2 Citizen 120D

To use this printer with the default RS-232 setting and default printer setting of the 9354A/T, select the following switch configuration:

DIP switch bank 1 : all OFF except 3 and 8, DIP switch bank 2 : all OFF.

10.3.2.3 HP LaserJet

Make sure that page feed is ON in the plotter menu to use the LaserJet. It is advisable to start out in single density with a size of A5. Then, depending upon the internal buffer size on the LaserJet, the image size and/or density can be increased. At one point, the internal buffer size of the DSO is also reached. The image is simply truncated, indicating that either density or size have to be reduced.

10.3.2.4 HP QuietJet

10.3.2.5 HP ThinkJet

To use printer with the default RS-232 setting and with the default cable select the following switch configuration:

- mode switch:

```

1 2 3 4           5 6 7 8
0 0 0 0 : 11" page length  0 0 0 0
1 : 12" page length

```

- RS-232 switch:

```

1           2 3           4 5
1           0 0           0 0
(use DTR handshake) (8bits, parity none) (9600 bauds)

```

Note : it may be possible that old ThinkJet recognize only the Epson protocol. If it is the case use the Epson.

10.3.2.6 HP DeskJet 550C

The standard cable is usable. The printer has been tested at 19200 bauds with the following configuration :

Switch 1 or Bank A : all down

Switch 2 or Bank B : 6 up for 19200 bauds, all the other down

10.3.2.7 Brother Printers

The Brother M-1509 and M-1709 have been tested with a serial connection. On the oscilloscope select "Epson FX-80 or compatible printer".

The switch settings are identical for both the printers:

```

- SW1 : 1 2 3 4 5 6 7 8
        ON ON ON OFF ON n/a n/a ON

- SW1 : 1 2 3 4 5 6 7 8
        ← ALL OFF →

- SW1 : 1 2 3 4 5 6 7 8
        OFF OFF OFF OFF 11" : OFF OFF ON OFF
                    12" : ON

```

10.3.3 GPIB Printers

10.3.3.1 HP QuietJet

Make sure the dip switches on the backplane of the printer are set to

- SRQ enable: 0
- GPIB listen only:
Listen always: 1
A5 to A1: 0 0 1 1 1
- GPIB Addressed:
Listen always: 0
A5 to A1: 0 0 1 1 1

10.3.3.2 HP ThinkJet (HP 2225A)

Make sure the dip switches on the backplane of the printer are set to

- SRQ Enable: 0
- GPIB listen only:
Listen always 1
A5 to A1: 0 0 1 1 1
- GPIB Addressed:
Listen always: 0
A5 to A1: 0 0 1 1 1

10.3.3.3 HP PaintJet (black/white only)

Make sure the dip switches near the GPIB connector are set to:

- GPIB Listen only:
NORM/SCS: NORM
A3 to A1: 1 1 1
PC8/ROM8: N/A
ENG/MET: has to match paper size ENG = 11" MET = 12"
- GPIB addressed:
NORM/SCS: NORM
A3 to A1: any combination except 1 1 1
(correspond to add. 0-6)
PC8/ROM8: N/A
ENG/MET: has to match paper size ENG = 11" MET = 12"

Section 10 Connecting the 9354A/T**10.4 Information on GPIB****10.4.1 Introduction**

This section is a simple description of the GPIB interface as an aid to understanding the interface in the 9354A/T DSO: it is not intended as a complete specification of the system.

The GPIB system is designed for the interaction of a number of devices, which may transmit or receive information as required. The system includes data lines over which the actual data are sent, bus management lines for control, and handshake lines to ensure correct acceptance of data at the right destination. The main features of the bus are summarized below:

Maximum number of devices	15
Maximum bus length	20 meters or 2 meters per device, whichever is less.
Connection	star or chain

Note that more than half of any connected devices must be powered up, even if they will not be used.

Data lines	8 DIO	1 to 8
Handshake lines	DAV	Data available
	NRFD	Not ready for data
	NDAC	not data accepted
Bus management lines	EOI	End or identity
	IFC	Interface clear
	SRQ	Service request
	ATN	Attention
	REN	Remote enable
Active level	+0.4 V	
Inactive level	+3,3 V	

Note that all signal lines are active low, and that they are wire ORed to allow participation by all devices.

In addition, there are 8 ground lines, making a total of 24 lines.

10.4.2 Functions in the GPIB

In order to allow satisfactory interconnection of several devices the following functions must be provided

- Enabling any device to transmit data
- Preventing any device from transmitting data
- Enabling any device to receive data

- Preventing any device to receive data
- Transmitting data to a specific device
- Ensuring that only one device is transmitting
- Ensuring that transmitting takes place only when reception is possible
- Enabling any device to request servicing
- Identify type of data to be sent

Any device can be activated into the "talk" or "listen" state, and can be deactivated by the commands "untalk" and "unlisten". Also a device can be a "controller".

Maximum number of current talkers	1
Maximum number of current listeners	14
Maximum number of current controllers	1

Function of bus lines:

- DAV Data available; talker says the data on the line are valid.
- NRFD Not ready for data; listener says it is not ready for more data.
All listeners must release the NRFD line, i.e., let it go high, before talker can send.
- NDAC Not data accepted; listener says it has not yet accepted the data. Talker must hold all data lines steady until all listeners have released this line, i.e., it goes high.

Clearly, the NRFD and NDAC are easy to implement by a wired OR system, so that any one device asserting the signal prevents progress to the next step. Progress is made at the speed of the slowest listener. A simple timing diagram is given in figure 10.1, and another way of presenting the system is given in figure 10.2.

The bus management lines functions as follows:

- EOI End Or Identify; talker sends this with last byte of a block transfer to indicate last byte. Also used with ATN to parallel poll devices for their status bit.
- IFC InterFace Clear; places the GPIB system into a quiescent state.
- SRQ Service ReQuest; any device can send it to the controller to indicate need for attention, and to request interruption of current operations.
- ATN ATeNtion; controller sends this to specify whether DIO lines are to be used for interface messages, e.g., addressing, or for data.
- REN Remote ENable; selects a device as being under local or remote control.

Addressing of the devices on the GPIB bus consult a specialized GPIB-IEEE488 document.

The principles of GPIB are quite simple - the system must wait for all users, and lines are wire ORed so that all can pull the lines down. The handshake sequence is illustrated in two ways. In figure 10.1 the signal waveforms are sketched.

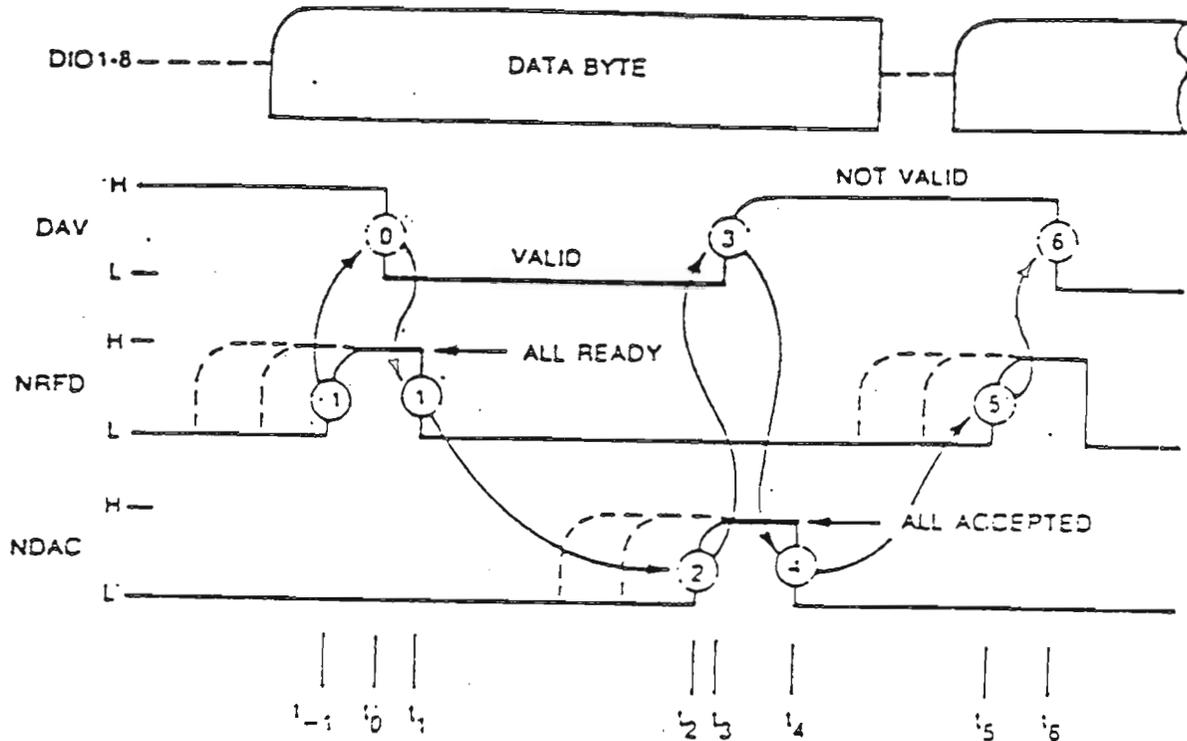


Figure 10.1 : DATA BYTE TRANSFER IN GPIB IEEE-488

The handshake timing sequence proceeds as follows:

Preliminary	The source checks for presence of listeners and places the next data byte on the data lines DI01-8.
t-1	Acceptors one by one become ready for byte. Last one allows NRFD to go high.
t0	Source pulls down DAV to validate data.
t1	The first listener to accept the data pulls down NRFD to show it is no longer ready for a new byte.
t2	The listeners one by one accept the data, and the last one lets NDAC go high.
t3	The source sets DAV high to show this byte is no longer valid.
t4	The listeners one by one accept this, the first one pulling NDAC low for the next cycle.
t5	As for t-1.

LeCroy