

9424 DIGITAL OSCILLOSCOPE

SERVICE MANUAL

Version 1.0

May 1993

TABLE OF CONTENTS

Chapter	1	Specifications 9424 Specifications Waveform processing package Fast Fourier processing package Memory Card System LeCalsoft Calibration Software
Chapter	2	Basic Operation and Block Diagrams DSO sub assemblies and block diagram Display description and block diagram Base board block diagram A/D converter description and block diagram Time base block diagram and sampling rate table Processor block diagram Front end description and block diagram Power supply specifications and block diagram
Chapter	3	Basic Performance Test Procedure Internal Diagnostics and Calibration
Chapter	4	Service Information and Procedures Disassembly/Assembly diagram and procedure Software upgrade procedure Options description and table Board exchange procedure Power supply adjustment procedure Front end calibration procedure Display calibration procedure
Chapter	5	Troubleshooting and Flow Charts Service equipment and spare parts
Chapter	6	Circuit Diagrams Boards layout Integrated circuits description
Chapter	7	Mechanical Parts Description and part number
Chapter	8	Parts List
Chapter	9	Connecting the 9424 to a Plotter or a printer

GENERAL INFORMATION

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.

Warranty

LeCroy warrants its oscilloscope products to operate within specifications under normal use for a period of two 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.

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.

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 two year warranty has expired. Other services such as installation, training, enhancements and on-site repair are available through specific Supplemental Support Agreements.

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.

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.

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.

ManualsPlus.com

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.

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.

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.

Corporate Headquarters

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

USA

TEL: (914) 425-2000
FAX: (914) 425-8967

European Headquarters

LECROY SA
2, CHEMIN PRE-DE-LA-FONTAINE
P.O. BOX 341
CH-1217 MEYRIN 1 GENEVA
SWITZERLAND

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

USA

===

LECROY CORPORATION
700 CHESTNUT RIDGE RD
CHESTNUT RIDGE NY 10977-6499

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

LECROY CORPORATION
14800 CENTRAL AVE SE
ALBUQUERQUE NM 87123

TEL: (505) 293-8100
FAX: (505) 293-9617

LECROY CORPORATION
5912 STONERIDGE MALL RD STE 150
PLEASANTON CA 94588

TEL: (510) 463-2600
FAX: (510) 463-9179

Europe

=====

LECROY GMBH
MANNHEIMERSTRASSE 177
POSTFACH 103767
D-6900 HEIDELBERG
WEST GERMANY

TEL: 49.6221.831001
FAX: 49.6221.834655

LECROY BV
WAALRESEWEG 17
NL-5554 HA VALKENSWAARD
THE NETHERLANDS

TEL: 31.4902.8.9285
FAX: 31.4902.42628

LECROY LTD
28 BLACKLANDS WAY
ABINGDON BUSINESS PARK
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

LECROY SRL
VIA PINTURICCHIO, 9
20133 MILANO
ITALY

TEL: 39.2.20.47.082
FAX: 39.2.20.47.026

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

TEL: 34.1.359.0088
FAX: 34.1.359.0298

LECROY SARL
B.P. 214
AVENUE DU PARANA
F-91941 LES ULIS CEDEX
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

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

TEL: 43.316.391.804
FAX: 43.316.391.052

LUTRONIC
VIBEHOLMS ALLE 11-15
2600 GLOSTRUP
DENMARK

TEL: 45.4245.9764
FAX: 45.4363.0720

ORBIS OY
VANHA KAARELANTIE 9
01610 VANTAA
FINLAND

TEL: 358.0.566.4066
FAX: 358.0.531.604

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
P.O BOX 10
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

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

TEL: 351.2.815.680
FAX: 351.2.815.630

Eastern Europe

ELSINCO GMBH
ROTENMUEHLGASSE 11
1120 VIENNA
AUSTRIA

TEL: 43.222.812.1751
FAX: 43.222.812.2329

Mideast

AMMO
60 PINKAS STREET
P.O. BOX 21384
61213 TEL AVIV
ISRAEL

TEL: 972.3.453.157
FAX: 972.3.544.1468

Asia

LECROY JAPAN CORPORATION
ESAKA SANSHO BLDG - 3RD FLOOR
16-3, 3-CHOME
TARUMICHO, SUIA 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 (dial slowly)
TLX: 95.22.57.00

ABEX ENGINEERING PTE. LTD.
126 JOO SENG ROAD # 09-05
GOLD PINE INDUSTRIAL BLDG
SINGAPORE 1336

TEL: 65.283.6288
FAX: 65.283.6628

MEASURETRONIX
2102/31 RAMKAMHANG ROAD
BANGKOK 10240
THAILAND

TEL: 66.2.375.2733-4
FAX: 66.2.374.996

EURO TECH (FAR EAST), LTD.
18 F, GEE CHANG HONG CENTER
65 WONG CHUCK HAND RD
HONG KONG

TEL: 8.52.814.0311
FAX: 8.52.873.5974

LeColn Technology CO.,LTD.
12F, NO 216, SEC 1,
HO PING E ROAD
TAIPEI TAIWAN R.O.C

TEL: 886.2.365.0612
FAX: 886.2.367.1792

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

TEL: 62.21.570.4563
FAX: 62.21.583.218

WOJOO 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

North America

=====

LECROY CANADA, INC.
2751 JACQUES CARTIER EST STE 200
LONGUEUIL, PQ, J4N 1L7
CANADA

TEL: 514 928-4707
FAX: 514 928-0969

ROHDE & SCHWARZ CANADA INC.
555 MARCH ROAD
KANATA, ONTARIO K2K 2M5
CANADA

TEL: 613.592.8000
FAX: 613.592.8009

South America

=====

SEARCH SA
VIAMONTE 1716 - PISO 7
1055 CAPITAL FEDERAL
ARGENTINA

TEL: 54.1.46.6156
FAX: 54.1.394.8374

ATP-HI-TEK
ALAMEDA AMAZONAS
422 ALPHAVILLE 06454
BARUEN, 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 TEST & MEASUREMENTS LTD
TUSCANY HOUSE
376 OAK AVENUE
RANDBURG 2194
REPUBLIC OF SOUTH AFRICA

TEL: 27.11.787.0473
FAX: 27.11.787.0237

Chapter 1

SPECIFICATIONS

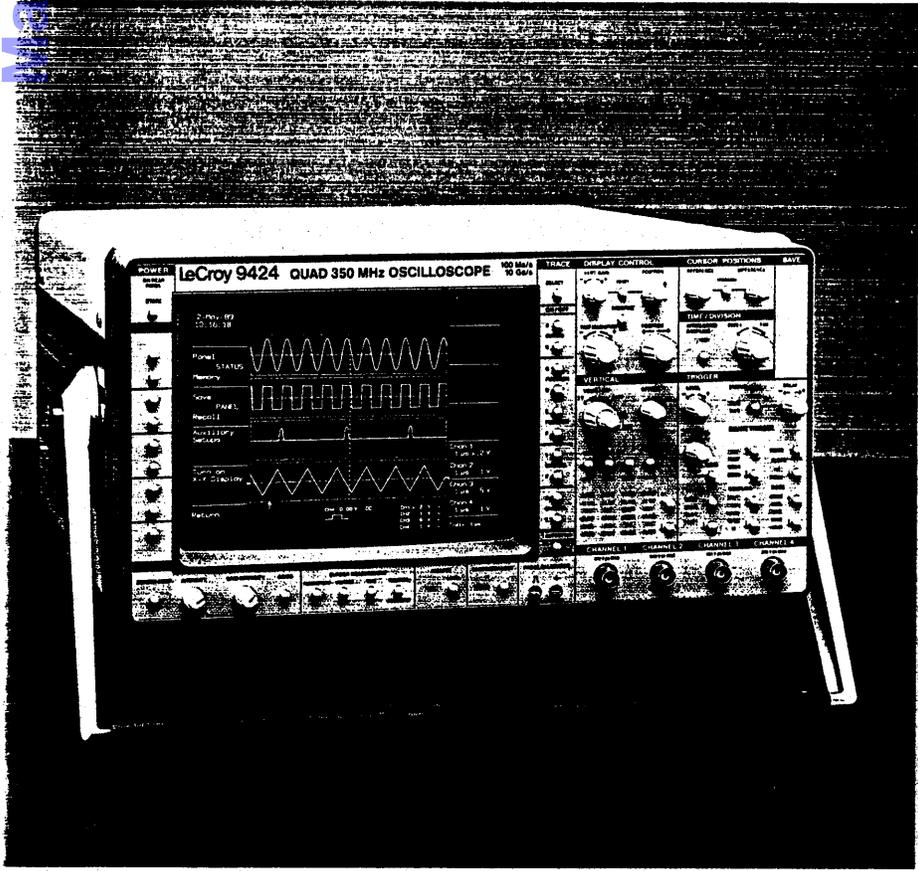
DIGITAL OSCILLOSCOPE

350 MHz BANDWIDTH, 100 Ms/s, RIS 10 Gs/s



MODEL 9424 PORTABLE QUAD-CHANNEL OSCILLOSCOPE

9424



- Four Channels with 350 MHz Bandwidth
- 50K of Non-volatile Memory per Channel
- FASTGLITCH Trigger Mode
- Pulse Parameters and Auto-setup
- TV Trigger and XY Display Mode
- Signal Processing and FFT Analysis

Above, the 9424 displays up to four traces simultaneously (in quad-grid mode) on its large high-resolution screen.

THE VERSATILE INSTRUMENT FOR MULTI-CHANNEL DESIGN AND TEST

The LeCroy 9424 Quad-channel Digital Oscilloscope is a portable instrument for high-frequency, multi-channel recording.

Combining 350 MHz bandwidth, 50K of non-volatile acquisition memory per channel, advanced triggering capabilities and digital design, the instrument offers many advantages over traditional multi-channel oscilloscopes. Independent 8-bit ADCs (for each channel) sample repetitive waveforms at up to 10 gigasamples/sec (single-shot phenomena at up to 100 megasamples/sec) to enable measurements with better timing resolution and precision. Extensive signal processing (including pulse parameters, averaging, mathematics and FFT analysis) performs complex measurements in a fraction of a second. Hard copies can be made directly over RS-232-C or GPIB onto a wide range of digital plotters and printers.

FEATURES

High bandwidth – The 9424 portable digital oscilloscope provides 350 MHz bandwidth on four channels. This high bandwidth, in combination with many other exceptional features, enables users to keep pace with current and future test and measurement requirements.

High fidelity ADCs – High-resolution 8-bit Flash ADCs deliver outstanding signal-to-noise ratios and wide dynamic range. Sampling rates up to 100 megasamples/sec for single-shot applications and 10 gigasamples/sec for repetitive waveforms are achieved simultaneously over four channels.

Long non-volatile memories – Four non-volatile 50K acquisition memories, one per channel, store signals. Long memories provide better timing resolution, and allow a wide range of time-base settings where maximum ADC sampling rate (and high single-shot bandwidth) is possible. Non-volatile waveform storage of 1 to 200 waveforms is possible by segmenting the four acquisition memories. An additional 200K of RAM is available for waveform processing, storage and display.

Comprehensive triggering – Capabilities include pre- and post-triggering, trigger hold-off by time or number of events, delay by time or number of events, TV trigger, logic trigger, state qualified trigger, time/events qualified trigger, and width-based triggers including FASTGLITCH and interval-width trigger.

FASTGLITCH triggering – LeCroy's innovative FASTGLITCH trigger enables the 9424 to trigger even on non-recurrent glitches less than 2.5 nsec wide, independently of the time-base speed.

Peak detection – Long memories and high sampling rates, together with min/max display routines, provide peak detection down to 0.002% of the record length (10 nsec minimum for single-shot measurements and 0.1 nsec minimum in RIS).

Signal processing – Built-in waveform processing includes mathematics (add, subtract and invert) and summation averaging (up to 1000 sweeps). Modular architecture allows easy installation of extended signal processing packages such as fast Fourier analysis.

Pulse parameters – Up to ten signal characteristics (risetime, falltime, RMS voltage, etc.) can be automatically calculated on displayed, stored, expanded and processed waveforms. The 9424's remarkable processing power means that these values are instantaneously updated when a new waveform is acquired.

Waveform expansion – Fine signal details are revealed using LeCroy's exclusive MULTI-ZOOM expansion which magnifies waveforms up to 1000 times. Expanded waveforms have improved timing resolution (up to $\pm 0.001\%$ of full scale) and can be analyzed further using the 9424's signal processing and pulse parameter routines.

Ease of use, auto-setup – Extensive processing power and familiar analog controls make the 9424 exceptionally responsive and easy to use. Repetitive waveforms are acquired in approximately one second with the convenient auto-setup facility. Recurring front-panel setups can be stored and recalled via simple push-button controls.

FUNCTIONAL DESCRIPTION

The LeCroy 9424 offers a breakthrough in digital oscilloscope technology by combining high bandwidth (350 MHz), portability and four independent input channels. Designed for use in mainstream electronics, telecommunications, applied research and automated testing, the instrument delivers better overall precision and enables improved productivity for applications requiring multi-channel waveform recording.

ACCURACY AND PRECISION

Using the latest ideas in digital technology, the Model 9424 features the speed and precision that have become standard in all LeCroy oscilloscopes. Waveforms are digitized by independent 8-bit (12-bit with averaging) Flash ADCs that provide a high signal-to-noise ratio and superior dynamic resolution. Sampling rates of up to 10 gigasamples/sec are available for repetitive signals and up to 100 megasamples/sec for transient signals.

Each channel of the 9424 features a massive 50K of non-volatile acquisition memory for easy waveform cap-

ture, better horizontal resolution and fast sampling rates on all time-base settings.

ADVANCED TRIGGERING

The 9424 features the most advanced trigger system available in any four-channel oscilloscope. Each of the inputs (Channel 1, 2 and 4) has independent circuits to allow individual adjustment of the trigger level, slope and coupling. Simple push-button controls and rotary knobs let the user select and adjust all the appropriate trigger parameters, such as hold-off or pre- and post-trigger settings, with ease and precision. Unique trigger graphics summarize the trigger configuration at a glance.

Tracking rare glitches, spikes, missing bits and drop-outs is easy using the 9424's FASTGLITCH or INTERVAL trigger modes. Both modes can be used to provide stable triggering on even the most troublesome phenomena. For television or video development and test, the 9424 includes a TV trigger facility that is ideal for use on NTSC, PAL or SECAM systems. Triggering on lines and fields enables jitter-free viewing (and expansion) of any portion of a TV signal under investigation.

High-speed logic testing is effortless using the 9424's PATTERN trigger mode. Logic status on three inputs may be simultaneously examined, enabling the 9424 to trigger on entering or exiting any predefined pattern. Users can even specify the length of time for which a pattern must remain valid before allowing a trigger to occur.

For conditional triggering applications the 9424 includes both STATE QUALIFIED and TIME/EVENT QUALIFIED modes of operation.

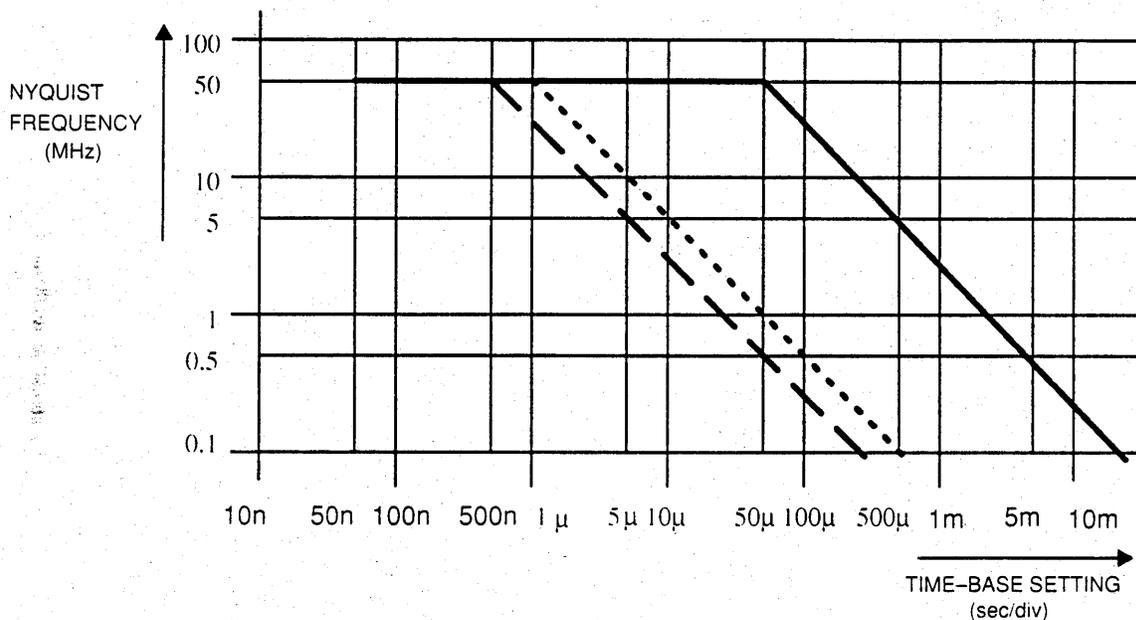
FOUR-CHANNEL PROCESSING

For situations that require noise reduction or improved dynamic range, the 9424 includes summation averaging

(up to 1000 waveforms) simultaneously over four channels. Built-in arithmetic (add, subtract and invert) and pulse parameter measurements are also standard. Up to 10 parameters can be automatically calculated on live, stored or processed waveforms.

Computations are made using high-speed processing so that values appear instantly on the screen. Additional processing power can be added by installing LeCroy's waveform processing options. WP02 performs spectral analysis and WP01 provides waveform characterization and extended mathematical analysis (integration, differentiation, etc.) as well as averaging.

SINGLE-SHOT BANDWIDTH (NYQUIST FREQUENCY) Vs. TIME-BASE SETTING



Single-shot bandwidth is a function of sampling rate. Long memories enable higher sampling rates at equal time-base settings. Above, the 9424 (solid line) is compared to oscilloscopes with 1K (dotted line) and 512 points (dashed line) of memory. At slower time-base settings, the single-shot bandwidth of the 9424, expressed as Nyquist frequency, is typically 50 times higher than in oscilloscopes with 1K memory and 100 times higher than in those with only 512 points.

SPECIFICATIONS

VERTICAL ANALOG SECTION

Bandwidth (– 3 dB):

@ 50 Ω: DC to 350 MHz.

@ 1 MΩ AC: < 10 Hz to 250 MHz typical at the probe tip.

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

Input impedance: 1 MΩ // 30 pF and 50 Ω ± 1%.

Channels: Four independent channels; standard BNC connector inputs.

Sensitivity range: 5 mV/div to 2.5 V/div; continuously variable from 1 to 2.5 times the fixed setting. Fixed settings range from 5 mV/div to 1 V/div (in a 1, 2, 5 sequence). Sensitivity can be extended to 25 V/div

using a D9010 High Impedance divider connected to the input BNLs.

Vertical expansion: up to 5 times (with averaging, up to 10 times or 500 μV/div sensitivity).

Scale factors: Probe attenuation factors of ×1, ×10, ×100, ×1000 or ×10000 may be selected and are remotely programmable.

Offset: ± 12 times the fixed sensitivity setting in 0.02 division increments up to ± 10 V max; ± 24 div @ 10 mV/div; ± 48 div @ 5mV/div.

DC accuracy: ≤ ± 2%.

Bandwidth limiter: 80 MHz (– 3 dB) typical.

Max. input voltage: 250 V (DC + peak AC) at 1 MΩ, ± 5 V DC (500 mW) or 5 V RMS at 50 Ω.

VERTICAL DIGITAL SECTION

ADCs: One per channel, 8-bit Flash.

Conversion rate: Up to 100 megasamples/sec for transients, up to 10 gigasamples/sec for repetitive signals, simultaneously on all channels.

Aperture uncertainty: ± 10 psec.

Acquisition memories, Channels 1, 2, 3 and 4:

Non-volatile memories (battery-backed for a minimum of 2 years) of 50 kilowords per channel can be segmented into 2, 5, 10, 20, 50, 100 or 200 blocks.

Reference memories C and D: 50K, 16-bit word memories, each storing one acquired or processed waveform, or up to 200 segmented waveforms.

Function memories E and F: Two 50K, 16-bit word memories for waveform processing.

Peak and Glitch Detection

Minimum and maximum peaks as fast as 0.002% of the record length (minimum 10 nsec) are captured and displayed with 100% probability.

Using LeCroy's new FASTGLITCH trigger technique (see the trigger section below), glitches faster than 2.5 nsec can be detected on all time-base settings.

HORIZONTAL SECTION

Time Base

Range: 1 nsec/div to 5000 sec/div.

Clock accuracy: $\leq \pm 0.01\%$.

Interpolator resolution: 5 psec.

Sampling clock output: BNC connector on rear panel.

External clock input: BNC connector on rear panel.

Acquisition Modes

Random Interleaved Sampling (RIS) for repetitive signals from 1 nsec/div to 20 μ sec/div.

Single shot for transient signals and repetitive signals from 50 nsec/div to 200 msec/div.

Roll for slowly-changing signals from 500 msec/div to 5000 sec/div.

Sequence mode divides the acquisition memory into 2, 5, 10, 20, 50, 100, or 200 segments.

Horizontal expansion: MULTI ZOOM mode allows different signals or different sections of the same signal to be expanded up to 1000 times.

Trigger

Pre-trigger recording: Adjustable in 0.2% increments to 100% of full scale (grid width).

Post-trigger delay: Adjustable in 0.02 division increments up to 10,000 divisions.

Rate: Up to 500 MHz using HF trigger coupling.

Timing: Trigger timing (date and time) is listed in the memory status menu. The timing of subsequent triggers in sequence mode is measured with 0.1 sec absolute resolution, or nanosecond resolution relative to the time of the first trigger.

Trigger output: BNC connector on rear panel.

Trigger veto: BNC connector on rear panel.

Standard Trigger

Sources: CHAN1, CHAN2, CHAN4. LINE. CHAN1, CHAN2 and CHAN4 have independent trigger circuits allowing slope, coupling and level to be set individually for each source. (CHAN3 is used for TV trigger).

Slope: Positive, negative.

Coupling: HF, AC, LF REJ, HF REJ, DC.

Modes:

Auto: Automatically re-arms after each sweep. If no trigger occurs, one is generated at an appropriate rate.

Normal: Re-arms after each sweep. If no trigger occurs after a reasonable length of time, the message "No or Slow Trigger" is displayed.

Single (hold): Holds display after a trigger occurs. Re-arms only when the "single" button is pressed again.

Sequence: Stores multiple events in segmented acquisition memories.

SMART Trigger

Single-source trigger operational modes:

Hold-off by time: 25 nsec to 20 sec.

Hold-off by events: 0 to 10^9 events.

Width-based trigger modes:

Pulse width < (FASTGLITCH): Triggers on opposite slopes of pulses narrower than a value in the range 2.5 nsec to 20 sec.

Pulse width >: Triggers on opposite slopes of pulses wider than a value in the range 2.5 nsec to 20 sec.

Interval width <: Triggers on similar slopes of signals narrower than a value in the range 10 nsec to 20 sec.

Interval width >: Triggers on similar slopes of signals wider than a value in the range 25 nsec to 20 sec.

Multi-source trigger operational modes:

Pattern: Triggers on the logical AND of CHAN1, CHAN2 and CHAN4, where each source can be defined as high (H), low (L) or don't care (X). The trigger can be selected at the beginning (entered) or at the end (exited) of the specified pattern.

Bi-level: This is a special condition of Pattern trigger which allows the 9424 to trigger on any signal that exceeds a certain pre-set high or low trigger level. The signal must be connected simultaneously to two channels. The third trigger channel must be set to don't care (X).

State qualified: Allows the 9424 to trigger on any source (CHAN1, CHAN2 or CHAN4), while requiring that a certain pattern of the other two channels is present or absent. In addition, a delay by time or by number of events can be selected from the moment the pattern is valid.

Time/Event qualified: Allows the 9424 to trigger on any source (CHAN1, CHAN2 or CHAN4), as soon as a certain pattern of the

three channels is entered or exited. From the moment of validity, a delay can be defined in terms of time or number of events.

TV: Allows stable triggering on TV signals that comply with PAL, SECAM or NTSC standards. Selection of both line and field number is possible. Active on CHAN3 only.

DISPLAY

CRT: 12.5 × 17.5 cm (5 × 7 inches); magnetic deflection; vector type.

Resolution: 4096 × 4096 points.

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

Grid: Internally generated; separate intensity control for grid and waveforms. Single, dual, quad and pulse parameter measurement grid mode.

XY mode: Plots any two sources (CHAN 1, CHAN2, CHAN3, CHAN4, MEMORY C or D, FUNCTION E or F and EXPAND A and B) against one another. Operates on live waveforms with cursor readout.

Hard copy: Single or multi-pen digital plotters as well as IBM, HP QuietJet, HP ThinkJet, HP LaserJet and EPSON printers can be used to make hard copies of the display. Screen dumps are activated by a front-panel button or via remote control. Plotters supported are: the HP 7400 and 7500 series, Philips PM 8151, Graphtek FP 5301, and compatible models. Plotting is done in parallel with normal 9424 operation.

Graphics: All waveforms and display information are presented using vector (linear) graphics. Expanded waveforms use LeCroy's DOT-LINEAR graphics that highlight actual data points and interpolate linearly between them.

Menus: Waveform storage; acquisition parameters; memory status; save/recall front-panel configurations; SMART trigger; waveform parameters, RS-232-C configuration; hardcopy setup and real-time clock setup, averaging, and arithmetic.

Cursors

Relative time: Two cursors provide time measurements with a resolution of ± 0.2% of full scale for unexpanded traces; up to 10% of the sampling interval for expanded traces. The corresponding frequency information is also provided.

Relative voltage: Two horizontal bars measure voltage differences to ± 0.2% of full scale.

Absolute time: A cross-hair marker measures absolute voltage versus signal ground, as well as the time relative to the trigger.

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

Pulse parameters: Two cross-hair cursors are used to define a region of interest for which pulse parameters will be calculated automatically.

AUTO-SETUP

Pressing the auto-setup button automatically scales the time base, trigger and sensitivity settings to display a wide range of repetitive input signals.

Type of signals detected: Repetitive signals with amplitudes between 2 mV and 8 V, frequency above 50 Hz and a duty cycle greater than 0.1%.

Auto-setup time: Approximately 2 sec.

WAVEFORM PROCESSING

Waveform processing routines are called and set up via menus. These include arithmetic functions (add, subtract and invert), and summation averaging (up to 1000 signals).

Pulse parameters: Based on ANSI/IEEE Std 181-1977 "Standard on Pulse Measurement and Analysis by Objective Techniques". The terminology is derived from IEEE Std 194-1977 "Standard Pulse Terms and Definitions".

Automatic measurements determine:

Maximum	Period
Minimum	Pulse width
Mean	Risetime
Standard deviation	Falltime
RMS	Delay

Sources: CHAN1, CHAN2, CHAN3, CHAN4, MEMORY C or D, FUNCTION E or F, EXPAND A or B. Cursors define the measurement zone. When more than one pulse is present in the measurement zone, averaged results for period, width, risetime and falltime are given.

REMOTE CONTROL

Front-panel controls, including variable gain, offset, position controls and cursors, as well as all internal functions are programmable.

RS-232-C port: For computer/terminal control or plotter connection. Asynchronous up to 19200 baud.

GPIO port: (IEEE-488). Configured as talker/listener for computer control and fast data transfer. Address switches on rear panel.

Local/remote: Remote control can be interrupted for local (manual) control at any time (except when in remote control with the lock-out state selected) by pushing a button on the front panel.

PROBES

Model: Four P9020 (×10, 10 MΩ //16 pF) probes supplied.

Probe calibration: 1 kHz square wave, 1 V p-p.

Probe power: Two rear-panel power outlets for use with active probes provide ± 15 V, + 5 V DC.

SELF TESTS

Auto-calibration ensures accuracy of:

DC accuracy: ± 2% full scale > 5 mV/div
± 3% full scale at 5 mV/div

Time: 20 psec RMS.

GENERAL

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

Humidity: < 80%.

Power required: 110 or 220 V AC, 45 to 440 Hz, 275 W.

Battery backup: Lithium batteries maintain front-panel settings and waveform data for 2 years.

Dimensions: (HWD) 19.2 × 37.0 × 49.5 cm, (7 1/2 × 14 1/2 × 19 1/2 inches).

Weight: 15 kg (33 lbs) net, 20 kg (44 lb) shipping.

Warranty: 2 years

ORDERING INFORMATION

Oscilloscope and Options

Code	Description
9424	Digital Oscilloscope
9424WP01	Waveform Processing Option
9424WP02	Fast Fourier Processing Option

Oscilloscope Accessories

OM9424	Operator's Manual
9424-FC	Front Cover
9424-MC01	Card Reader plus 512K Memory Card
9424-MC02	128K Memory Card
9424-MC04	512K Memory Card
CA9001	Camera (using Polaroid film) and Hood.

Oscilloscope Accessories (cont'd)

CA9002	Camera Adapter (35 mm) with Hood
D9010	10:1 High Impedance Divider
DC/GPIB-2	2-meter GPIB Cable
DP9001	Digital Plotter, 8-pen A4 size
DP9003	Epson Printer
OC9001	Oscilloscope Cart
P9010	10:1 Oscilloscope Probe
P9010/2	10:1 Oscilloscope Probe with 2 m cable
P9011	10:1/1:1 Oscilloscope Probe
P9020	10:1 Oscilloscope Probe (300 MHz)
P9100	100:1 Oscilloscope Probe
RM9400	Rackmount
SG9001	High Voltage Protector
TC9001	Transit Case
TC9002	Carrying Bag

U.S. SALES OFFICES

1-800-5-LeCroy (1-800-553-2769):

automatically connects you to your local sales office.

WORLDWIDE

Argentina: Search SA, (01) 394-5882
Australia: Scient. Devices Pty, Ltd, (03) 579-3622
Austria: Dewetron Elektr. GmbH, (0316) 391804
Benelux: LeCroy B.V. *31-4902-89285
Brazil: A. Santos, (021) 233 5590
Canada: Rayonics, W. Ontario, (416) 736-1600
Denmark: Lutronic, (42) 459764
Finland: Labtronic OY, (90) 847144
France: LeCroy Sarl (1) 69073897
Germany: LeCroy GmbH, (06221) 81001
 (North) (0405) 42713
Greece: Hellenic S/R Ltd., (01) 721 1140

India: Electronic Ent., (022) 4137096
Israel: Ammo, (03) 453157
Italy: LeCroy S.r.l., Roma (06) 327.02.02 or 331.31.46
 Milano (02) 2940-5634
Japan: Toyo Corp., (03) 279 0771
Korea: Samduk Science & Ind., Ltd., (02) 468 0491
Mexico: Nucleoelectronica SA, (905) 593 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) 691116
Singapore: Sing. Electr. and Eng. Ltd (65) 481-8888
Spain: Anadig Ingenieros SA, (01) 433 2412
Switzerland: LeCroy S.A. (022) 719 21 11
Sweden: MSS AB, (0764) 68100
Taiwan: Topward El.Inst., Ltd., (02) 601 8801
Thailand: Measuretronix Ltd., (02) 374 2516
United Kingdom: LeCroy Ltd., (0235) 33 114

LeCroy

Innovators in Instrumentation

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

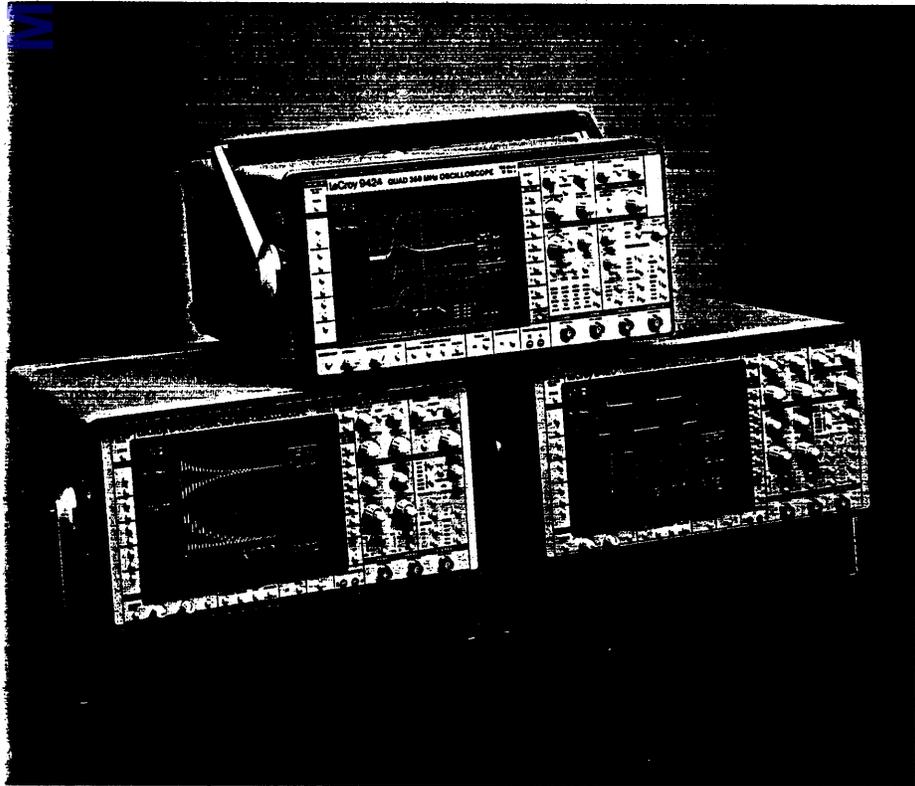
LeCROY EUROPEAN HEADQUARTERS
 2, rue Pré-de-la-Fontaine
 P.O. Box 341
 1217 Meyrin 1-Geneva, Switzerland
 Telephone: (022) 710 21 11 Telex: 41 90 58
 Fax: (022) 782 39 15

WAVEFORM PROCESSING PACKAGE AVERAGING, MATHEMATICS, HIGH RESOLUTION



WP01 WAVEFORM PROCESSING FIRMWARE
FOR MODELS 9420/24/50 DIGITAL OSCILLOSCOPES

9420/24/50 WP01



- Averaging – Summation and Continuous
- Arithmetic – incl. Addition, Subtraction, Ratio and Multiplication
- Functions – including Integration, Differentiation, Log, Exp, ABS and Square Root
- Extrema Mode – Storage of Extreme Positive and Negative Values
- High-Resolution Mode for 11-bit Performance

Added as a factory option or retrofitted in the field, the WP01 Waveform Processing Package adds high-speed averaging, filtering and mathematical capabilities to the Models 9420, 9424 or 9450 digital oscilloscopes.

FOR SIGNAL CHARACTERIZATION AND ANALYSIS

The LeCroy WP01 Waveform Processing package offers powerful routines that extend the processing capabilities of the Models 9420, 9424 and 9450 Digital Oscilloscopes. All processing is built in to eliminate the need for external computers and controllers. High-speed microprocessors are used to ensure that computed waveforms are displayed instantly on the screen. The package is fully programmable over the GPIB or RS-232-C interface and hard copies can be directly made on a wide range of digital plotters or printers.

FEATURES

Extensive Signal Averaging – Two operation modes:

- Summation averaging up to 1,000,000 waveforms.
- Continuous averaging with weighting factors up to 128.

Average speed up to 300,000 points/sec in summation averaging mode.

Offset Dithering – Improves the vertical resolution for low-noise measurements by several bits in summation averaging mode. Reduces the effect of ADC differential non-linearities.

Artifact Rejection – Rejects waveforms that exceed the dynamic range of the ADC to ensure statistical validity of summed average results.

Extrema Mode – Keeps track of time and amplitude drift by storing extreme positive and negative values, such as glitches, over a programmable number of sweeps.

Powerful Arithmetic – Processes identity, negation and reciprocal on single waveforms as well as addition, subtraction, multiplication or division on pairs of waveforms stored in the 9420/24/50's memory locations CH1, CH2 (CH3 and CH4 in the 9424), A, B, C, D, E and F. Waveform data can be normalized by additive or multiplicative constants.

Mathematical Functions – Computes integration, differentiation, square, square root, absolute value, exponential and log on single waveforms stored in the 9420/24/50 memory locations CH1, CH2 (CH3, CH4 in the 9424) A, B, C, D, E and F. Waveform data can be normalized by additive or multiplicative constants.

High Resolution – Allows filtering of the digitized signals, whether they are single-shot or repetitive, in order to increase the resolution of the displayed trace from 8 bits to 11 bits in steps of 0.5 bits.

Vertical Expansion – Provides vertical scale expansion by a factor of up to 10.

Chaining of Operations – Automatically chains two operations (four in the 9424):

Example: $F(E) = \text{Average (CH1-CH2)}$.

An indefinite number of operations can be performed sequentially, either manually or via remote control.

Remote Control – Controls remotely all front-panel settings, as well as all waveform processing options via either GPIB or RS-232-C interfaces.

Color Archiving – Copies screen in color using a wide range of digital plotters or printers.

FUNCTIONAL DESCRIPTION

The WP01 waveform processing package for the Models 9420, 9424 and 9450 Digital Oscilloscopes is optimized for processing signals in real time. Powerful 68020 microprocessors and 68881 co-processors enable very rapid representation of results such as averages, integrations, exponentials and multiplications.

Waveform operations can be performed on live, stored, processed or expanded waveforms. They are selected through simple menus that allow functions to be chained together allowing more complex computations. For example, it is possible to perform the integration of an averaged waveform or the multiplication of a differentiated waveform.

All processing occurs in function memories E and F (C, D, E and F for the Model 9424) which may be displayed on the screen by simply pressing the appropriate function button. Processing is fully automatic and is simultaneous whenever more than one function has been selected.

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 500 $\mu\text{V/division}$.

Summed Averaging consists of the repeated addition (with equal weight) of recurrences of the selected source waveform. The number of acquisitions averaged can be selected between 2 and 1,000,000 sweeps with the accumulation automatically stopping when the number is reached. Signals exceeding the range of the oscilloscope's ADC can be automatically rejected to ensure valid summed averaging results.

The user may choose to "dither" the programmable offset of the input amplifier after each acquisition. Dithering uses slightly different portions of the ADC for successive waveforms so that the differential non-linearities are also averaged. As a result, in low-noise applications, the measurement precision and dynamic range are improved.

Continuous Averaging, sometimes called exponential averaging, is the repeated weighted average of the source waveform with the previous average. Averaging goes on indefinitely with each new acquisition and the effect of previous waveforms gradually tends to zero. Relative weighting factors can be chosen from 1:1 to 1:127. The method is particularly useful for monitoring noisy signals which may change slowly over a period of time.

HIGH RESOLUTION

The WP01 package provides a selective filtering technique that improves vertical resolution for reduced bandwidth applications. By effectively removing high-frequency noise, with digital smoothing functions, waveforms can be analyzed with resolution from 8 to 11 bits. The technique can be used with both single-shot and repetitive signals and provides an ideal method for smoothing transient phenomena.

EXTREMA MODE

Tracking rare glitches or monitoring signals drifting in time and amplitude is made easy with EXTREMA mode. EXTREMA waveforms are produced by repeatedly com-

paring acquisitions of a source waveform with a stored waveform that contains previous maximum and/or minimum excursions. Whenever a given data point of a new acquisition exceeds the existing data point of the stored waveform, the old data point is replaced by the new. In this way the envelope of all waveforms is accumulated for up to a maximum of 1,000,000 sweeps.

ARITHMETIC

WP01 offers basic arithmetic operations such as addition, subtraction, division and multiplication. These arithmetic functions can be performed on any source waveform on a point by point basis. Different vertical gains and offsets of the source waveforms are automatically taken into account in the computed result.

MATHEMATICAL FUNCTIONS

Functions including differentiation, integration, square, square root, logarithm (base 10 and e), exponential and absolute value may be performed on any source waveform. The waveforms may be multiplied by a constant factor or offset by a constant. Arithmetical and mathematical functions can also be chained together to construct more complex processing routines.

SPECIFICATIONS

SUMMATION AVERAGING

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

Number of input points: 50 to 50,000.

Offset dithering: only on acquisition channels; ON/OFF.

Artifact rejection: ON/OFF.

Vertical expansion: 10 × maximum.

Maximum sensitivity: 500 $\mu\text{V}/\text{div}$ after vertical expansion.

Speed: up to 300,000 words/sec.

CONTINUOUS AVERAGING

Possible weighting factors: 1:1, 1:3, 1:7, 1:15, 1:31 and 1:127.

Number of input points: 50 to 50,000.

Vertical expansion: 10 × maximum.

Maximum sensitivity: 500 $\mu\text{V}/\text{div}$ after vertical expansion.

ARITHMETIC

Identity, negation and reciprocal of any waveform. Addition, subtraction, multiplication, and ratio on any two waveforms.

Number of input points: 50 to 50,000.

Multiplicative constant on first input: from 0.001×10^{-33} to 999.999×10^{33} .

Additive constant on first input: from -999.999×10^{33} to 999.999×10^{33} .

Vertical expansion: 5 × maximum.

FUNCTIONS

Integration, differentiation, square, square root, logarithm and exponential (base e and 10).

Number of input points: 50 to 50,000.

Multiplicative constant on input: from 0.001×10^{-33} to 999.999×10^{33} .

Additive constant on input: from -999.999×10^{33} to 999.999×10^{33} .

Vertical expansion: 5 × maximum.

HIGH RESOLUTION

Choice of four low-pass filters for vertical resolution improvement from 8 to 11 bits at reduced bandwidth.

Vertical expansion: 10 × maximum.

Maximum sensitivity: 500 $\mu\text{V}/\text{div}$ after vertical expansion.

Maximum bandwidth (for 11 bit resolution):

RIS mode: 80 MHz.

Single-shot mode: 3.2 MHz (9450), 800 kHz (9420 and 9424).

Speed: from 50 kilowords/sec up to 300 kilowords/sec.

EXTREMA

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.

Number of input points: 50 to 50,000.

Glitches as short as 0.002% of the time base (down to 2.5 nsec for the 9450, 10 nsec for the 9420 and 9424) are displayed.

Vertical expansion: 5 × maximum.

CHAINING OF OPERATIONS

Two functions can be automatically chained using Functions E and F (four functions in the 9424). Using memory

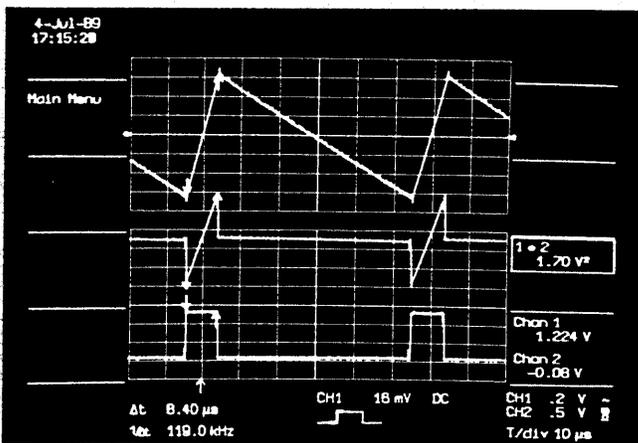
C and D for intermediate results, any number of operations can be chained manually or via remote control.

REMOTE CONTROL

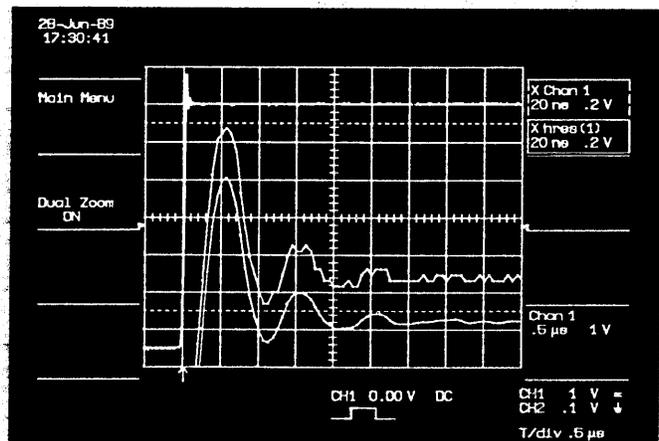
All controls and waveform processing functions are fully programmable using the oscilloscope's GPIB or RS-232-C interfaces. Simple English-like commands are used.

STORED FRONT PANELS

Up to 7 front-panel setups, including WP01 settings, can be stored in non-volatile memory and recalled using the menu buttons at the left side of the screen or via remote control.



Whether it's sophisticated functions (like integration, differentiation or logarithm) or simple mathematics (like addition, subtraction and multiplication), the WP01 package can calculate the results with just a touch of a button. Above, a ramp (top trace) and a square wave (lower trace) are multiplied together. The result is shown in the middle trace complete with cursor readout.



The WP01 package performs digital filtering techniques that allow improved vertical resolution and sensitivity. The above example shows the ringing on a step response (top trace) expanded 5 times vertically and 25 times horizontally (middle trace). The lower trace shows the same expansion but with 9-bit resolution. The second and third oscillations are now clearly visible.

LeCroy

Innovators in Instrumentation

LeCROY CORPORATE HEADQUARTERS
700 Chestnut Ridge Road
Chestnut Ridge, NY 10977-6499
Telephone: (914) 578 6097
TWX: (710) 577-2832
Fax: (914) 425-8967

LeCROY EUROPEAN HEADQUARTERS
Route du Nant-d'Avril 101
P.O. Box 341
1217 Meyrin 1-Geneva, Switzerland
Telephone: (022) 782 33 55 Telex: 41 90 58
Fax: (022) 782 39 15

Other sales and service representatives throughout the world.

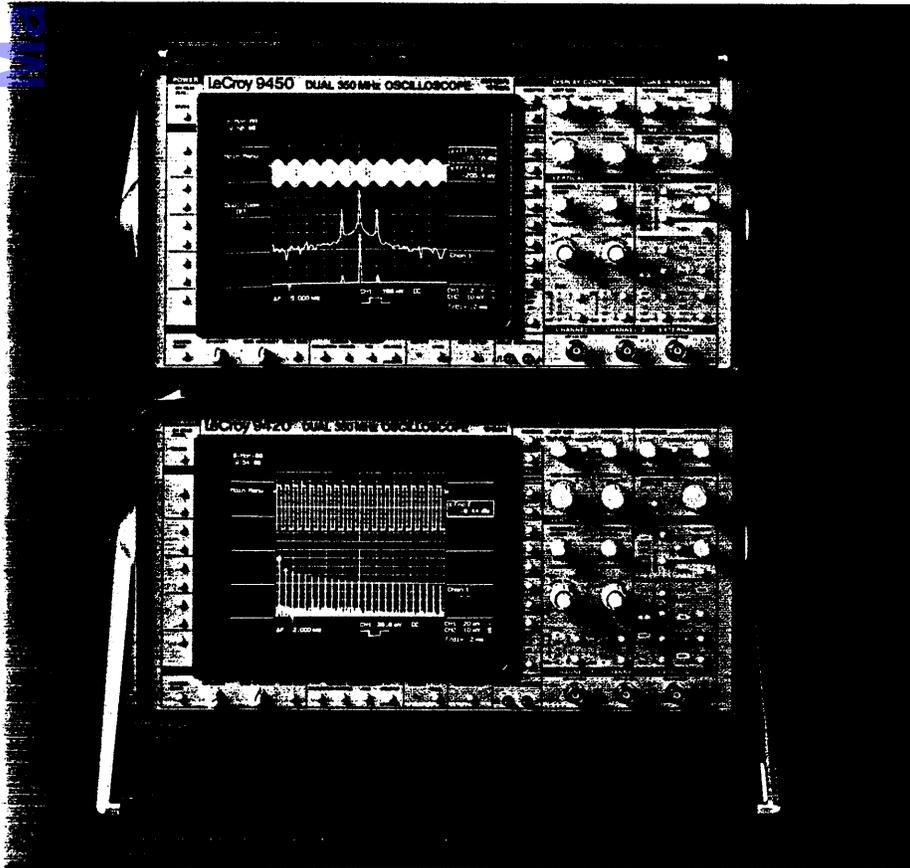
FAST FOURIER PROCESSING PACKAGE

50,000 POINT TRANSFORMS, SPECTRAL AVERAGING

LeCroy

WP02 SPECTRUM ANALYSIS FIRMWARE FOR MODELS 9420/24/50 DIGITAL OSCILLOSCOPES

9420 /24/50 WP02



The instrument at the top (Model 9450) shows a modulated signal (top trace) analyzed in the frequency domain. Both power spectrum (middle trace) and magnitude (lower trace) are displayed. Side lobes 5 kHz from the fundamental frequency are clearly visible. The instrument at the bottom (Model 9420) shows a square wave (top trace) and its power spectrum (bottom trace).

- 50,000 point FFTs over Two (or Four) Channels Simultaneously
- Frequency Range from DC to > 350 MHz
- Frequency Resolution from 20 μ Hz to 100 MHz
- Up to 10 Gs/sec Sampling Rates
- Time and Frequency Domain Averaging
- Wide Selection of Display Formats and Window Functions
- 1,000-point FFTs ten times a second!

FREQUENCY DOMAIN MEASUREMENTS AND ANALYSIS

The WP02 Spectrum Analysis Package extends the range of measurement capabilities of the Models 9420 and 9450, two-channel Digital Oscilloscopes, and the Model 9424, four-channel Digital Oscilloscope. 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. Hard copies can be directly made on a wide range of plotters and printers. As the package is a firmware option which is installed inside the oscilloscope, it eliminates the need for any external controller and is easy to retrofit.

FEATURES

Long record transforms – Extremely long record FFTs (up to 50,000 points) provide significant signal-to-noise ratio improvement.

Wide-band frequency analysis – DC to 350 MHz bandwidth with high resolution.

High sampling rates – Up to 10 gigasamples/sec effectively eliminates aliasing errors.

Broad spectrum coverage – Up to 25,000 spectral components.

Multi-channel analysis – All input channels can be analyzed simultaneously to allow comparison of independent signals for common frequency-domain characteristics.

Versatile display formats – Frequency-domain data may be presented as magnitude, phase, real, imaginary, complex, log-power and log-PSD (Power Spectral Density). These display formats can all be selected via menu options.

Standard window functions – Rectangular for transient signals; von Hann (Hanning) and Hamming for continuous waveform data; Flattop for accurate amplitude measurements; Blackman-Harris for maximum frequency resolution.

Calibrated vertical scaling – Flattop truncation window provides precisely calibrated vertical scaling for all spectral components.

Frequency domain averaging – Up to 50,000 FFT results may be averaged to reduce base-line noise and enable analysis of phase-incoherent signals or signals which cannot be triggered on.

Time-domain averaging – Averaging real-time signals prior to FFT execution can increase the dynamic range up to 70 dB.

Frequency cursors – Cursors give up to 0.004% frequency resolution and measure power or voltage differences to 0.2% of full scale.

Automatic DC suppression – DC signal components may be suppressed automatically prior to FFT execution (menu selected).

Full documentation – The oscilloscope's status in the frequency domain is fully documented on one comprehensive display page which specifies parameters such as Nyquist frequency, number of points, vertical scaling and window function.

Chaining of operations – Two operations (four in the 9424) can be automatically chained, e.g., Function F = FFT of (CH1 \times CH2). Any number of operations can be performed sequentially, either manually or via remote control.

Full remote control – All front-panel settings and waveform processing functions are programmable via GPIB or RS-232-C interfaces. Acquired and processed waveforms can be down-loaded to a computer and can later be retrieved and displayed on the oscilloscope.

Color archiving – Provides color hard copies of the screen using a wide range of digital plotters.

Processing of expansions – Up to two regions (three in the 9424) of the same waveform, or of different waveforms, can be expanded and processed simultaneously.

FFT on segmented waveforms – Individual waveform segments can be expanded and then analyzed using FFT. Time and date information is automatically recorded for each segment.

FUNCTIONAL DESCRIPTION

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 (FFTs) 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. The principal advantage of FFT is the speed with which it can analyze large quantities of waveform samples. Using standard measurement techniques, FFT converts a time-domain measurement instrument into a digital spectrum analyzer.

The Spectrum Analysis package enhances the outstanding features of the LeCroy Models 9420, 9424 and 9450. It provides high resolution and wide-band spectrum analysis together with sophisticated window functions and fast processing.

FFT AND LeCROY OSCILLOSCOPES

In FFT mode, LeCroy oscilloscopes provide measurement capabilities superior to those of common swept spectrum analyzers. It is now possible to perform spectral analysis on repetitive and single events at an attractive price. Users can obtain time and frequency values simultaneously and compare phases of the various frequency components with each other.

Rather than the commonly used "power of two" record lengths, the routines used in the WP02 package feature decimal record lengths which can be selected in a 1, 2, 5 sequence. Resulting spectra are also calibrated in convenient decimal Hertz values.

The WP02 package is supported by the exceptional acquisition characteristics which are the hallmark of LeCroy oscilloscopes ($\pm 2\%$ DC accuracy, high effective bits, improved resolution through averaging). Computations are made using 16-bit processing that allows high accuracy, stability and repeatability.

With LeCroy oscilloscopes, signals may be acquired and processed simultaneously using Channels 1 and 2 (1 to 4 in the 9424). This is particularly useful for network characterization or when looking for common frequency-domain characteristics on multiple signals.

IMPROVED RESOLUTION

The Fast Fourier Transform calculates equally-spaced frequency components from DC to the full instrument bandwidth. By lowering the sampling rate, it is possible to make measurements with 20 μ Hz resolution up to 0.5 Hz

SPECIFICATIONS

MEMORIES

Acquisition memory: 50K, 8-bit word memories per channel.

Reference and function memories: for the 9420/50 – 2 x 50K, 16-bit word reference memories which can each store one acquired or processed waveform (or up to 200 segmented waveforms) and 2 x 50K, 16-bit word function memories for waveform processing. The 9424 has 4 x 50K, 16-bit word memories which can be used both as reference or as function memories.

FREQUENCY

Frequency range: DC to > 350 MHz.

Frequency resolution: 20 μ Hz to 100 MHz.

Nyquist frequency range: 0.5 Hz to 5 GHz.

Frequency scale factors: 0.05 Hz/div to 0.5 GHz/div in a 1–2–5 sequence.

Frequency accuracy: 0.01%

Horizontal expansion: up to 1000 times.

Selection of the transform size: 50 to 50,000 data points in 10 steps in a 1–2–5 sequence. The transform size defines the decimation applied to the signal after the acquisition.

The Nyquist frequency can be adjusted and optimized after signal acquisition and prior to FFT execution.

AMPLITUDE AND PHASE

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

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

DC suppression: selected via the menu (ON/OFF). It removes the DC component prior to FFT execution.

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

(Nyquist). By increasing the sampling rate to 10 gigasamples/sec (100 psec/point) in random interleaved sampling mode, the widest resolution becomes 100 MHz and the Nyquist frequency 5.0 GHz, comfortably above the highest frequency components recordable by the oscilloscope, thus virtually eliminating aliasing effects.

VERSATILE WINDOW FUNCTIONS

The WP02 FFT software provides a selection of window functions designed to minimize leakage and to maximize spectral resolution of single and non-cyclic events. These include the rectangular or unmodified window typically used for transient events, the von Hann (Hanning) and Hamming windows for continuous signals, and also the Flattop and Blackman–Harris windows for more precise amplitude (power) measurements or strong suppression of side lobes respectively.

Phase range: -180° to $+180^\circ$.

Phase accuracy: $\pm 5^\circ$ (for amplitude > 1.4 div).

Phase scale factor: 50° /division.

Zero base line: 0 div (center of screen).

Spectrum Display Formats and Scaling

Frequency scale: linear, real, imaginary or complex spectrum, in V/div, zero base line at 0 div (center of screen).

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

Power spectral density (PSD) in dBm.

Phase display: linear.

Magnitude display: linear.

Power and PSD spectra displays have 80 dB range (10 dB/div), expandable to 5, 2 or 1 dB/div.

Frequency Domain Power Averaging

Up to 50,000 spectra for power, PSD or magnitude.

Vertical Expansion

All spectral formats, up to 10 times, in a 1–2–5 sequence.

Window Functions

Rectangular, von Hann (Hanning), Hamming, Flattop and Blackman–Harris. The table below indicates the filter pass-band shape and the resolution:

FILTER PASS BAND AND RESOLUTION

Window type	Filter bandwidth at -6 dB [freq. bins]	Highest side lobe [dB]	Scallop loss [dB]	Noise band-width [freq. bins]
Rect-angular	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

Definitions

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 maximum loss of amplitude accuracy of the magnitude spectrum.

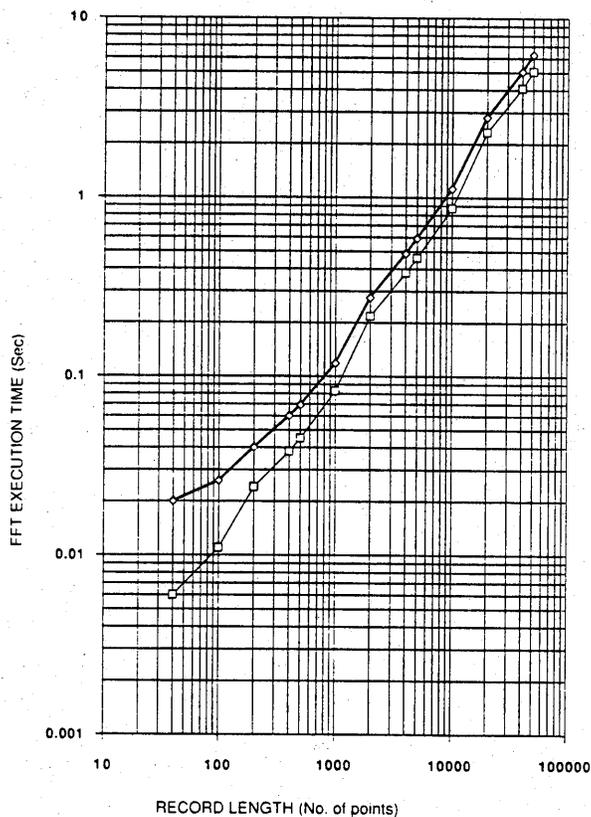
Noise bandwidth is the bandwidth of an equivalent rectangular filter.

CURSORS

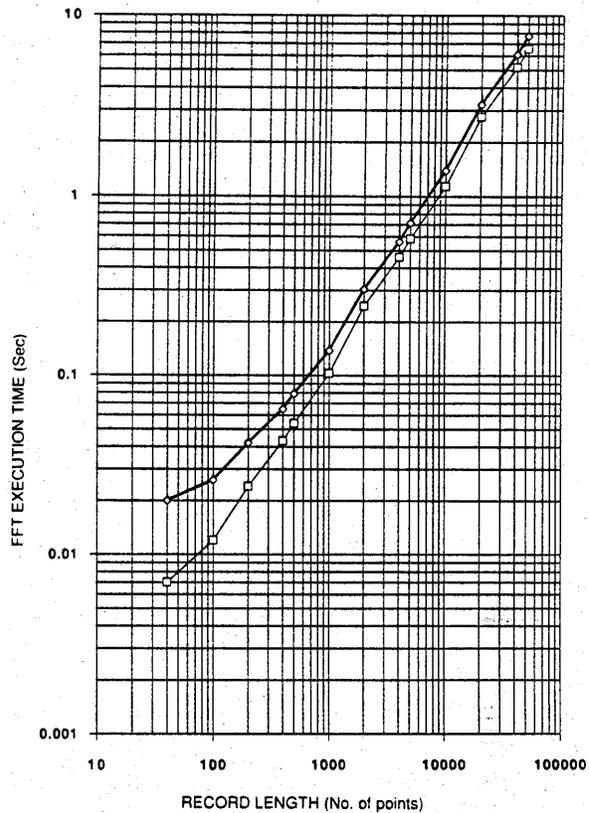
Absolute (crosshair) and relative (arrow) cursors provide frequency and amplitude (phase, power, power density) measurements.

Horizontal bars provide absolute and relative amplitude, and power and power density measurements.

FFT EXECUTION TIME



9424/50 FFT execution time as a function of record length, including window calculations. The top trace is the maximum execution time, i.e. when the FFT definition or the source acquisition conditions have changed. The bottom trace is the repetitive execution time, i.e. when only the input data have changed.



9420 FFT execution time as a function of record length, including window calculations. Same top and bottom trace definition as in the previous graph.

REMOTE CONTROL

All WP02 processing functions are fully programmable via the GPIB and RS-232-C interfaces. Simple English-like commands are used.

Remote read and write

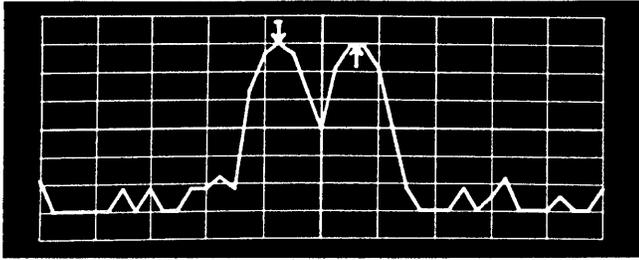
All waveform formats including complex can be read by computer for storage or further processing. Externally generated waveforms can be written into Memories C and D for FFT or other processing.

STORED FRONT PANELS

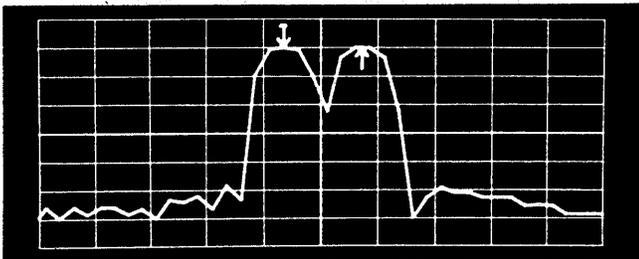
Up to 7 front-panel setups, including WP02 menu settings can be stored in non-volatile memory and recalled by the menu buttons at the left side of the screen.

WP02 INSTALLATION

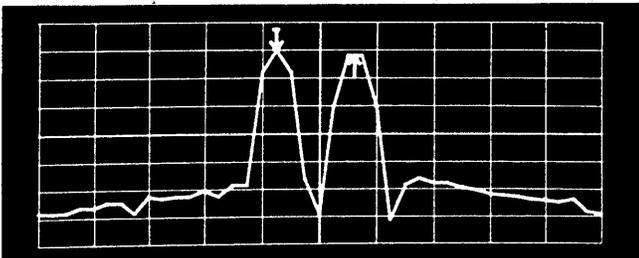
A WP02 package may be retrofitted to a LeCroy 9420/24/50 Digital Oscilloscope.



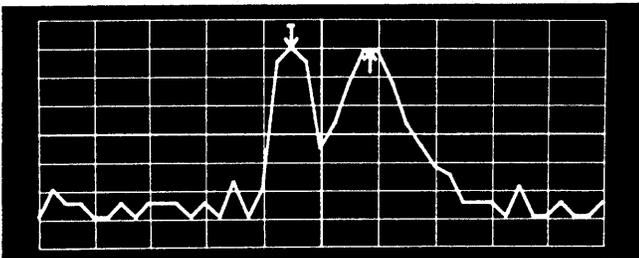
Blackman-Harris



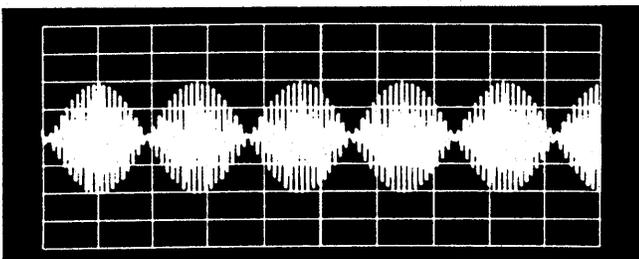
Flatop



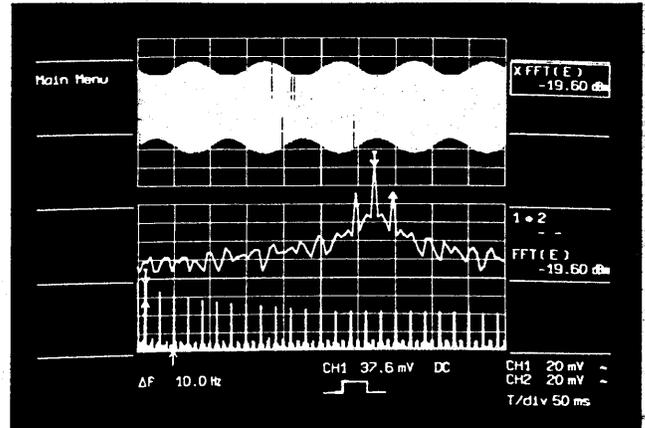
Hamming



von Hann (Hanning)



The sum of two sinusoids of 500 kHz and 527.5 kHz is digitized over 200 points and transformed to the frequency domain. Four different window functions are applied to indicate their effect on leakage suppression and spectral resolution.



Long records give wide frequency span. FFT of a 1000 Hz amplitude modulated square wave, recorded over 50,000 points, shows harmonics up to 51 kHz. Expansion shows side bands at 10 Hz and -19.5 dBm.

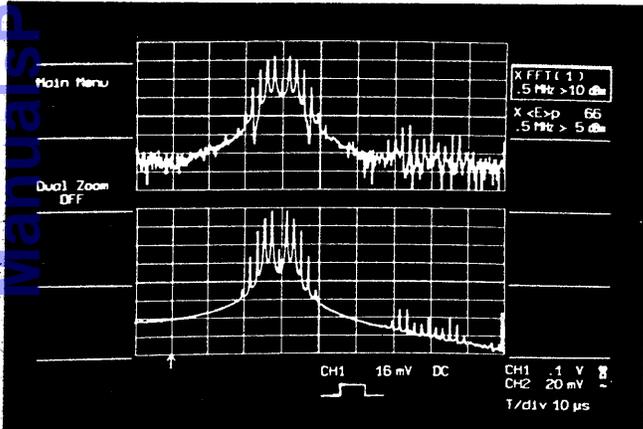
ORDERING INFORMATION

Oscilloscopes and Options

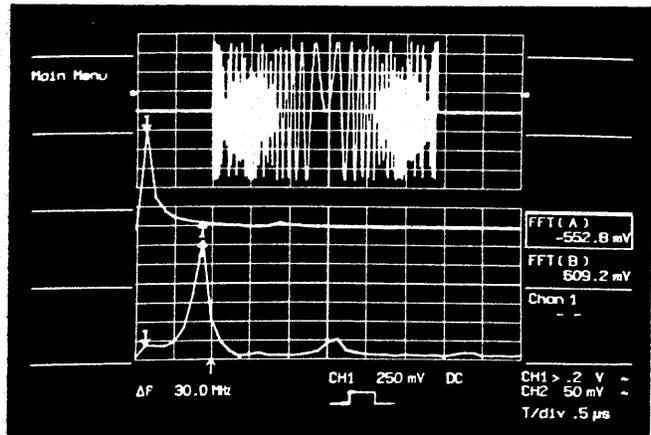
Code	Description
9400A	2-channel, 175 MHz Oscilloscope, 100 Ms/s
9420	2-channel, 350 MHz Oscilloscope, 100 Ms/s
9424	4-channel, 350 MHz Oscilloscope, 100 Ms/s
9450	2-channel, 350 MHz Oscilloscope, 400 Ms/s
9400AWP01	Waveform Processing for 9400A
9420WP01	Waveform Processing for 9420
9424WP01	Waveform Processing for 9424
9450WP01	Waveform Processing for 9450
9400AWP02	FFT Firmware for 9400A
9420WP02	FFT Firmware for 9420
9424WP02	FFT Firmware for 9424
9450WP02	FFT Firmware for 9450

Oscilloscope Accessories

OM 9420/50	Operator's Manual
OM 9424	Operator's Manual
CA9001	Camera (Polaroid film) and Hood
CA9002	Camera Adapter (35mm) with Hood
D9010	High Impedance Divider 10:1
DP9001	Digital Plotter, 8-pen A4 size
DP9003	Epson Printer
OC9001	Oscilloscope Cart
P9010	10:1 Oscilloscope Probe
P9011	10:1/1:1 Oscilloscope Probe
P9010/2	10:1 Oscilloscope Probe - 2m cable
P9020	10:1 Oscilloscope Probe (300 MHz)
P9100	100:1 Oscilloscope Probe
RM9400	Rackmount for portable oscilloscopes
SG9001	High Voltage Protector
TC9001	Transit Case
TC9002	Protective Cover



A 2 MHz signal is frequency modulated with a 99 kHz sine wave. To improve the signal-to-noise ratio on the phase-incoherent FM signal, 66 spectra are averaged (bottom trace). The part of the spectrum at the right-hand side is the 2nd harmonic of the carrier with side bands.



A frequency coded radar signal has been captured in single shot (upper trace). Two time windows have been applied (not visible on the screen) to isolate different portions of the signal, and the respective FFTs have been calculated. The middle and the lower trace show the two amplitude spectra. A frequency shift of 30 MHz is clearly visible.

Definition of Function E	
Previous FIELD	Class: Fourier Transform
Next	Type: Power Spectrum
Previous VALUE	Max number of points: 50000
Next	Source: Channel 1
	Multiplication factor: 1.000 e ⁰
	Additive constant: +0.000 e ⁰ V
	Window Type: Rectangular
Cancel	Zero Suppression: DN
Return	FE = PS(FFT(C1))
	For 50000 points Nyquist = 50.0 kHz
	Δf = 2.00 Hz

VALUES
Rectangular
Von Hann
Hamming
Flat Top
Blackman-Ha

The FFT menu documents all the relevant parameters.

LeCroy

Innovators in Instrumentation

LeCROY CORPORATE HEADQUARTERS

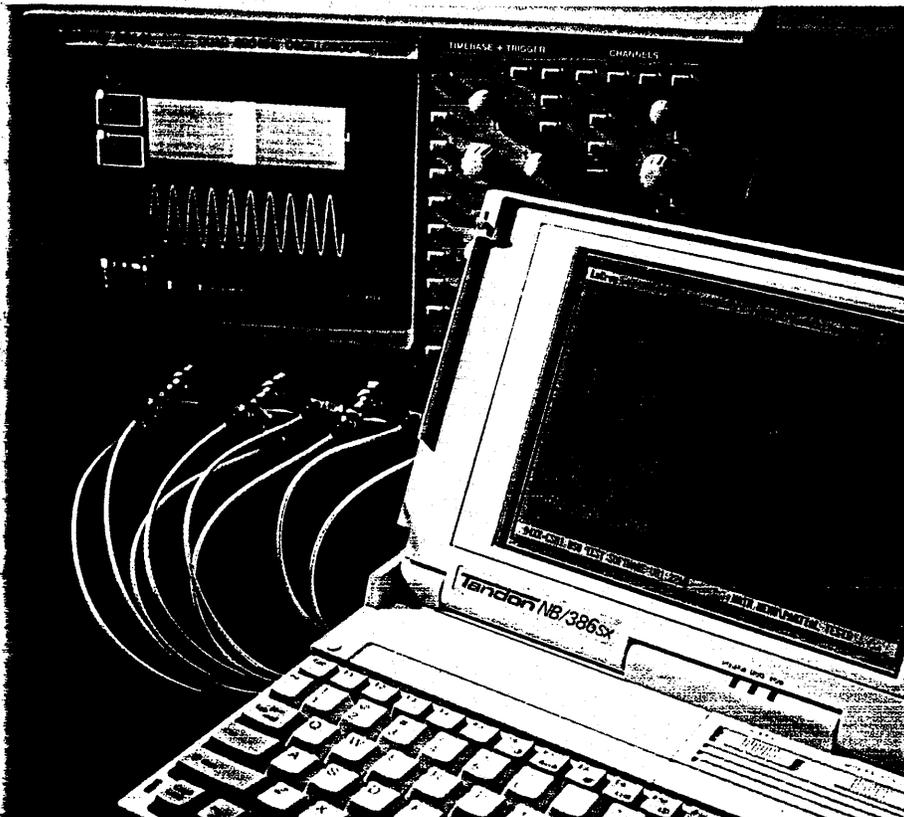
700 Chestnut Ridge Road
 Chestnut Ridge, NY 10977-6499, USA
 Telephone: (914) 425-2000
 TWX:(710) 577-2832
 Fax: (914) 425-8967

LeCROY EUROPEAN HEADQUARTERS

2, rue Pré-de-la-Fontaine
 P.O. Box 341
 1217 Meyrin 1-Geneva, Switzerland
 Telephone: (022) 719 21 11 Telex: 41 90 58
 Fax: (022) 782 39 15

Other sales and service representatives throughout the world.

LeCalsoft—Calibration Software for LeCroy Digital Oscilloscopes



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

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

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: Avante 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

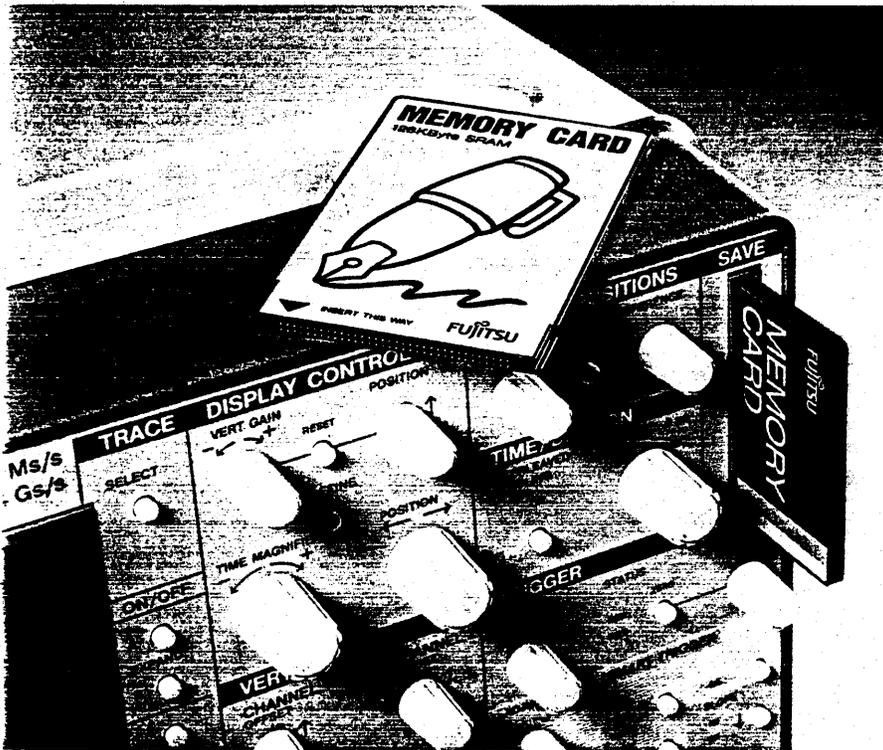
LeCROY CORPORATE HEADQUARTERS

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

MEMORY CARD SYSTEM FOR MODELS 9410, 9414, 9424, 9430 AND 9300-SERIES DIGITAL OSCILLOSCOPES



- Ultra-fast Throughput Rates
- Automatic Waveform Storage
- New PCMCIA Standard (DOS-compatible)
- 128K Byte – or 512K Byte – cards available
- Ideal for automatic PASS/FAIL Testing

FEATURES

Versatility – The memory card is mainly used to save and retrieve either waveforms (acquired or processed) or instrument settings.

Autostore – Waveforms can be automatically stored to the card after every acquisition. The user can choose to stop the automatic storage when the card is full, or to perform "wraparound" storage, discarding the oldest waveforms in a first-in-first out manner.

PASS/FAIL Testing – The oscilloscope's new PASS/FAIL feature allows for automatic storage of failure data to the memory card.

High Efficiency – Select up to 8 different traces (10 traces on 4-channel scopes) to save with just one

keystroke. This feature is also available in "Autostore" configurations.

User-friendliness – A convenient "Replay" function helps the user to visualize the waveforms stored on the card.

Fully Featured with Remote Control – All the front-panel commands used to drive the memory card system are available through remote control. This allows testing time to be cut significantly in ATE applications, thanks to the memory card's extremely fast transfer speed.

Standard PCMCIA/JEIDA Format – PCMCIA is the memory card standard agreed upon by all the major PC manufacturers.

SPECIFICATIONS

Formatted MC Size: 506K for MC04, 122K for MC02

Front-Panel File Size: 2K Bytes

Waveform Size: A 10000-points waveform will use 2 bytes per point in word format plus 346 bytes of waveform descriptor, for a total of 20346 bytes.

Template Size: 22K Bytes

Throughput Performance

Examples:

Waveform Length	Transfer Time
1000	22 msec
10000	82 msec
50000	322 msec

ORDERING EXAMPLE

To order a memory card system with one 128K card and one 512K card for a Model 9410 oscilloscope:

9410-MC01 for the Memory Card firmware.
 9410-MC02 for the 128K Memory Card.
 9410-MC04 for the 512K Memory Card.

800-5-LeCroy (1-800-553-2769):

automatically connects you to your local sales office.

WORLDWIDE

Australia: Search SA, (01) 46 6156

Canada: Scientific Devices Pty Ltd.
(03) 579-3622

Germany: Dewetron GmbH, (0316) 391804

Holland: LeCroy BV (0031) 4902-89285

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

Japan: 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 (16) 907 3897

Germany: LeCroy GmbH, (06221) 831001

Greece: Hellenic S/R Ltd., (01) 721 1140 or (01) 721 3154

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

India: Tata Honeywell, (0212) 670 445

Israel: Ammo, (03) 453157

Italy: LeCroy Srl, Roma (06) 300.97.00
 Milano (02) 204 7082 or 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: Electro Tech. Corp, (021) 493-8087

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

Singapore: Sing. Electr. and Eng. Ltd, (65) 480.7783

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

Spain: Essa, (01) 359 0088

Sweden: MSS AB, (0764) 68100

Switzerland: LeCroy SA (064) 51 91 81

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

Thailand: Measuretronix Ltd, (02) 375 2733-4

USA: LeCroy Ltd, (023) 553 3114

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
 Telex: 41 90 58
 Fax: (022) 782-39-15



The Digital Scope Specialists

Chapter 2

BASIC OPERATION

AND

BLOCK DIAGRAMS

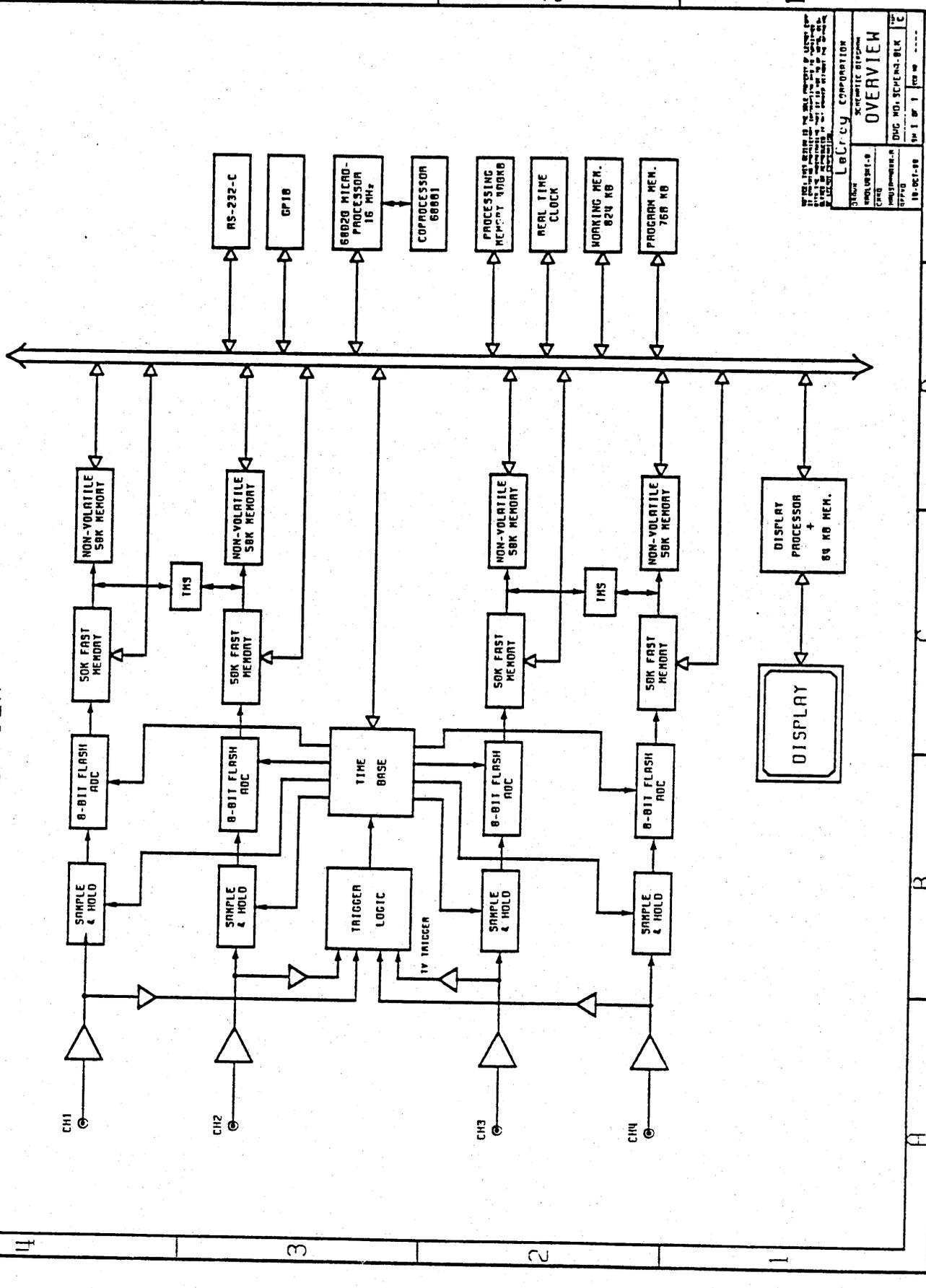
Table of contents

Section	
2.1	9424 Sub assemblies and Block Diagram
2.2	F9450-2 Display Board Description and Block Diagram
2.3	F9424-1 Base Board Block Diagram
2.4	F9420-3 ADC Block Diagram
2.5	F9420-4 TDC Block Diagram Sampling Clock Rates vs Time/Div
2.6	F9424-6 Processor Block Diagram
2.7	F9424-7 Front End Block Diagram
2.8	F9451.1 Power Supply Specifications and Block Diagram

2.1 9424 Sub-assemblies

F9424-1	Base Board
F9451-1	Power Supply
F9424-2	Support for Memory Card
F9450-2	Display
F9420-3	Dual channel ADC
F9420-4	Time Base
F9424E-5	Front Panel
F9424-6	Processor
F9424E-7	Quad channel front end
F9424-8	Clock bus
F9424E-9	Rear panel
M9424E	Mechanical for 9424

9424 HARDWARE OVERVIEW



FOR THE USER: THIS IS THE HIGHEST LEVEL OF ABSTRACTION OF THE HARDWARE. IT DOES NOT SHOW THE INTERNALS OF THE HARDWARE, BUT ONLY THE FUNCTIONAL BLOCKS AND THEIR INTERCONNECTIONS.	
LeCrucy CORPORATION	
31000	SCIENTIFIC DIVISION
REQUIREMENT-9	OVERVIEW
CH40	
HW/ISS/MS/MS-A	
18-001-00	1 of 1

2.2 F9450-2 Display Board

2.2.1 General Description

This board is designed to display a monochrome 10" CRT image. The image is composed of instructions downloaded from the processor board 9424-6 into the resident memory via the internal 9424 bus.

The image is a vector type display. The principle of a vector display is to move the spot with intensity ON or OFF between two XY positions of the screen. This represents the major use of the display board. For special applications, the capability of a pseudo-raster mode has been added. This mode is realized by turning the beam spot ON or OFF according to a downloaded bit mask while moving the spot in the x-direction.

The spot position is controlled by the monolithic display processor MDS403. It is a LeCroy proprietary gate array. The data and address busses are 16n bits wide. The processor supports instructions like JMP, JSR, RTS, and 12 bit X, Y or XY vector instructions.

The resident display memory is a static 32K*16 RAM. It can be R/W accessed via the internal 9424 bus, or read only by the MDS403.

The digital X, Y coordinates output from the MDS403, are converted to analog signals by two 12-bit DACs.

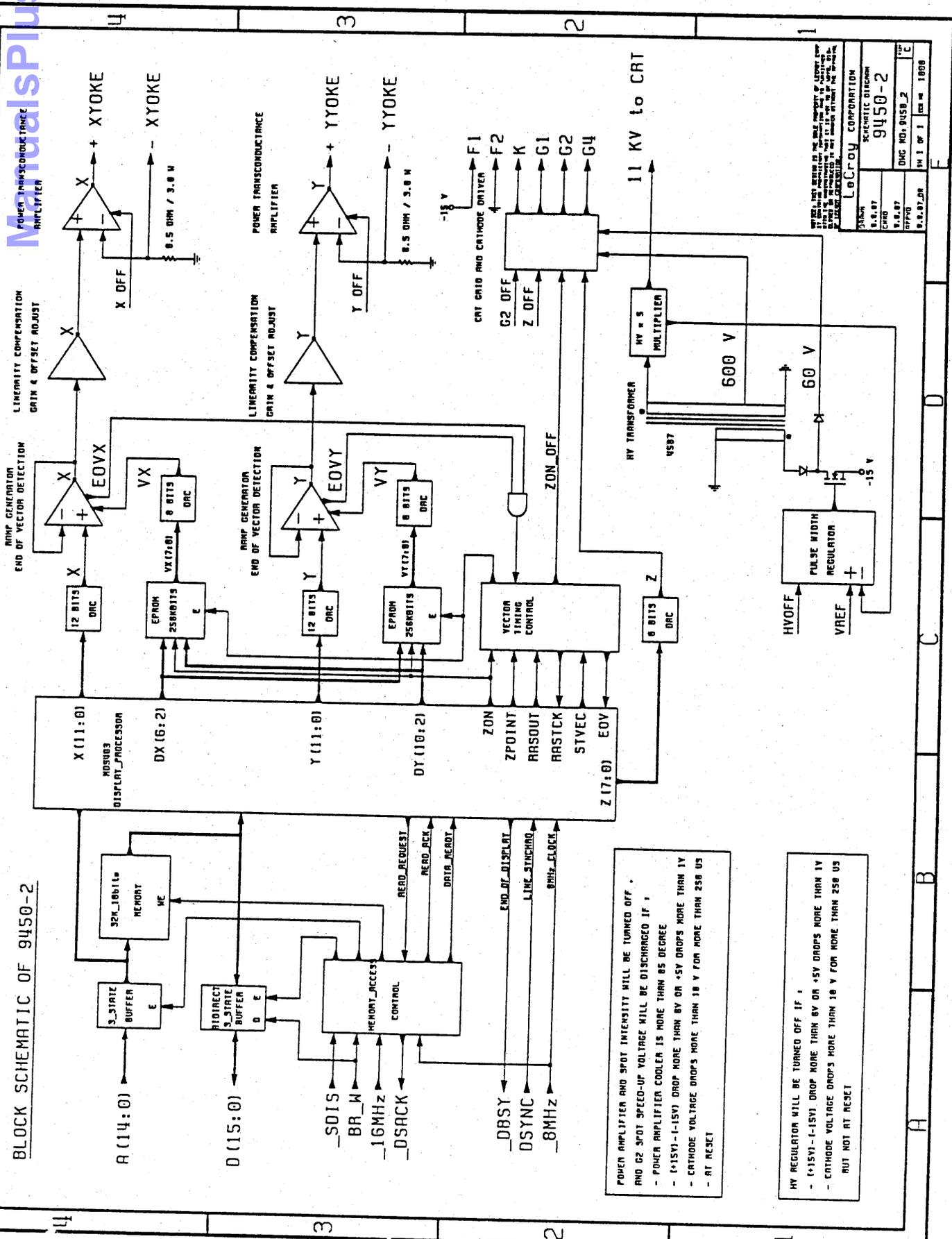
In order to generate a constant spot velocity (intensity) over the screen, there are two rate controlled integrators, one for the X and one for the Y axis. The rate is calculated by table look-up using two EPROMS addressed by delta X and delta Y simultaneously.

For each axis there is a non-linear correction amplifier, one gain and one offset control amplifier, and one transconductance power amplifier to drive the current through the magnetic deflection coil.

The high voltage needed for the CRT is generated with a fly-back mode switching regulator through a high voltage transformer and a diode high voltage multiplier.

Last not least comprehensive protection circuitry is implemented.

BLOCK SCHEMATIC OF 9450-2



THIS UNIT INCLUDES THE MAIN PORTION OF MODEL 9450 WHICH IS DESCRIBED IN THE SERVICE MANUAL FOR MODEL 9450. THIS UNIT IS NOT TO BE USED WITHOUT THE POWER SUPPLY UNIT DESCRIBED IN THE SERVICE MANUAL FOR MODEL 9450.

LeCroy CORPORATION
SCIENTIFIC DIVISION
9450-2
DNC NO. 9450_2
REV. 1 OF 1
DEC 1988

2.2.2. Input Interface and Display Memory

All data and instructions are written into the resident memory by the main processor via the internal bus. The 9424 main processor can read back the display memory in order to plot the screen contents via the external printer port or for test purposes. The display processor can only read the memory to control the display.

The PAL (16R4) RAMACC controls the memory access and timing. One of its flip-flop selects the memory user. Priority is given to the 9424 main processor. All timings are set for memories with maximum access time of 120 nsec.

2.2.2.1 The PAL RAMACC

The line BCK is the 16 MHz master clock from the F9424-6 processor board.

CK8M is BCK divided by two. The external bus R/W access are synchronous to the BCK clock. The MDS403 read cycles are synchronous to the CK8M clock.

The line G244 controls the address driver output state. A high level disables the outputs. The line G245 controls the data driver output state. A High level disables the outputs.

The line BR_W controls the direction of data: '1' to read from memory and '0' to write to memory. The line WE256 is set low during a write cycle to enable the memory data load.

The four lines SDIS, BAS, BR_W and DSACK are to control the R/W timing between the external bus and the memory.

The line SDIS is generated on the F9424-1 base board by decoding the address lines BA19 to BA24. The display address space is hex 178xxxx.

The three lines RREQ, RDACK and RDRDY are to control the read cycle of the MDS403.

2.2.2.2 External Bus to Memory Access Timing

- a. The memory is available. This is the fastest access:

For a read cycle, the line WE256 will remain high for the entire cycle.

When the external user wants to access the memory, SDIS is set to '0'. The access is given at state A0 of the PAL. If the state is A0 and SDIS low, the state will change to A1 at the next trailing edge BCK.

The states A1, A2, A3 and A4 are always two BCK periods long.

The signal G244 will go low and enable the outputs of the external address driver during states A0 through A3 for SDIS low.

The signal G245 will go low and enable the external data driver, according to BR_W, from A1 through A3

The signal WE256 will go low if the memory access is a write cycle, simultaneously with G245. It will remain high for a read cycle.

The ready answer line DSACK is low during the state A2 and A3.

b. The memory is in use:

All signals will remain high (except for BAS and SDIS) until the PAL comes to state A0. The cycle will then be exactly the same. Therefore the maximum number of wait states is 8.

2.2.2.3 MDS403 Memory Access Timing

a. The memory is available. This is the fastest access:

The gate array has read-only memory access. The entire cycle is minimum 500 nsec (8 BCK clock periods).

When the MDS403 wants to access the memory, it sets RREQ to '1'. Access will be granted at the end of state A0 if the external user is not requesting access. Priority is given to the external user. If the memory is not busy and state is A0, access will be given at the next occurrence of CK8M low, at the trailing edge of BCK.

The state will then change to A5 and the signal RDACK will enable the MDS403 to drive the address lines until RREQ returns low.

The states A5 and A6 are always two BCK periods, and the state A7 is always one.

The signal RDRDY goes high at the beginning of state A6 and returns low at the end of state A7. This signal is synchronized in the MDS403 at the falling edge of CK8M and is named 'Rdys'. 'Rdys' enables the MDS403 to load data at the next trailing edge of CK8M. This is two BCK periods after the beginning of the state A6.

The signal RREQ returns low when the data are loaded.

b. The memory is in use:

All signals except RREQ remain low until access can be granted. The cycle is then exactly the same.

2.2.2.4 Reset and Frame Synchronization

At power-on or reset, the beam intensity is set OFF and the spot is positioned to the screen center. The display processor is set in a wait state. The address bus is internally set to hex0000, but the outputs are put into the high impedance state.

The display processor waits until the user enables it to access the memory by sending the first frame synchro. At this moment the processor starts to read data from memory address hex0000. It is the user's responsibility to make sure that the data in the memory makes sense to the display processor.

2.2.3 Display Processor

The MDS403 is a LeCroy proprietary 3K gate array in a ceramic package with 120 pins.

2.2.4 Principle of Vector Display

A vector is a linear displacement of the beam spot between two X,Y positions: the current position and the position to go. Due to the flatness of the screen, the X,Y position of the spot is proportional to the tangent of the respective X,Y deflection currents. This makes a slightly non-linear behaviour which a good display must account for and correct. This is accomplished in the simplest way by a non-linear correction applied to the analog signal amplifier.

A vector is generated by a composition of two X and Y linear current ramps. The start level of both represent the current X,Y position, and the end level represent the X,Y coordinate to go. Two kind of vectors are distinguished: one-axis vectors where the spot moves only along X or Y direction, and two-axis vectors where the spot moves in both the X and Y direction.

The displacement velocity is limited by the power supply and the inductance of the deflection yoke. If one neglects the losses in the yoke and the yoke driver, the maximum attainable velocity is:

$$di/dt = U/L$$

where U is the applied voltage and L the yoke inductance.

In order to get a constant spot velocity for a constant spot intensity, the rate of the X and Y ramps are not the same for all vectors. They depend on the ratio between X and Y displacement.

The rate for a either one-axis vector is equal to the maximum spot velocity V_{spot} .

For two-axis vectors, the individual X and Y rates are calculated using look-up tables contained in two EPROMs. They are addressed by both DX and DY combined and output the resulting X and Y velocities V_x and V_y . For this computation the MDS403 always outputs DX and DY, the difference of current to new spot position.

The combined DX/DY address space and the resulting memory size becomes rapidly very large with increasing DX and DY. This limits the length of two-axis vectors possible in practice, as outlined in the next paragraph.

2.2.5 Practical Limitation of Two-axis Vectors

The limit is imposed by the size of the EPROM to be used and the desired X, Y velocity accuracy.

If we decide to use the largest possible DX, DY we need $2048 \times 2048 = 4.2$ mega times 10 bits for 1 per 1000 precision. This makes 42 megabits of EPROM and is certainly not realistic.

The design of the analog X and Y ramp generator limits the precision to about 1%. Therefore the X and Y rate DAC outputs are chosen 8 bits wide.

The X and Y position DACs are 12 bits. The least significant bit represents 0.04 mm on the screen. Therefore the two LSBs are not used.

Two-axis vectors are needed to draw characters which don't require large vectors. For drawing traces, only small DX values are needed. The final choice on the DX/DY size is to use bits 2 to 10 of DY and bits 2 to 6 of DX. This results in the following limitation:

- +/- 31 counts for DX and DY for the instructions MOXY and DRXY (move and draw XY)
- +/- 127 for DX and +/- 2047 for DY, for the four auto X increment instructions (MYAX, DYAX, PYAX and DPYX)

This makes a memory size of 16 Kbytes. As the signal ZON is also input as a memory address, the final EPROM size used is 32 Kbytes, one each for VX and VY rate.

2.2.6 Vector by MDS403

When the beam spot has reached the final XY position, the signal EOV (end of vector) becomes true and the MDS403 is enable to load the next XY position. The strobe VECSTR indicates that a new XY value is loaded. AT the same time it loads the signals DX, DY, VMAX, ZON, ZPOINT and RASOUT.

The signal EOV must be tied to low directly after the signal VECSTR goes high, until the XY position has reached the final value. EOV will be high again, and enables the MDS403 to send a new XY position.

2.2.7 Spot Intensity Control and Timing Principle

Of the 12 bits available for the spot intensity (ZC0 to ZC11), only 8 are used. The ZC register, internal to the MDS403, is not reloaded with a new value until the vector in progress is completed (i.e. EOV high). There is, however, a delay of about 600 nsec between the end of vector at the output of the ramp generator and the actual yoke current change. This is accounted for by adjustable start-of-vector and end-of-vector delays, as described in paragraph 10.

The 8 intensity bits are converted to analog current by an 8-bit DAC. This current controls via an amplifier the cathode voltage of the CRT. It is 42 V for OFF and about 15 V for full intensity (hexff).

The digital ON/OFF control at the beginning and end of vectors is done by the ZCTR signal output from the PAL INTCTR.

A special hardware feature of the F9450-2 display is the "pointed" vectors with an intensified point at the end, used to highlight the actual digitized data points out of the linear interpolation. This is realized by increasing the beam ON control timing by 500 nsec. During this extra time the spot does not move and gives therefore rise to the intensified point.

2.2.8 The Ramp Generator

The X and Y outputs, 12 bits each, from the MDS403 processor are converted to analog voltage by two 12-bit DACs, A13 and A14. The VX and VY outputs of the two rate EPROMs are converted to analog current by two 8-bit DACs, A10 and A11.

The voltage V_{out} at the capacitor (C74 and C75 in circuit) represents the current spot position, and V_{in} the final spot position at the end of a vector to be drawn. While V_{in} and V_{out} are different, the capacitor is charged or discharged with a rate given by I_{in} , the integrator current, until V_{out} reaches V_{in} . The analog X/Y positions are connected to the positive input of the X or Y ramp generator. The analog rate signal XINT and YINT are connected to the current control of the respective ramp generator.

In order to allow for sufficient look-up time for the VX and VY rates from the EPROMs, a delay of 250 nsec is generated after the new X,Y positions are loaded (VECSTR from MDS403 to the PAL VECTIM, and OESPEED from the PAL to enable the EPROM outputs). During this delay, the analog rates are held at zero which keeps the analog X/Y positions stable.

The analog signal WRVEC, "end of vector", goes low when the spot has reached the final position. In the PAL VECTIM the falling edge of WRVEC gives rise to EOVS high which enables the MDS403 processor to load the next X, Y position or intensity value, and, after a separate delay, turns OFF the intensity (ZCTR). EOVS is further delayed if the draw mode "pointed vector" is enabled.

2.2.9 Vector Timing

After the display processor has loaded a new X, Y position, a delay is generated to allow for the EPROM look-up time of the VX, VY rates. After that delay, the vector is drawn on the screen. When the spot reaches its final position, the EOVS line goes high and enables the processor to output the next X, Y position. The intensity ON/OFF control line ZCTR is subject to additional delays to account for the inertia of the yoke current changes.

In raster mode, the intensity ON/OFF bits are shifted out of the display processor while the beam is moving, using an extra asynchronous raster clock (C96, R54, R219 next to PAL VECTIM). A divider by two, three or four is used (PAL RASTCK). It is controlled by the size of the possible X-increments, bits DX5 to DX7.

The timing is controlled by the asynchronous clock generated with the PAL VAZTIM in conjunction with a counter (A8) which is reset to 0 at each start of a new vector. The rate enable is OFF from state 0 to state 3 included. At state 4, the rate is enabled and the vector drawn. For "move" vectors, the rate is not set OFF from state 0 to 3. The signal ZON goes low at the same time. It returns high when the signal WRVEC goes low. After a delay defined by the yoke inertia, ZCTR enables the intensity of the spot. For raster vectors, the signal ZON follows inverted the raster intensity control line RASOUT from the MDS403.

2.2.9.1 Timing Diagram for Draw Mode

The two delays SVD and EVD have, in addition to the fixed digital delay, a small analog adjust range provided by potentiometers R45 and R46.

For "move" type vectors, the signal OESPEED remains low and the signal ZON, ZCTR remains high. Both WRVEC and EOVS are the same as for draw vectors.

2.2.9.2 Timing Diagram for Point Mode

For "point" vectors, the intensity is set ON at the end of the vector for about 1 usec. The signal EOV goes high after the intensity is OFF again. The extra timing for point vectors is an analog fixed delay in the PAL VAZTIM.

2.2.9.3 Raster Mode Timing

There are three raster steps available. The selection is made by loading the auto-increment register of the gate array. The increment may be positive or negative. For a better display timing, it is preferable to implement a raster display with lines drawn in the positive and negative horizontal direction. In this way there is no time lost by returning the spot to the start of the next line. For a raster command, the first intensity bit out of the gate array is always bit d0, regardless of the direction. (positive or negative horizontal)

The intensity bits are shifted out of the gate array with the clock RCKOUT from PAL RASTCK (A29). This clock gets automatically set to the frequency corresponding to the step selected.

The timing is the same as for the draw mode, except for ZON and ZCTR which follow the intensity bits out of the display processor.

For each raster instruction there are eight clock pulses on the line RCKOUT to output the intensity bits. The period depends on the Xinc step selected.

2.2.10 Velocity and Position: Digital to Analog Correspondence

For all move vectors, the X and Y rates are maximum and equal to 255 hex.

For one-axis draw vectors, the maximum rate is different for X and Y because the length in millimeters on the screen of the same deltaX and deltaY is different. The maximum X rate is CC hex, and the maximum Y rate is FF (1.44 mA and 1.6 mA).

For a CRT high voltage of 11 kV.

2.2.11 Deflection Non-Linearity

In a CRT the deflection angle is proportional to the deflection coil current. On a flat screen, the spot position is proportional to the tangent of the current. This effect is accounted for by two (X and Y) nonlinear amplifiers, using diode characteristics in the feed-back loop.

2.2.12 X/Y Power Transconductance Amplifier

These amplifiers provide the current for the deflection coils. The current is measured through a shunt resistor of 0.44 Ohm.

The bandwidth depends on the transconductance of the output power MOSFET which changes with the drain-source current.

The amplifier is provided with an OFF command to disable it in case of overheat or when the protection circuitry detects a problem.

The left side panel of the 9424 box is used as the heat sink.

2.2.13 High Voltage Power Supply

The switching fly-back regulator generates 3 voltages: 2.2Kv which is divided by 1000 for the feed-back loop, 600 V and 60 V. The 11 kV is made through a high voltage times five multiplier.

In operation, the current drawn from the 11 kV supply (anode current) may be up to 300 uA. The current causes a voltage drop due to the internal output impedance of the multiplier, up to 500 V. The deflection angle depends slightly on the anode voltage. To compensate for this, the reference point of the regulator is increased proportional to the current drawn.

In order to improve the efficiency, the switching frequency of the regulator is automatically adjusted to the self-resonant frequency of the high voltage transformer which is about 80 kHz.

The supply is equipped with an OFF control line to disable its operation when the protection circuitry detects a fault condition (+- 15 V power drop, +5 V power drop, HV supply defective).

2.2.14 Deflection Yoke

The deflection is realized by a symmetrical coil which represents a 250 uH inductance. It's resonant frequency is 1.2 MHz. In parallel a 1 KOhm resistor is added. The value is given by:

$$R = 0.5 \text{ SQRT } (L/C)$$

It corresponds to the critical damping.

Attached to the coil are four permanent magnets to compensate for the pin cushion effect caused by the coil and the CRT.

2.2.15 Cathode Ray Tube

It is a "10", 90 deg rectangular CRT with a 20 mm neck diameter. The screen is antireflecting. The useful area is $189 * 149 \text{ mm}^2$. The phosphor is orange L5C.

2.2.16 Screen Protection Circuitry

In order to prevent damage to the CRT screen, the intensity Control is set OFF, grid 2 speed-up voltage is set to 0 V and the power amplifier is turned off under one of the following conditions:

- power amplifier temperature above 85 deg centigrade
- +15 and -15 V drops by more than 6 V
- +5 V drops by more than 1 V
- cathode voltage drops by more than 10 V for more than 300 usec
- at reset

In addition, the high voltage regulator is turned off under one of the following conditions:

- +15 V or -15 V drop by more than 6 V
- +5 V drops by more than 1 V
- cathode voltage drops by more than 10 V for more than 300 usec

During the time the reset signal is low, the HV regulator is not turned off in order to allow it to come up.

2.2.17 Operation Status Lines

The ON/OFF state of the power amplifier, HV power supply and the intensity and grid 2 voltage is controlled by four comparators (A22). They drive lines SHUT and ZAMPOFF. The signals XOFF, YOFF and INTOFF are the same and controlled by ZAMPOFF through transistors Q68 to Q70. HVREGOFF is controlled by the line SHUT. Therefore there are two different signals which control the status of the board: ZAMPOFF and SHUT.

The signal SHUT has priority over ZAMPOFF. The line SHUT may pull down ZAMPOFF through diodes D37 to D9. The inverse is not possible.

The line SHUT is the wired OR of the three comparator outputs:

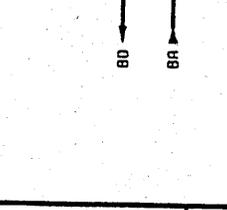
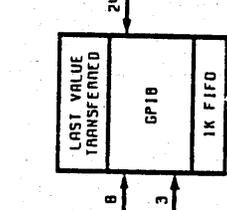
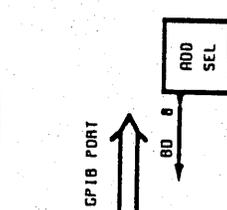
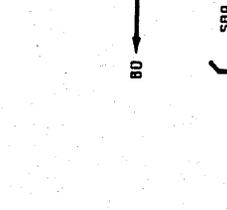
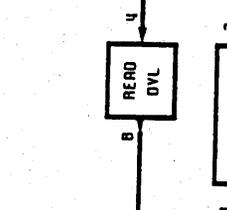
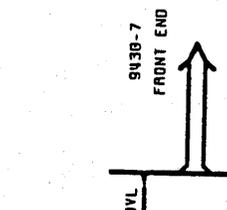
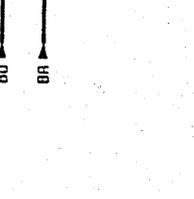
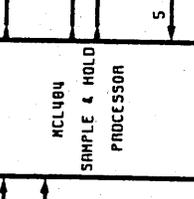
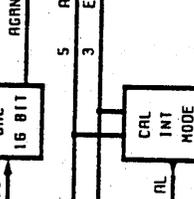
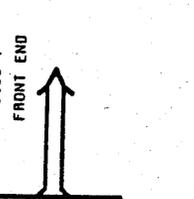
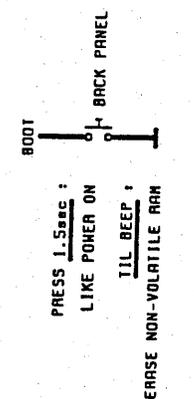
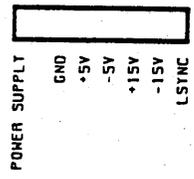
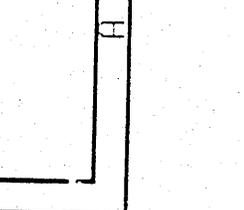
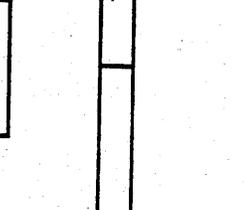
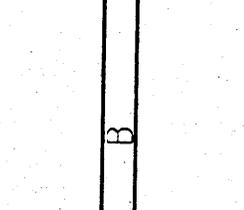
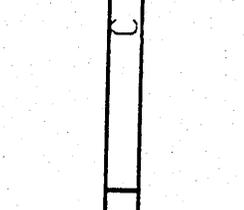
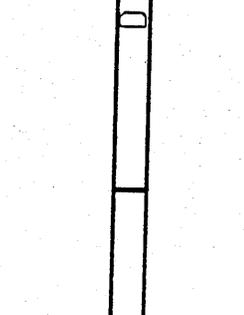
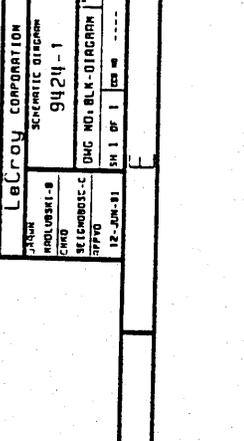
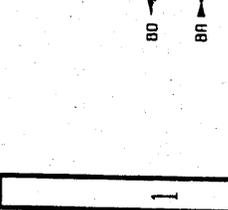
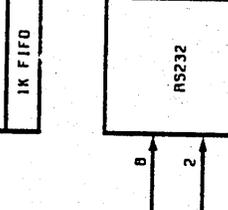
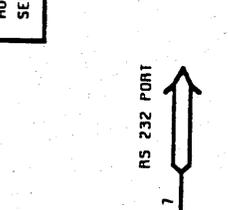
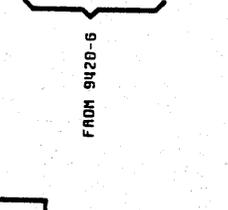
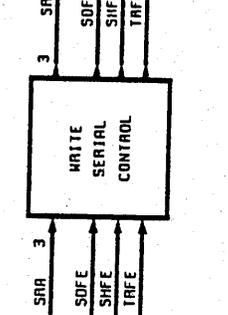
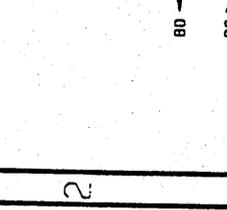
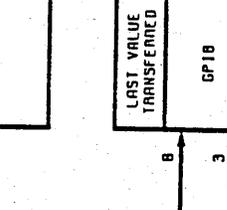
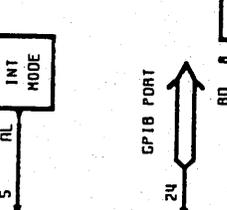
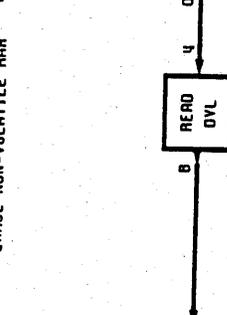
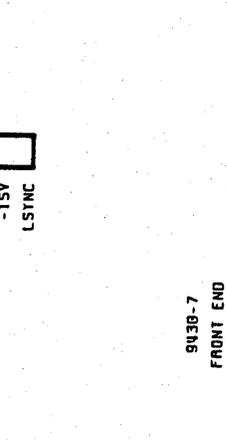
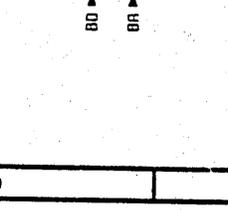
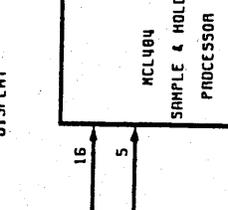
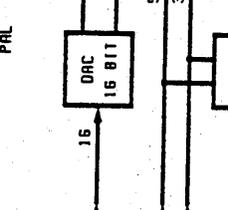
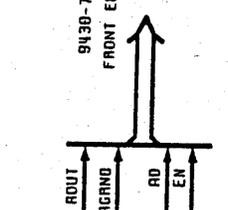
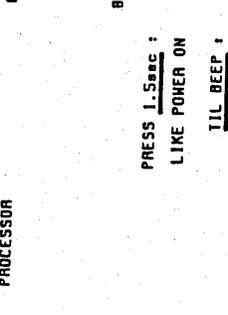
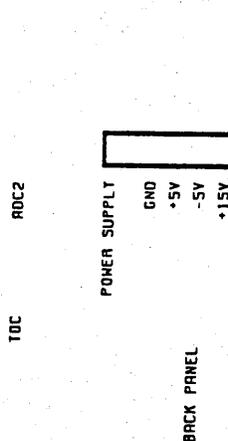
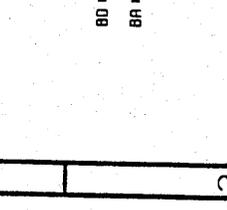
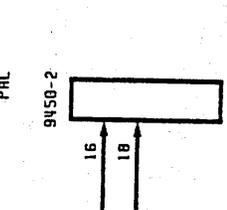
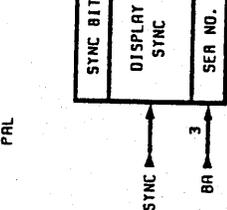
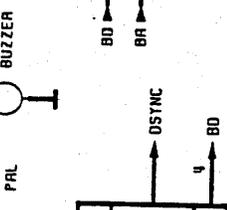
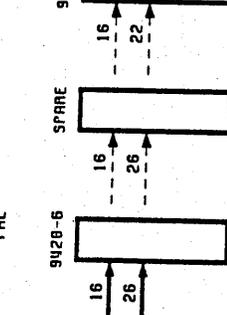
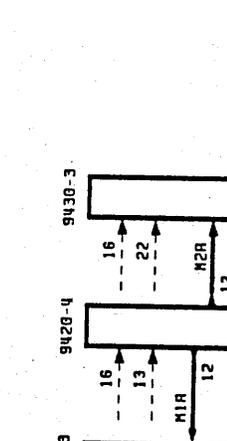
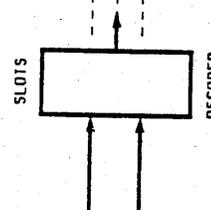
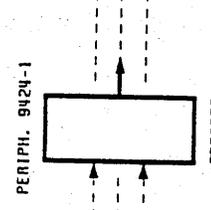
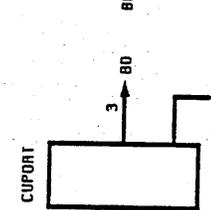
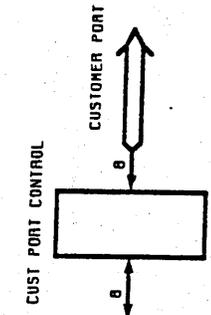
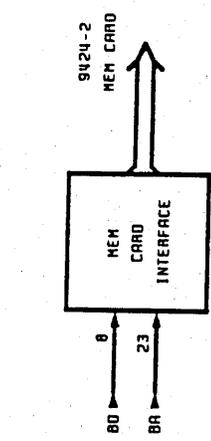
- pin 22 of A22: low if +5 V is less than 4V
- pin 14 of A22: low if +15 V or -15 V drop by more than 6 V
- pin 1 of A22: low if cathode voltage is less than 30 V for more than 300 usec after reset. The time constant is realized by R33, R271, R214 and C1, C13. The input to the comparator, pin 6 of A22, is low at -15 V while the reset is low.

If one of these three lines is low, SHUT is low. If all three lines are high (about -10 V), SHUT is high (-10 V).

The line ZAMPOFF is the wired OR of the three following signals:

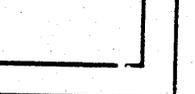
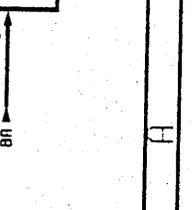
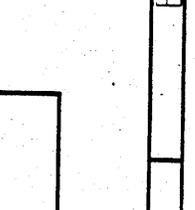
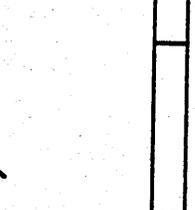
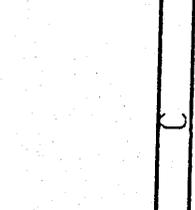
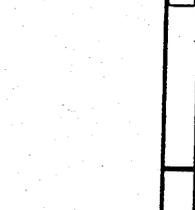
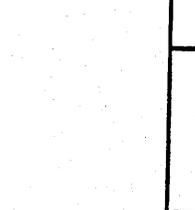
- Thermal switch: pulls down ZAMPOFF if the power amplifier exceeds 85 degree centigrade.
- pin 2 of A22: pulls down ZAMPOFF while reset is low.
- signal SHUT: pulls down ZAMPOFF if low.

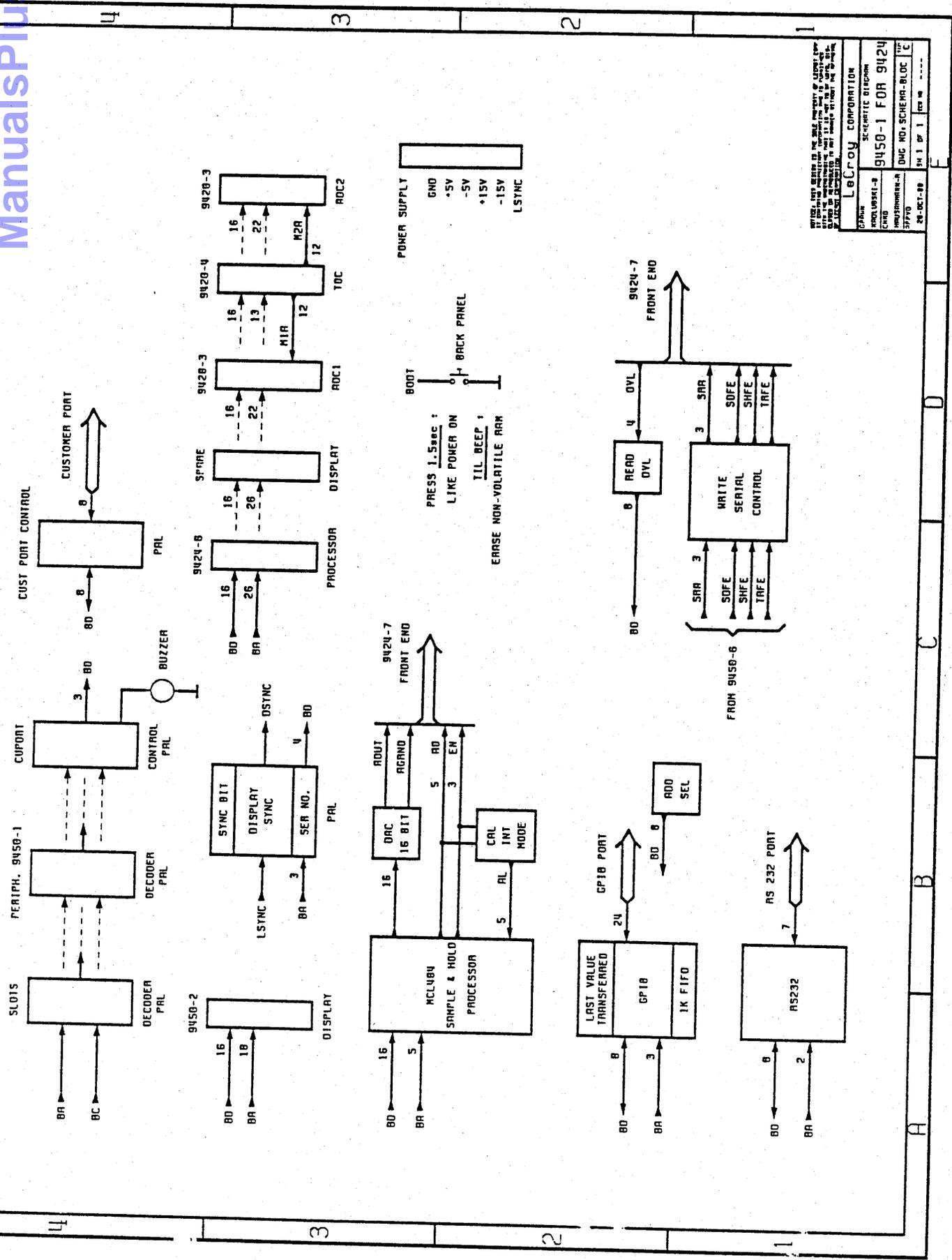
If one of these lines is low (-15 V), ZAMPOFF is low. If all three are high (about -10 V), ZAMPOFF is high (about -10 V).



NOTICE: THIS MANUAL IS THE SOLE PROPERTY OF LEXROY CORP. IT IS TO BE KEPT IN THE IMMEDIATE VICINITY OF THE EQUIPMENT TO WHICH IT APPLIES. IT IS TO BE RETURNED TO THE COMPANY AT THE TIME OF EQUIPMENT RETURN. 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.

LEXROY CORPORATION
 9424-1
 DMC NO. BLK-DIAGRAM
 12-JUN-81

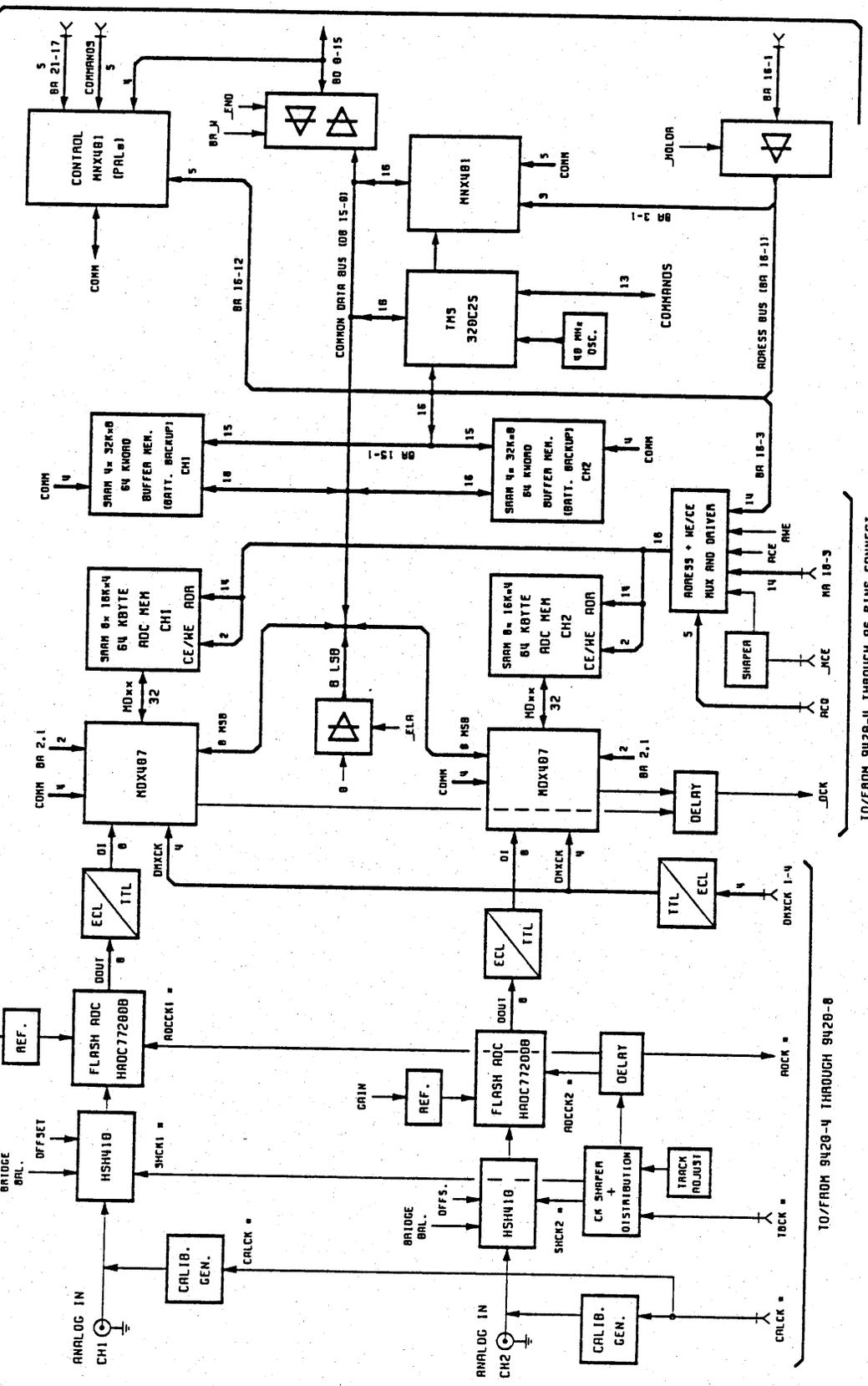




NOTICE: THIS SCHEMATIC IS THE SOLE PROPERTY OF LEICROY CORPORATION. IT IS TO BE USED ONLY FOR THE EQUIPMENT AND SYSTEMS FOR WHICH IT IS DESIGNED. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

LEICROY CORPORATION	SCHEMATIC DESIGN
MODEL 9420-1	9450-1 FOR 9424
DATE: 28-OCT-88	REV: 1
DESIGNER: J. B. ...	DWG. NO.: SCHEM-9420-1
CHECKED: ...	SCALE: 1:1

INTERFACE TO
68920 BUS
(96 PINS CONNECT.)



THIS ICEL, PART NUMBER 9420-3, IS THE PROPERTY OF LUCENT TECHNOLOGIES CORPORATION. IT IS LOANED TO YOU BY THE INFORMATION SYSTEMS GROUP. IT IS TO BE RETURNED TO THE INFORMATION SYSTEMS GROUP, 100 NEW YORK AVENUE, NEW YORK, NY 10021. NO PART OF THIS ICEL 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.

DATE	10-19-88	REV	1 OF 1
DESIGNER	LABROY CORPORATION	MODEL	9420-3
ENGINEER	LABROY CORPORATION	REV	ADC
TESTER	LABROY CORPORATION	CHKD BY	LABROY CORPORATION
DATE	10-19-88	CHKD BY	LABROY CORPORATION

TO/FROM 9420-4 THROUGH 96 PINS CONNECT.

TO/FROM 9420-4 THROUGH 9420-8

DIFFERENTIAL ECL CLOCK LINES

2.5 Sampling Clock Rates vs Time/div

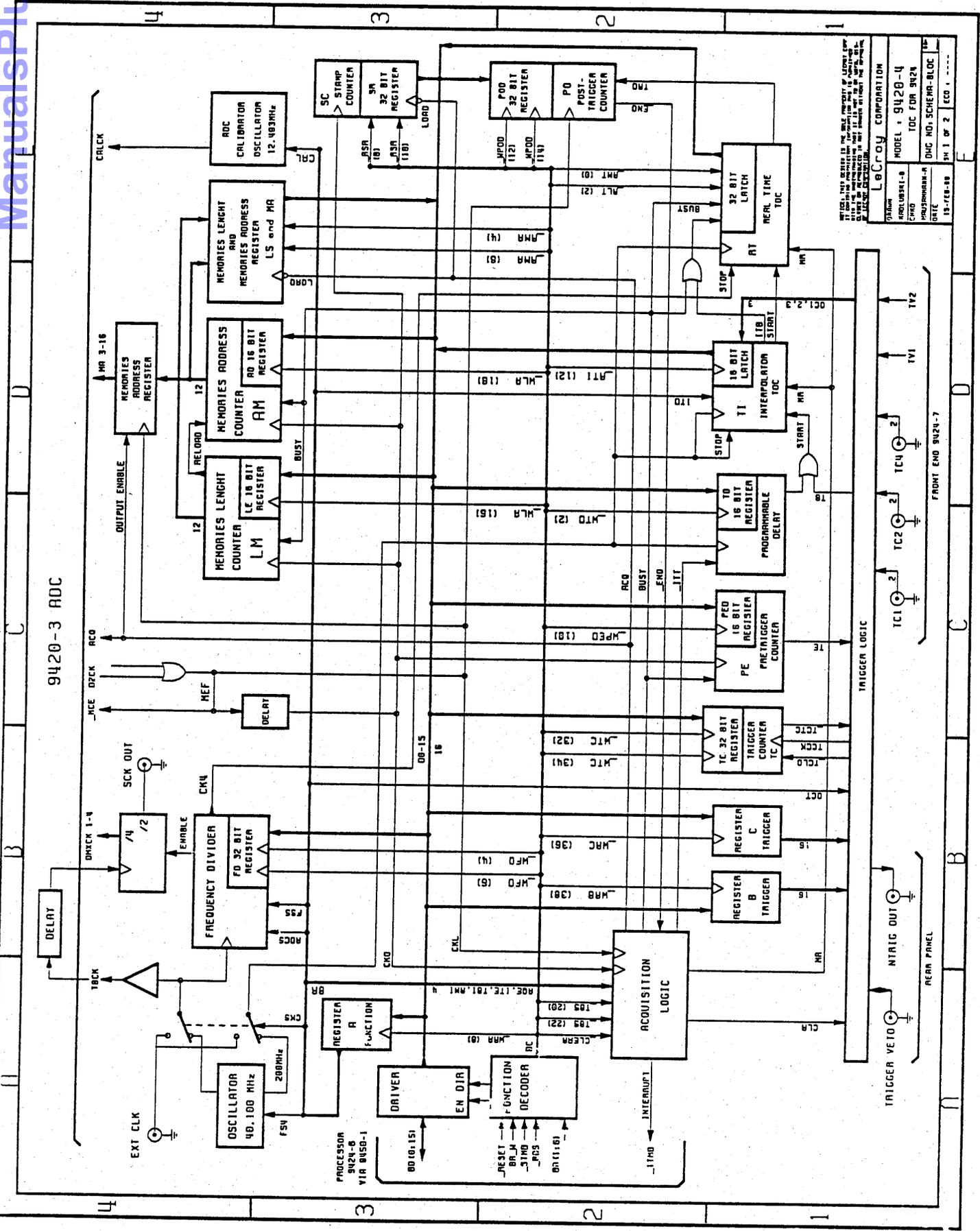
Single-shot:

Sampl. Rate Ms/sec	Sample Intvl nsec	Time/div
100	10	50 nsec
		.
100	10.0	50 μ sec
40	25	.1 msec
20	50	.2 msec
10	100	.5 msec
4	250	1 msec
2	500	2 msec
1	1000	5 msec
.	.	.
.	.	.
.	.	.
1 Hz	1 sec	5 ksec

RIS:

Sampl. Rate Ms/sec	Equiv. rate Gs/sec	Sample Intvl.	Time/div
100	10	100 psec	1 nsec
			.
100	4	250 psec	1 μ sec
100	2	500 psec	2 μ sec
100	1	1 nsec	5 μ sec
100	.5	2 nsec	10 μ sec
100	.2	5 nsec	20 μ sec

9420-3 ADC



MODEL: 9420-4
 TOC FOR 9424
 DHC NO. SCHEM-BLOC
 15-722-10
 PH 1 OF 2 ECO

LECROY CORPORATION
 ENCLOSURE-B
 CARD PROGRAMMER-A
 DATE

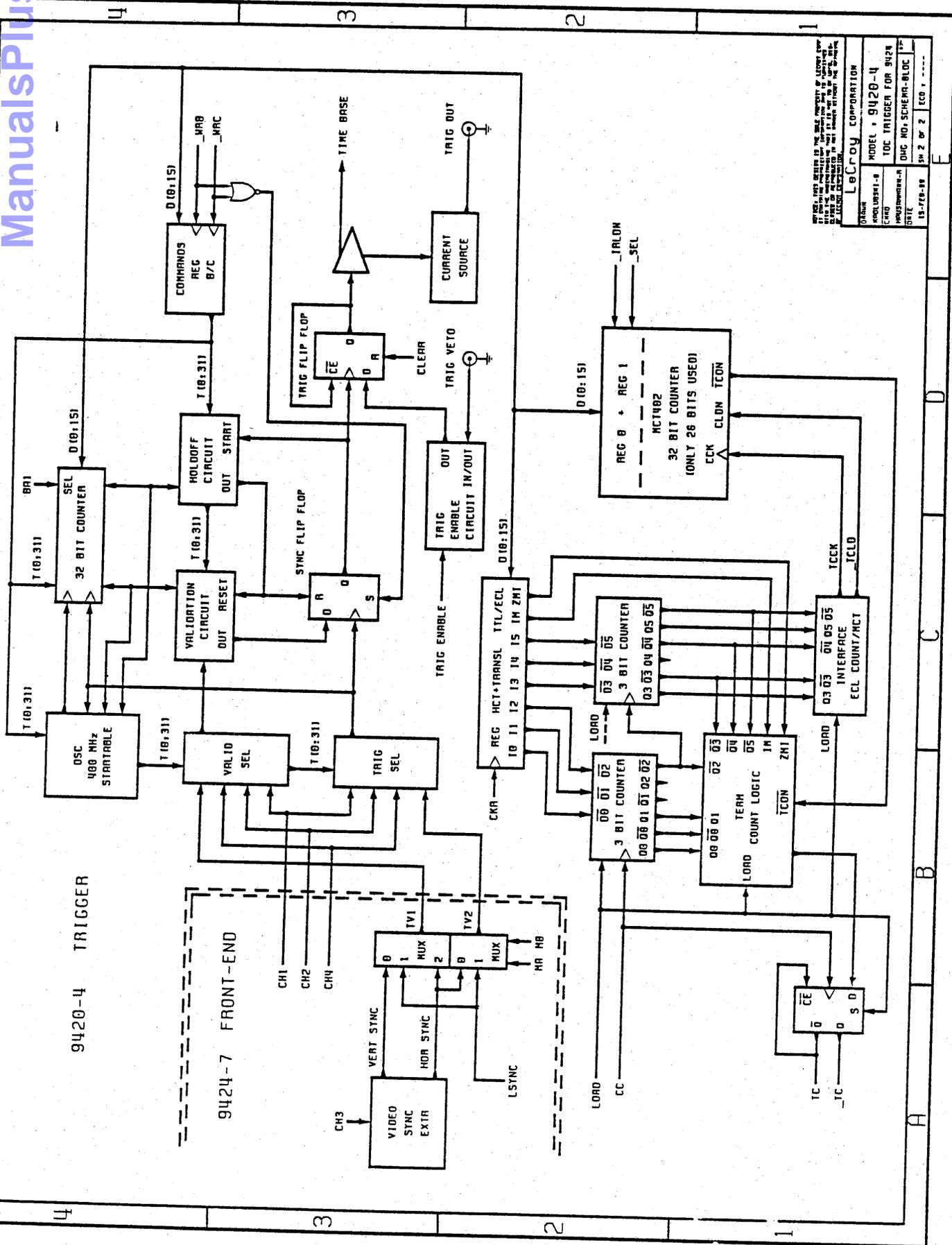
FRONT END 9424-7
 T1
 T2
 T3
 T4
 T5
 T6
 T7
 T8
 T9
 T10
 T11
 T12
 T13
 T14
 T15
 T16
 T17
 T18
 T19
 T20
 T21
 T22
 T23
 T24
 T25
 T26
 T27
 T28
 T29
 T30
 T31
 T32
 T33
 T34
 T35
 T36
 T37
 T38
 T39
 T40
 T41
 T42
 T43
 T44
 T45
 T46
 T47
 T48
 T49
 T50
 T51
 T52
 T53
 T54
 T55
 T56
 T57
 T58
 T59
 T60
 T61
 T62
 T63
 T64
 T65
 T66
 T67
 T68
 T69
 T70
 T71
 T72
 T73
 T74
 T75
 T76
 T77
 T78
 T79
 T80
 T81
 T82
 T83
 T84
 T85
 T86
 T87
 T88
 T89
 T90
 T91
 T92
 T93
 T94
 T95
 T96
 T97
 T98
 T99
 T100

REAR PANEL
 TRIGGER VETO
 INTIG OUT

TRIGGER LOGIC
 T1
 T2
 T3
 T4
 T5
 T6
 T7
 T8
 T9
 T10
 T11
 T12
 T13
 T14
 T15
 T16
 T17
 T18
 T19
 T20
 T21
 T22
 T23
 T24
 T25
 T26
 T27
 T28
 T29
 T30
 T31
 T32
 T33
 T34
 T35
 T36
 T37
 T38
 T39
 T40
 T41
 T42
 T43
 T44
 T45
 T46
 T47
 T48
 T49
 T50
 T51
 T52
 T53
 T54
 T55
 T56
 T57
 T58
 T59
 T60
 T61
 T62
 T63
 T64
 T65
 T66
 T67
 T68
 T69
 T70
 T71
 T72
 T73
 T74
 T75
 T76
 T77
 T78
 T79
 T80
 T81
 T82
 T83
 T84
 T85
 T86
 T87
 T88
 T89
 T90
 T91
 T92
 T93
 T94
 T95
 T96
 T97
 T98
 T99
 T100

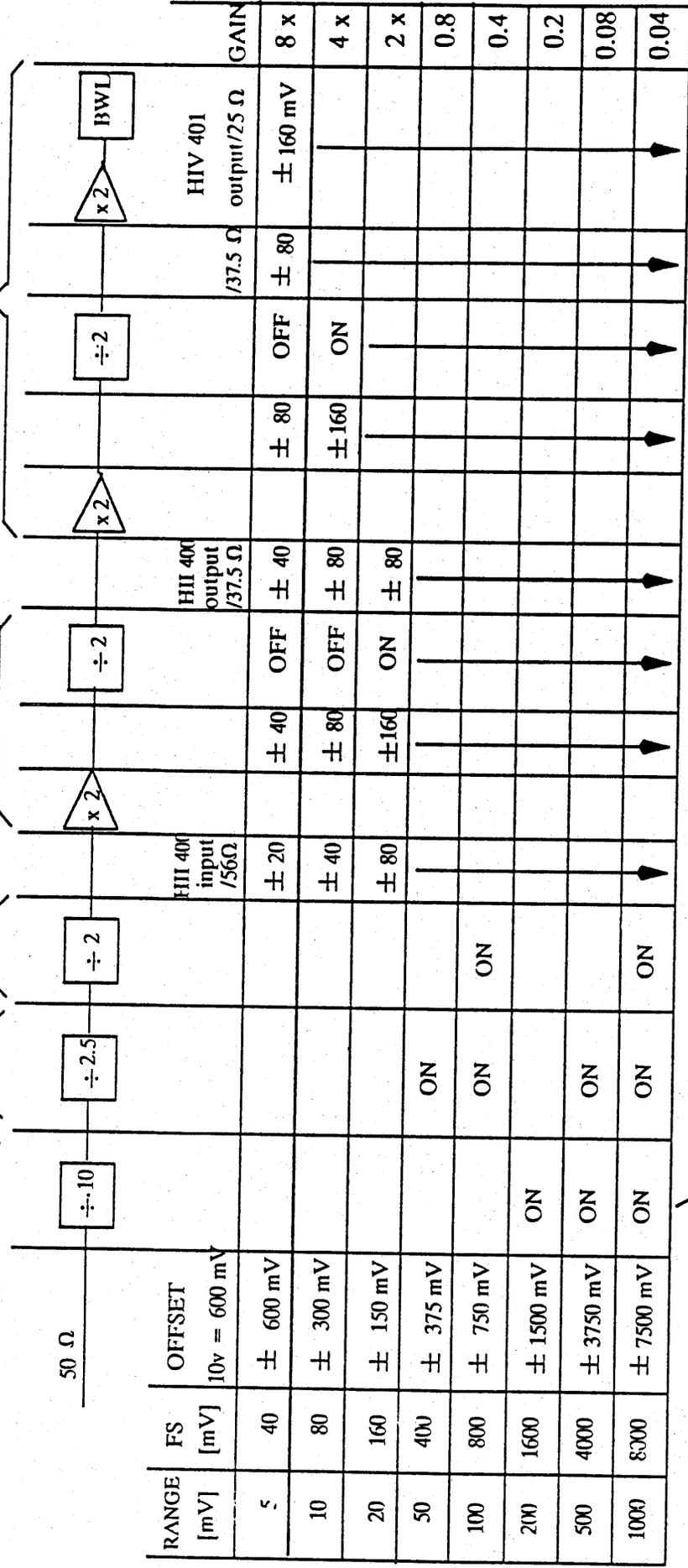
9420-4 TRIGGER

9424-7 FRONT-END



THIS DRAWING IS THE PROPERTY OF LEADERSHIP ELECTRONICS CORPORATION. IT IS TO BE USED ONLY FOR THE PROJECT AND FOR THE QUANTITY SPECIFIED THEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

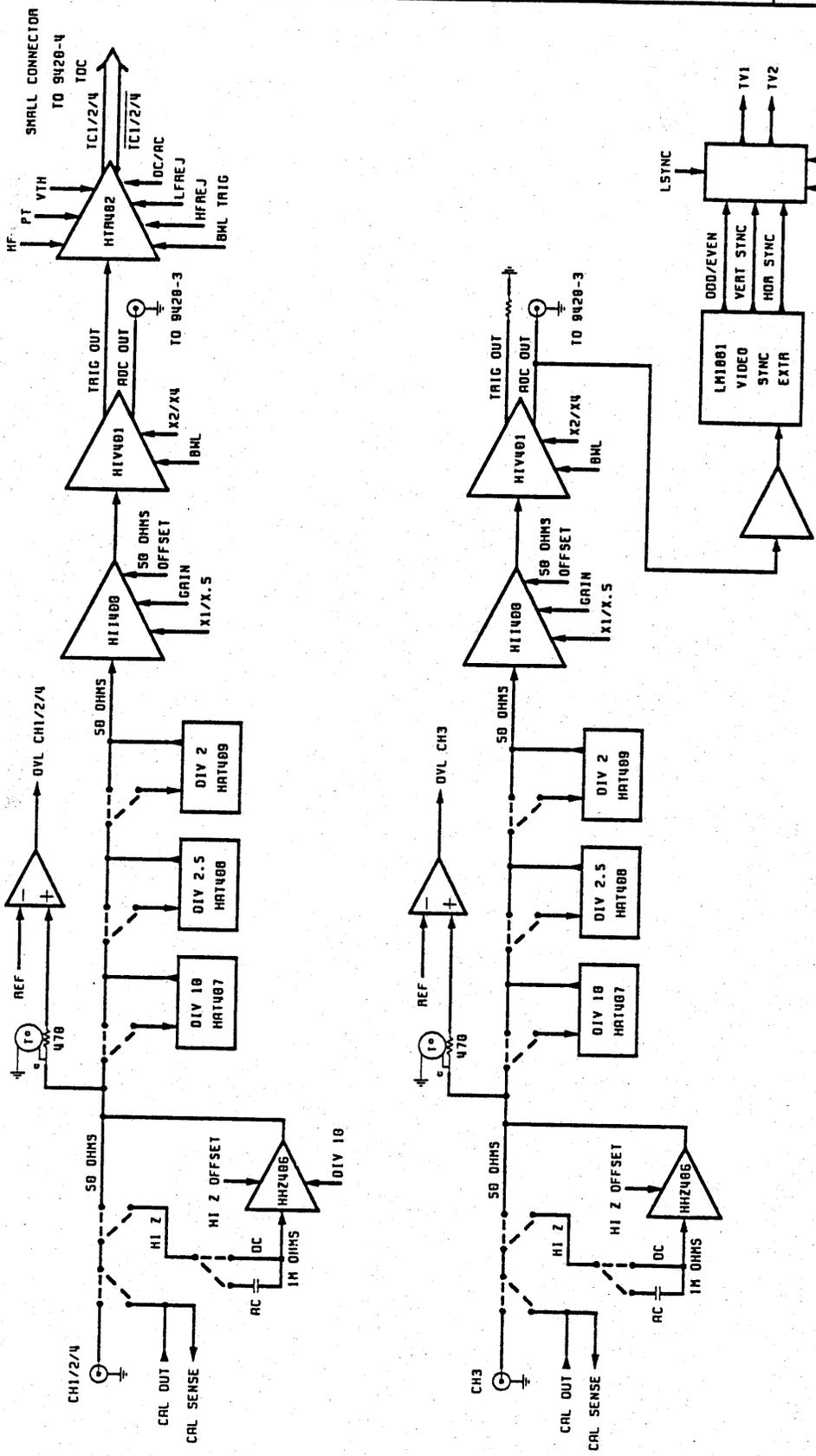
DATE	18-7-80
DESIGNER	LeCroy CORPORATION
MODEL	9420-4
REV	TDC TRIGGER FOR 9424
REV	001
REV	002
REV	003
REV	004
REV	005
REV	006
REV	007
REV	008
REV	009
REV	010
REV	011
REV	012
REV	013
REV	014
REV	015
REV	016
REV	017
REV	018
REV	019
REV	020
REV	021
REV	022
REV	023
REV	024
REV	025
REV	026
REV	027
REV	028
REV	029
REV	030
REV	031
REV	032
REV	033
REV	034
REV	035
REV	036
REV	037
REV	038
REV	039
REV	040
REV	041
REV	042
REV	043
REV	044
REV	045
REV	046
REV	047
REV	048
REV	049
REV	050
REV	051
REV	052
REV	053
REV	054
REV	055
REV	056
REV	057
REV	058
REV	059
REV	060
REV	061
REV	062
REV	063
REV	064
REV	065
REV	066
REV	067
REV	068
REV	069
REV	070
REV	071
REV	072
REV	073
REV	074
REV	075
REV	076
REV	077
REV	078
REV	079
REV	080
REV	081
REV	082
REV	083
REV	084
REV	085
REV	086
REV	087
REV	088
REV	089
REV	090
REV	091
REV	092
REV	093
REV	094
REV	095
REV	096
REV	097
REV	098
REV	099
REV	100



RANGE [mV]	FS [mV]	OFFSET 10v = 600 mV	IIAT 407 ÷10	IIAT 408 ÷2.5	IIAT 409 ÷2	HII 400 input /56Ω x2	HII 400 output /37.5Ω ÷2	HIV 401 output/25Ω x2	BWL	GAIN
5	40	± 600 mV				± 20	± 40	± 80		8 x
10	80	± 300 mV				± 40	± 80	± 160		4 x
20	160	± 150 mV				± 80	± 80			2 x
50	400	± 375 mV		ON						0.8
100	800	± 750 mV		ON	ON					0.4
200	1600	± 1500 mV	ON							0.2
500	4000	± 3750 mV	ON	ON						0.08
1000	8000	± 7500 mV	ON	ON	ON					0.04

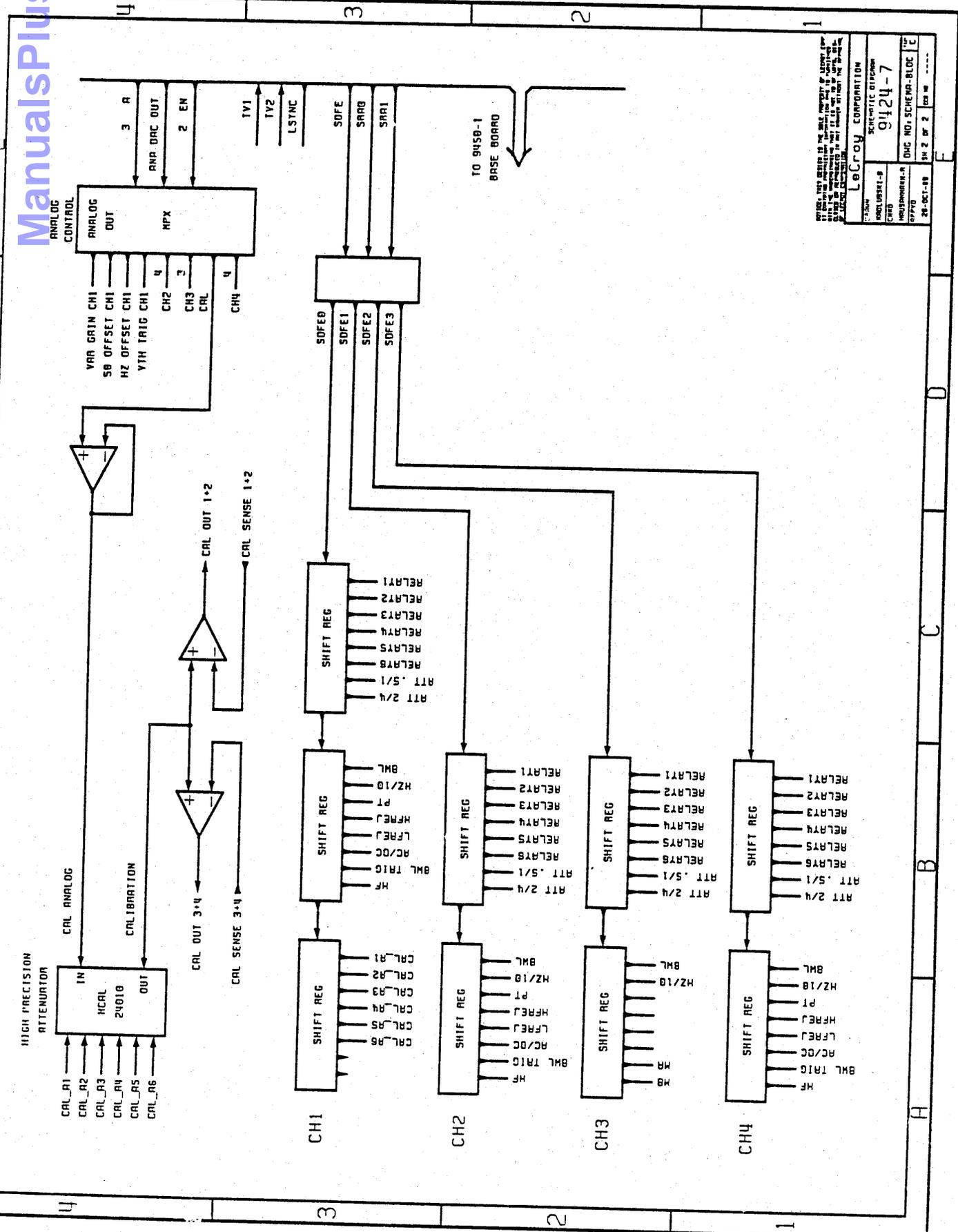
HZ ÷ 10 HZ out

50	400	OFF	± 200	OFF	ON	± 80				
100	800	OFF	± 400	ON	ON	± 80	± 80	± 80	± 160	
200	1600	ON	± 80			± 80	± 80	± 80	± 160	
500	4000	ON	± 200	ON	ON	± 80	± 80	± 80	± 160	
1000	8000	ON	± 400	ON	ON	± 80	± 80	± 80	± 160	



THIS DOCUMENT IS THE PROPERTY OF LEICROY CORPORATION. IT IS TO BE RETURNED TO THE COMPANY OR TO THE USER'S SUPERVISOR. 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	LEICROY CORPORATION
SCHEMATIC SYMBOL	9424-7
REV	
DATE	
DESIGNED BY	
CHECKED BY	
APP'D	
28-OCT-88	SH 1 OF 2



THIS DRAWING IS THE PROPERTY OF LEICROY CORPORATION
 IT IS TO BE USED ONLY FOR THE PROJECT AND FOR THE QUANTITY
 SPECIFIED THEREON. IT IS TO BE RETURNED TO LEICROY CORPORATION
 UPON COMPLETION OF THE PROJECT AND SHALL NOT BE REPRODUCED
 OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION
 OF LEICROY CORPORATION.

LeCroy CORPORATION
 SCHEMATIC DRAWING
 9424-7
 DRAWING NO. SCHEM-DLOC 12
 28-OCT-68 SH 2 OF 2 (REV)

MODEL 9451-1 POWER SUPPLY

Specifications

Input voltage:	90 to 132 V _{AC} , 180 to 264 V _{AC} , selected by the user
Input frequency:	45 to 440 Hz
Inrush current:	max. 10 A at start-up
Operating temperature range:	0° C to 65° C at full load
Hold-up time:	min. 20 msec, at full load and minimal input
Conducting EMI:	VDE 0871 curve B, IEC 801
Isolation:	VDE 0411/0730/0804/0806, IEC 348/380/435 3750 V _{AC} , 4000 V _{DC} input lines to ground leakage current <5 mA _{AC} , 50 Hz
Input over-voltage protection:	yes
Outputs:	four, with common return (ground)
Output voltage:	out 1, +15 V: +15.00 V ±1%, nom. 3.2 A _{RMS} out 2, -15 V: -15.04 V ±1%, nom. 3.8 A _{RMS} out 3, +5 V: +5.07 V ±1%, nom. 8.6 A _{RMS} out 4, -5 V: -5.16 V ±1%, nom. 10.8 A _{RMS}
Output voltage adjustment:	min. ±5%
Output over-voltage protection:	no
Line regulation:	max. 0.1% at any load
Output voltage regulation:	+15 V and -15 V: ±1% 1.5 A to 4.5 A load +5 V: ±1% 6 A to 11 A load -5 V: ±1% 9 A to 13 A load
Transient response (100 Hz):	+15 V and -15 V: <0.5 V, 500 μsec: 2 A to 4.5 A + 5 V: <0.2 V, 500 μsec: 6 A to 11 A

Output ripple and noise:

+15 V and -15 V: max. 100 mV_{pp} (100 MHz)

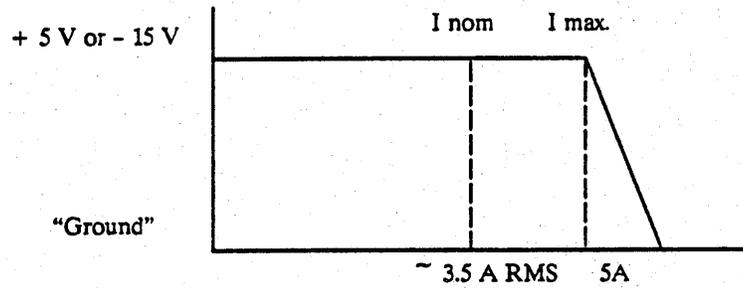
+5 V and -5 V: max. 80 mV_{pp} (100 MHz)

50 Hz output ripple:

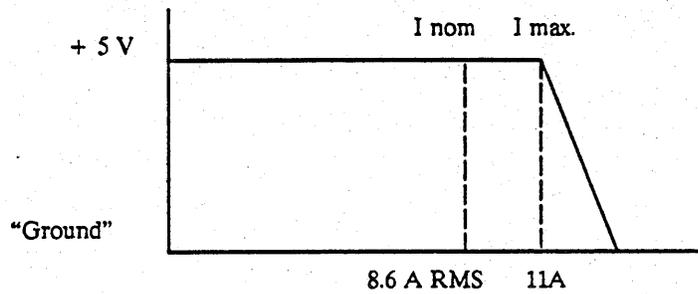
max. 5 mV

Maximum output current:

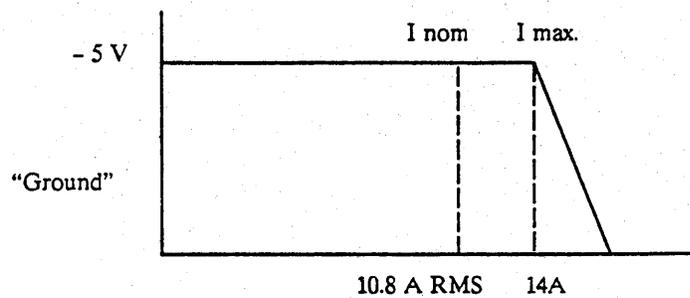
+ 15 V and - 15 V: I max. = 5 A₊₁⁻⁰



+ 5 V : I max. = 11 A₊₁⁻⁰

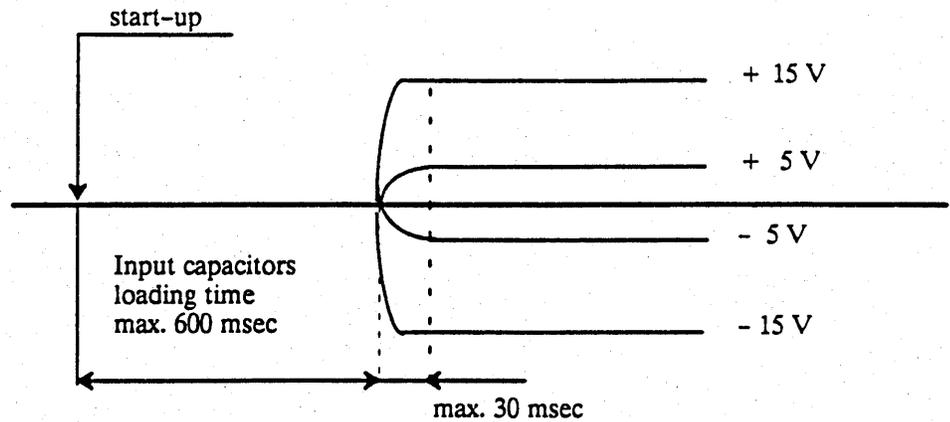


+ 5 V : I max. = 14 A₊₁⁻⁰



Max. output current adjustment: min. $\pm 20\%$

Soft-start: input 90 V_{AC} , 45 Hz: outputs I_{nominal}



Power output: nominal 204 W

maximum 240 W

Line sync output: square signal, duty cycle 50%, 45 to 440 Hz

levels: 0 = 0 V , 1 = +5 V

rise and fall time <100 nsec

isolation: line-line sync output 2.5 kV_{AC}

Fan power supply output: 15 V_{DC} , max. 0.15 A

Safety: designed to meet the following international safety requirements:

VDE 0411/0730/0804/0806, IEC 348/380/435

Line input connector: CEE 22/VI (XIV), ASE type 113

X2 Base card connector:

header 10 pins 94V0 material

AMP

pin assignment

1: positive line sync

2: common return

3 to 5: +5 V

7 to 8: -5 V

4 to 6: common return

9: +15 V

10: -15 V

X3 display cord connector:

header 3 pins, 94V0 material

AMP 350789-1

pin assignment

1: -15 V, with fuse slow 2 A

2: common return

3: +15 V, with fuse slow 2 A

X1 Fan connector:

header 2 pins, 94V0 material

AMP 350786-1

pin assignment

1: common return

2: +15 V

Probe power connector:

two, located on the switchboard

LEMO RA 0304 N

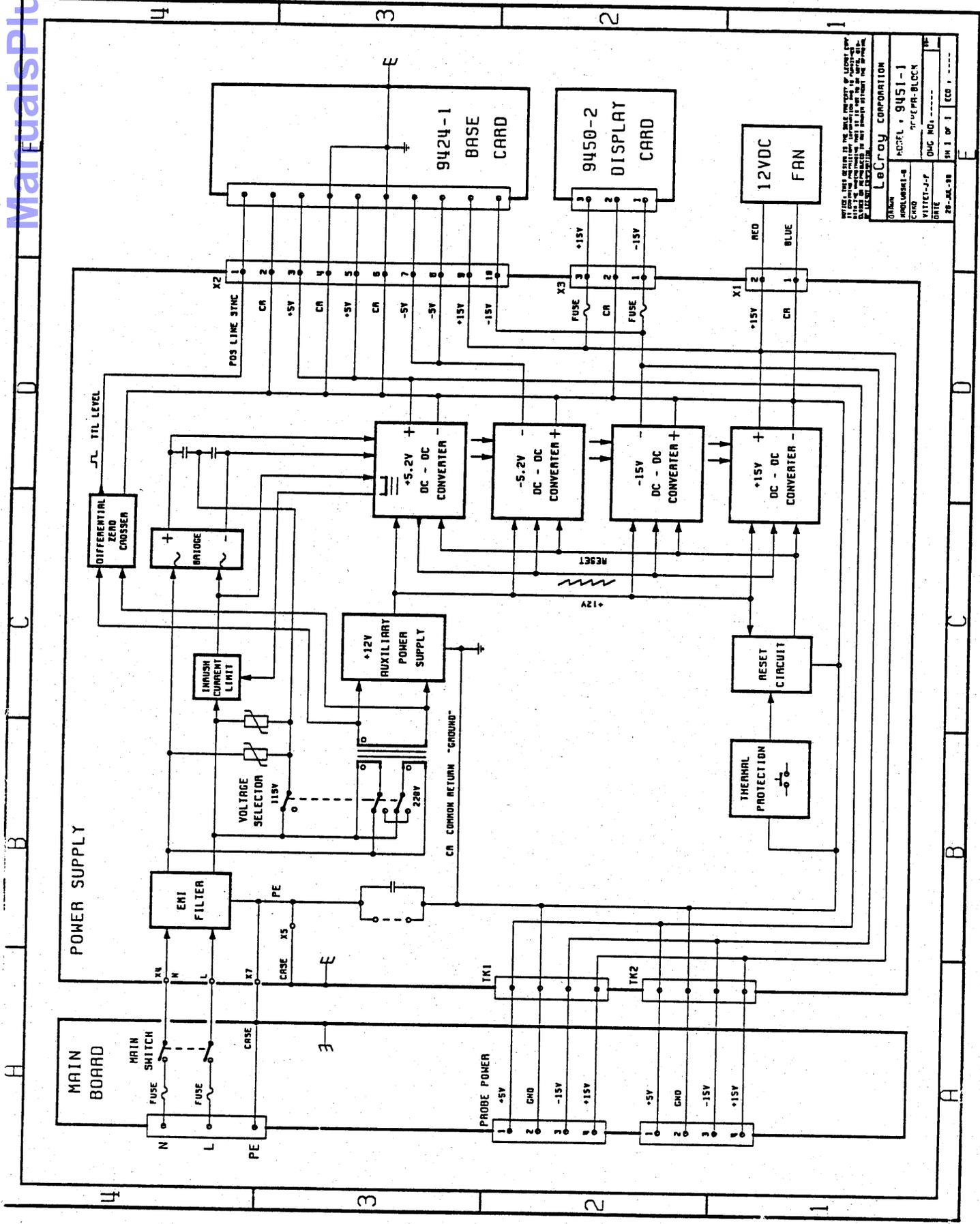
pin assignment

1: +5 V

2: ground, common return

3: -15 V

4: +15 V



THIS UNIT IS THE PROPERTY OF LEADERSHIP ELECTRONICS, INC. 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.

ORDER	MODEL	9451-1
MANUFACTURE	TYPE	POWER-BLOCK
DATE	DATE	20-04-98
REV	REV	1 OF 1

LeCroy CORPORATION

Chapter 3

**BASIC PERFORMANCE TEST PROCEDURE
AND
INTERNAL DIAGNOSTICS AND CALIBRATION**

Table of contents :**Section**

3.1	Performance Verification
3.1.1	Turn on
3.1.2	Noise on the Inputs
3.1.3	Test of the ADC's
3.1.4	Offset
3.1.5	50 Ohm and 1 MOhm Input Impedance
3.1.6	Front-End
3.2	Internal Diagnostics and Calibration
3.2.1	Calibration Error Log
3.2.2	Chan 1+2, Chan 3+4 Full Test
3.2.3	Chan 1+2, Chan 3+4 Gain Curves
3.2.4	Chan 1+2, Chan 3+4 Gain vs Time
3.3	Bandwidth
3.3.1	Bandwidth at 50 Ohm Input Impedance
3.3.2	Bandwidth at 1 MOhm Input Impedance
3.4	Manual Linearity Test (NIST Traceable)
3.5	Trigger Level for DC and HFrej
3.6	Smart/Complex Trigger
3.6.1	Trigger on Pulse Width >, <
3.6.2	Trigger on Interval Width <
3.6.3	Trigger on Interval Width >
3.7	Time Base Accuracy
3.7.1	Manual Time Base Test
3.7.2	NIST Calibration

ManualsPlus.com

3.1 Basic Performance Test Procedure for the 9424 Digital Oscilloscope

3.1.1 Turn-On

Before switching on the 9424 Digital Storage Oscilloscope (DSO), check that the correct line voltage is set at the rear-panel power selector. Switch on the power using the power switch on the rear panel. Then check:

- that the display turns on after about 10 seconds
- that the display is stable
- that the range of INTENSITY and GRID INTENSITY is reasonable

Wait for about 20 minutes for the scope to reach a stable operating temperature.

3.1.2 Noise on the Inputs

This is to verify the proper operation of all front-end components. With no signal connected to the inputs, set the DSO as follows:

- turn on traces CH1, CH2, CH3 and CH4
- Grid: single
- Input couplings : 1 M Ω DC
- Input gain: 5 mV/div
- Trigger:
 - SMART (COMPLEX) Trigger: OFF
 - Source: LINE
 - Coupling: AC
 - Mode: NORM
- Time/div: 10 msec/div
- BWL: OFF

Check:

- displayed waveforms should have a constant band of less than 3 minor divisions
- there is no discernible periodic structure

Repeat the test for Time/div = 5 msec/div, 2 msec/div, 1 msec/div, and .5 msec/div and check as above.

3.1.3 Test of the ADCs

This is to verify proper operation of the ADCs at the two nominal sampling frequencies: 100 and 40 Ms/sec.

With all inputs open, set the DSO as follows:

- turn on the CH1 trace
- Grid normal
- Input coupling CH1: 1 M Ω DC
- Input gain 50 mV/div, offset zero
- Trigger:

```
SMART (COMPLEX) Trigger: OFF
Source:                  LINE
Coupling:                AC
Mode:                    NORM
```

- Time/div = 50, 100 μ sec/div

For each of the two time bases above, check for CH1:

- displayed waveform should lie within a band of less than 3 minor divisions
- using the offset control, move the trace for CH1, slowly through the entire range and check that there is no significant change in the displayed trace. Repeat for channel 2, 3 and 4.

3.1.4 Offset

Set the DSO as follows:

- turn on the trace for CH1
- Grid normal
- Input set to GND
- Input gain 5 mV/div, offset zero
- Trigger:

```
SMART (COMPLEX) Trigger: OFF
Source:                  LINE
Coupling:                AC
Mode:                    NORM
```

- Time/div = 50 μ sec/div
- BWL OFF

Switch between 50 Ω DC and GND, and 1 M Ω DC and GND.
Check:

- the trace should not move more than a minor division or 1 mV

Repeat the same test for CH2, CH3 AND CH4.

3.1.5 Input Impedance

Set the DSO CH1 input to 1 M Ω DC with any time base and gain.
Check with an ohmmeter:

- input impedance must be 1 M Ω \pm 2%

Set DSO CH1 input to 50 Ω , 20 mV/div with any time base.
Check:

- input impedance must be 50 Ω \pm 2%

Repeat 50 Ω test for 50, 100, 200, 500 and 1000 mV/div.

Repeat all impedance checks for CH2, CH3, CH4.

3.1.6 Front-End

Set the DSO as follows:

- turn on the trace for CH1
- Grid normal
- Input 50 Ω , gain 100 mV/div, offset zero
- Trigger:

SMART (COMPLEX) Trigger:	OFF
Source:	CH1
Coupling:	DC
Mode:	NORM
Delay:	50%
Level:	zero

- Time/div = .1 μ sec/div
- BWL OFF

Apply a 600 mV p-p 1 MHz square wave from a fast (less than 1 nsec) risetime function generator (for example TEK PG502) to CH1 input. Press the Interleaved Sampling button on the oscilloscope to turn on the RIS mode.

Check:

- There should be no large overshoot at the rising and falling edge:
50 Ω : less than 10% overshoot
- Check the same at 10 mV/div, input 60 mV p-p
- Repeat the above test for CH2/3/4 .

3.2 Internal Diagnostics and Calibration

The 9424 Internal Diagnostics and Calibration menu is entered by pressing the "Main Menu" button while keeping the lowest menu button depressed. To quickly check the performance of the scope, press the 'CALIBRATION Constants' button and then press 'Full Recalibration'. It is advisable to perform this type of check when the scope is in a stable condition after about 20 minutes of warm-up. Then enter 'Calibration Error Log' and you get a comprehensive summary of the scope's calibration status. If all the error status codes are zero, it is very likely that everything is OK, except for the linearity which is best checked by 'Chan 1+2/3+4 Full Test'. If you find error codes different from zero, you can find more information on the problem from the other 'Constants' menus or from the various 'Curves' menus. Before we turn to a description of the menus relevant to service, let us give the interpretation of the calibration error log.

3.2.1 Calibration Error Log

This is a handy tool to perform a quick but comprehensive internal performance check, without touching the acquisition settings. Just push 'Full Recalibration', then go to 'Calibration Error Log'. The result displayed is independent of your current time base, sensitivity and other acquisition settings. The conditions to be tested are set automatically during the recalibration. The error conditions are coded into binary bits, i.e. each bit set represents a certain error. The error status is represented in a hexadecimal number (= 4 bits = 1 nibble) for each acquisition condition, see Figure 1.

CALIBRATION ERROR LOG					
Vertical Calibration					
4 nibbles=(BWL OFF, 50Ω) (OFF, 1MΩ) (ON, 50Ω) (ON, 1MΩ)					
(8=Offset Range, 4=Offset Conv, 2=Gain Range, 1=Gain Conv)					
Chan 1+2		CHAN1	CHAN2	CHAN3	CHAN4
CALIB CONST	5 mV	0	0	0	0
Chan 3+4	10 mV	0	0	0	0
	20 mV	0	0	0	0
Chan 1+2	50 mV	0	0	0	0
FULL TEST	.1 V	0	0	0	0
Chan 3+4	.2 V	0	0	0	0
	.5 V	0	0	0	0
Full Re-	1 V	0	0	0	0
calibration	TMS Status	Working		Working	
Calibration	4 nibbles =	(unused)	(unused)	(100Ms)	(40Ms)
Error Log	Trigger Cal.	0	0	0	0
				(2=No BWL, 1=BWL)	
More Consts					
Return	TDC Calibration		0		

Figure 1: Calibration Error Log

Vertical Calibration:

BWL ON/OFF and 50/1M input coupling makes 4 acquisition conditions per channel. The error status of each is represented by a nibble (as explained on the display). The 4 error bits have the following meaning:

1=gain convergence: One or more of the 8 nominal DAC calibration points cannot be reached.

2=gain range: A multiplicative calibration parameter becomes too small ($dgain < 0.95$) such that there may not be sufficient variable gain. Some older units may show this problem at 1 MΩ due to an imprecise switchable attenuation.

4=offset convergence: One or more of the nominal points to calibrate the offset DAC cannot be reached.

8=offset range: the calibration found may go out of DAC range for certain offset values chosen (this problem should never occur at 5/10 mV)

Examples:

Code 303: Gain range and gain conv. problem at 1 M Ω , BWL ON and OFF

Code 4c6d: Offset conv. problem on all 4 coupling conditions
Offset range problem at 1 M Ω BWL ON and OFF
Gain range problem at 50 Ω BWL ON
Gain conv. problem at 1 M Ω BWL ON

TMS status: Status must be 'working'. 'No memory' is indicated if the ADC board is not present. Other fatal messages may come up, like 'TMS broken'.

The following tests report problems for each of the two possible sampling rates (100 Ms/s and 40 Ms/s).

Trigger Calibration:

1=BWL ON
2=BWL OFF

Example:

Code 31: Problem at BWL ON for the two sampling rates.
Problem BWL OFF at 100 Ms.

TDC Calibration:

The Interpolating TDC is calibrated at 40 and 100 Ms/sec. If it is OK, error code is equal to zero.

Examples:

TDC Calibration Code 10: Calibration problem at 100 Ms.

That's all that is required for a quick but complete internal check of the scope. If there remain error codes (not equal to zero), the following menus may be used to get more detailed information on possible problems and failures.

3.2.2 Chan 1+2/3+4 Full Test

The DC non-linearity is analyzed automatically for BWL ON/OFF, 50/1M coupling and both channels for the sampling rate you have set. The last two lines at the bottom of the table list the largest non-linearities found for 5 mV/div and all other gains. The test should be done for the two possible sampling rates 40 and 100 Ms/sec, i.e. for time bases 100 and 50 μ sec/div. However, the current sampling rate is not displayed. In order to change the rate, one has to leave the menu and set the time/div appropriate to the required sampling rate, see table in 7.1. At present, the non-linearities should not be larger than 3% for 5 mV/div, and 2% for > 5 mV/div, see Figure 2 and 3.

Before starting CH 1+2/3+4 Full Test, perform a Full Recalibration.

LeCroy

FULL DC NON-LINEARITY ANALYSIS Srate 100Ms/s									
	BW-Limit	CH1				CH2			
		OFF	ON	OFF	ON				
Chan 1+2 CALIB CONST									
Chan 3+4	50 Ω : Max. Deviations (in %)								
	5 mV	-.6/ .4	-.9/ -.1	-.5/ .4	-.3/ .4				
	10 mV	-.7/ .2	-.4/ .3	-.5/ .3	-.4/ .2				
Chan 1+2	20 mV	-.5/ .2	-.4/ .2	-.4/ .1	-.4/ .2				
FULL TEST	50 mV	-.8/ .2	-.4/ .2	-.6/ .0	-.2/ .2				
Chan 3+4	.1 V	-.6/ .2	-.4/ .1	-.6/ .1	-.4/ .4				
	.2 V	-.6/ .2	-.5/ .2	-.5/ .0	-.2/ .3				
	.5 V	-.4/ .2	-.9/ .2	-.5/ .1	-.1/ .2				
Full Re- calibration	1 V	-.4/ .1	-.2/ .3	-.4/ .4	-.2/ .6				
Calibration Error Log	1 M Ω : Max. Deviations (in %)								
	5 mV	-1.3/ -.1	-.8/ .4	-.2/ .5	-.3/ .4				
	10 mV	-.7/ .2	-.7/ .3	-.4/ .2	-.4/ .3				
	20 mV	-.7/ .9	-.5/ .2	-.4/ .0	-.2/ .2				
	50 mV	-.6/ .2	-.8/ .3	-.3/ .0	-.3/ .4				
	.1 V	-.8/ .2	-.5/ .4	-.9/ .1	-.3/ .2				
	.2 V	-.6/ .2	-.5/ .2	-.6/ .1	-.3/ .4				
More Consts	.5 V	-.6/ .2	-.4/ .2	-.6/ .1	-.3/ .4				
	1 V	-.6/ .2	-.5/ .4	-.4/ .3	-.2/ .4				
Return	Summary	5mV **	-1.3/ 0.4 **	**	-0.5/ 0.5 **				
		> 5mV **	-0.8/ 0.4 **	**	-0.6/ 0.6 **				

Figure 2: CH 1+2 Linearity Analysis

FULL DC NON-LINEARITY ANALYSIS Rate 100Ms/s									
Chan 1+2 CALIB CONST Chan 3+4	BW-Limit	CH3				CH4			
		OFF	ON	OFF	ON				
50 Ω : Max. Deviations (in %)									
	5 mV	-.5/	.9	-.4/	.8	-.4/	.4	-.3/	.4
	10 mV	-.5/	.5	-.3/	.6	-.6/	.1	-.6/	.2
Chan 1+2	20 mV	-.4/	.4	-.2/	.5	-.4/	.3	-.4/	.2
FULL TEST	50 mV	-.4/	.3	-.3/	.4	-.5/	.1	-.4/	.1
Chan 3+4	.1 V	-.4/	.3	-.4/	.5	-.6/	.2	-.5/	.3
	.2 V	-.3/	.1	-.2/	.4	-.4/	.1	-.5/	.0
	.5 V	-.4/	.3	-.4/	.6	-.5/	.2	-.4/	.2
Full Re- calibration	1 V	-.5/	.4	-.4/	.7	-.7/	.3	-.7/	.3
1 M Ω : Max. Deviations (in %)									
Calibration Error Log	5 mV	-.3/	.7	-.1/	.4	-.5/	.4	-.4/	.3
	10 mV	-.4/	.2	-.0/	.3	-.5/	.1	-.3/	.3
	20 mV	-.2/	.2	-.1/	.2	-.3/	.1	-.3/	.1
	50 mV	-.3/	.1	-.0/	.3	-.5/	.0	-.4/	.1
	.1 V	-.3/	.1	-.1/	.2	-.5/	.2	-.3/	.0
More Consts	.2 V	-.4/	.2	-.1/	.4	-.4/	.2	-.3/	.2
	.5 V	-.2/	.2	-.0/	.4	-.4/	.1	-.2/	.1
	1 V	-.2/	.3	.0/	.4	-.4/	.2	-.3/	.1
Return	Summary	5mV	**	-0.5/ 0.9	**	**	-0.5/ 0.4	**	**
		> 5mV	**	-0.5/ 0.7	**	**	-0.7/ 0.3	**	**

Figure 3: CH 3+4 Linearity Analysis

3.2.3 Chan 1+2/3+4 Gain Curves

The variable gain curve is displayed for two channels for the acquisition parameters set. The center line is at inverse gain 1.75 (e.g. 1.75 V/div total gain for fixed gain at 1 V/div) and vertical units are 0.25/div. So the top border is at 2.75 and the bottom at 0.75. Horizontally the curve goes from DAC -8 V at the left to 0 V at the right. The curves should be smooth and go well above the inverse gain 2.5 and 1.0 limits indicated, where the variable gain is at .4 and 1., see figure 4 and 5.

srata 100Ms/s bw1 OFF Ch 1: 50 mV 1M Ch 2: 50 mV 1M LeCroy

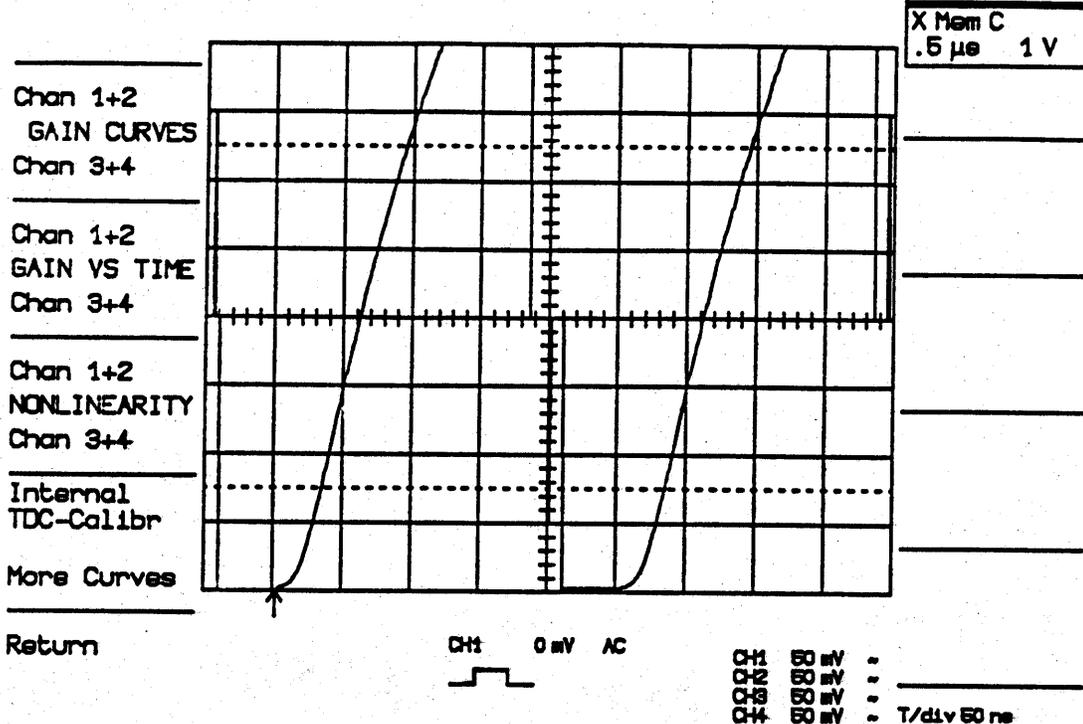


Figure 4: CH 1+2 Gain Curves

srata 100Ms/s bw1 OFF Ch 3: 50 mV 1M Ch 4: 50 mV 1M LeCroy

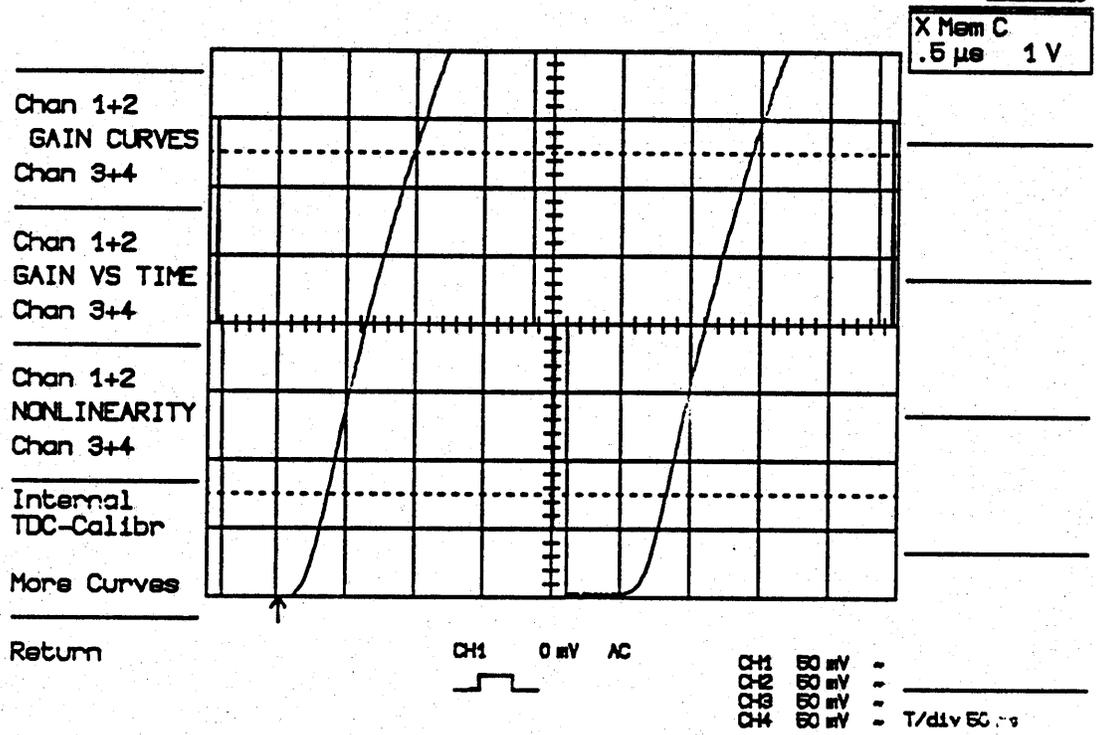


Figure 5: CH 3+4 Gain Curves

3.2.4 Chan 1+2/3+4 Gain vs Time

The gain variations over time are displayed for both channels for the acquisition parameters set. One vertical div is 0.5%. At present, the variations should stay within $\pm 3\%$, see Figure 6 and 7.

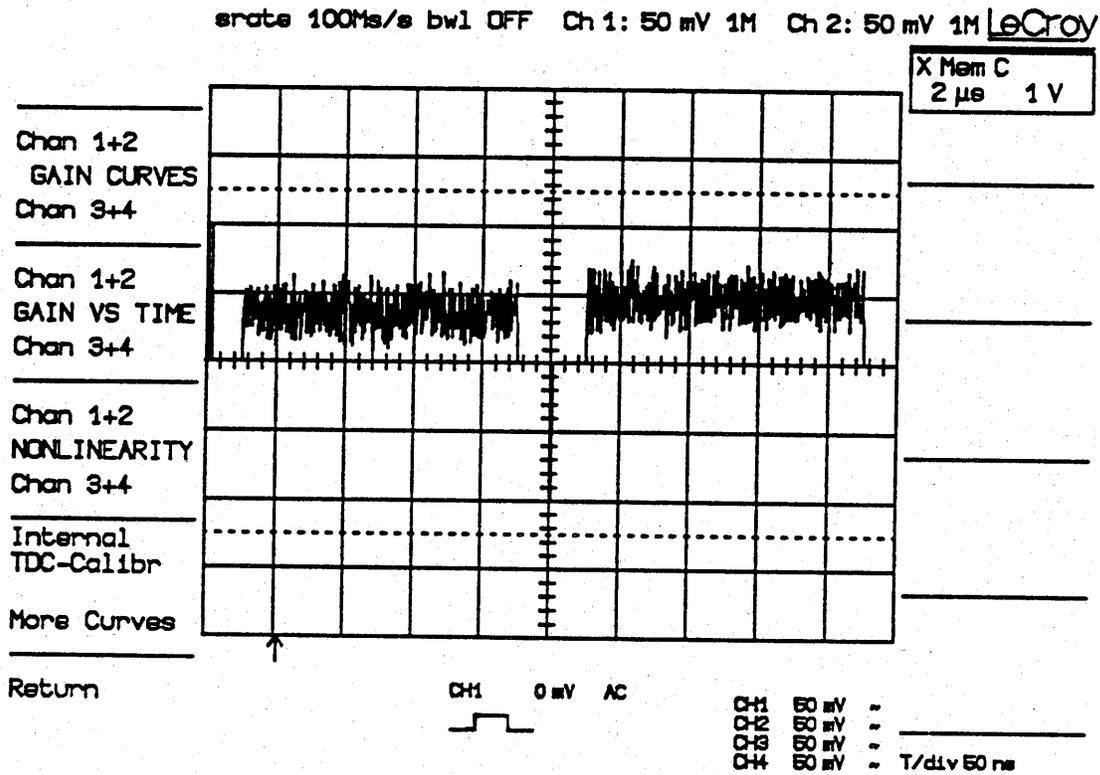


Figure 6: CH 1+2 Gain vs Time

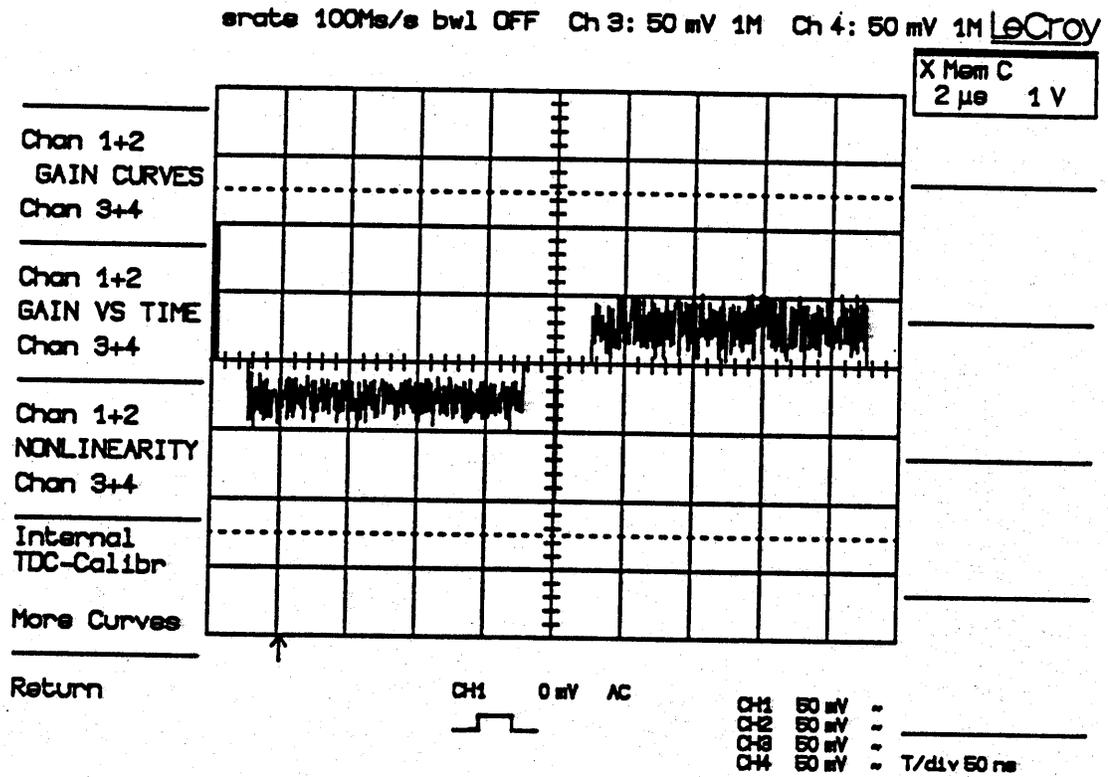


Figure 7: CH 3+4 Gain vs Time

3.3.1 Bandwidth at 50 Ω Input Impedance

The purpose of this test is to ensure that the entire 9424 system has a bandwidth of at least 350 MHz at 50 Ω input impedance.

Set up a Levelled Sine Wave Generator (for example Marconi 2019A):

- Frequency .5 MHz
- Amplitude 2.8 V p-p (maximum for Marconi)

Connect the generator output to CH1 input.

Turn off all the traces, except CH1.

Set the trigger:

SMART (COMPLEX) Trigger: OFF
Source: CH1
Coupl: HF
Mode: NORM
Delay: zero
Level: zero

Set input CH1:

Coupl: 50 Ω
Gain: 1V/div
Var Gain: 1
Offset: zero

Set the time base:

-Time/div .5 μ sec/div
-Interleaved ON

Bandwidth limit: OFF

Adjust the generator output amplitude and CH1 offset to get a 5 division p-p sine wave, or maximum possible from the generator for the large V/div gains (Marconi 2.8 V p-p maximum).

Increase the generator frequency, while decreasing the Time/div until the sine wave p-p amplitude is $.7 * 5$ divisions = 3.5 divisions (3 dB point), or 70% of the initial amplitude at .5 MHz.

Check:

- the frequency of the generator must be at least 350 MHz

Repeat the above for CH1, CH2, CH3 and CH4 for input Volts/div = .5 V, .2 V, .1 V, 50 mV, 20mV, 10 mV, 5 mV.

Set the bandwidth limiter ON.

Repeat the same test as for the bandwidth limiter OFF.

Check:

- the frequency of the generator at the 3 dB point must be 70 MHz \pm 20%

3.3.2 Bandwidth at 1 M Ω Input Impedance (at Probe Tip)

The purpose of this test is to ensure that the entire 9420 system has a bandwidth of at least 200 MHz at probe tip at 1 M Ω input impedance.

Set up a Tektronix SG 503 Leveled Sine Wave Generator or equivalent (note for the Marconi that the maximum amplitude is smaller than 5 V):

- Frequency .5 MHz
- Amplitude 5 V p-p

Terminate the output of the SG 503 via a 50 Ω feedthrough and connect it to the CH1 input through a 300 MHz 10 M Ω /10 probe using the probe tip - BCN jack. Make sure the probe has a 300 MHz bandwidth (for example our model P9020 M15x10HF), and is perfectly adjusted, low frequency and high frequency (see brochure enclosed with probe).

Turn off all the traces except CH1.

Trigger:

```

SMART (COMPLEX) Trigger: OFF
Source:                   CH1
Coupl:                    HF
Mode:                     NORM
Delay:                    zero
Level:                    zero

```

Set the input of CH1:

```

- Coupl:                  1 M $\Omega$  AC
- Gain:                   .1 V/div
- Var:                    Gain 1
- Offset:                 zero

```

Set the time base:

```

- Time/div                .5  $\mu$ sec/div
- Interleaved             ON

```

Bandwidth limit OFF

Adjust the SG 503 output amplitude and the CH1 offset to provide a 5 division p-p sine wave.

Increase the SG 503 frequency, while decreasing the Time/div until the sine wave p-p amplitude is $.7 * 5$ divisions = 3.5 divisions (3 dB point).

Check:

- the frequency of the SG 503 must be at least 200 MHz

Repeat the above for CH1, CH2, CH3 and CH4 for input Volts/div = 50 mV, 20 mV, 10 mV, and 5 mV.

Set the bandwidth limiter ON.

Repeat the same test as for bandwidth limiter OFF.

Check:

- the frequency of the SG 503 at the 3 dB point must be $70 \text{ MHz} \pm 20\%$

3.4 Manual linearity test using an external high precision voltage source.

NIST traceable calibration

In absence of the computer automated calibration system based on CALSOFT2 for the 9424 model oscilloscope, the manual Performance Test Procedure can be followed for establishing an NIST traceable calibration, provided the measurement instruments used are NIST traceable calibrate.

For an NIST calibration, follow the manual linearity test procedure using a calibrated and certified high precision (better than 0.1%) voltage source, for example TEK PS5004 supported by CALSOFT2.

Manual linearity Test Procedure

Set scope to:

Single Grid ON

Ch to be tested ON, offset 0

2 msec/div

BWL ON

Pulse parameters ON

LINE trigger

SMART trigger OFF

For each V/div and both 50 Ohm and 1 M Ohm DC coupling and for all channels separately, check the following:

Apply to the CH to be tested a DC voltage from the high precision voltage source with the following three values one after the other: 0, + 3 major screen divisions, - 3 major screen divisions. For each point, read off the 'Mean' parameter voltage and compare to the digital read-out of the voltage reference.

The difference of the two values in volts should be within 2% of full scale of the scope.

3.5 Trigger Level for DC and HFRej

Set up any sine wave generator, capable of generating sine waves to 500 Hz, for example Intron IFG-422 or Topward TFG-8101:

- frequency 500 Hz

Connect the output of the generator to CH1.

Set up the DSO:

Turn off all the traces except CH1.

Set the trigger:

SMART (COMPLEX) Trigger:	OFF
Source:	CH1
Coupl:	DC
Mode:	NORM
Delay:	50% Pretrigger
Level:	zero

Set the input CH1:

- Coupl:	1 M Ω , DC
- Gain:	.5 V/div
- Var:	Gain 1
- Offset:	zero

Set the time base:

- Time/div:	.2 msec/div
-------------	-------------

Adjust the sine wave generator's output amplitude to get 8 divisions p-p, corresponding to a 2 V amplitude. It is important that the offset of the input is set to zero (use Panel Status to verify). Use the offset adjustment of the sine wave generator to center the signal with respect to the screen.

Check:

- the sine wave must pass through the horizontal center of the screen (50% pretrigger line) at the vertical position zero (vertical center) within ± 3 minor divisions

Repeat for the following conditions:

- trigger slope POS and NEG (verify slope at check point)
- trigger coupling DC and HFRej

Set the trigger level to + 1.5 V.

Check:

- the sine wave must pass the horizontal center at + 3 divisions within ± 3 minor divisions

Repeat for the following conditions:

- trigger slope POS and NEG (verify slope at check point)
- trigger coupling DC and HFRej

Set the trigger level to - 1.5 V.

Check:

- the sine wave must pass the horizontal center at - 3 divisions within ± 3 minor divisions

Repeat for the following conditions:

- trigger slope POS and NEG (verify slope at check point)
- trigger coupling DC and HFRej

Disconnect the input from CH1 and connect it to input of CH2.

Turn off all the traces except for CH2.

Set input CH2:

- Coupl:	1 M Ω , DC
- Gain:	.5 V/div
- Var:	Gain 1
- Offset:	zero

Set the trigger source to CH2.

Repeat the above check procedure for CH2 then for CH4.

3.6 Smart/Complex Trigger

3.6.1 Trigger on Pulse Width >, <

Set up the DSO:

Turn off all the traces except CH1.

Set the trigger:

Smart/Complex Trigger:	ON
Trigger Type:	SINGLE SOURCE
Width Type:	PULSE WIDTH
Source:	CH1
Coupl:	AC
Slope:	+
Level:	zero
Delay:	20% Pretrigger

Set the input of CH1:

- Coupl:	50 Ω
- Gain:	.5 V/div
- Var:	Gain 1
- Offset:	zero

Set the time base:

- Time/div:	20 nsec/div
- Interleaved:	ON

Apply sine wave signal 3 V p-p of 75 MHz. Adjust PULSE Width to 7.5 nsec for both < and >, and switch between WIDTH < and WIDTH >.

Check:

- Width < 7.5 nsec scope should trigger
- Width > 7.5 nsec scope should NOT trigger

Set the sine wave generator to 230 MHz. Adjust PULSE WIDTH to 2.5 nsec and switch between WIDTH < and WIDTH >.

Check:

- Width < 2.5 nsec scope should trigger
- Width > 2.5 nsec scope should NOT trigger

Repeat the above test for CH2 and CH4.

3.6.2 Trigger on Interval Width <

Set up the DS0:

Turn off all the traces except CH1.

Set trigger:

- Smart/Complex Trigger ON
- Trigger Type SINGLE SOURCE
- Width Type INTERVAL WIDTH
- Source CH1
- Coupl AC
- Slope +
- Level zero
- Delay 20% Pretrigger

Set the input of CH1:

- Coupl 50 Ω
- Gain .5 V/div
- Var Gain 1
- Offset zero

Set the time base:

- Time/div 2 nsec/div
- Interleaved ON

Apply a sine wave signal 3 V p-p of 200 MHz to CH1. Turn to INTERVAL Width < and adjust width to 10 nsec.

Check:

- 200 MHz: Width < 10 nsec, scope should trigger
- 110 MHz: Width < 10 nsec, scope should trigger
- 91 MHz: Width < 10 nsec, scope should NOT trigger

Set frequency to 74 MHz and INTERVAL Width to < 15 nsec.

Check:

- 74 MHz: Width < 15 nsec, scope should trigger
- 61 MHz: Width < 15 nsec, scope should NOT trigger

Repeat the above test for CH2 and CH4.

3.6.3 Trigger on Interval Width >

Set up the DSO:

Turn off all the traces except CH1.

Set the trigger:

- | | |
|-------------------------|----------------|
| - Smart/Complex Trigger | ON |
| - Trigger Type | SINGLE SOURCE |
| - Width Type | INTERVAL WIDTH |
| - Source | CH1 |
| - Coupl | AC |
| - Slope | + |
| - Level | zero |
| - Delay | 20% Pretrigger |

Set the input of CH1:

- | | |
|----------|-------------|
| - Coupl | 50 Ω |
| - Gain | .5 V/div |
| - Var | Gain 1 |
| - Offset | zero |

Set the time base:

- | | |
|---------------|------------|
| - Time/div | 5 nsec/div |
| - Interleaved | ON |

Apply sine wave signal 3 V p-p of 100 MHz to CH1. Turn to INTERVAL Width > and adjust width to 25 nsec.

Check:

- 100 MHz: Width > 25 nsec, scope should NOT trigger
- 44 MHz: Width > 25 nsec, scope should NOT trigger
- 37 MHz: Width > 25 nsec, scope should trigger

Set the frequency to 40 MHz and INTERVAL Width to > 27.5 nsec.

Check:

- 40 MHz: Width > 27.5 nsec, scope should NOT trigger
- 33 MHz: Width > 27.5 nsec, scope should trigger

Repeat the above test for CH2 and CH4.

3.7 Time Base Accuracy

3.7.1 Manual Time Base Test

In order to verify the time base, use a sine wave generator of 1 MHz with a frequency accuracy of better than 10 ppm (for example Marconi 2019A).

Set up the DSO:

Turn off all the traces except CH1.

Set the trigger:

- SMART (COMPLEX) Trigger OFF
- Source CH1
- Coupl DC
- Mode NORM
- Slope +
- Delay 0%
- Level zero

Set the input of CH1:

- Coupl 50 Ω
- Gain .5 V/div
- Var Gain 1
- Offset zero

Set the time base:

- Time/div 2 μ sec/div
- Interleaved ON

Set the sine wave generator to 1 MHz and put a signal on to CH1. Adjust amplitude to get about a 6 division p-p signal.

Select trigger mode SINGLE (HOLD).

Turn DUAL GRID ON.

Turn ON EXPAND A with CH1 as the source.

Adjust TIME MAGNIFIER to .1 μ sec/div.

Turn horizontal POSITION on DISPLAY CONTROL to select the 3rd period of the displayed waveform.

Put the expanded trace on the second grid using the vertical POSITION knob, see Figure 8.

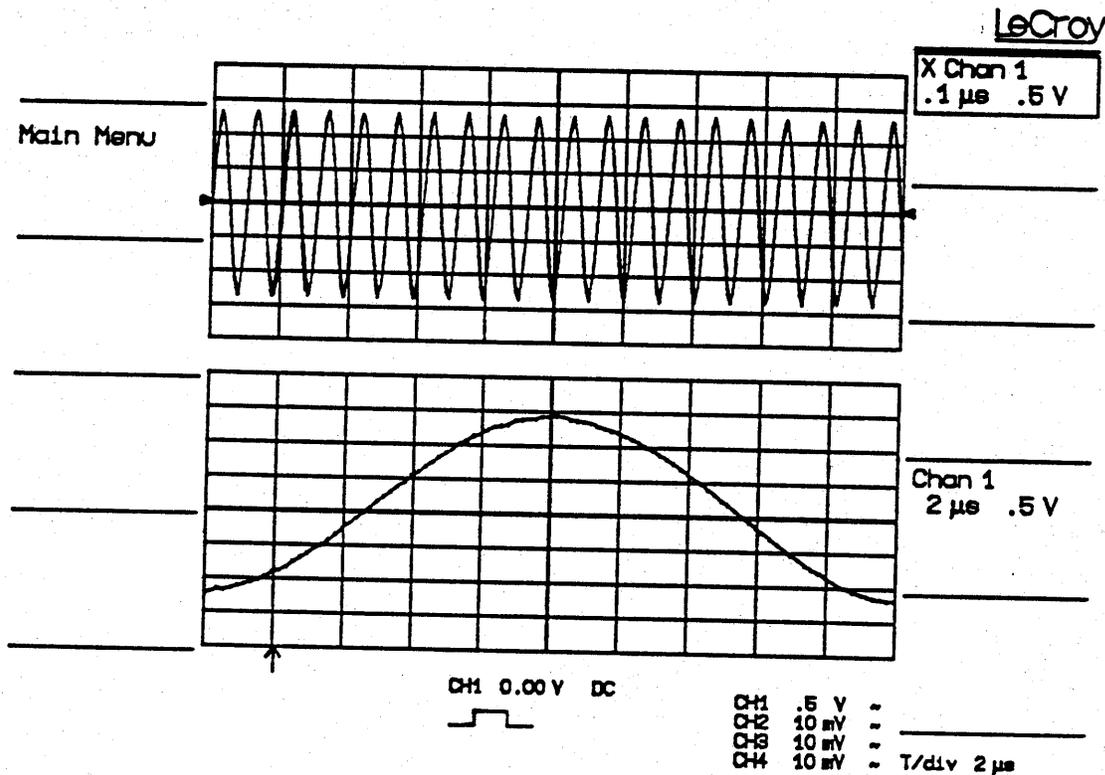


Figure 8: 3rd Period Expanded

Turn ON EXPAND B with CH1 as the source.

Adjust TIME MAGNIFIER to $.1 \mu\text{sec}/\text{div}$.

Turn the horizontal POSITION on DISPLAY CONTROL to select the 13th period.

Overlay the 2 expanded traces on the lower grid using vertical and horizontal POSITION knobs on DISPLAY CONTROL, see Figure 9.

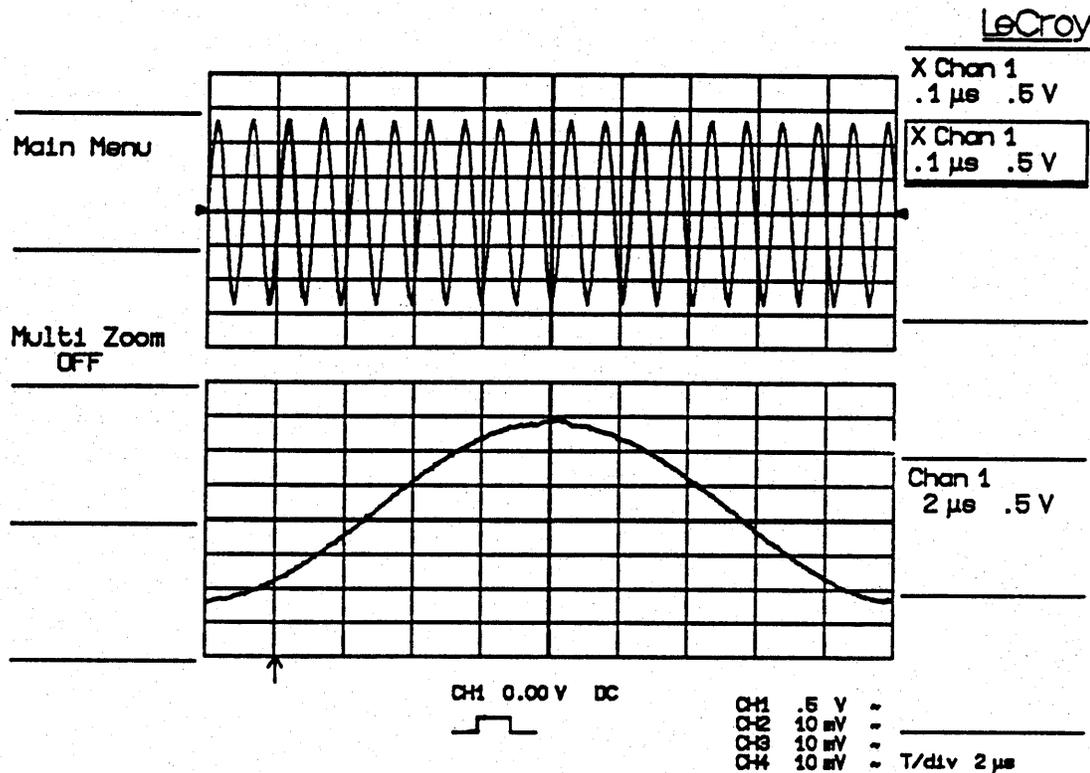


Figure 9: 3rd and 13th period overlaid

Measurement of the time difference:

- turn the RELATIVE TIME CURSORS ON
- put the REFERENCE cursor on top of the 3rd period (check on upper grid)
- Put the DIFFERENCE cursor on top of the 13th period (check on upper grid) and adjust alignment of the two cursors (check on lower grid), see Figure 10.

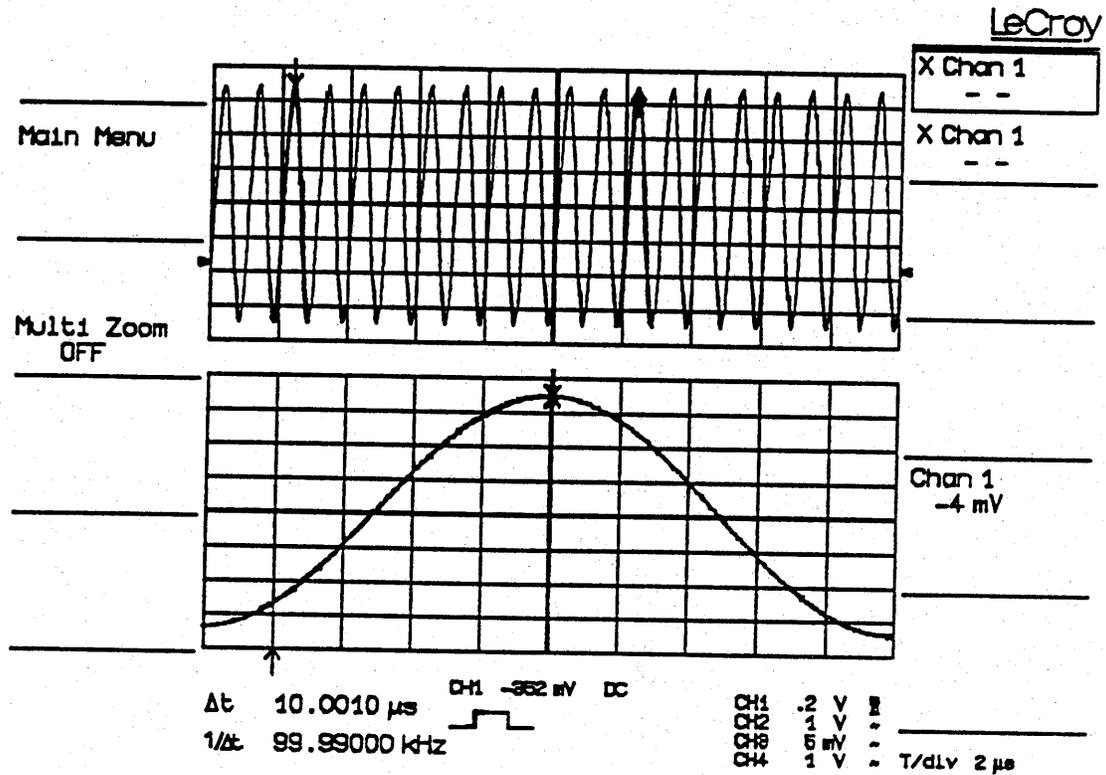


Figure 10: Aligned cursors

Turn DUAL ZOOM ON.

Turn TIME MAGNIFIER (DISPLAY CONTROL) to select the maximum expansion. Refine adjustment of the two cursors, see Figure 11.

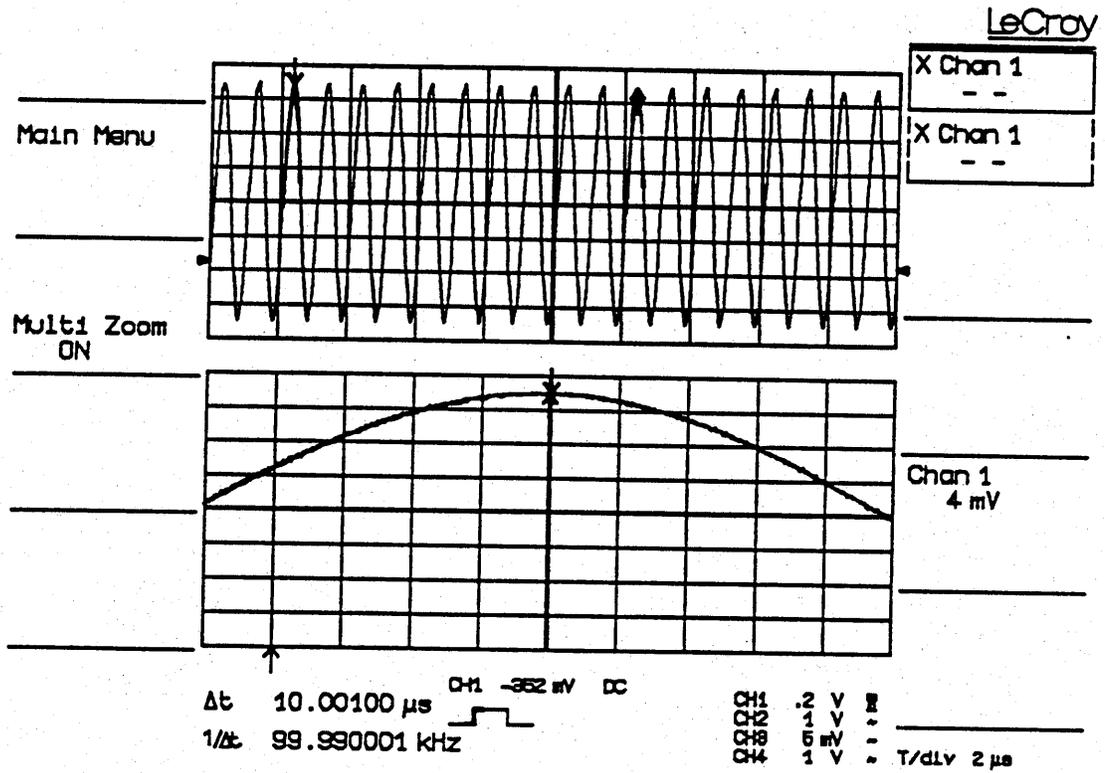


Figure 11: Alignment of cursors with maximum expansion

Check:

- The difference time reading must be within 9.998 and 10.002 μs

3.7.2 NIST Calibration

In the absence of the computer automated calibration system based on LeCalsoft for the 9424 model oscilloscope, this procedure can be followed for establishing an NIST traceable calibration provided the measurement instruments used are NIST traceable.

For an NIST Calibration use this procedure in place of the Manual Time base Test procedure (3.7.1).

Scope set-up :

Time Base : 10 μ sec

RIS MUST BE OFF

Set Trigger to Auto

Smart Trigger OFF

Connect the rear panel SAMPLE CLK OUT BNC to a suitable frequency counter. This output should be terminated 50 Ohm to GND. This is a DC coupled high impedance output which will drive a 50 Ohm load from 0 mV to -800 mV.

This sample clock output delivers a continuous signal at half the sampling frequency, 100 MSample/sec sample rate will read 50 MHz at the clock out.

The accuracy of the sample clock out will reflect the internal clock accuracy, however scopes shipped after December 1988 have a clock accuracy of 0.002%, scopes shipped before this date and not yet modified are 0.01%.

If you have a scope that is fitted with the 0.01% clock accuracy, it can be upgraded to 0.002% at no charge. Please call your local LeCroy service center for details.

The frequency measured at the sample clock out on the 9424 oscilloscopes with 0.01% accuracy will measure 49.995 to 50.005 MHz, 0.002% accuracy will measure 49.999 to 50.001 MHz.

Chapter 4

SERVICE INFORMATION

AND

PROCEDURES

TABLE OF CONTENTS

4.1.	Disassembly and assembly procedure
4.1.1	Disassembly and assembly diagram
4.1.2	Upper and lower covers
4.1.3	Power supply support and card retainer
4.1.4	F9424-8 Clock bus
4.1.5	F9424-5 Front panel
4.1.6	F9424-9 Rear panel
4.1.7	F9450-2 Display
4.1.8	Cathode ray tube with deflection yoke
4.1.9	Deflection yoke
4.1.10	F9451-1 Power supply
4.1.11	F9424-6 Processor
4.1.12	F9420-3 ADC
4.1.13	F9420-4 TDC
4.1.14	F9424-7 Front end
4.1.15	F9424-1 Base
4.1.16	F9424-2 Support for Memory card
4.2	Software upgrade procedure
4.2.1	Changing Eproms
4.2.2	Changing software selection PAL
4.3	Software option description and table
4.4	Board exchange procedure
4.4.1	F9424-1 Base
4.4.2	F9424-6 Processor
4.5	F9451-1 Power supply adjustment procedure
4.6	F9424-7 Front end test and calibration procedure
4.7	F9450-2 Display calibration procedure

4.1 Disassembly and Assembly Procedure

The disassembly and assembly procedures detailed below refer to the assembly and disassembly diagram and the view of figure 4.1.,4.2.,4.3.

Please study the diagram and figures before attempting disassembly.

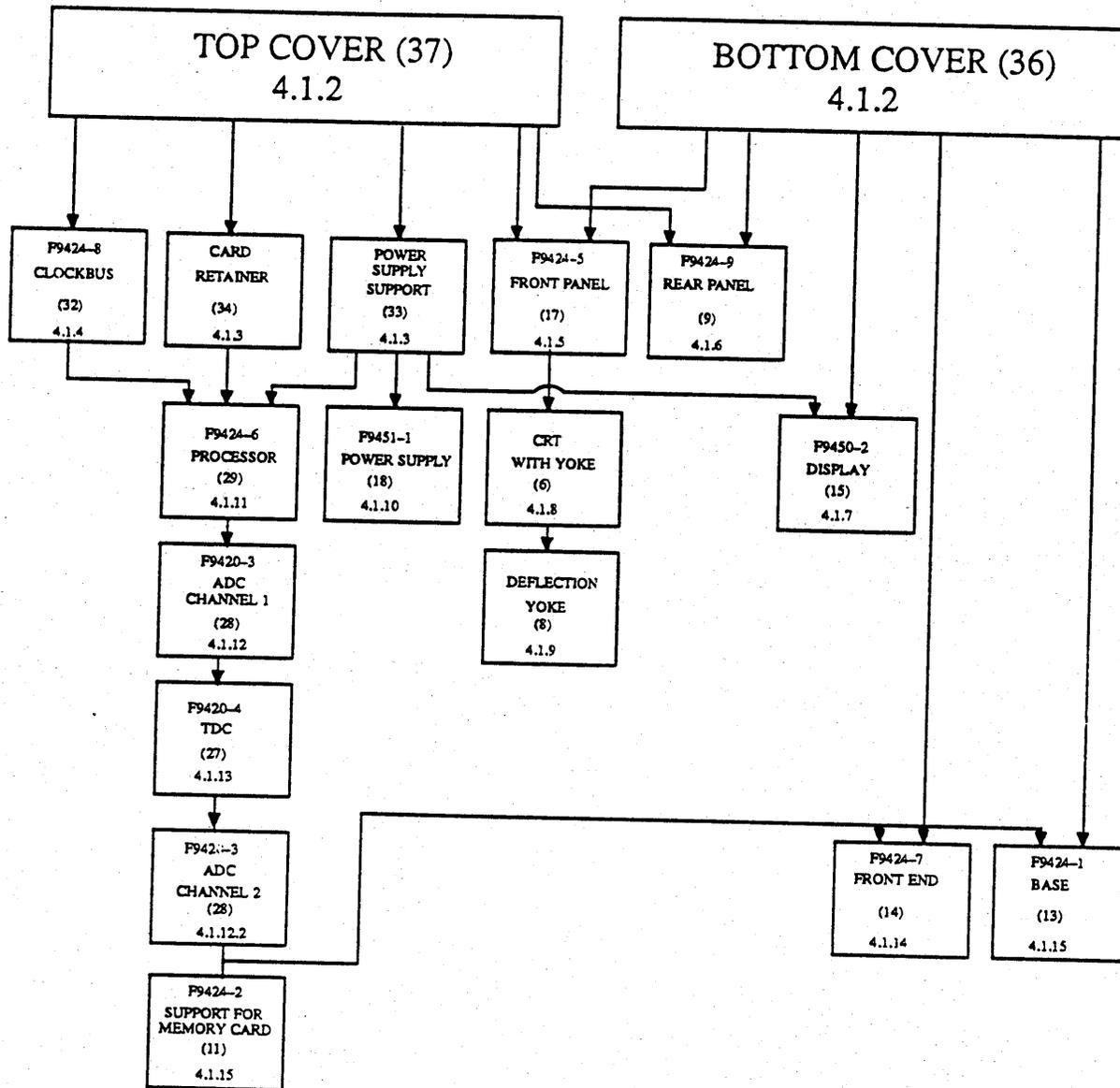
***** C A U T I O N *****

Before removing any parts from the LeCroy 9424 DSO, be sure to read carefully the instructions referring to those parts, noting any precautions needed to avoid problems caused by mechanical behavior, static electricity, high-voltage supplies, etc...

The usual precautions against static electricity are required (antistatic MAT, foam, bag)

4.1.1 Disassembly and Assembly Diagram

Disassembly: Any board can be removed only if any items higher in the diagram and connected by a line are already out.



Assembly: The reassembly procedure is the inverse of the disassembly procedure.

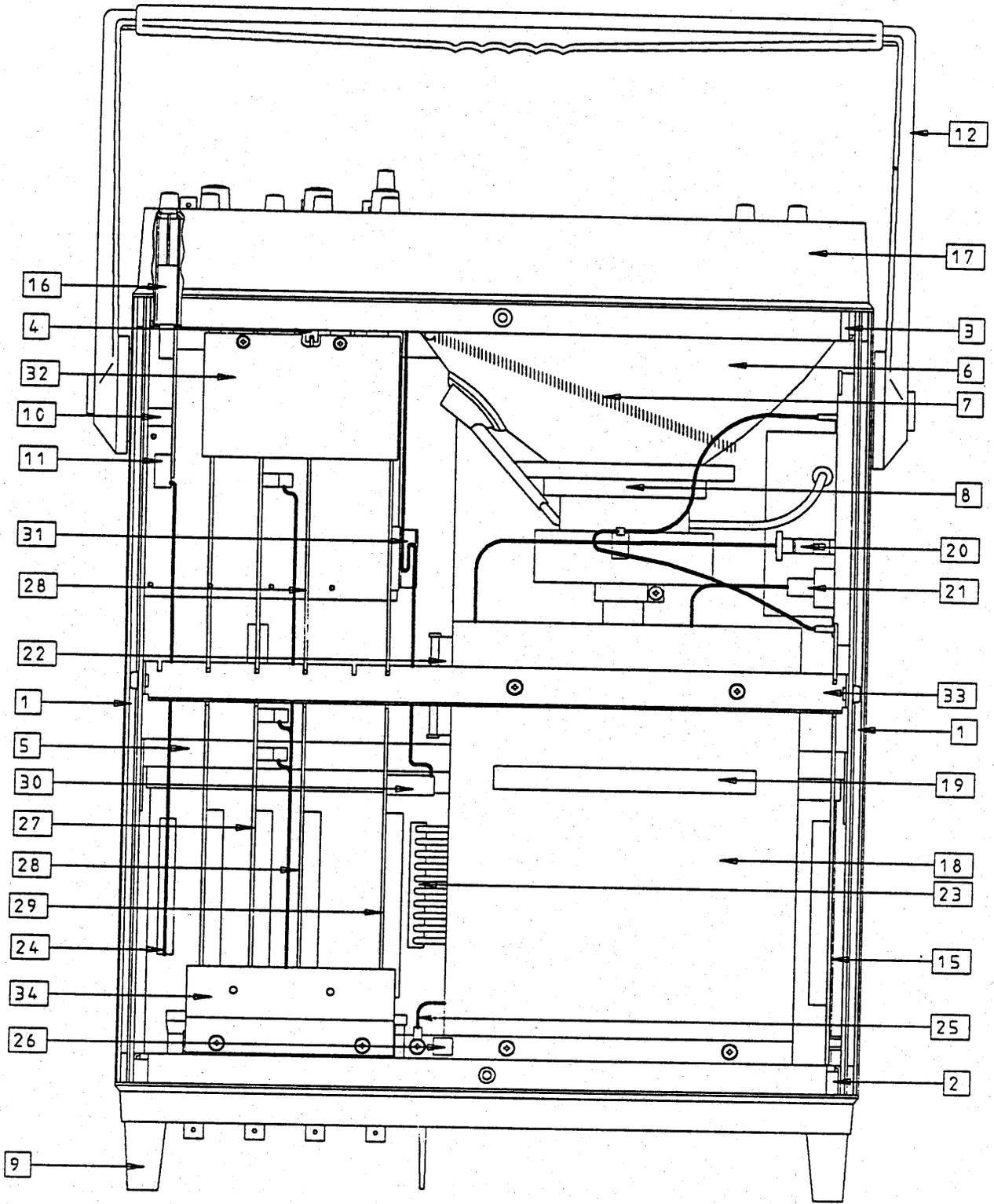


Figure 4.1

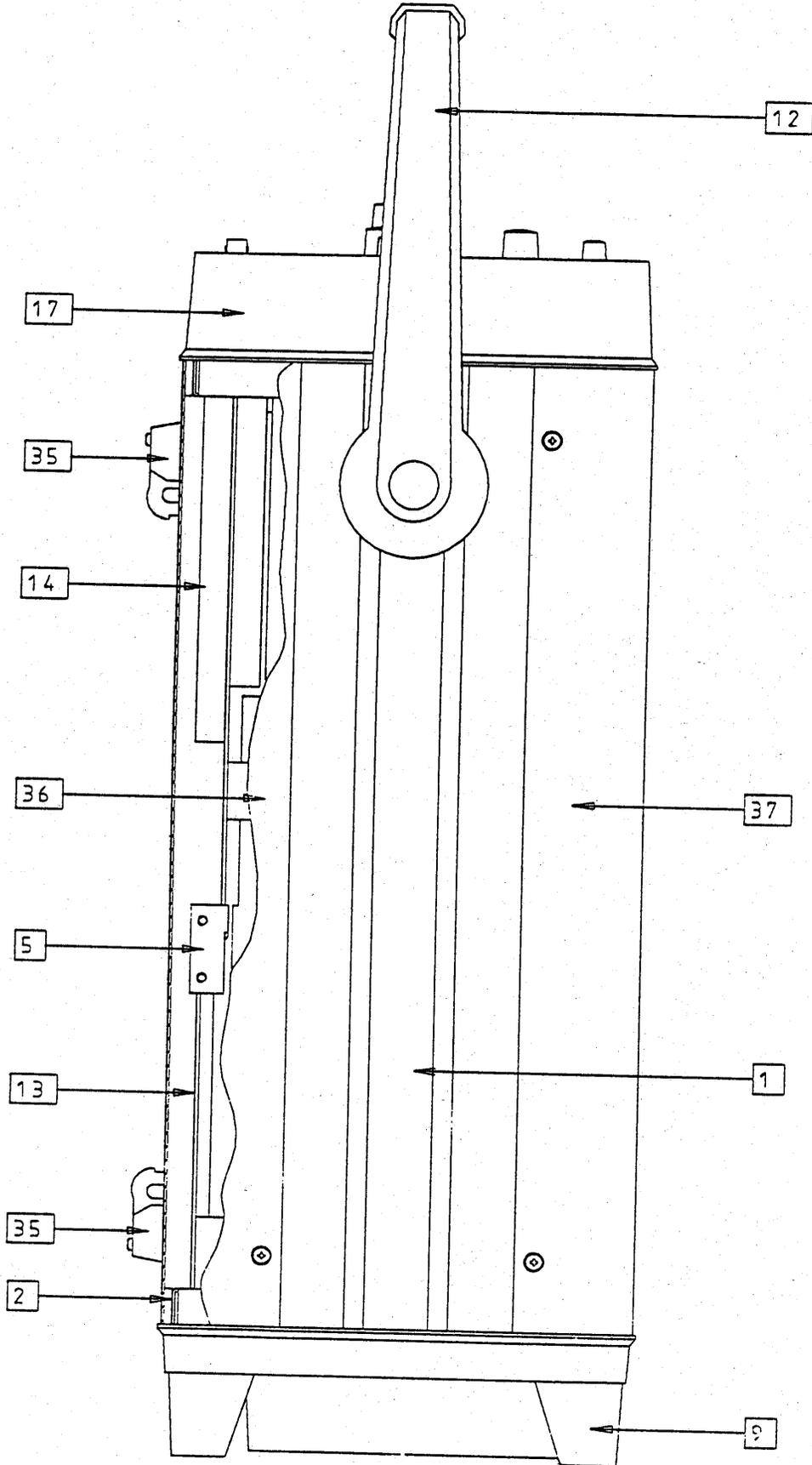


Figure 4.2

ASSEMBLY SEQUENCE OF PARTS				SCREWS		WASHERS		NUTS	
POS	DESCRIPTION	PART NUMBER	QTY						
1	SIDE PANEL	709 424 021	2						
2	REAR SUPPORT	709 424 041	1	550 440 108	4	551 440 300	4		
3	DISPLAY SUPPORT	709 424 031	1	550 440 108	4	551 440 300	4		
4	CARD GUIDE	530 410 001	5	550 430 104	10	551 430 300	10		
5	MOTHER CARD SUPPORT	709 424 051	1	550 440 108	4	551 440 300	4		
6	CRT ORANGE	321 220 009	1	550 440 416	4	554 440 202	4	552 440 100	4
						709 450 071	4		
7	SPRING EXT TYPE 190mm	554 310 001	1						
8	DEFLECTION YOKE	300 090 001	1						
9	REAR PANEL FOR 9424	F9424-9	1	550 440 406	6				
10	SPACER INSERT GUIDE	709 424 098	1	550 440 120	1	551 440 300	1	709 424 011	1
11	SUPPORT FOR MC	F9424-2	1						
12	HANDLE	530 301 005	1	550 440 120	2			709 424 011	2
13	94XX-1 WITH MC LOGIC	F9424-1	1	550 430 106	4	551 430 300	4		
14	QUAD CHANNEL FRONTEND	F9424-7	1	550 430 106	2	551 430 300	5		
				550 430 108	3				
15	DISPLAY CARD FOR 94XX	F9450-2	1	550 430 106	4	551 430 300	4		
16	INSERTION GUIDE MC	709 424 098	1						
17	QUAD CHANNEL FP CARD	F9424-5	1	550 440 406	6				
18	POWER SUPPLY 9451-1	315 040 015	1	550 440 105	4	551 440 300	4		
				550 440 506	2				
19	LABEL "DANGER---ONLY	377 051 005	1						
20	DISPLAY POWER CABLE	780 210 030	1						
21	CRT CABLE	780 299 025	1						
22	FRONTEND BASE CABLE	780 231 120	1						
23	BASE CARD POWER CABLE	780 220 015	1						
24	MEMORY CARD CABLE	780 231 131	1						
25	GROUND CABLE	780 544 512	1						
26	LABEL GROUND SYMBOL	377 131 001	1						
27	TIMEBASE CARD	F9420-4	1						
28	DUAL CHANNEL ADC	F9420-3	2						
29	PROCESSOR CARD	F9424-6	1						
30	FRONT PANEL CABLE	780 411 236	1						
31	CABLE CLIP AD BACK	594 230 002	1						
32	CLOCK-BUS	F9424-8	1	550 430 106	2	551 430 300	2		
33	POWER SUPPLY SUPPORT	709 424 061	1	550 430 106	2	551 430 300	2		
34	CARD RETAINER	709 424 095	1	550 440 108	2	551 440 300	2		
35	FOOT	530 010 024	4	550 440 110	4	551 440 300	4	552 440 100	4
36	LOWER COVER	709 424 081	1	550 440 708	4	551 440 501	4		
37	UPPER COVER	709 424 071	1	550 440 708	4	551 440 501	4		

Figure 4.3

4.1.2 Removal of upper and lower covers

The top (37) and bottom (36) covers are each secured by four M4X8 screws and washers. To remove the bottom (36) cover turn the handle (12) to the forward position. See figure 4.1 and 4.2

Removal of the top cover (37) gives access to the following boards:

11	-	F9424-2	Support for Memory Card
15	-	F9450-2	Display Board
18	-	F9451-1	Power Supply or 94XX-1701
27	-	F9420-4	Time Base
28	-	F9420-3	Dual ADC
29	-	F9424-6	Processor
32	-	F9424-8	Clock Bus

while removal of the bottom cover (36) gives access to:

13	-	F9424-1	Base
14	-	F9424-7	Front End

when working on the DSO it is useful to remove both covers, also to access to:

9	-	F9424-9	Rear Panel
17	-	F9424-5	Front Panel

4.1.3 Removal of the power supply support and card retainer

The power supply support (33) and the card retainer (34) hold the F9450-2 (15), F9424-6 (29), F9420-3 (28) F9420-4 (27), and the F9451-1 (18) power supply in place and must be removed if any of these boards is to be removed. They are fixed with screws and washers see figure 4.1 and 4.2.

4.1.4 Removal of the F9424-8 clock bus

This is the little board (32) at the front right of the DSO across the top of the ADC board (28) and the TDC board (27). It is attached to the display support (3) with two screws and lock washers. Be careful to replace it after any work on the boards, and make sure that the two connectors are well aligned before pushing it home.

4.1.5 Removal of the F9424-5 front panel

In order to remove this board, first remove both covers (36), (37).
(4.1.2)

Next remove the ribbon front panel cable (30) from the F9424-6 processor board (29).

Remove the six screws at the top, bottom, left and right of the front panel (17).

Now the front panel assembly can be removed from the DSO. If any parts need to be changed on the board F9424-5, the plastic front panel must be separated from the board.

All the rotary knobs must be removed, which means taking off all the caps (careful, soft plastic) and loosening the screws and nuts.

Then the 13 screws can be removed which frees the board.

When replacing a push button, take great care to achieve good alignment, to avoid sticking when the button is used.

To change the fine gain potentiometers remove the 9424-52 by removing the four screws and washers.

4.1.6 Removal of the F9424-9 rear panel

Remove the 6 screws at the top, bottom, left and right of the plastic rear panel (9).

Disconnect the fan cable from the F9451-1 power supply (18). The rear panel assembly can be removed from the DSO.

4.1.7 Removal of the F9450-2 display board

The display board (15) is situated along the left side of the DSO.

To remove it, first remove the top and bottom covers, and the power supply support (33). There are five cables connected to the F9450-2.

- Remove the two cables which lead to the deflection yoke.
- Remove the display power cable (20)
- Remove the CRT cable (21)
- Remove the EHT plug from the receptacle at the right side of the CRT

Touch the free end of the cable to the display support (3), 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 metallic display support and on the CRT receptacle, repeat until no spark is seen or heard.

Remove the four screws which secure the F9450-2 to the left panel and the board can now be removed vertically from the DSO, making sure that the EHT cable is kept away from boards, as some charge may remain.

*** C A U T I O N ***

The remaining electric field around the HV cable to the CRT can damage components on the F9424-6 (Eproms, 68020 co-processor) and front panel boards when it comes close to the processor board or the flat cable going to the front panel.

For this reason the HV cable has to be led around the top of the CRT as far away as possible from the boards and flat cable.

4.1.8 Removal of the CRT with the deflection yoke

Remove the following:

- Top and bottom covers 4.1.2
- F9424-5 Front panel 4.1.5
- EHT plug, the CRT cable and the two cables which lead to the deflection yoke, from the F9450-2 display board (15).
- Long helical grounding spring (7) which runs diagonally across the back of the bulb.
- Four screws, washers, and nuts on the front.

The tube (6) with the deflection yoke (8) can now, with care, be removed without any other boards having to be moved.

Hold the CRT very carefully or place soft padding under it.

4.1.9 Removal of the deflection yoke

Remove the following:

- Top and Bottom cover 4.1.2
- Front Panel 4.1.5
- CRT 4.1.8

Loosen the screw on the yoke ring holder.

The deflection yoke can be removed from the cathode ray tube.

4.1.10 Removal of the F9451-1 power supply

Ensure the line power cable is disconnected.

Remove the following:

- Top cover of 9424 4.1.2
- Power supply support 4.1.3
- Two screws from the F9424-9 rear panel (9)
- Two screws, washers from the rear support (2)
- One screw, washer, and nut from the ground cable (25)

Disconnect the following:

- Fan power supply cable
- Display power cable (20)
- Base Card power cable (23)

The F9451-1 power supply can be removed from the DS0.

4.1.11 Removal of the F9424-6 processor board

Remove the following:

- Top cover 4.1.2
- Power supply support 4.1.3
- Card retainer 4.1.3
- F9424-8 Clock bus 4.1.4

Disconnect the flat ribbon cable (30) from the F9424-6 processor (29) the board can now be removed vertically from the F9424-1 base board (13).

4.1.12 Removal of the F9420-3 dual ADC board

Remove the following:

- Top cover 4.1.2
- Power supply support 4.1.3
- Card retainer 4.1.3
- F9424-8 Clock bus 4.1.4
- F9424-6 Processor 4.1.11

Disconnect the two signal input cables from the ADC board (28). The F9420-3 can be removed vertically from the F9424-1 base board (13) Remove the TDC board (see 4.1.13) to access to the second ADC board.

4.1.13 Removal of the F9420-4 TDC board

Remove the following:

- Top cover 4.1.2
- Power supply support 4.1.3
- Card retainer 4.1.3
- F9424-8 Clock bus 4.1.4
- F9424-6 Processor 4.1.11
- F9420-3 ADC 4.1.12

The 9424 is equipped with the trigger OUT, trigger VETO, clock IN and clock OUT options. Disconnect the four SMD cables from the TDC board, connectors J2, J3, J7 and J10 (see figure 4.4: cabling diagram). Now the F9420-4 can be removed vertically from the F9424-1 base board (13) and the F9424-7 front end (14).

9420-4 CABLING DIAGRAM

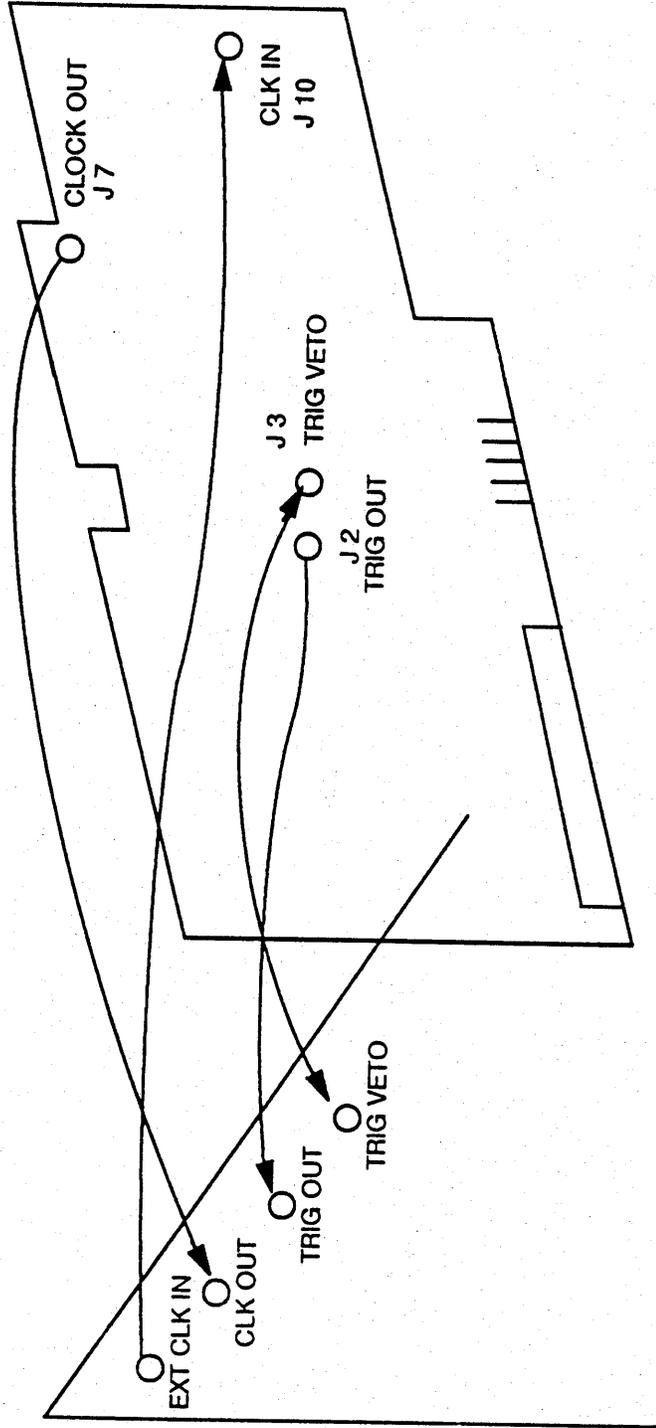


Figure 4.4

4.1.14 Removal of the F9424-7 front end

Remove the following:

- Top and bottom covers 4.1.2
- Power supply support 4.1.3
- Card retainer 4.1.3
- F9424-8 Clock bus 4.1.4
- F9424-6 Processor 4.1.11
- F9420-3 ADC 4.1.12
- F9420-4 TDC 4.1.13
- Two screws and washers from the mother card support (5)
- Three screws and washers which secure the F9424-7 to the right panel.
- Front End Base Cable (22)

If the 9424 is equipped with the external trigger option, disconnect the SMD cable from connector J15.

Now the front end can be removed forward.

4.1.15 Removal of the F9424-1 base board

Remove following:

- Top and bottom covers 4.1.2
- Power supply support 4.1.3
- Card retainer 4.1.3
- F9424-8 Clock bus 4.1.4
- F9424-6 Processor 4.1.11
- F9420-3 ADC 4.1.12
- F9420-4 TDC 4.1.13
- Front End base cable (22)
- Base card cable (23)
- Memory card cable (24)
- Four screws and washers from the mother card support (5)

At this stage the F9424-1 base board can be removed forward from the 9424.

4.1.16 Removal of the F9424-2 support for Memory card

Remove the following:

- Top cover 4.1.2
- Power supply support 4.1.3
- Card retainer 4.1.3
- F9424-8 clock bus 4.1.4
- F9424-6 processor 4.1.11
- F9420-3 ADC 4.1.12
- F9420-4 TDC 4.1.13

Disconnect the memory card cable (24) from the F9424-2 connector. The screws and washers which secure the board to the right panel can be removed.

Slide the board out of the F9424-5 front panel.

4.2 Software upgrade procedure

4.2.1 Changing Eproms

These six Eproms are on the F9424-6 processor (29) board, and access is possible only by removing the board.

Follow 4.1.11 procedure: removal of the F9424-6 processor board.

The precautions against static electricity are required.

Do not place the solder side of the board directly on an antistatic foam or mat, which are slightly conducting and can discharge the battery.

The Eproms can be removed using an IC extractor.

Replace the Eproms at location A1 to A6 see figure 4.5 and 4.6 with the latest version.

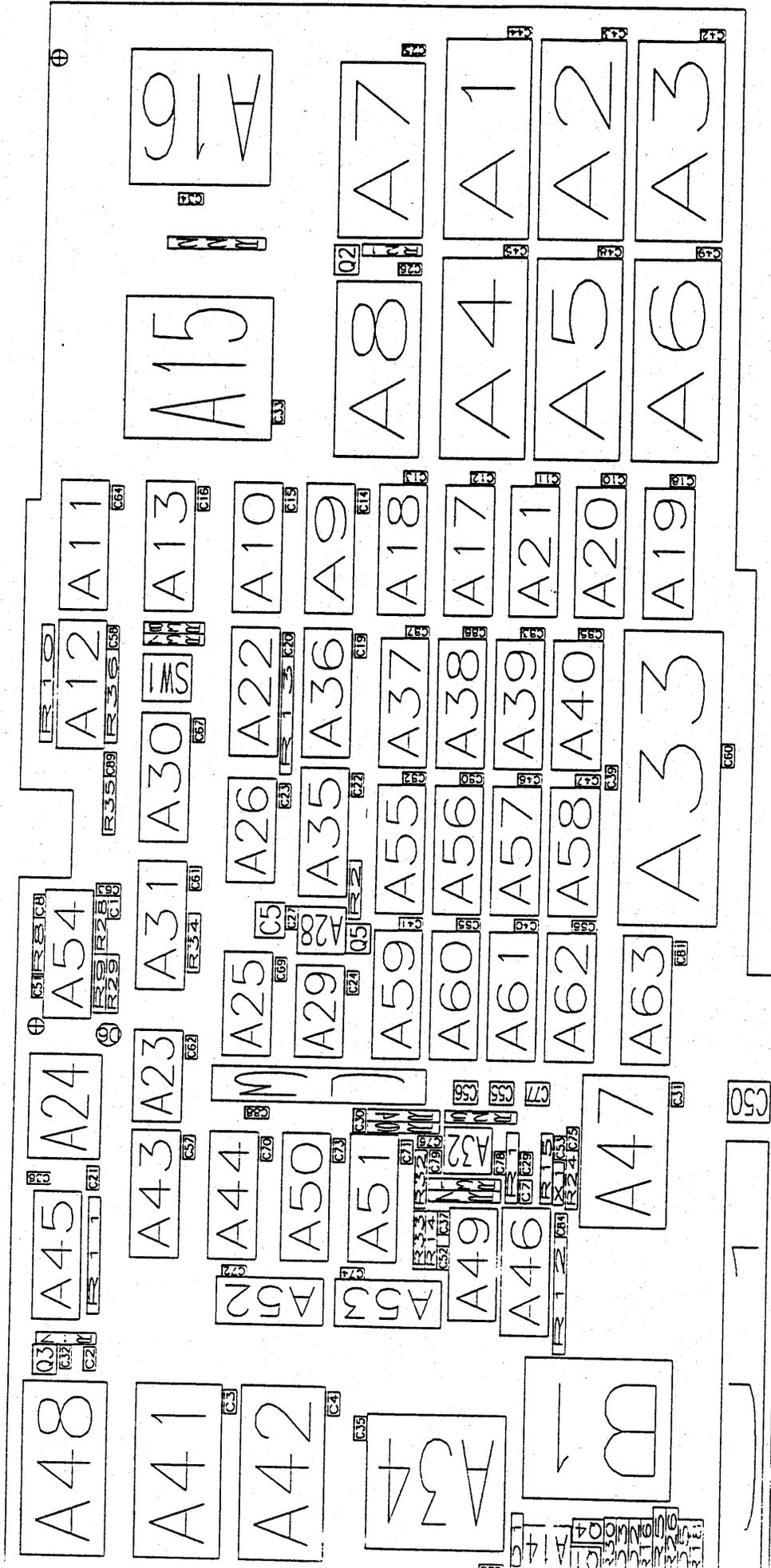
Make sure that the guiding notch in the chip is aligned with the PCB reassemble scope and check that it boots up properly.

4.2.2 Changing software selection PAL

The software option selection PAL is located on the F9424-6 processor board in socket A45 (top left) see figure 4.5 and 4.6 follow 4.1.11 procedure and 4.2.1. Insert or replace the PAL into location A45.

Watch out to match the orientation notch.

Reassemble the boards and check that the scope boots correctly.



94XX_6 Rev:A

Figure 4.5.

4.3 Software option selection PAL

The available software option selection PAL

0000:	standard:	Pal not necessary
0001:	WPO1 :	Basic function package
0002:	WPO2 :	Basic FFT package
0004:	WPO3 :	Extended pulse parameter and histograms.
0008:	WPO4 :	ATE support
0100:	MATE :	MATE remote control
0200:	CARD :	Memory card

See figure 4.7

OPTIONS						PAL Description
MATE	CARD	WP04	WP03	WP02	WP01	
	-	-	-	-	-	Standard PAL not necessary
	-	-	-	-	X	PG0001
	-	-	-	X	-	PG0002
	-	-	-	X	X	PG0003
	-	-	X	-	-	PG0004
	-	-	X	-	X	PG0005
	-	-	X	X	-	PG0006
	-	-	X	X	X	PG0007
	-	X	-	-	-	PG0008
	-	X	-	-	X	PG0009
	-	X	-	X	-	PG000A
	-	X	-	X	X	PG000B
	-	X	X	-	-	PG000C
	-	X	X	-	X	PG000D
	-	X	X	X	-	PG000E
	-	X	X	X	X	PG000F
X		-	-	-	-	PG0100
X		-	-	-	X	PG0101
X		-	-	X	-	PG0102
X		-	-	X	X	PG0103
X		-	X	-	-	PG0104
X		-	X	-	X	PG0105
X		-	X	X	-	PG0106
X		-	X	X	X	PG0107
X		X	-	-	-	PG0108
X		X	-	-	X	PG0109
X		X	-	X	-	PG010A
X		X	-	X	X	PG010B
X		X	X	-	-	PG010C
X		X	X	-	X	PG010D
X		X	X	X	-	PG010E
X		X	X	X	X	PG010F
	X	-	-	-	-	PG0200
	X	-	-	-	X	PG0201
	X	-	-	X	-	PG0202
	X	-	-	X	X	PG0203
	X	-	X	-	-	PG0204
	X	-	X	-	X	PG0205
	X	-	X	X	-	PG0206
	X	-	X	X	X	PG0207
	X	X	-	-	-	PG0208
	X	X	-	-	X	PG0209
	X	X	-	X	-	PG020A
	X	X	X	-	X	PG020B
	X	X	X	-	-	PGC20C
	X	X	X	-	X	PGC20D
	X	X	X	X	-	PGC20E
	X	X	X	X	X	PGC20F

Figure 4.7

4.4 Board exchange procedure

4.4.1 F9424-1 Base board

This card carry the programmable array logic (PAL) which is specific to the DSO serial number (S/N):

PAL XXXX in location A22
XXXX = DSO serial number

WARNING: The replacement board is supplied without this PAL.

Therefore you have to transfer the existing PAL from the faulty board to the new board.

4.4.2 F9424-6 Processor board

The processor carry Eproms (LOC A1 to A6) and software option selection PAL (LOC A45).

see figure 4.5 and 4.6

PAL PG XXXX_R

XXXX = software option.
R = release

see figure 4.7

The Eproms and PAL can be removed using an IC extractor. The usual precautions against static electricity are required.

WARNING: The replacement board is supplied without PAL neither Eproms

Therefore you have to transfer the existing PAL and Eproms from the faulty board to the new board.

4.5 F9451-1 Power Supply Adjustment Procedure

The +/- 5V, +/- 15V can be adjusted to the nominal values in the following way. The reference for the measurements are the pins on connector J7 on the 9424-1 Base Board.

From top to bottom

-15v pin 10, +15v pin 9, -5v pin 8, +5v pin 5, Gnd pin 6

Have the scope turned on. For safety reasons, unplug the mains cable from the outlet without turning the scope off.

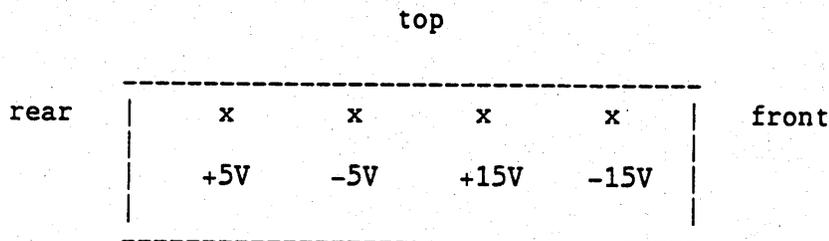
Follow the F9451-1 power supply disassembly procedure 4.1.10.

The adjustment potentiometers are situated on the small power supply PCB next to the 9450-2 display board.

In order to get access for adjustment, put the scope on its rear feet and pivot the power supply unit slightly away from the display board. Make sure the mains cable stays plugged into the line filter.

Plug the mains cable back into the outlet and wait for the scope to turn on.

Proceed to voltage adjustments with a very small screwdriver. The four potentiometers are arranged on the PCB in the following order:



Note the nominal voltages with their tolerances given in the specifications.

+ 15.10 V	+/-	1%
- 15.10 V	+/-	1%
+ 5.10 V	+/-	1%
- 5.10 V	+/-	1%

Unplug the mains cable from the outlet. Reassemble the power supply unit to the scope.

4.6 F9424-7 Front End Test and Calibration Procedure

4.6.1 Power Supplies

Adjust potentiometer R65 to get + 6.00 V between pin 3 and 4 of TP1.

Check with a voltmeter on Test Point TP1 (16 pins), the following voltages :

TP1	Pin 1 - 2 (-)	:	+ 12 V	+/-	0.35 V
"	Pin 5 - 6 (-)	:	- 6 V	+/-	0.35 V
"	Pin 7 - 8 (-)	:	- 12 V	+/-	0.35 V
"	Pin 9 - 10(-)	:	+ 5 V	+/-	0.15 V
"	Pin 11 - 12(-)	:	- 5 V	+/-	0.15 V

4.6.2 Input Impedance

Set DSO CH1 input to 50 Ohm, 100mV/div, DC, with any Time Base
Check with an ohmmeter:

- input impedance must be 50 Ohm +/- 2%

Repeat all impedance checks for CH2, CH3, CH4 and External Trigger.

Set DSO CH1 input to 1 mOhm, DC Coupling, 100 mV/div, with any Time Base.

Check:

- input impedance must be 1 mOhm +/- 2%

Repeat all impedance checks for CH2, CH3 and CH4.

4.6.3 External Trigger level Verification

The 9424 model Digital Storage Oscilloscope comes in two different versions : the standard 9424 and the 9424E with an External trigger input from the Trigger Veto (labelled Trig IN on 9424E) connector on the rear panel to the trigger circuit on channel 4. This option is realized with the front end board F9424-7 at revision E and up.

Ext Trigger input characteristics :

impedance : 50 Ohm

maximum amplitude : +/- 0.8 V

- Set scope to Channel 2, 1 mOhm DC, 0.2 V/div, offset zero,
- Trigger on EXT, DC, level 0 mV, pretrigger delay 50 %,
- Apply 100 HZ sine wave with zero offset, 6 div peak peak amplitude, through 20 dB attenuator to CH2 and External Trigger input.

Use a T BNC adaptor.

- Set External Trigger on POS slope, and Auto
- Check :

The sine wave must pass through the horizontal center of the screen (50 % pretrigger) at the vertical position zero, (vertical center) within +/- 2 minor divisions.

- Repeat the test for following conditions :
- Trigger slope NEG (verify slope at check point)
- Trigger coupling AC, HF, HFrej, LFrej

4.6.4 50 Ohm Overshoot Compensation

- Apply the pulse generator LeCroy 4969 (< 700 ps) to 50 Ohm input of the 9424 DSO.
- Set DSO to 50 Ohm, DC, 100 mV/div, 5 ns/div, RIS mode
- Turn on the pulse parameters.
- Press Pass/Fail mode
- Press Setup Pass/Fail
- Set Channel 1, Channel 2, Channel 3, and Channel 4 to parameters on Show, over +, and rise
- Adjust C142 on CH1, C242 on CH2, C342 on CH3, and C442 on CH4 in order to get less than:

8 % overshoot

Typically 5 to 7 %

- Check the rise time, should be less than 0.96 ns
- Check the Bandwidth : 350 MHz

4.6.5 50 Ohm CH1, CH2, CH3 and CH4 Overload Protection Adjustment

- The front-end has to be in the 9424 scope with the aluminium covers mounted and the upper DSO cover closed.
- Warm up the unit for 20 minutes.
- Set scope to 50 Ohm, 2s/div, norm, pos
- Apply 7.07 V (1 watt) to the channel to be adjusted.
- Adjust the overload detection, potentiometer R21 (OVL1) for CH1, R20 (OVL2) for CH2, R19 (OVL3) for CH3, and R18 (OVL4) for CH4 such that the overload trips within 10 to 20 seconds.
- Turn the potentiometer clockwise if it's too slow, or counterclockwise if it's too fast.
- Apply 5 V (0.5 watt) to the channel to be tested, and check that the overload doesn't trip after 40 seconds.

4.7 F9450-2 Display Board Calibration Procedure

It is advisable to perform this adjustment when the scope is in a stable condition, after few minutes of warm up.

Also it is important to check the power supplies, and to readjust them to the nominal values.

The reference for the measurements are the pins on connector J7 on the base board F9424-1.

- 15.00 V	: +/- 1%	on pin 10
+ 15.04 V	: +/- 1%	on pin 9
- 5.07 V	: +/- 1%	on pin 8
+ 5.16 V	: +/- 1%	on pin 5
GND	:	on pin 6

4.7.1 Image Position adjustment

If the X,Y Gain amplifiers or X,Y Offset amplifiers are not correctly adjusted, or the image is poorly centered or distorted on the screen, it may be desirable to readjust the four potentiometers on the F9450-2 display board, or the two magnetic rings on the yoke, or the mechanical yoke position.

4.7.1.1 Vertical, Horizontal, Gain and Offset Amplifiers adjustment

By pressing the "Main Menu" button while keeping the lowest menu button depressed, enter into the secret menu, then press the "Software Tests" key, and select "Characters". See figure 1.

With the help of the border lines of the Character set Display, adjust the potentiometers GAIN X, OFFS X, GAIN Y, OFFS Y (see POT LAYOUT) to center the image on the screen.

Adjust the size of the display, in order to get 5mm gap between the middle of the image lines (top, bottom, left, right) and the CRT lines.

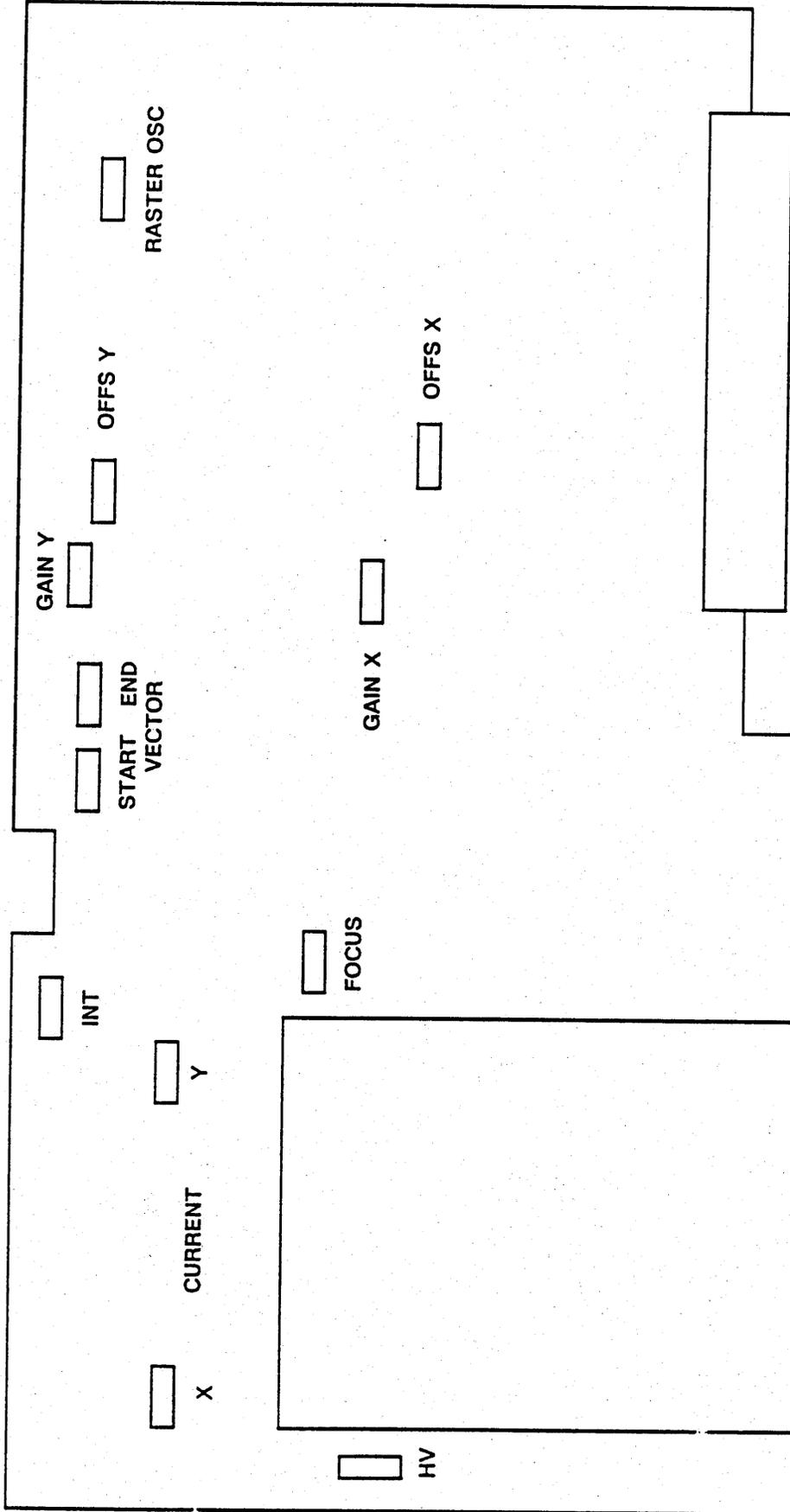
4.7.1.2 Centralizing adjustment and Yoke Rotation

This should be done unless all other sources of offset have been eliminated.

By adjusting the two rings on the Yoke, center the image on the screen.

Loosen the screw on the Yoke ring holder, and rotate the image by turning the mechanical Yoke position.

TOP



9450-2 POT LAYOUT

4.7.5 Raster

Set the DSO to 1 MOhm, DC, .2V/div, .2ms/div, auto trigger on CH1

Send a 1 kHz sine wave or square wave to channel 1, adjust the signal amplitude to 6 V peak to peak.

Turn on the persistence mode, set 1 sweep, and make a single trigger.

With the RASTER OSC potentiometer on the display board, adjust the vertical alignment of the dots. See figure 2.

14-Mar-91
14:48:12

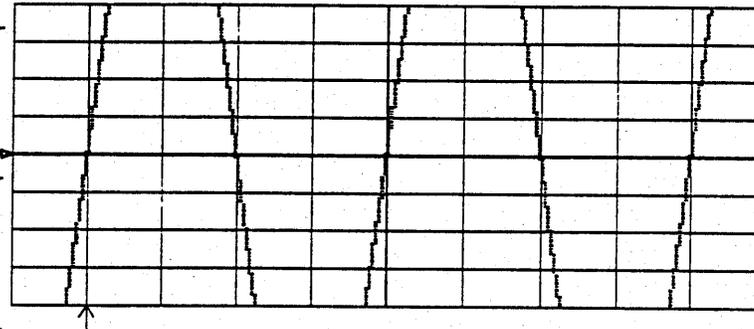
LeCroy

Main Menu

Clear display

Sweeps
1

Persistence
off



1 Sweeps

Chan 1
.2 ms .2 V

CH1 0 mV DC



CH1 .2 V =
CH2 .2 V =

T/div .2 ms

Figure 2 : Raster Oscillator

Chapter 5

TROUBLESHOOTING and FLOW CHARTS

0274
0275
0276
0277
0278
0279
0280

Table of contents:

- 5.1 Introduction
- 5.2 Front panel controls do not operate
- 5.3 Rear panel controls do not operate
- 5.4 No Remote control GPIB or RS-232-C
- 5.5 No display or front panel control
- 5.6 Abnormal image on screen
- 5.7 Basic manual Performance Test Procedure
- 5.8 Recommended service equipment and spare parts

5.1 Introduction

In order to help simplify servicing and minimize downtime, the following list of possible symptoms, likely causes, and troubleshooting steps have been prepared. Most procedures in this section will allow a technician to troubleshooting down to the board level.

Defective circuit boards will be repaired or exchanged by our regional LeCroy service office .

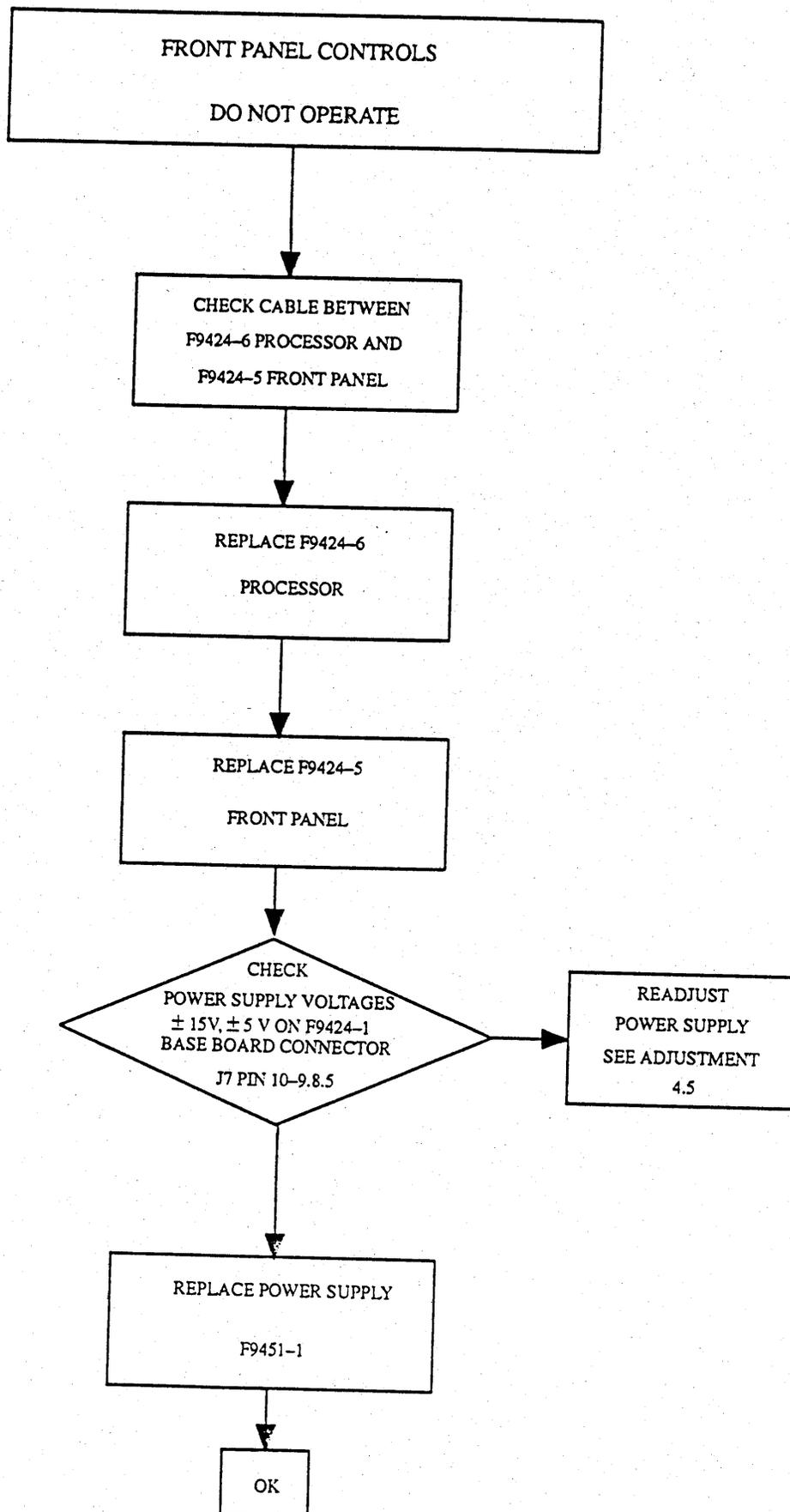
The first step in troubleshooting is to check for obvious items like blown fuses, voltage selector switch in correct position and loose line cord.

The power supply is the next item to check before proceeding to more detailed troubleshooting.

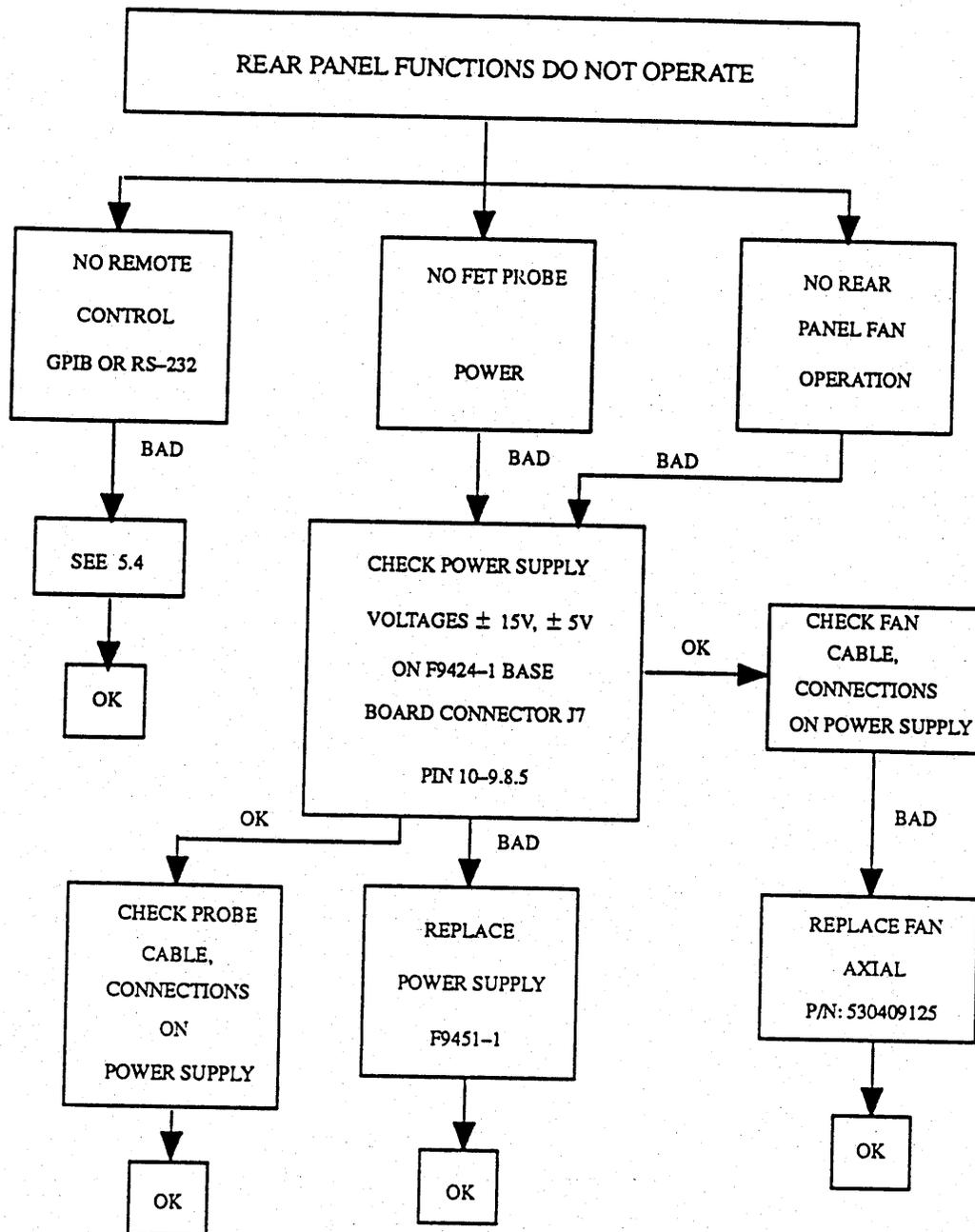
Noisy or low power supply can cause a variety of problems, both digital and analog.

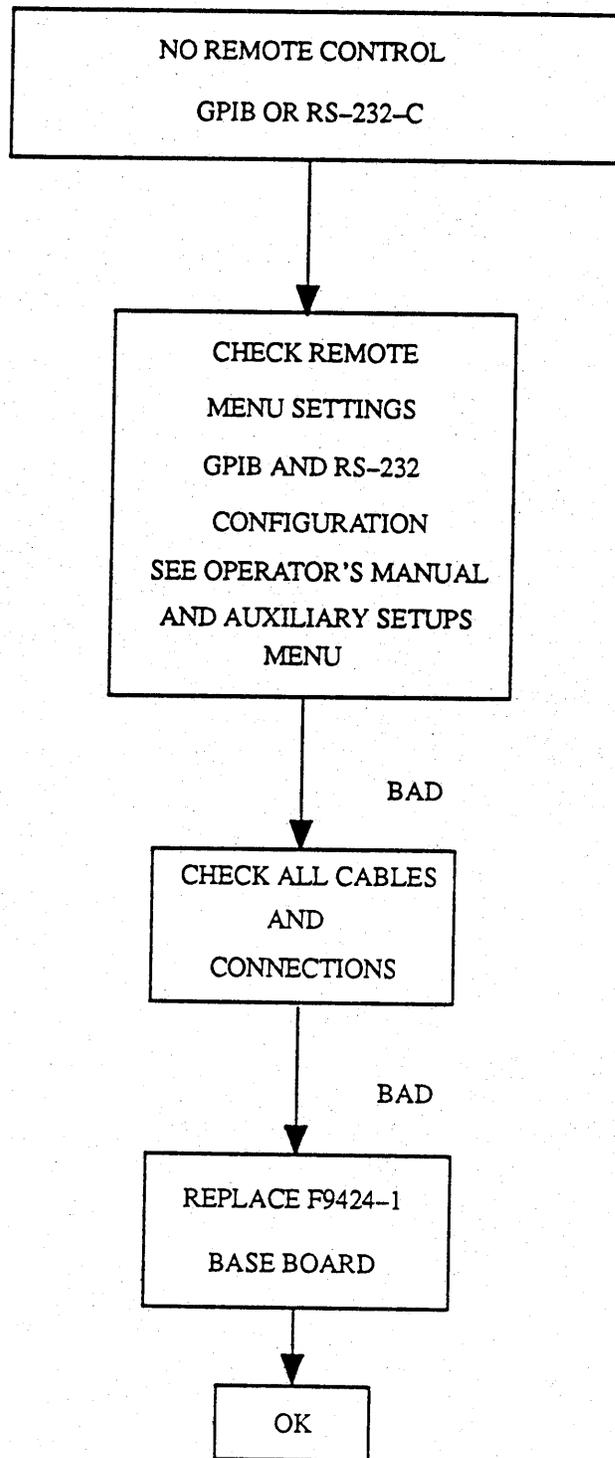
A complete list of recommended service equipment and spare parts is given in section 5.8.

5.2

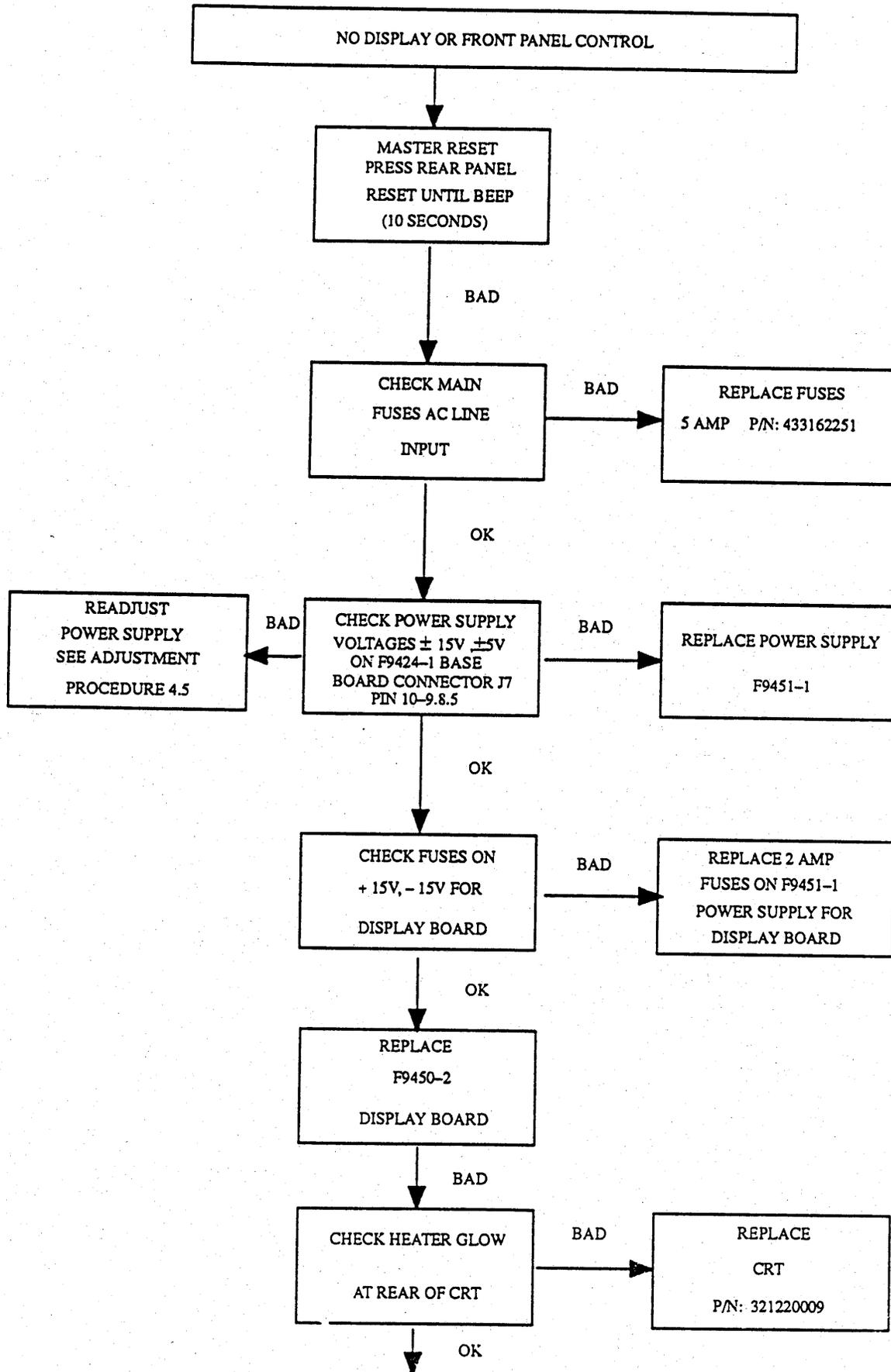


5.3

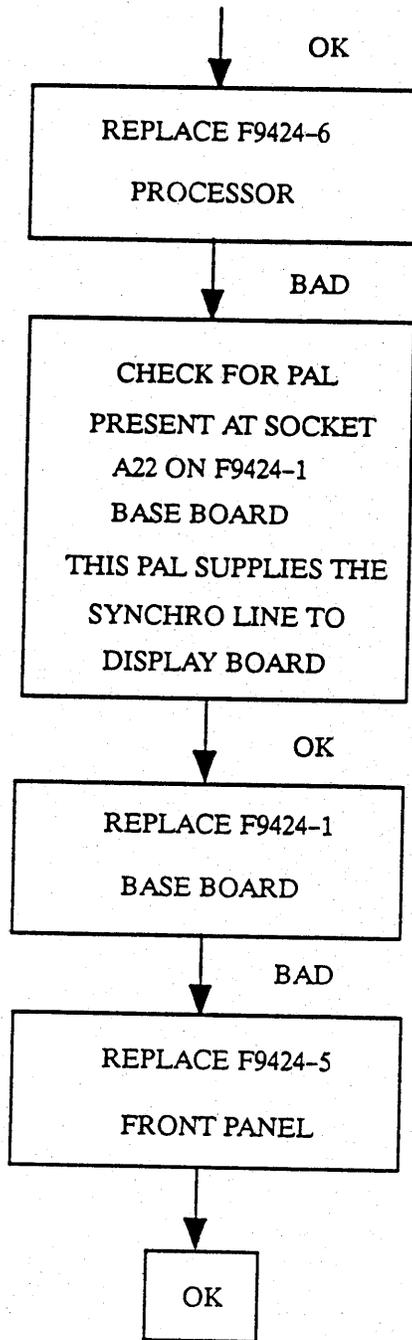




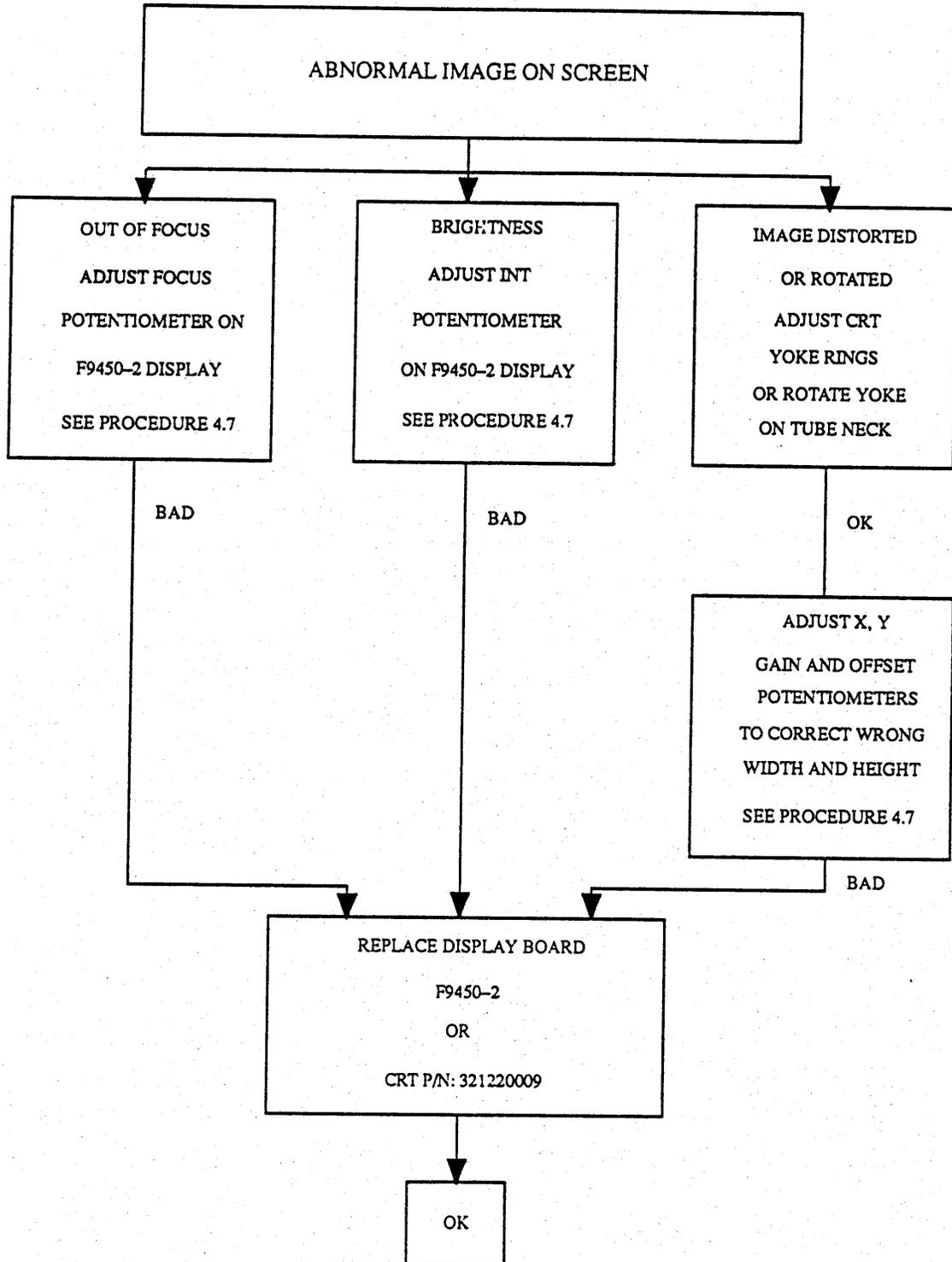
5.5.1



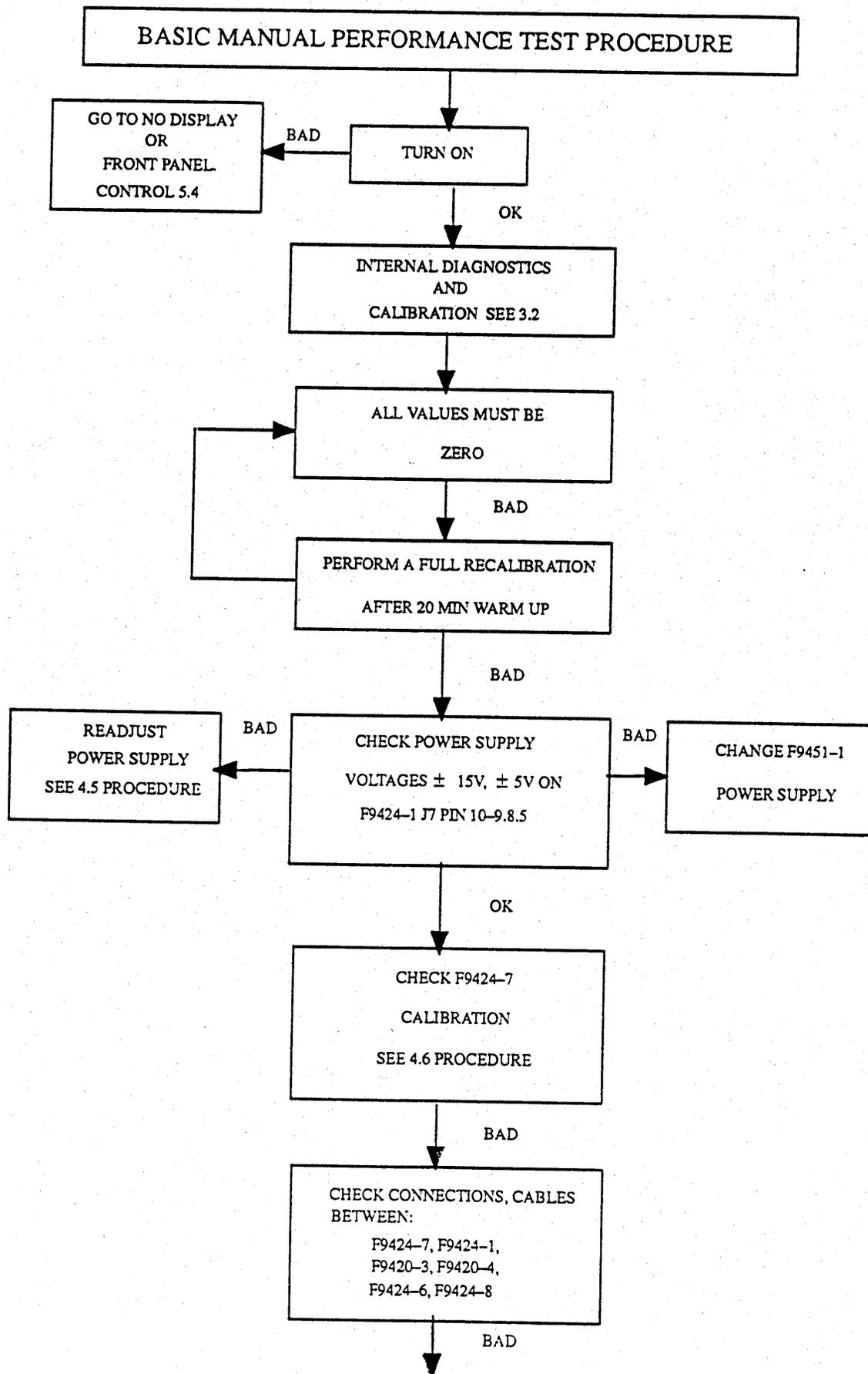
5.5.2



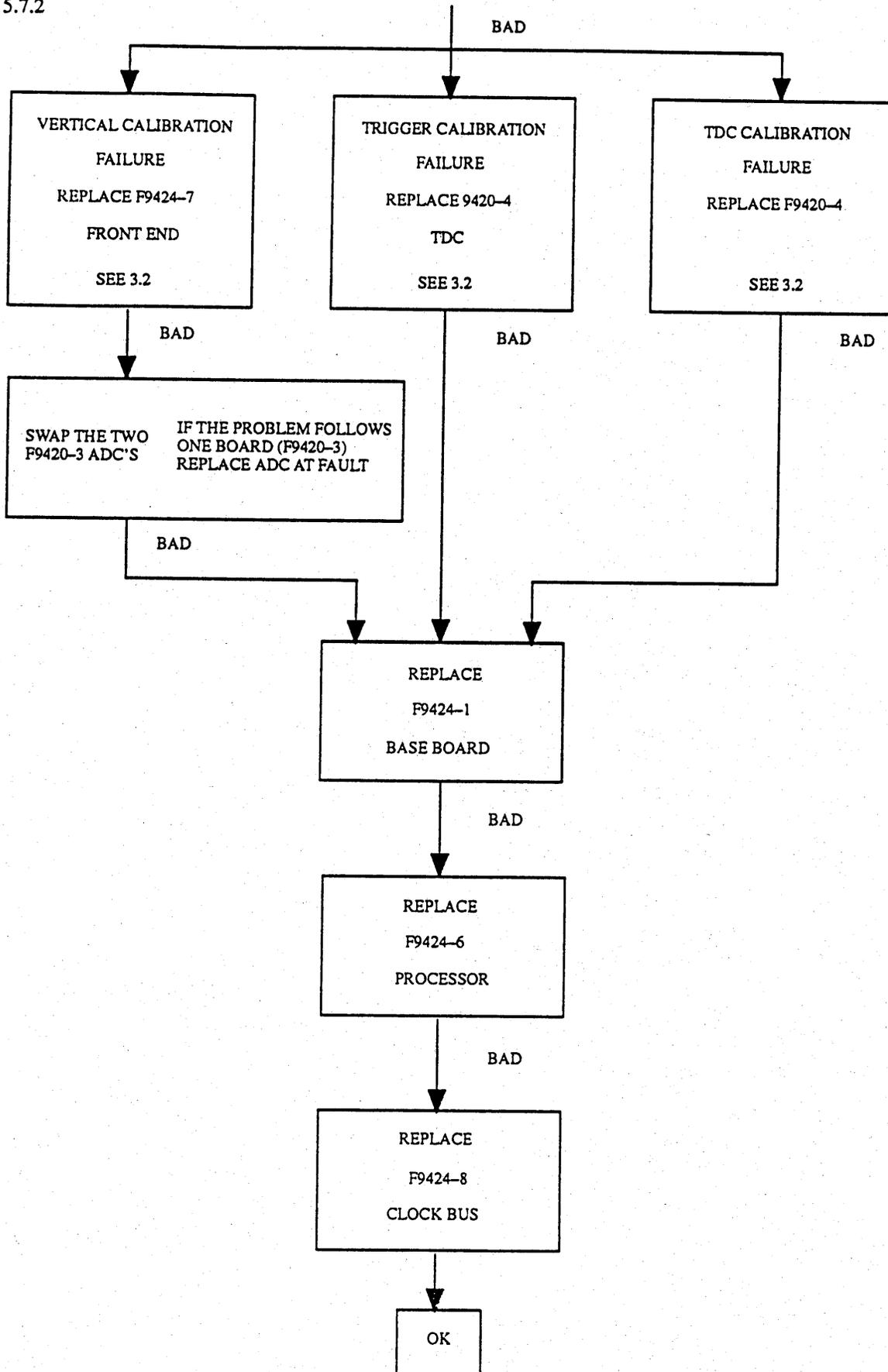
5.6



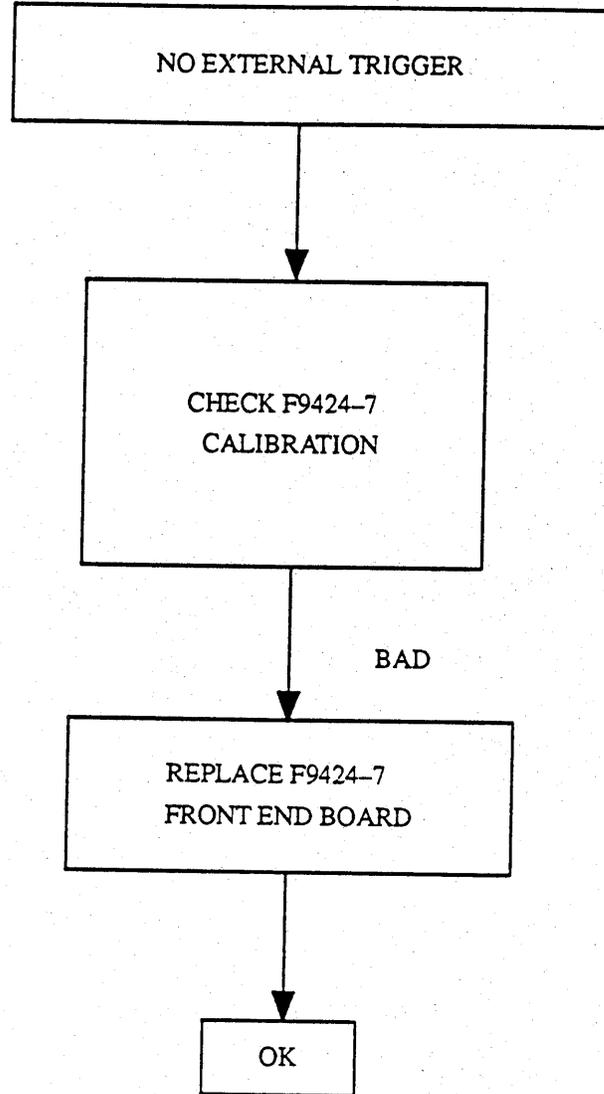
5.7.1



5.7.2



5.7.3



5.8 Equipment and spare parts recommended for service

5.8.1 Equipment

The following list of equipment are needed to provide the technician access to the 9424 subassemblies during repair and calibration.

- 1- Sine wave generator: Marconi 2019A, 2022C, 2030 or equivalent.
- 2- Sine wave generator: 5 volt peak to peak amplitude type SG503 or equivalent.
- 3- DC precision power supply: Tektronix PS5004 or equivalent.
- 4- Digital Multimeter: Philips PM2525 or equivalent.
- 5- Digital scope 350 MHz bandwidth: LeCroy 9450 or equivalent.
- 6- Fast rise time pulser: LeCroy 4969 (<700PS) or equivalent.
- 7- BNC coaxial cables (5 nsec, 2 nsec, 1 nsec), adapter T BNC, Adapter BNC - banana, 50 Ω BNC terminator feed through.

5.8.2 Spare parts

In order to make the repair of 9424 at board level, a minimum stock of boards is at least one each:

- | | |
|-----------|-----------------------------------|
| - F9424-1 | Base board |
| - F9450-2 | Display board |
| - F9420-3 | ADC (Analog to Digital Converter) |
| - F9420-4 | TDC (Time to Digital Converter) |
| - F9424-5 | Front panel |
| - F9424-6 | Processor |
| - F9424-7 | Front End |
| - F9424-8 | Clock bus |
| - F9451-1 | Power supply |

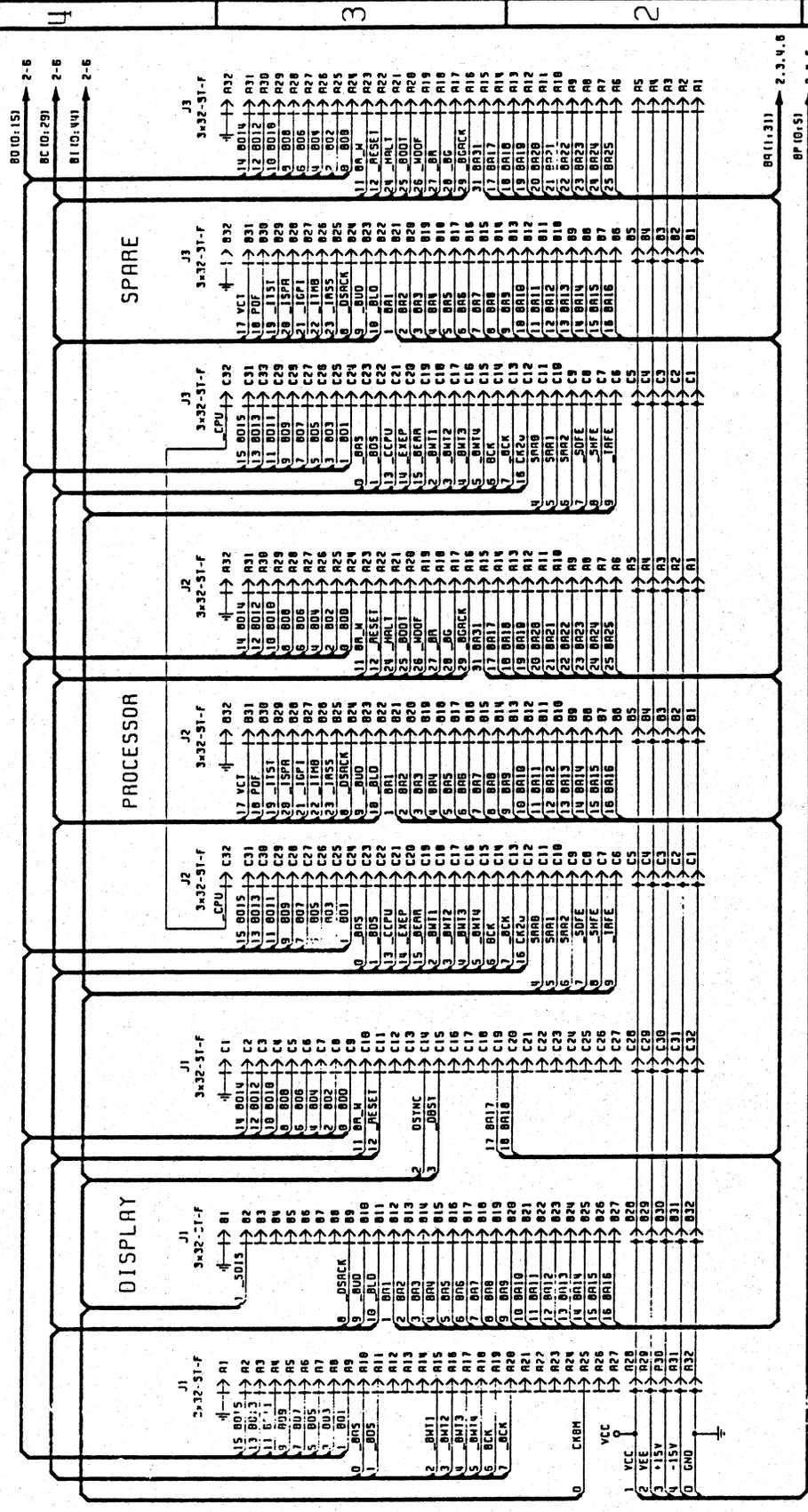
The display tube, yoke and fan are very reliable parts. Their failure rate is extremely low. Also a few other parts (scope handle, metal enclosure case and back panel) are not on the above list.

Chapter 6

CIRCUIT DIAGRAMS

Table of Contents:

F9424-1	Base board
F9424-2	Support for Memory card
F9450-2	Display board
F9420-3	ADC board
F9420-4	TDC board
F9424E-5	Front panel board
F9424-6	Processor board
F9424E-7	Front end
F9424-8	Clock bus



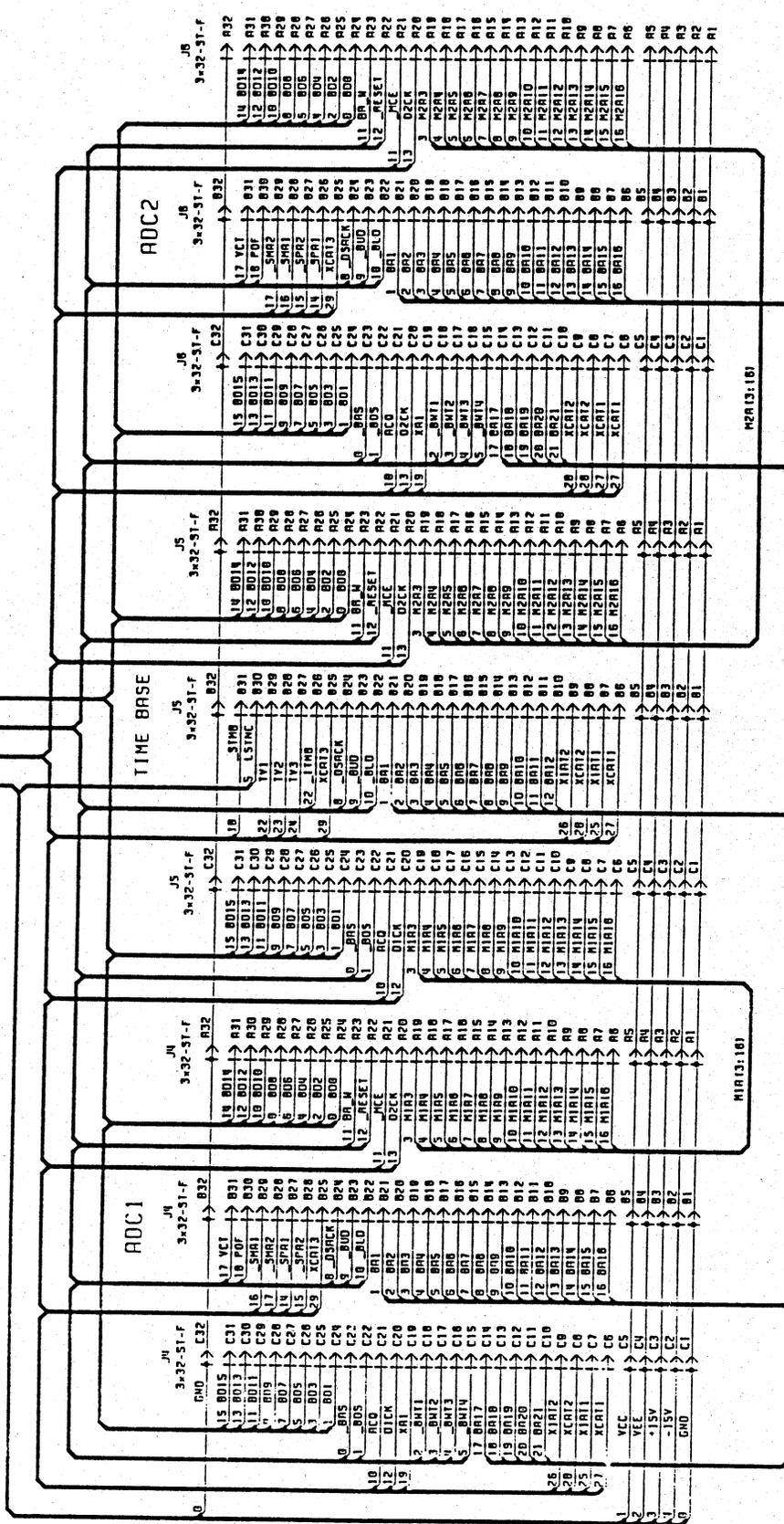
THIS UNIT IS THE PROPERTY OF LEROY CORPORATION. IT IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS DESIGNED. IT IS NOT TO BE REPAIRED OR MODIFIED WITHOUT THE WRITTEN PERMISSION OF LEROY CORPORATION.

MODEL	9424-1
MODULAR	9424-1 WITH MEM. CARD
ORDER NO.	9424-1-S1
TITLE	16-021-08
REV.	1
DATE	10-01-80

LeRoy CORPORATION

16-021-08
REV. 1
10-01-80

- 1 00 (0:15)
- 1 00 (0:29)
- 1 01 (0:44)
- 1 00 (0:51)



00 (1:31)

WHEN THE PART IS USED IN THE MODES OF OPERATION, THE USER SHOULD REFER TO THE USER MANUAL FOR THE MODES OF OPERATION. THE PART IS NOT TO BE USED IN THE MODES OF OPERATION.

LeCroy CORPORATION

MODEL: 9424-1
 SERIAL: 9424-1-31
 DATE: 10-OCT-88

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

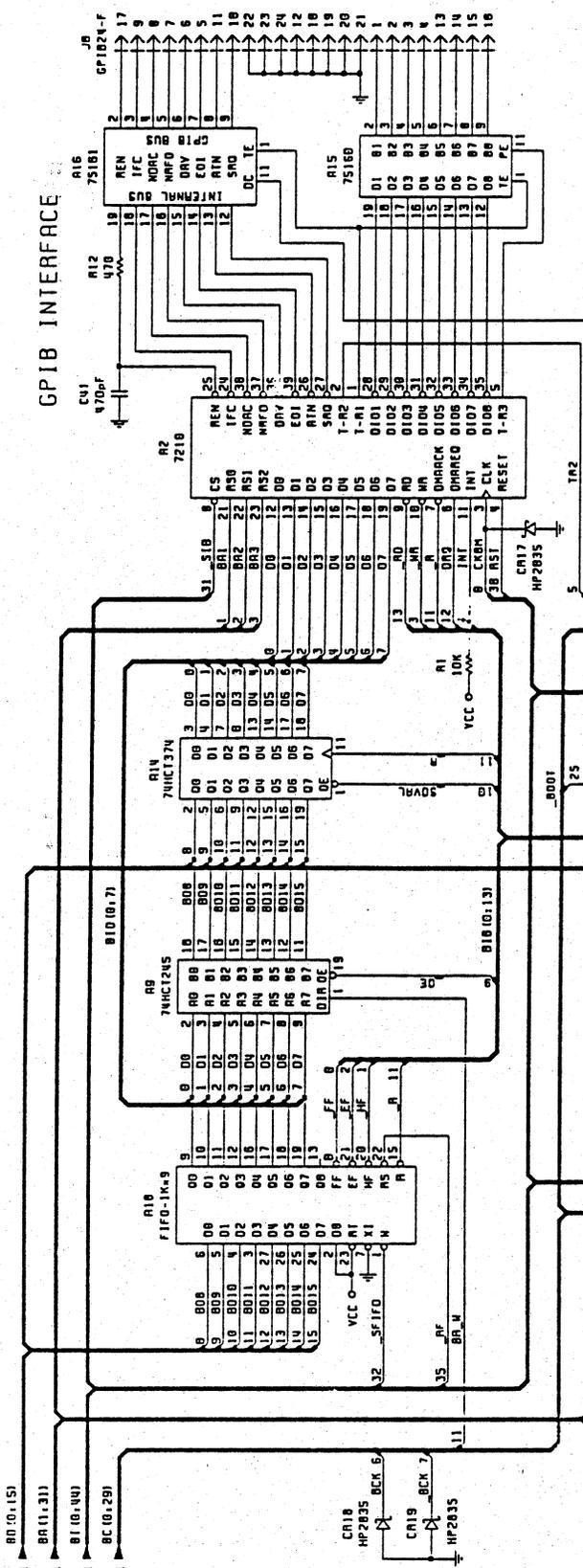
10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

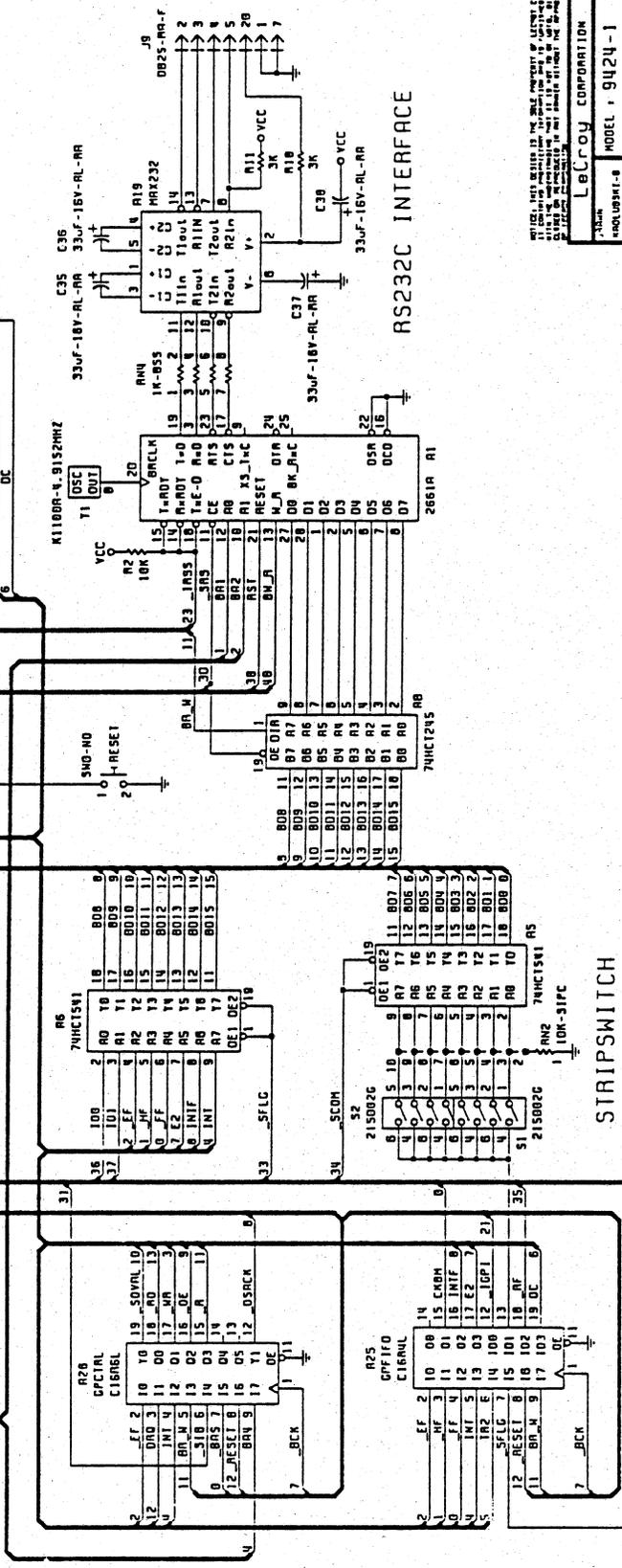
10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32

GPIO INTERFACE



RS232C INTERFACE

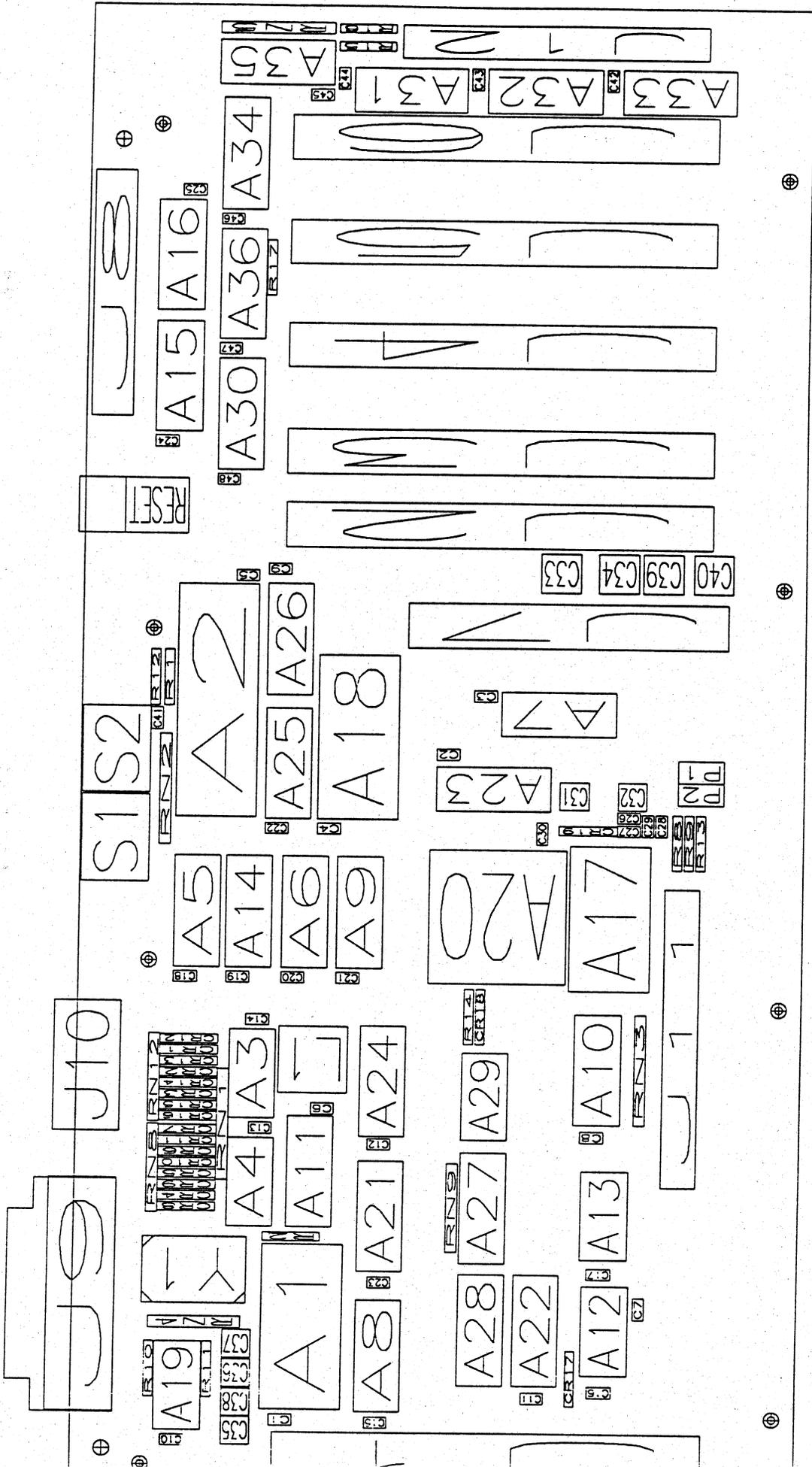


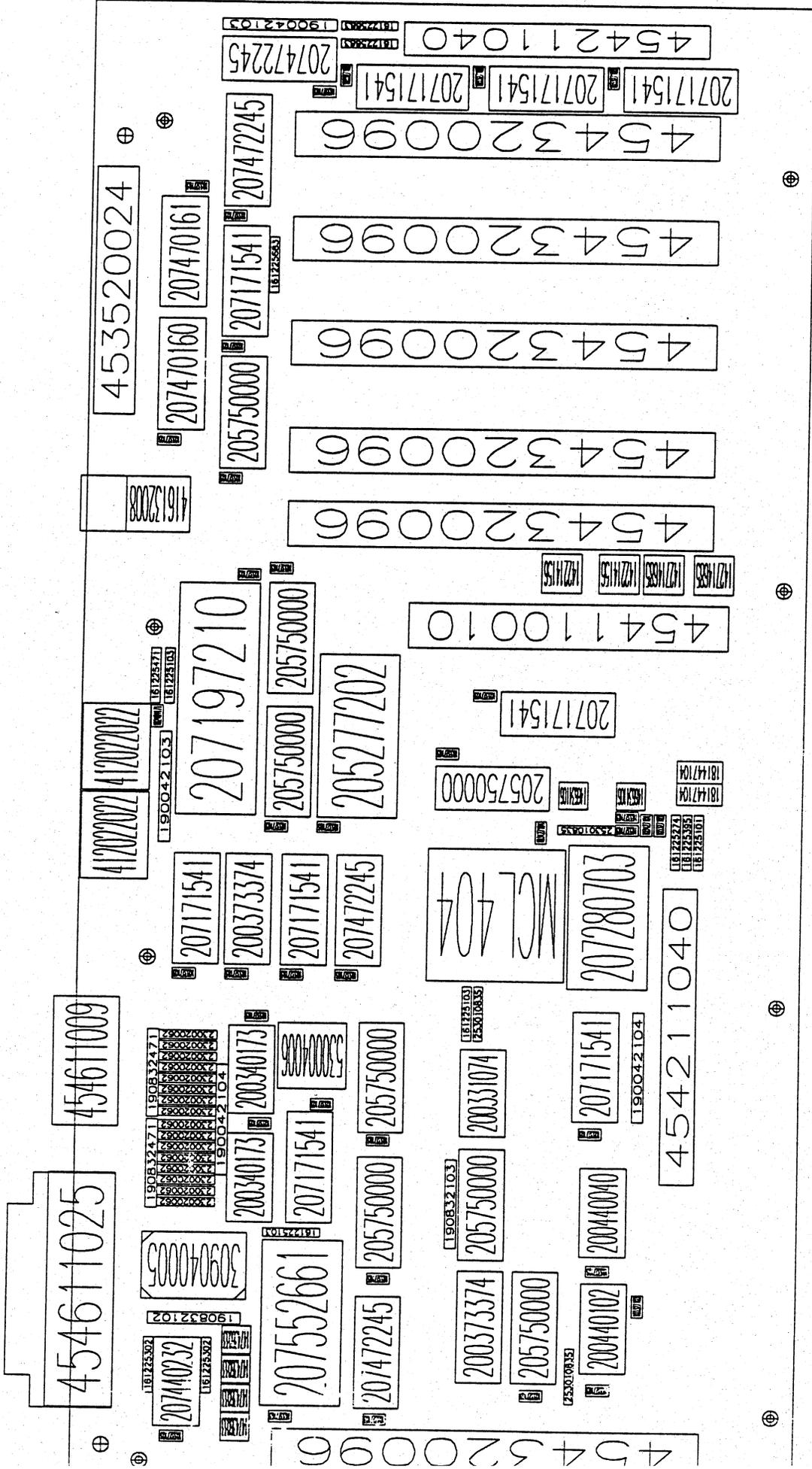
NOTICE: THIS DESIGN IS THE SOLE PROPERTY OF LEXTRON CORP. IT IS TO BE USED ONLY FOR THE PURPOSES SPECIFIED IN THE ORIGINAL ORDER. NO PARTS OF THIS DESIGN ARE TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC, MECHANICAL, PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEXTRON CORPORATION.

Lextron CORPORATION
 MODEL: 9424-1
 ENCLOSURE: 8
 PART NO: 9424-1-01
 DATE: 18-OCT-88

STRIPSWITCH
 1 10K-51PC

NAME: 33

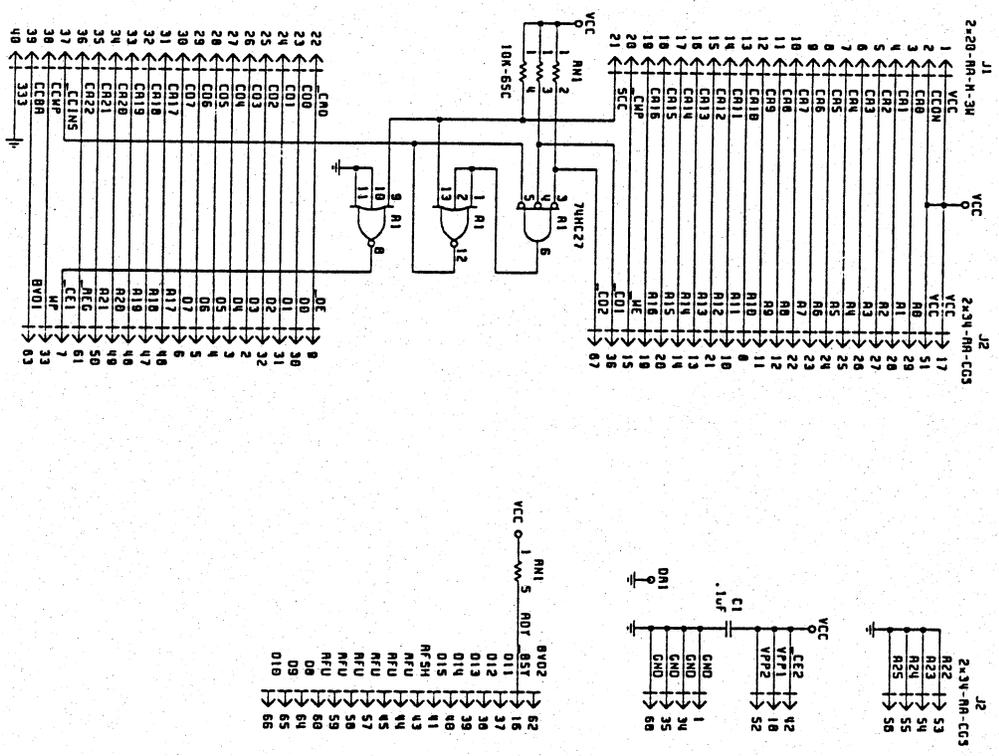




A1	207552661	2661A	DIP28
A2	207197210	7210	DIP40
A3	200340173	74HCT173	DIP16
A4	200340173	74HCT173	DIP16
A5	207171541	74HCT541	DIP20
A6	207171541	74HCT541	DIP20
A7	207171541	74HCT541	DIP20
A8	207472245	74HCT245	DIP20
A9	207472245	74HCT245	DIP20
A10	207171541	74HCT541	DIP20
A11	207171541	74HCT541	DIP20
A12	200440102	74HCT40102	DIP16
A13	200440040	74HCT4040	DIP16
A14	200373374	74HCT374	DIP20
A15	207470160	75160	DIP20
A16	207470161	75161	DIP20
A17	207280703	DAC703	DIP24
A18	205277202	FIFO-1Kx9	DIP28
A19	207440232	MAX232	DIP16
A20	MCL404	MCL404-ON-SOCKET	QILE68EX
A21	205750000	C16L8L	DIP20
A22	205750000	C16L8L	DIP20
A23	205750000	C16L8L	DIP20
A24	205750000	C16L8L	DIP20
A25	205750000	C16R4L	DIP20
A26	205750000	C16R6L	DIP20
A27	205750000	C16R4L	DIP20
A28	200373374	74HCT374	DIP20
A29	200331074	74HCT74	DIP14
A30	205750000	C16L8L	DIP20
A31	207171541	74HCT541	DIP20
A32	207171541	74HCT541	DIP20
A33	207171541	74HCT541	DIP20
A34	207472245	74HCT245	DIP20
A35	207472245	74HCT245	DIP20
A36	207171541	74HCT541	DIP20
C1	103327103	.01uF	SMONOBP
C2	103327103	.01uF	SMONOBP
C3	103327103	.01uF	SMONOBP
C4	103327103	.01uF	SMONOBP
C5	103327103	.01uF	SMONOBP
C6	103327103	.01uF	SMONOBP
C7	103327103	.01uF	SMONOBP
C8	103327103	.01uF	SMONOBP
C9	103327103	.01uF	SMONOBP
C10	103327103	.01uF	SMONOBP
C11	103327103	.01uF	SMONOBP
C12	103327103	.01uF	SMONOBP
C13	103327103	.01uF	SMONOBP
C14	103327103	.01uF	SMONOBP
C15	103327103	.01uF	SMONOBP
C16	103327103	.01uF	SMONOBP
C17	103327103	.01uF	SMONOBP
C18	103327103	.01uF	SMONOBP
C19	103327103	.01uF	SMONOBP
C20	103327103	.01uF	SMONOBP

C21	103327103	.01uF	SMONOBP
C22	103327103	.01uF	SMONOBP
C23	103327103	.01uF	SMONOBP
C24	103327103	.01uF	SMONOBP
C25	103327103	.01uF	SMONOBP
C26	103327103	.01uF	SMONOBP
C27	103327103	.01uF	SMONOBP
C28	103327103	.01uF	SMONOBP
C29	103427104	.1uF	SMONOBP
C30	103427104	.1uF	SMONOBP
C31	146634106	10uF-35V-AL-RA	TCAP
C32	146634106	10uF-35V-AL-RA	TCAP
C33	142214156	15uF-10V-SAL	LTCAP
C34	142214156	15uF-10V-SAL	LTCAP
C35	147436033	33uF-16V-AL-RA	TCAP
C36	147436033	33uF-16V-AL-RA	TCAP
C37	147436033	33uF-16V-AL-RA	TCAP
C38	147436033	33uF-16V-AL-RA	TCAP
C39	142714685	6.8uF-25V-SAL	LTCAP
C40	142714685	6.8uF-25V-SAL	LTCAP
C41	102484471	470pF	SMONO
C42	103327103	.01uF	SMONOBP
C43	103327103	.01uF	SMONOBP
C44	103327103	.01uF	SMONOBP
C45	103327103	.01uF	SMONOBP
C46	103327103	.01uF	SMONOBP
C47	103327103	.01uF	SMONOBP
C48	103327103	.01uF	SMONOBP
CR1	230020062	BAW62	DO35
CR2	230020062	BAW62	DO35
CR3	230020062	BAW62	DO35
CR4	230020062	BAW62	DO35
CR5	230020062	BAW62	DO35
CR6	230020062	BAW62	DO35
CR7	230020062	BAW62	DO35
CR8	230020062	BAW62	DO35
CR9	230020062	BAW62	DO35
CR10	230020062	BAW62	DO35
CR11	230020062	BAW62	DO35
CR12	230020062	BAW62	DO35
CR13	230020062	BAW62	DO35
CR14	230020062	BAW62	DO35
CR15	230020062	BAW62	DO35
CR16	230020062	BAW62	DO35
CR17	253010835	HP2835	DO35
CR18	253010835	HP2835	DO35
CR19	253010835	HP2835	DO35
DR1	\$NULL	DRILL4_3	DRILL4_3
DR2	\$NULL	DRILL4_3	DRILL4_3
J1	454320096	3x32-ST-F	CONN3X32_ST_F
J2	454320096	3x32-ST-F	CONN3X32_ST_F
J3	454320096	3x32-ST-F	CONN3X32_ST_F
J4	454320096	3x32-ST-F	CONN3X32_ST_F
J5	454320096	3x32-ST-F	CONN3X32_ST_F
J6	454320096	3x32-ST-F	CONN3X32_ST_F
J7	454110010	POWER1x10-M	POWER1X10_M

J8	453520024	GPIB24-F	GPIB24_F
J9	454611025	DB25-RA-F	DB25_RA_F
J10	454611009	DB9-RA-F	DB9_RA_F
J11	454211040	2X20-ST-M	CONN2X20_ST_M
J12	454211040	2X20-ST-M	CONN2X20_ST_M
L1	530004006	HMB-06	HBM_06
P1	181447104	100K-12T	POT66WR
P2	181447104	100K-12T	POT66WR
R1	161225103	10K	RES05
R2	161225103	10K	RES05
R8	161225274	270K	RES05
R9	161225395	3.9M	RES05
R10	161225302	3K	RES05
R11	161225302	3K	RES05
R12	161225471	470	RES05
R13	161225101	100	RES05
R14	161225103	10K	RES05
R15	161225683	68K	RES05
R16	161225683	68K	RES05
R17	161225683	68K	RES05
RN1	190042104	100K-SIPC	SIP10RES
RN2	190042103	10K-SIPC	SIP10RES
RN3	190042104	100K-SIPC	SIP10RES
RN4	190832102	1K-8SS	SIP8RES
RN5	190042103	10K-SC	SIP10RES
RN8	190832471	470-8SS	SIP8RES
RN9	190832103	10K-8SS	SIP8RES
RN12	190832471	470-8SS	SIP8RES
RESET	416132008	SWO-NO	SWO_NO
S1	412022022	215002G	STRIPSWITCH
S2	412022022	215002G	STRIPSWITCH
Y1	309040005	K1100A-4.9152MHZ	\$1100_QUARTZ



Model 9424-2
 SUPPORT FOR MEM. CARD
 DHC NO. 9424-2-51
 DATE: 1984-01-11
 PCB: 1 OF 1
 ECO: 1008

9424-2 Rev: E

404500068

74HC27

103427104

190642103

ALL

454611040

9424-2 Rev: E

2x34-RA-CGS

74HC27

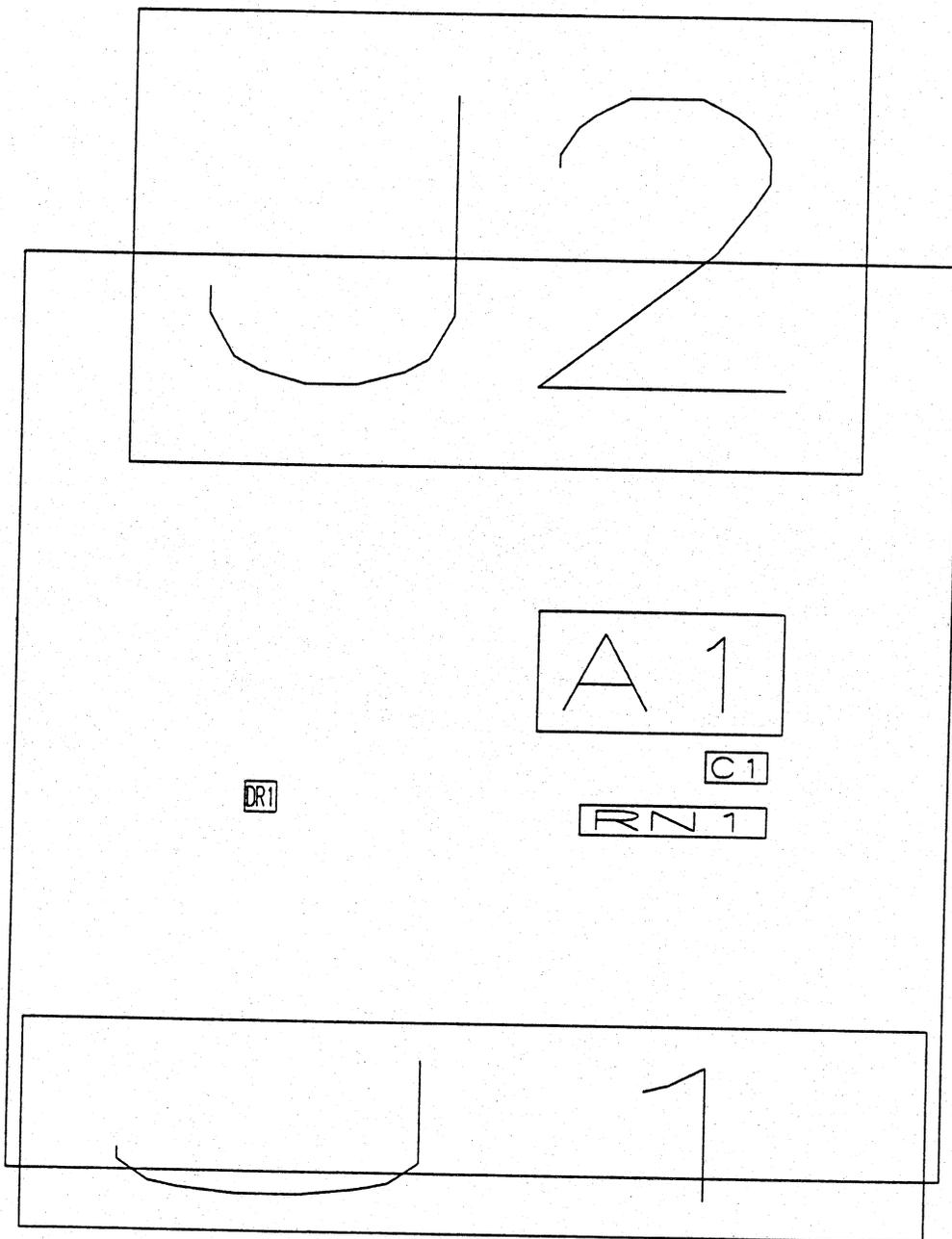
.1uF

10K-6SC

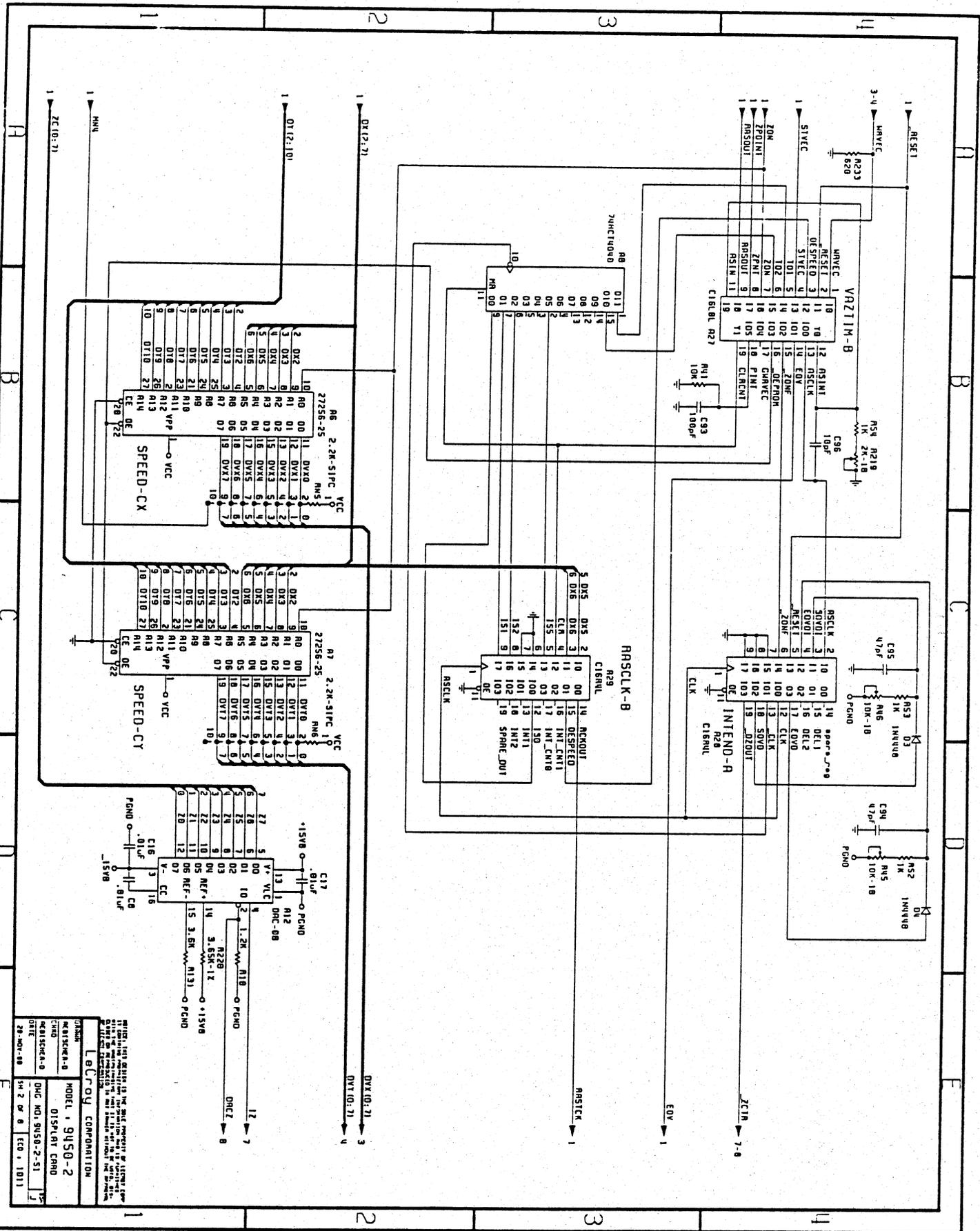


2x20-RA-M-3W

9424-2 Rev:E

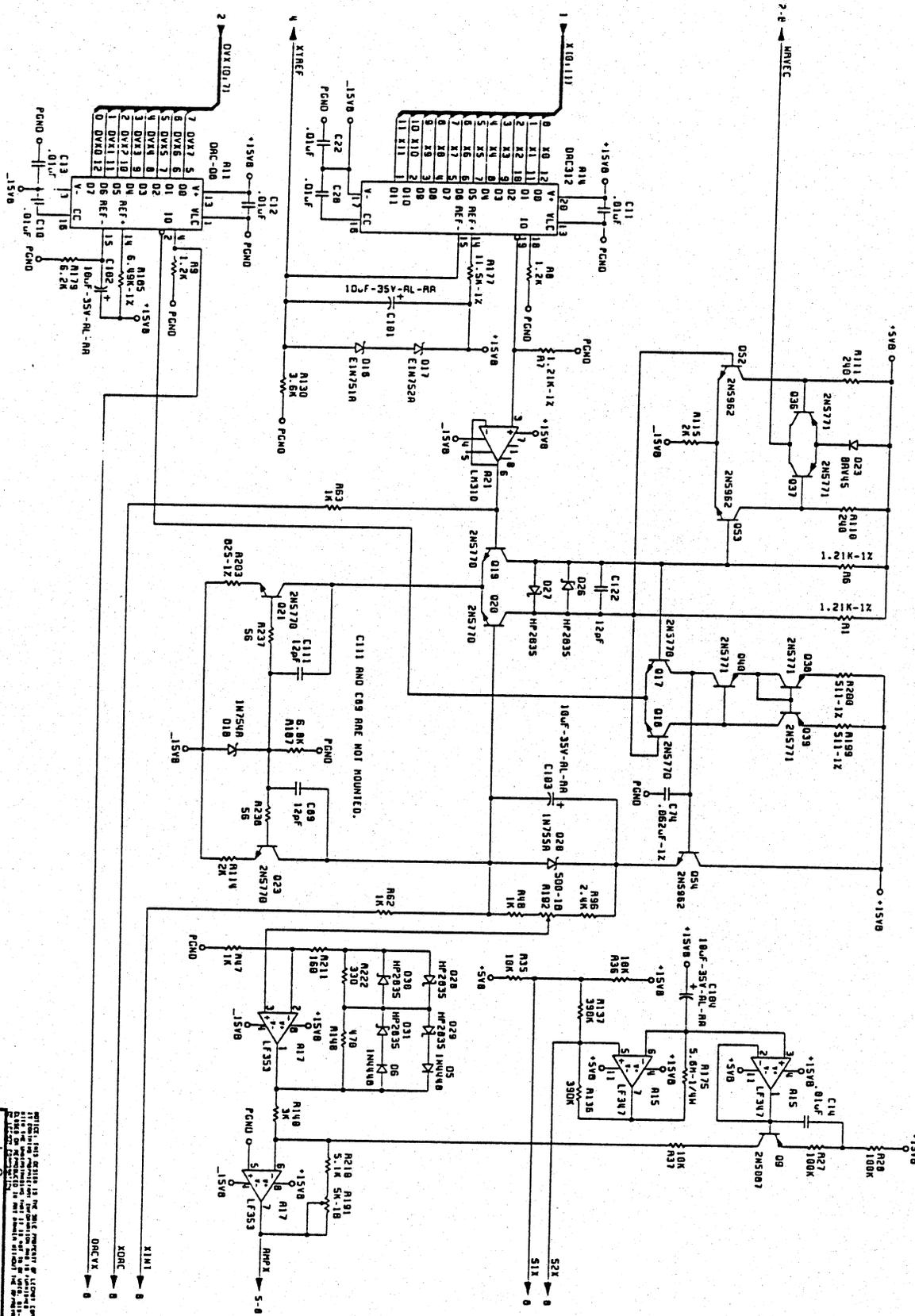


A1	74HC27	74HC27	DIP14
C1	103427104	.1uF	SMONOBP
DR1	\$NULL	DRILL4_3_380	DRILL4_3_380
J1	454611040	2x20-RA-M-3W	CONN2X20_RA_M_3W
J2	404500068	2x34-RA-CGS	CONN4X17_RA_CGS
RN1	190642103	10K-6SC	SIP6RES



LeCroy COMPONENTS MODEL: 9150-2 DISPLAY CARD OHC NO. 9150-2-51 SH. 2 of 8 ECO. 1011	
PART NO. 9150-2-51	REV. 1

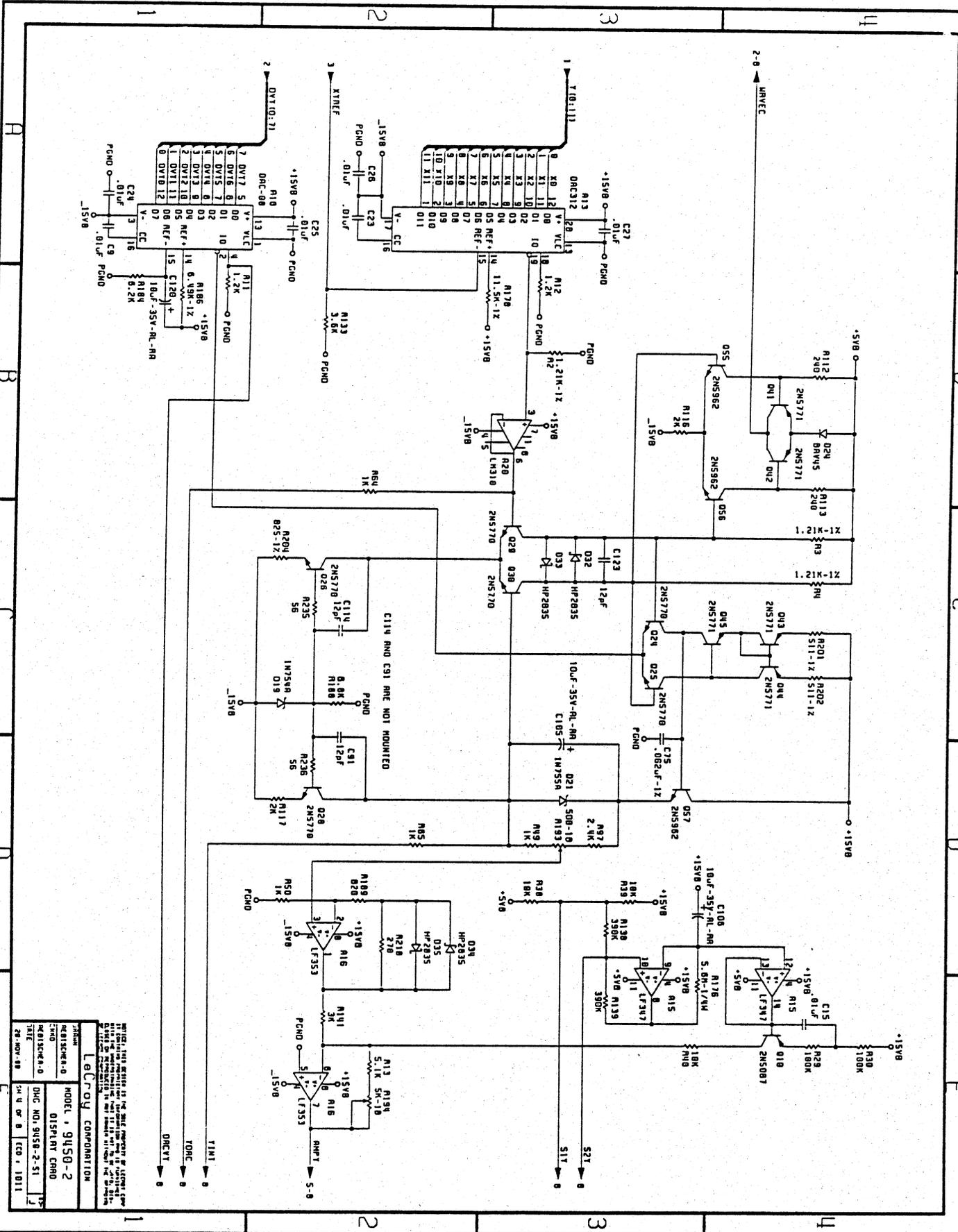
THIS BOARD IS THE MAIN CONTROL OF THE 9150-2 OSCILLOSCOPE DISPLAY CARD. IT CONTAINS THE LOGIC FOR THE DISPLAY CARD AND IS THE MAIN CONTROL OF THE DISPLAY CARD. IT IS THE MAIN CONTROL OF THE DISPLAY CARD. IT IS THE MAIN CONTROL OF THE DISPLAY CARD.



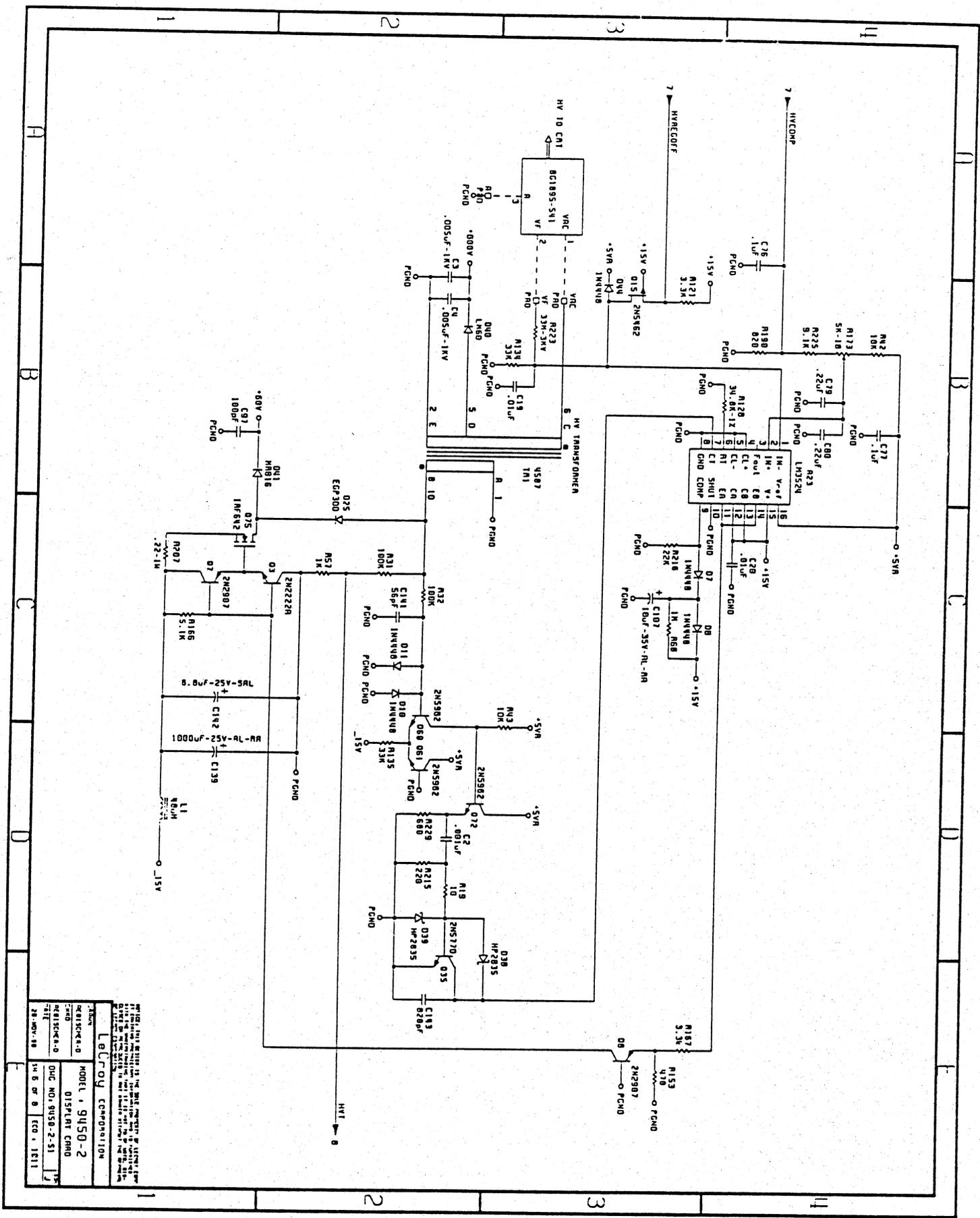
C111 AND C89 ARE NOT MOUNTED.

L6CROY CORPORATION	
MODEL	9450-2
DISPLAY CARD	
DATE	DEC. NO. 1958-2-51
REV.	3 OF 8 (CO. 1811)

NOTES: 1. THIS DRAWING IS THE SOLE PROPERTY OF L6CROY CORPORATION. 2. THIS DRAWING 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. 3. THIS DRAWING IS THE PROPERTY OF L6CROY CORPORATION 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. 4. THIS DRAWING IS THE PROPERTY OF L6CROY CORPORATION 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.

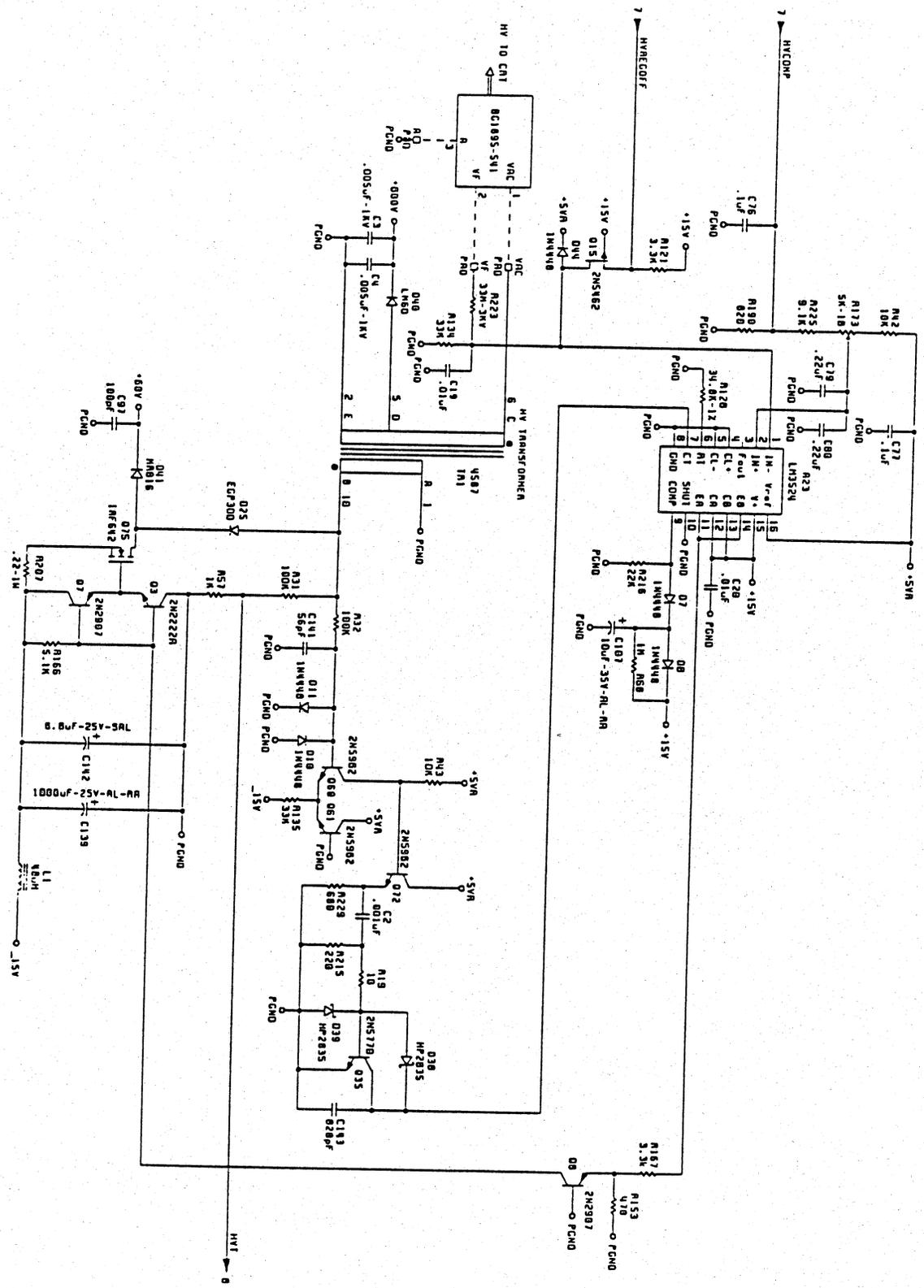


<p>NOTE: THIS DESIGN IS THE SOLE PROPERTY OF LEROY COMPANY. ALL RIGHTS ARE RESERVED. NO PART OF THIS DOCUMENT IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM LEROY COMPANY.</p>	
Model	LeRoy COMPARTOR
Resistor	MODEL: 9450-2
Capacitor	DISP/ARY CMD
Diode	RESISTOR
IC	DIC NO. 9458-2-51
DATE	24-NOV-88
REV	1
DESIGNER	PCD
CHECKER	CD
DATE	1011



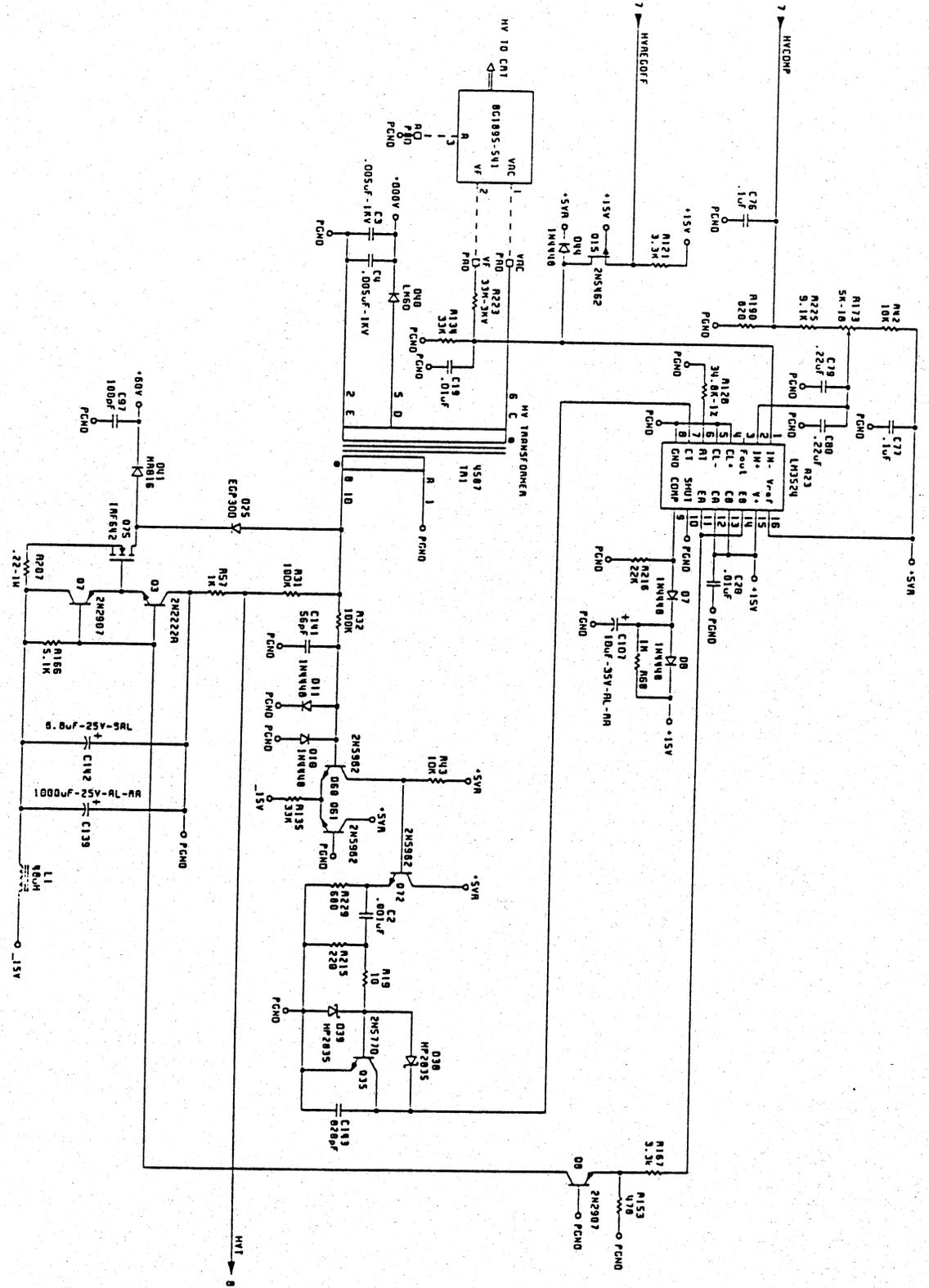
MODEL 9450-2
 O15P/ART CMO
 DUC NO. 9450-2-51
 28 NOV 68
 15V 6 OF 8 (CO - 1811)

LEROY COMPTON
 1000 W. 11th St., Lincoln, NE 68502
 (402) 441-1111



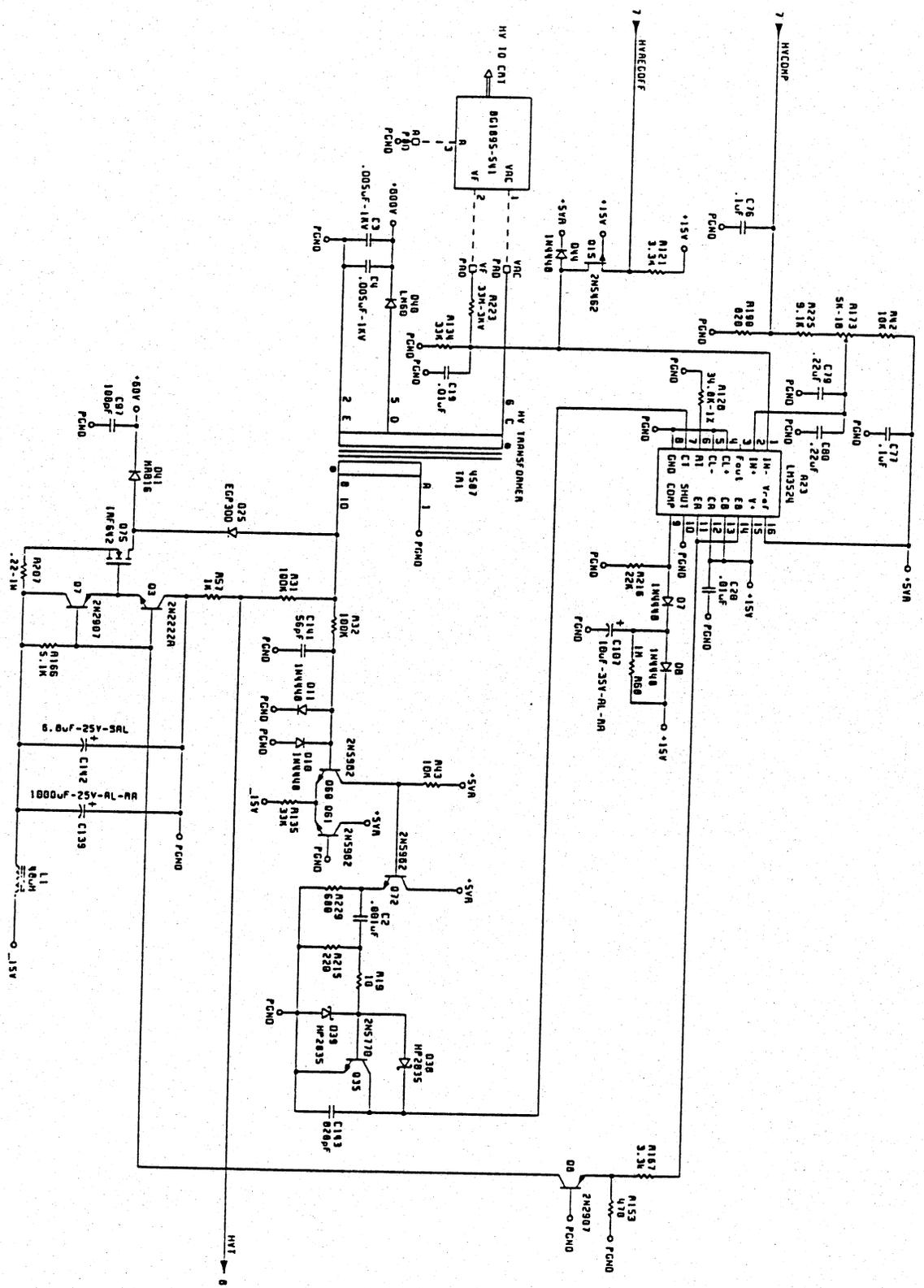
MODEL 9450-2
 DISPLAY CARD
 DUC NO. 9450-2-51
 28-NOV-68

LeCroy CORPORATION
 MODEL 9450-2
 DISPLAY CARD
 DUC NO. 9450-2-51
 28-NOV-68

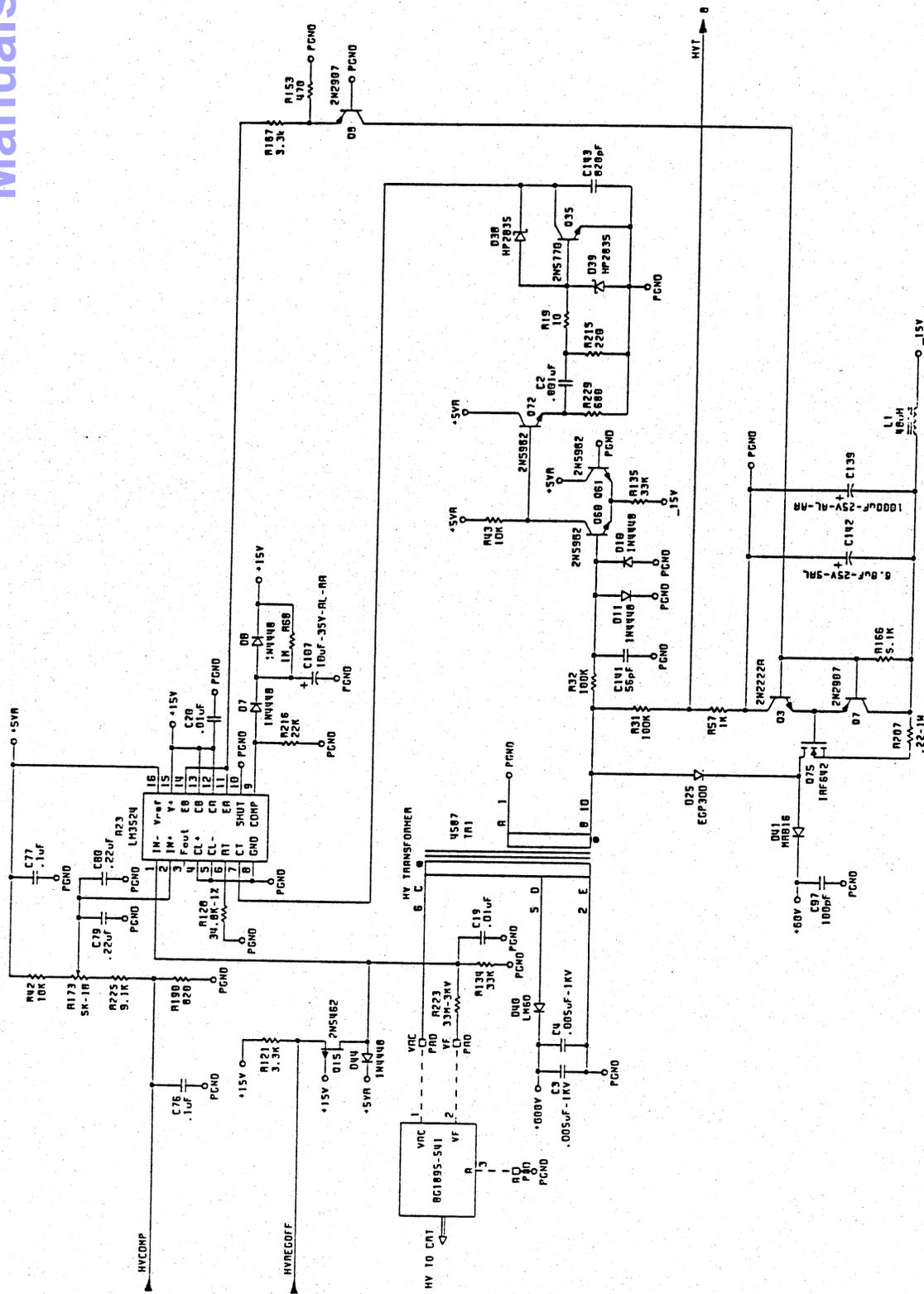


MODEL 9450-2
 DISPLAY CARD
 QDC NO. 9450-2-51
 DEC. 1964

LeCroy CORPORATION
 150 B'way
 Yonkers, N.Y. 10461

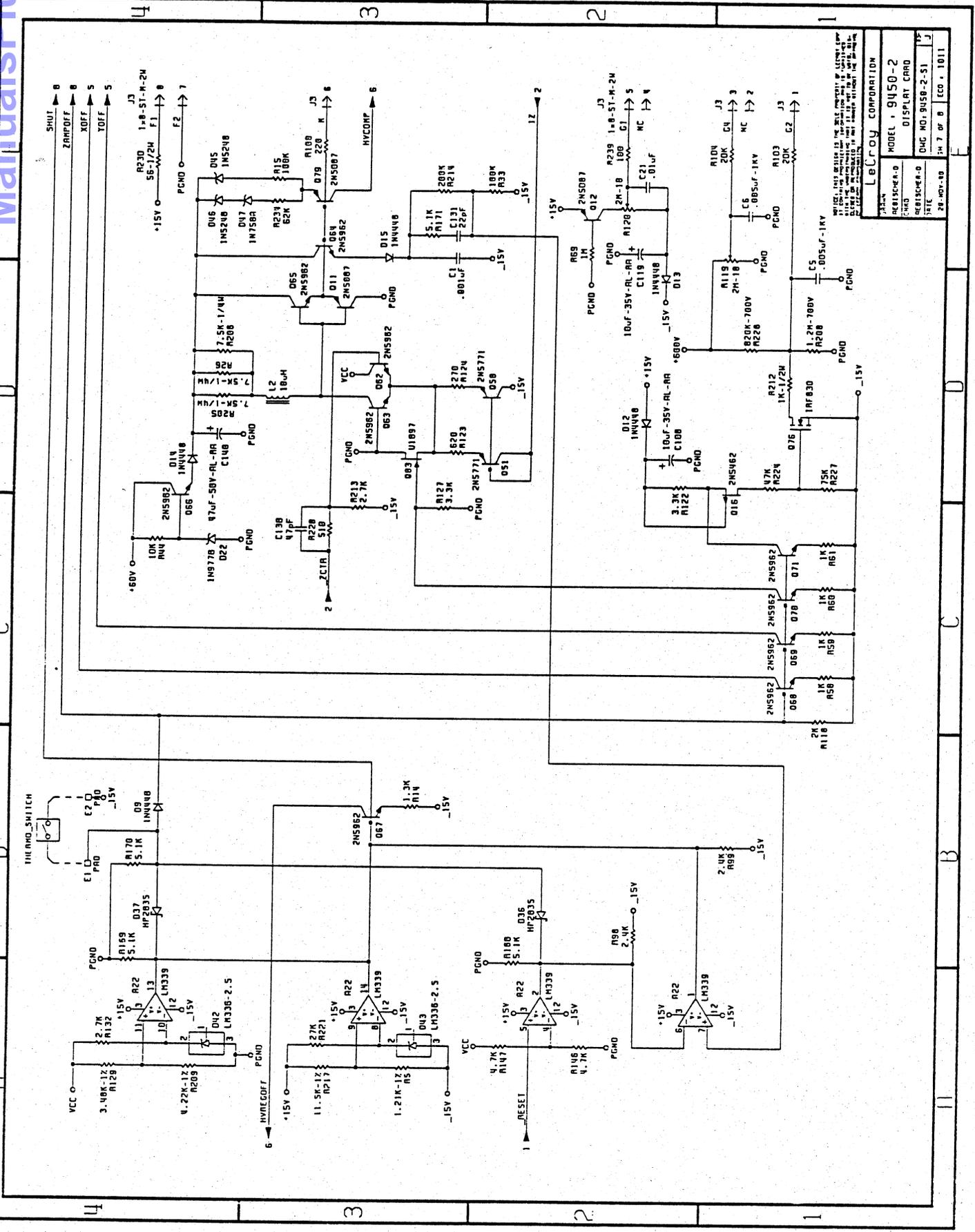


LEROY COMPANION	
MODEL	9450-2
DISPLANT	CRND
DATE	54 6 8 8
ECO	1811



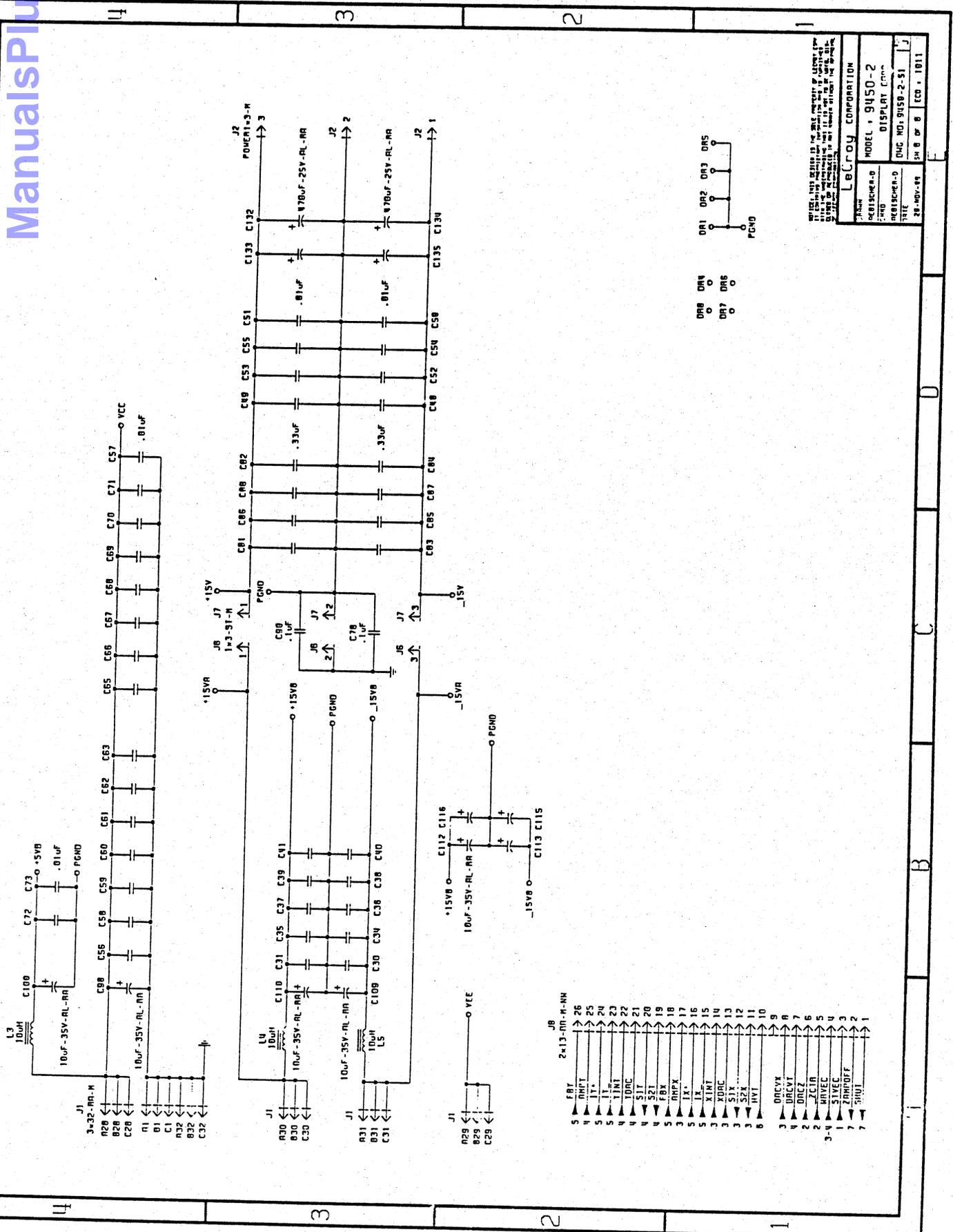
THIS UNIT IS THE PROPERTY OF LEONARD
 ELECTRONICS, INC. ALL RIGHTS RESERVED.
 THIS UNIT IS NOT TO BE REPRODUCED OR
 TRANSMITTED IN ANY FORM OR BY ANY
 MEANS, ELECTRONIC OR MECHANICAL,
 INCLUDING PHOTOCOPYING, RECORDING,
 OR BY ANY INFORMATION STORAGE AND
 RETRIEVAL SYSTEM.

LEONARD CORPORATION
 MODEL 9450-2
 DISPLAY CARD
 DHC NO. 9450-2-51
 28-MAY-88
 1A 6 OF 8 CO. 1C11



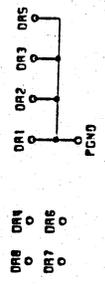
NOTES: THIS CIRCUIT IS THE PROPERTY OF LEUCROY CORPORATION. IT IS TO BE USED ONLY FOR THE PURPOSES SPECIFIED IN THE ORDER. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF LEUCROY CORPORATION.

MODEL	LEUCROY CORPORATION
MODEL NO.	9450-2
DISP. NO.	DISP. CARD
QNC NO.	QNC NO. 9450-2-S1
REV.	1
DATE	28-NOV-70
BY	JH 7 OF 8
ECO.	1811

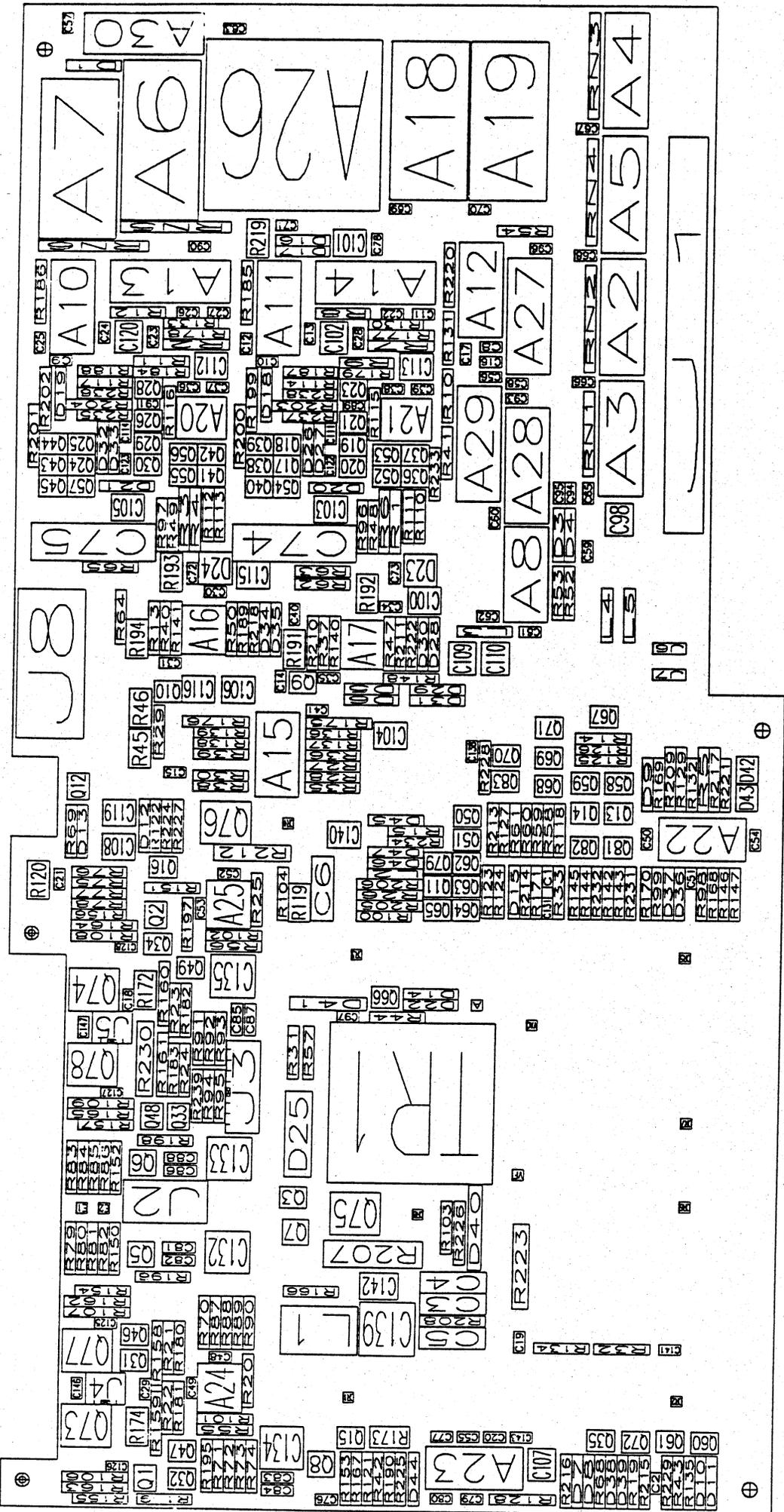


THIS UNIT OBTAINED IN THE SALE PROPERTY OF LEICROY CORP.
 WITH THE UNDERSTANDING THAT THE MANUFACTURER ASSUMES NO LIABILITY
 FOR THE REPAIR OR REPAIR OF THIS UNIT WITHOUT THE WRITING
 OF THE MANUFACTURER.

LEICROY CORPORATION
 MODEL: 9450-2
 DISPLAY: 1000
 DATE: 20 NOV 68
 SH 8 OF 8
 CD - 1011



- J8 2x13-110-M-NH
- 5 ▲ FRT → 26
 - 4 ▲ DR1T → 25
 - 3 ▲ 1T* → 24
 - 2 ▲ 1T → 23
 - 1 ▲ 1T → 22
 - 4 ▲ 1DRC → 21
 - 3 ▲ 1T → 20
 - 2 ▲ 1T → 19
 - 1 ▲ 1T → 18
 - 3 ▲ 1T → 17
 - 2 ▲ 1T → 16
 - 1 ▲ 1T → 15
 - 3 ▲ 1T → 14
 - 2 ▲ 1T → 13
 - 1 ▲ 1T → 12
 - 3 ▲ 1T → 11
 - 2 ▲ 1T → 10
 - 1 ▲ 1T → 9
 - 3 ▲ 1T → 8
 - 2 ▲ 1T → 7
 - 1 ▲ 1T → 6
 - 3 ▲ 1T → 5
 - 2 ▲ 1T → 4
 - 1 ▲ 1T → 3
 - 3 ▲ 1T → 2
 - 2 ▲ 1T → 1



A	\$NULL	PAD	TESTPAD
A2	207174244	74HCT244	DIP20
A3	207174244	74HCT244	DIP20
A4	207472245	74HCT245	DIP20
A5	207472245	74HCT245	DIP20
A6	205370256	27256-25	DIP28
A7	205370256	27256-25	DIP28
A8	200440040	74HCT4040	DIP16
A10	208041001	DAC-08	DIP16
A11	208041001	DAC-08	DIP16
A12	208041001	DAC-08	DIP16
A13	207270312	DAC312	DIP20
A14	207270312	DAC312	DIP20
A15	208130347	LF347	DIP14
A16	208110353	LF353	DIP8
A17	208110353	LF353	DIP8
A18	205271256	62256-12	DIP28
A19	205271256	62256-12	DIP28
A20	208011005	LM310	DIP8
A21	208011005	LM310	DIP8
A22	208031010	LM339	DIP14
A23	208041524	LM3524	DIP16
A24	208116365	LM6365	DIP8
A25	208116365	LM6365	DIP8
A26	MDS403	MDS403	GRID121
A27	205750000	C16L8L	DIP20
A28	205750000	C16R4L	DIP20
A29	205750000	C16R4L	DIP20
A30	205750000	C16R4L	DIP20
C1	103327102	.001uF	SMONO
C2	103327102	.001uF	SMONO
C3	102940502	.005uF-1KV	R_P375_L500X200
C4	102940502	.005uF-1KV	R_P375_L500X200
C5	102940502	.005uF-1KV	R_P375_L500X200
C6	102940502	.005uF-1KV	R_P375_L500X200
C8	103327103	.01uF	SMONOBP
C9	103327103	.01uF	SMONOBP
C10	103327103	.01uF	SMONOBP
C11	103327103	.01uF	SMONOBP
C12	103327103	.01uF	SMONOBP
C13	103327103	.01uF	SMONOBP
C14	103327103	.01uF	SMONOBP
C15	103327103	.01uF	SMONOBP
C16	103327103	.01uF	SMONOBP
C17	103327103	.01uF	SMONOBP
C18	103327103	.01uF	SMONOBP
C19	103327103	.01uF	SMONOBP
C20	103327103	.01uF	SMONOBP
C21	103327103	.01uF	SMONOBP
C22	103327103	.01uF	SMONOBP
C23	103327103	.01uF	SMONOBP
C24	103327103	.01uF	SMONOBP
C25	103327103	.01uF	SMONOBP
C26	103327103	.01uF	SMONOBP
C27	103327103	.01uF	SMONOBP
C28	103327103	.01uF	SMONOBP

C29	103327103	.01uF	SMONOBP
C30	103327103	.01uF	SMONOBP
C31	103327103	.01uF	SMONOBP
C34	103327103	.01uF	SMONOBP
C35	103327103	.01uF	SMONOBP
C36	103327103	.01uF	SMONOBP
C37	103327103	.01uF	SMONOBP
C38	103327103	.01uF	SMONOBP
C39	103327103	.01uF	SMONOBP
C40	103327103	.01uF	SMONOBP
C41	103327103	.01uF	SMONOBP
C48	103327103	.01uF	SMONOBP
C49	103327103	.01uF	SMONOBP
C50	103327103	.01uF	SMONOBP
C51	103327103	.01uF	SMONOBP
C52	103327103	.01uF	SMONOBP
C53	103327103	.01uF	SMONOBP
C54	103327103	.01uF	SMONOBP
C55	103327103	.01uF	SMONOBP
C56	103327103	.01uF	SMONOBP
C57	103327103	.01uF	SMONOBP
C58	103327103	.01uF	SMONOBP
C59	103327103	.01uF	SMONOBP
C60	103327103	.01uF	SMONOBP
C61	103327103	.01uF	SMONOBP
C62	103327103	.01uF	SMONOBP
C63	103327103	.01uF	SMONOBP
C65	103327103	.01uF	SMONOBP
C66	103327103	.01uF	SMONOBP
C67	103327103	.01uF	SMONOBP
C68	103327103	.01uF	SMONOBP
C69	103327103	.01uF	SMONOBP
C70	103327103	.01uF	SMONOBP
C71	103327103	.01uF	SMONOBP
C72	103327103	.01uF	SMONOBP
C73	103327103	.01uF	SMONOBP
C74	124171623	'.062uF-1%'	A_P900_L600X350
C75	124171623	'.062uF-1%'	A_P900_L600X350
C76	103427104	.1uF	SMONOBP
C77	103427104	.1uF	SMONOBP
C78	103427104	.1uF	SMONOBP
C79	103327224	.22uF	SMONO
C80	103327224	.22uF	SMONO
C81	103437334	.33uF	LMONO
C82	103437334	.33uF	LMONO
C83	103437334	.33uF	LMONO
C84	103437334	.33uF	LMONO
C85	103437334	.33uF	LMONO
C86	103437334	.33uF	LMONO
C87	103437334	.33uF	LMONO
C88	103437334	.33uF	LMONO
C89	102412120	12pF	SMONO
C90	103427104	.1uF	SMONOBP
C91	102412120	12pF	SMONO
C93	102412101	100pF	SMONO
C94	102412470	47pF	SMONO

C95	102412470	47pF	SMONO
C96	102412100	10pF	SMONO
C97	102412101	100pF	SMONO
C98	146634106	10uF-35V-AL-RA	TCAP
C100	146634106	10uF-35V-AL-RA	TCAP
C101	146634106	10uF-35V-AL-RA	TCAP
C102	146634106	10uF-35V-AL-RA	TCAP
C103	146634106	10uF-35V-AL-RA	TCAP
C104	146634106	10uF-35V-AL-RA	TCAP
C105	146634106	10uF-35V-AL-RA	TCAP
C106	146634106	10uF-35V-AL-RA	TCAP
C107	146634106	10uF-35V-AL-RA	TCAP
C108	146634106	10uF-35V-AL-RA	TCAP
C109	146634106	10uF-35V-AL-RA	TCAP
C110	146634106	10uF-35V-AL-RA	TCAP
C111	102412120	12pF	SMONO
C112	146634106	10uF-35V-AL-RA	TCAP
C113	146634106	10uF-35V-AL-RA	TCAP
C114	102412120	12pF	SMONO
C115	146634106	10uF-35V-AL-RA	TCAP
C116	146634106	10uF-35V-AL-RA	TCAP
C119	146634106	10uF-35V-AL-RA	TCAP
C120	146634106	10uF-35V-AL-RA	TCAP
C122	102412120	12pF	SMONO
C123	102412120	12pF	SMONO
C125	102412120	12pF	SMONO
C126	102412120	12pF	SMONO
C127	102412120	12pF	SMONO
C128	102412120	12pF	SMONO
C131	102412220	22pF	SMONO
C132	146544471	470uF-25V-AL-RA	R_P200_D400
C133	146544471	470uF-25V-AL-RA	R_P200_D400
C134	146544471	470uF-25V-AL-RA	R_P200_D400
C135	146544471	470uF-25V-AL-RA	R_P200_D400
C138	102412470	47pF	SMONO
C139	147634102	1000uF-25V-AL-RA	R_P200_D500
C140	146754470	47uF-50V-AL-RA	TCAP
C141	102412560	56pF	SMONO
C142	142714685	6.8uF-25V-SAL	LTCAP
C143	102484821	820pF	SMONO
C146	102412470	47pF	SMONO
C147	102412470	47pF	SMONO
D1	253010835	HP2835	DO35
D3	230110005	1N4448	DO35
D4	230110005	1N4448	DO35
D5	230110005	1N4448	DO35
D6	230110005	1N4448	DO35
D7	230110005	1N4448	DO35
D8	230110005	1N4448	DO35
D9	230110005	1N4448	DO35
D10	230110005	1N4448	DO35
D11	230110005	1N4448	DO35
D12	230110005	1N4448	DO35
D13	230110005	1N4448	DO35
D14	230110005	1N4448	DO35
D15	230110005	1N4448	DO35

D16	240425751	E1N751A	DO35
D17	240425752	E1N752A	DO35
D18	240415754	1N754A	DO35
D19	240415754	1N754A	DO35
D20	240413755	1N755A	DO35
D21	240413755	1N755A	DO35
D22	240513977	1N977B	DO35
D23	230150045	BAV45	tol8_2L
D24	230150045	BAV45	tol8_2L
D25	235820030	EGP30D	A_P600_L400X250
D26	253010835	HP2835	DO35
D27	253010835	HP2835	DO35
D28	253010835	HP2835	DO35
D29	253010835	HP2835	DO35
D30	253010835	HP2835	DO35
D31	253010835	HP2835	DO35
D32	253010835	HP2835	DO35
D33	253010835	HP2835	DO35
D34	253010835	HP2835	DO35
D35	253010835	HP2835	DO35
D36	253010835	HP2835	DO35
D37	253010835	HP2835	DO35
D38	253010835	HP2835	DO35
D39	253010835	HP2835	DO35
D40	235040060	LM60	A_P600_L400X125
D41	235930816	MR816	A_P500_L300X120
D42	208590336	LM336-2.5	TO92
D43	208590336	LM336-2.5	TO92
D44	230110005	1N4448	DO35
D45	240225720	1N5248-DO35	DO35
D46	240225720	1N5248-DO35	DO35
D47	240425758	1N758A	DO7
DR1	\$NULL	DRILL3_5	DRILL3_5
DR2	\$NULL	DRILL3_5	DRILL3_5
DR3	\$NULL	DRILL3_5	DRILL3_5
DR4	\$NULL	DRILL3_2	DRILL3_2
DR5	\$NULL	DRILL3_5	DRILL3_5
DR6	\$NULL	DRILL4_3	DRILL4_3
DR7	\$NULL	DRILL4_3	DRILL4_3
DR8	\$NULL	DRILL3_2	DRILL3_2
E1	\$NULL	PAD	TESTPAD
E2	\$NULL	PAD	TESTPAD
J1	454610096	3x32-RA-M	CONN3X32_RA_M
J2	454121003	POWER1x3-M	POWER1X3_M
J3	454111008	1x8-ST-M-2W	CONN1X8_ST_M_2W
J4	454110003	1x3-ST-M-2W	CONN1X3_ST_M_2W
J5	454110003	1x3-ST-M-2W	CONN1X3_ST_M_2W
J6	454311003	1x3-ST-M	CONN1X3_ST_M
J7	454311003	1x3-ST-M	CONN1X3_ST_M
J8	454711026	2x13-RA-M-NW	CONN2X13_RA_M_NW
L1	302380480	48uH	E106
L2	301016103	10uH	IND07
L3	301016103	10uH	IND07
L4	301016103	10uH	IND07
L5	301016103	10uH	IND07
Q1	270110003	2N2222A	TO92

Q2	270110003	2N2222A	T092
Q3	270110003	2N2222A	T092
Q5	275110001	2n2907	T018
Q6	275110001	2n2907	T018
Q7	275110001	2n2907	T018
Q8	275110001	2n2907	T018
Q9	275170001	2n5087	T092
Q10	275170001	2n5087	T092
Q11	275170001	2n5087	T092
Q12	275170001	2n5087	T092
Q13	281170001	2N5462	T092
Q14	281170001	2N5462	T092
Q15	281170001	2N5462	T092
Q16	281170001	2N5462	T092
Q17	270170001	2N5770	T092
Q18	270170001	2N5770	T092
Q19	270170001	2N5770	T092
Q20	270170001	2N5770	T092
Q21	270170001	2N5770	T092
Q23	270170001	2N5770	T092
Q24	270170001	2N5770	T092
Q25	270170001	2N5770	T092
Q26	270170001	2N5770	T092
Q28	270170001	2N5770	T092
Q29	270170001	2N5770	T092
Q30	270170001	2N5770	T092
Q31	270170001	2N5770	T092
Q32	270170001	2N5770	T092
Q33	270170001	2N5770	T092
Q34	270170001	2N5770	T092
Q35	270170001	2N5770	T092
Q36	275170002	2n5771	T092
Q37	275170002	2n5771	T092
Q38	275170002	2n5771	T092
Q39	275170002	2n5771	T092
Q40	275170002	2n5771	T092
Q41	275170002	2n5771	T092
Q42	275170002	2n5771	T092
Q43	275170002	2n5771	T092
Q44	275170002	2n5771	T092
Q45	275170002	2n5771	T092
Q46	275170002	2n5771	T092
Q47	275170002	2n5771	T092
Q48	275170002	2n5771	T092
Q49	275170002	2n5771	T092
Q50	275170002	2n5771	T092
Q51	275170002	2n5771	T092
Q52	270170002	2N5962	T092
Q53	270170002	2N5962	T092
Q54	270170002	2N5962	T092
Q55	270170002	2N5962	T092
Q56	270170002	2N5962	T092
Q57	270170002	2N5962	T092
Q58	270170002	2N5962	T092
Q59	270170002	2N5962	T092
Q60	270170002	2N5962	T092

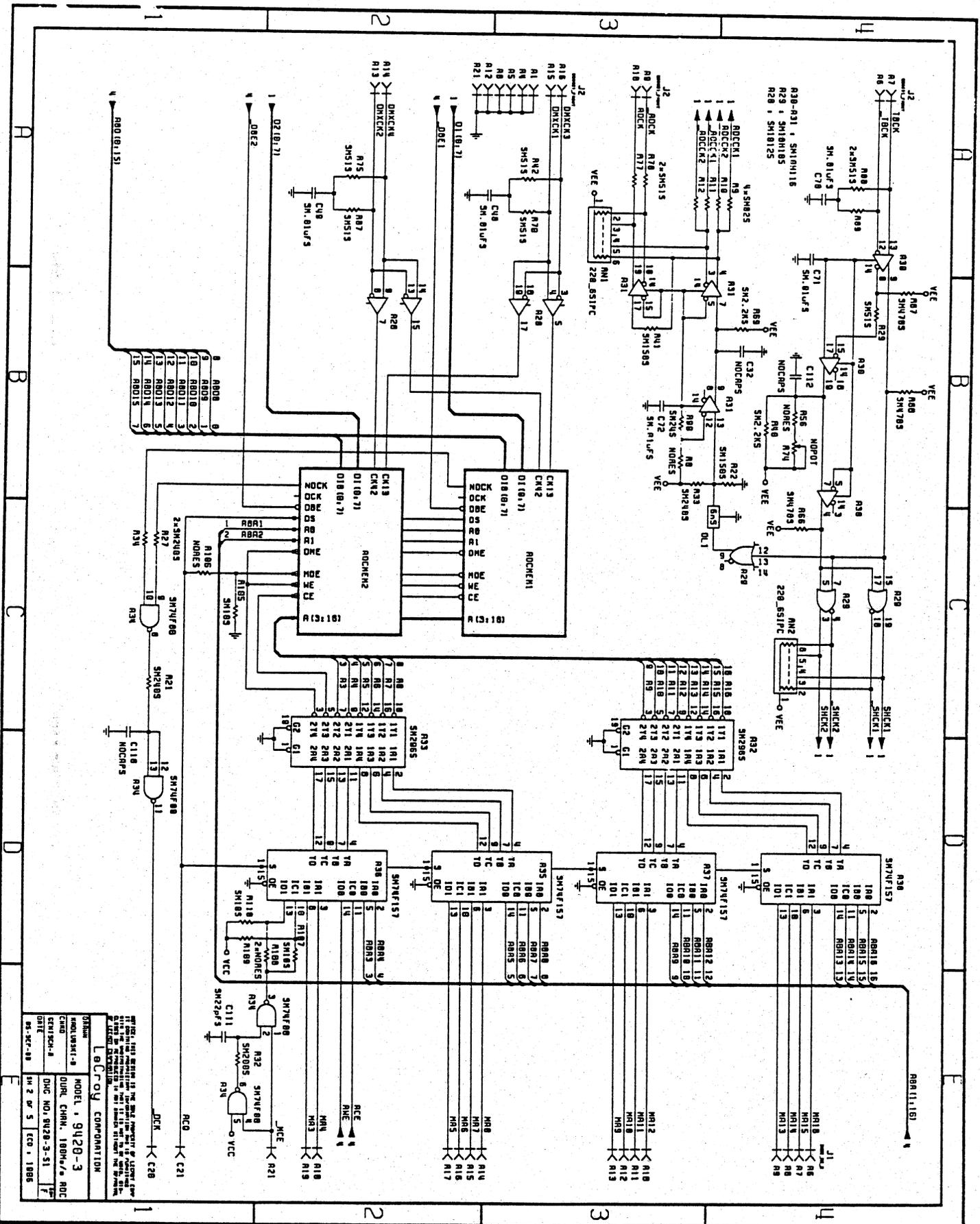
Q61	270170002	2N5962	TO92
Q62	270170002	2N5962	TO92
Q63	270170002	2N5962	TO92
Q64	270170002	2N5962	TO92
Q65	270170002	2N5962	TO92
Q66	270170002	2N5962	TO92
Q67	270170002	2N5962	TO92
Q68	270170002	2N5962	TO92
Q69	270170002	2N5962	TO92
Q70	270170002	2N5962	TO92
Q71	270170002	2N5962	TO92
Q72	270170002	2N5962	TO92
Q73	280190513	IRF513	TO220
Q74	280190513	IRF513	TO220
Q75	280190642	IRF642	TO220
Q76	280190830	IRF830	TO220
Q77	281190523	IRF9523	TO220
Q78	281190523	IRF9523	TO220
Q79	275170001	2n5087	TO92
Q81	280180001	U1897	TO92
Q82	280180001	U1897	TO92
Q83	280180001	U1897	TO92
R1	168531401	'1.21K-1%'	RES07
R2	168531401	'1.21K-1%'	RES07
R3	168531401	'1.21K-1%'	RES07
R4	168531401	'1.21K-1%'	RES07
R5	168531401	'1.21K-1%'	RES07
R6	168531401	'1.21K-1%'	RES07
R7	168531401	'1.21K-1%'	RES07
R8	161225122	1.2K	RES05
R9	161225122	1.2K	RES05
R10	161225122	1.2K	RES05
R11	161225122	1.2K	RES05
R12	161225122	1.2K	RES05
R13	161225512	5.1K	RES05
R14	161225132	1.3K	RES05
R15	161225104	100K	RES05
R19	161225100	10	RES05
R20	161225202	2K	RES05
R21	161225101	100	RES05
R22	161225101	100	RES05
R23	161225101	100	RES05
R24	161225101	100	RES05
R25	161225302	3K	RES05
R26	161335752	7.5K-1/4W	RES07
R27	161225104	100K	RES05
R28	161225104	100K	RES05
R29	161225104	100K	RES05
R30	161225104	100K	RES05
R31	161225104	100K	RES05
R32	161225104	100K	RES05
R33	161225104	100K	RES05
R35	161225103	10K	RES05
R36	161225103	10K	RES05
R37	161225103	10K	RES05
R38	161225103	10K	RES05

R39	161225103	10K	RES05
R40	161225103	10K	RES05
R41	161225103	10K	RES05
R42	161225103	10K	RES05
R43	161225103	10K	RES05
R44	161225103	10K	RES05
R45	180487103	10K-1B	pot3386x
R46	180487103	10K-1B	pot3386x
R47	161225102	1K	RES05
R48	161225102	1K	RES05
R49	161225102	1K	RES05
R50	161225102	1K	RES05
R52	161225102	1K	RES05
R53	161225102	1K	RES05
R54	161225102	1K	RES05
R55	161225221	220	RES05
R56	161225221	220	RES05
R57	161225102	1K	RES05
R58	161225102	1K	RES05
R59	161225102	1K	RES05
R60	161225102	1K	RES05
R61	161225102	1K	RES05
R62	161225102	1K	RES05
R63	161225102	1K	RES05
R64	161225102	1K	RES05
R65	161225102	1K	RES05
R68	161225105	1M	RES05
R69	161225105	1M	RES05
R70	168031022	2.2-.6W	A_P400_L300X100
R71	168031022	2.2-.6W	A_P400_L300X100
R72	168031022	2.2-.6W	A_P400_L300X100
R73	168031022	2.2-.6W	A_P400_L300X100
R74	168031022	2.2-.6W	A_P400_L300X100
R75	168031022	2.2-.6W	A_P400_L300X100
R76	168031022	2.2-.6W	A_P400_L300X100
R77	168031022	2.2-.6W	A_P400_L300X100
R78	168031022	2.2-.6W	A_P400_L300X100
R79	168031022	2.2-.6W	A_P400_L300X100
R80	168031022	2.2-.6W	A_P400_L300X100
R81	168031022	2.2-.6W	A_P400_L300X100
R82	168031022	2.2-.6W	A_P400_L300X100
R83	168031022	2.2-.6W	A_P400_L300X100
R84	168031022	2.2-.6W	A_P400_L300X100
R85	168031022	2.2-.6W	A_P400_L300X100
R86	168031022	2.2-.6W	A_P400_L300X100
R87	168031022	2.2-.6W	A_P400_L300X100
R88	168031022	2.2-.6W	A_P400_L300X100
R89	168031022	2.2-.6W	A_P400_L300X100
R90	168031022	2.2-.6W	A_P400_L300X100
R91	168031022	2.2-.6W	A_P400_L300X100
R92	168031022	2.2-.6W	A_P400_L300X100
R93	168031022	2.2-.6W	A_P400_L300X100
R94	168031022	2.2-.6W	A_P400_L300X100
R95	168031022	2.2-.6W	A_P400_L300X100
R96	161225242	2.4K	RES05
R97	161225242	2.4K	RES05

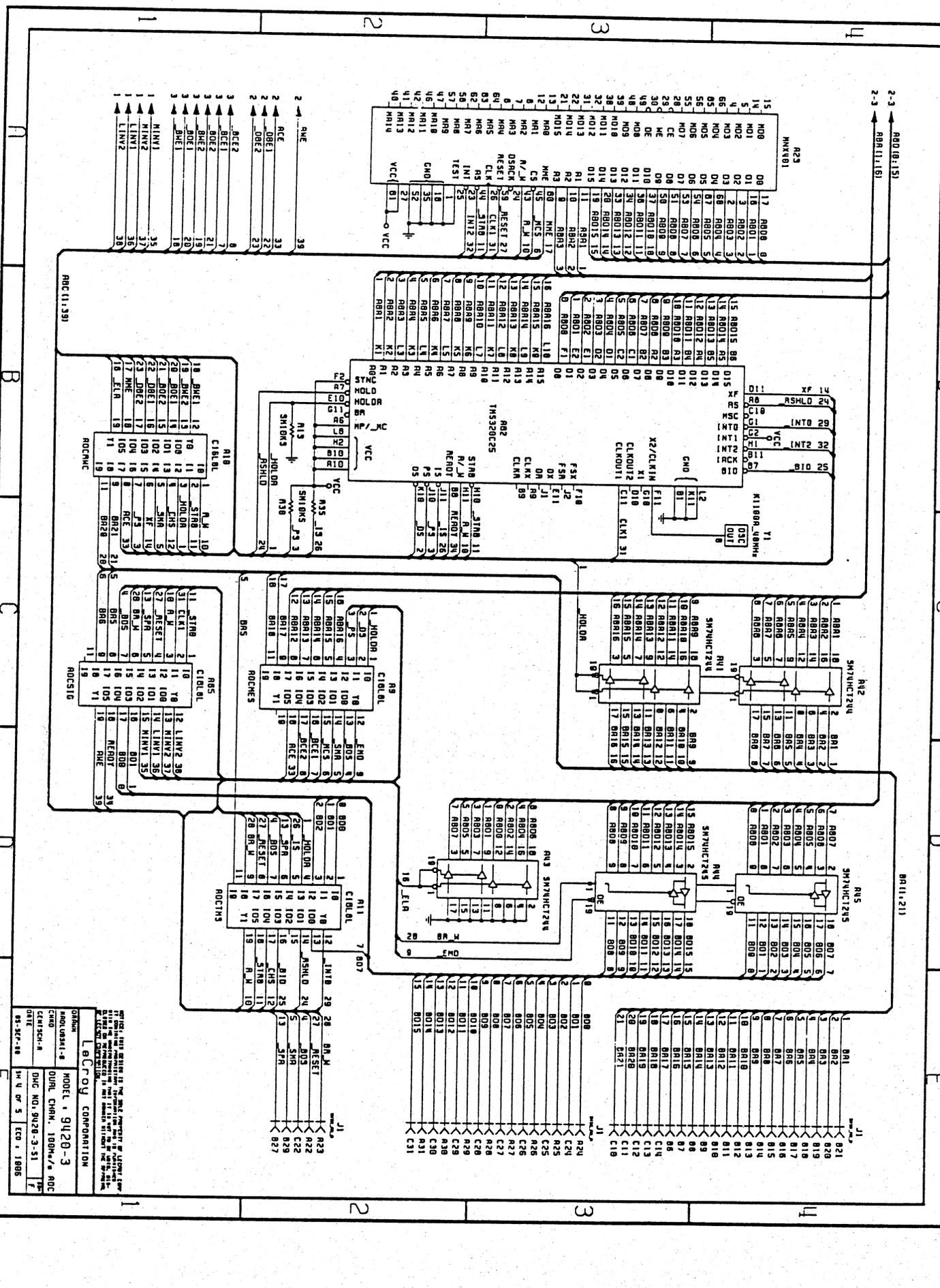
R98	161225242	2.4K	RES05
R99	161225242	2.4K	RES05
R100	161225221	220	RES05
R101	161225753	75K	RES05
R102	161225753	75K	RES05
R103	161225203	20K	RES05
R104	161225203	20K	RES05
R106	161335221	220-1/4W	RES07
R107	161335221	220-1/4W	RES07
R108	161335221	220-1/4W	RES07
R109	161335221	220-1/4W	RES07
R110	161225241	240	RES05
R111	161225241	240	RES05
R112	161225241	240	RES05
R113	161225241	240	RES05
R114	161225202	2K	RES05
R115	161225202	2K	RES05
R116	161225202	2K	RES05
R117	161225202	2K	RES05
R118	161225202	2K	RES05
R119	180487205	2M-1B	pot3386x
R120	180487205	2M-1B	pot3386x
R121	161225332	3.3K	RES05
R122	161225332	3.3K	RES05
R123	161225621	620	RES05
R124	161225271	270	RES05
R125	161225332	3.3K	RES05
R126	161225332	3.3K	RES05
R127	161225332	3.3K	RES05
R128	168531541	'34.8K-1%'	RES07
R129	168531445	'3.48K-1%'	RES07
R130	161225362	3.6K	RES05
R131	161225362	3.6K	RES05
R132	161225272	2.7K	RES05
R133	161225362	3.6K	RES05
R134	161225333	33K	RES05
R135	161225333	33K	RES05
R136	161225394	390K	RES05
R137	161225394	390K	RES05
R138	161225394	390K	RES05
R139	161225394	390K	RES05
R140	161225302	3K	RES05
R141	161225302	3K	RES05
R142	161225302	3K	RES05
R143	161225302	3K	RES05
R144	161225302	3K	RES05
R145	161225302	3K	RES05
R146	161225472	4.7K	RES05
R147	161225472	4.7K	RES05
R148	161225471	470	RES05
R149	161225471	470	RES05
R150	161225471	470	RES05
R151	161225471	470	RES05
R152	161225471	470	RES05
R153	161225471	470	RES05
R154	161225471	470	RES05

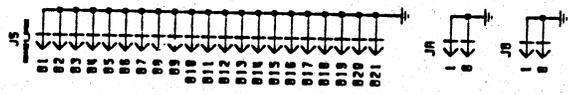
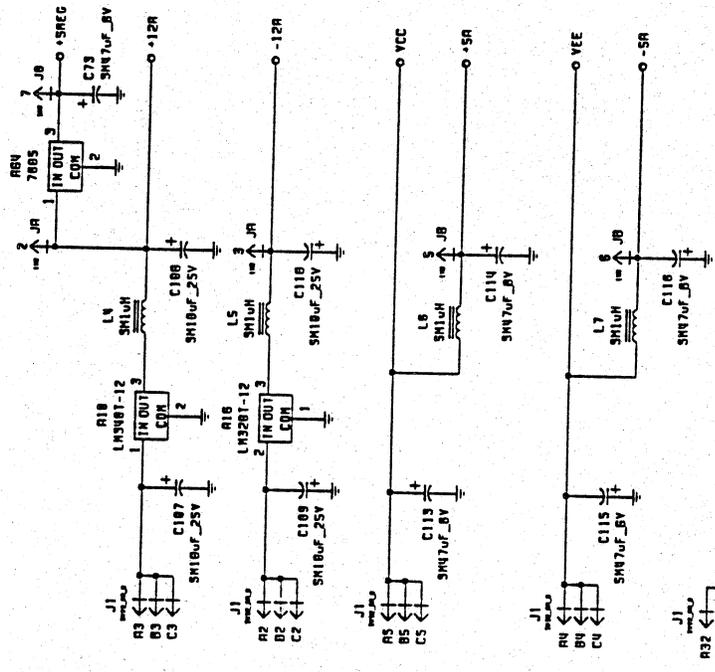
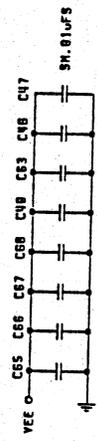
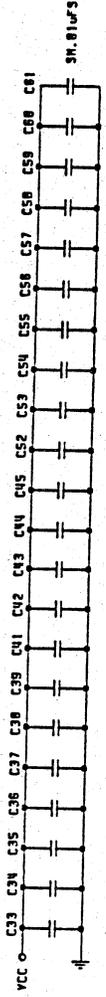
R155	161225471	470	RES05
R156	161225471	470	RES05
R157	161225471	470	RES05
R158	161335241	240-1/4W	RES07
R159	161335241	240-1/4W	RES07
R160	161335241	240-1/4W	RES07
R161	161335241	240-1/4W	RES07
R162	161335471	470-1/4W	RES07
R163	161335471	470-1/4W	RES07
R164	161335471	470-1/4W	RES07
R165	161335471	470-1/4W	RES07
R166	161225512	5.1K	RES05
R167	161225332	3.3K	RES05
R168	161225512	5.1K	RES05
R169	161225512	5.1K	RES05
R170	161225512	5.1K	RES05
R171	161225512	5.1K	RES05
R172	180487502	5K-1B	pot3386x
R173	180487502	5K-1B	pot3386x
R174	180487502	5K-1B	pot3386x
R175	161335565	5.6M-1/4W	RES07
R176	161335565	5.6M-1/4W	RES07
R177	168531495	'11.5K-1%'	RES07
R178	168531495	'11.5K-1%'	RES07
R179	161225622	6.2K	RES05
R180	161225752	7.5K	RES05
R181	161225752	7.5K	RES05
R182	161225752	7.5K	RES05
R183	161225752	7.5K	RES05
R184	161225622	6.2K	RES05
R185	168531471	'6.49K-1%'	RES07
R186	168531471	'6.49K-1%'	RES07
R187	161225682	6.8K	RES05
R188	161225682	6.8K	RES05
R189	161225821	820	RES05
R190	161225821	820	RES05
R191	180487502	5K-1B	pot3386x
R192	180487501	500-1B	pot3386x
R193	180487501	500-1B	pot3386x
R194	180487502	5K-1B	pot3386x
R195	161225510	51	RES05
R196	161225510	51	RES05
R197	161225510	51	RES05
R198	161225510	51	RES05
R199	168531365	'511-1%'	RES07
R200	168531365	'511-1%'	RES07
R201	168531365	'511-1%'	RES07
R202	168531365	'511-1%'	RES07
R203	168531385	'825-1%'	RES07
R204	168531385	'825-1%'	RES07
R205	161335752	7.5K-1/4W	RES07
R206	161335752	7.5K-1/4W	RES07
R207	172137022	.22-1W	RES32
R208	168035125	1.2M-700V	A_P500_L300X100
R209	168531453	'4.22K-1%'	RES07
R210	161225512	5.1K	RES05

R211	161225161	160	RES05
R212	161445102	1K-1/2W	RES20
R213	161225272	2.7K	RES05
R214	161225204	200K	RES05
R215	161225221	220	RES05
R216	161225223	22K	RES05
R217	168531495	'11.5K-1%'	RES07
R218	161225271	270	RES05
R219	180487202	2K-1B	pot3386x
R220	168531447	'3.65K-1%'	RES07
R221	161225273	27K	RES05
R222	161225331	330	RES05
R223	168045336	33M-3KV	A_P600_L400X150
R224	161225473	47K	RES05
R225	161225912	9.1K	RES05
R226	165375824	820K-700V	A_P500_L300X100
R227	161225753	75K	RES05
R228	161225511	510	RES05
R229	161225681	680	RES05
R230	161445560	56-1/2W	RES20
R231	161225103	10K	RES05
R232	161225103	10K	RES05
R233	161225621	620	RES05
R234	161225623	62K	RES05
R235	161225560	56	RES05
R236	161225560	56	RES05
R237	161225560	56	RES05
R238	161225560	56	RES05
R239	161225101	100	RES05
RN1	190842222	2.2K-8SIPC	SIP8RES
RN2	190042222	2.2K-SIPC	SIP10RES
RN3	190042222	2.2K-SIPC	SIP10RES
RN4	190042222	2.2K-SIPC	SIP10RES
RN5	190042222	2.2K-SIPC	SIP10RES
RN6	190042222	2.2K-SIPC	SIP10RES
TR1	440290001	4587	TRANSFO_HT
VF	\$NULL	PAD	TESTPAD
VAC	\$NULL	PAD	TESTPAD



Telroy CORPORATION	
Model	9420-3
Hardware	DIRC, CHM, 100H, 100C, 100D, 100E, 100F, 100G, 100H, 100I, 100J, 100K, 100L, 100M, 100N, 100O, 100P, 100Q, 100R, 100S, 100T, 100U, 100V, 100W, 100X, 100Y, 100Z
Control	DIRC, CHM, 100H, 100C, 100D, 100E, 100F, 100G, 100H, 100I, 100J, 100K, 100L, 100M, 100N, 100O, 100P, 100Q, 100R, 100S, 100T, 100U, 100V, 100W, 100X, 100Y, 100Z
Order	DIRC, CHM, 100H, 100C, 100D, 100E, 100F, 100G, 100H, 100I, 100J, 100K, 100L, 100M, 100N, 100O, 100P, 100Q, 100R, 100S, 100T, 100U, 100V, 100W, 100X, 100Y, 100Z
Part No.	9420-3-1
Rev.	1
Date	10-1-1985





THIS IS NOT A SERVICE MANUAL. IT IS THE PROPERTY OF LECTROY CORP. IT IS TO BE USED ONLY FOR THE PURPOSES OF REPAIR AND MAINTENANCE. 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	LECTROY CORPORATION
MODEL NO.	9420-3
ENCLOSURE	DUAL CHAN. 180MHz ROC
DATE	DWG NO. 9420-3-51
REV	REV 5 OF 5
ECO	ECO 1806

4

3

2

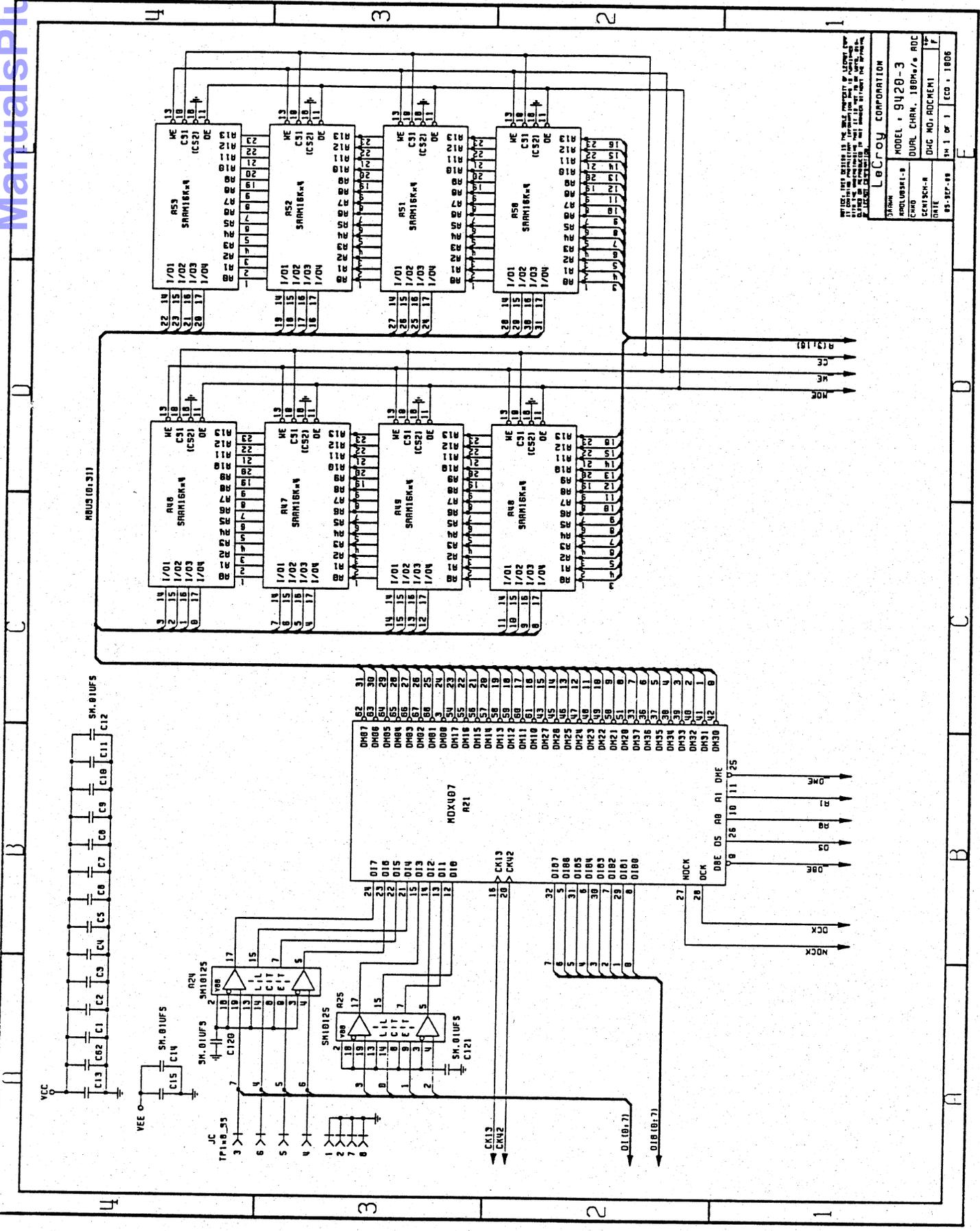
1

A

B

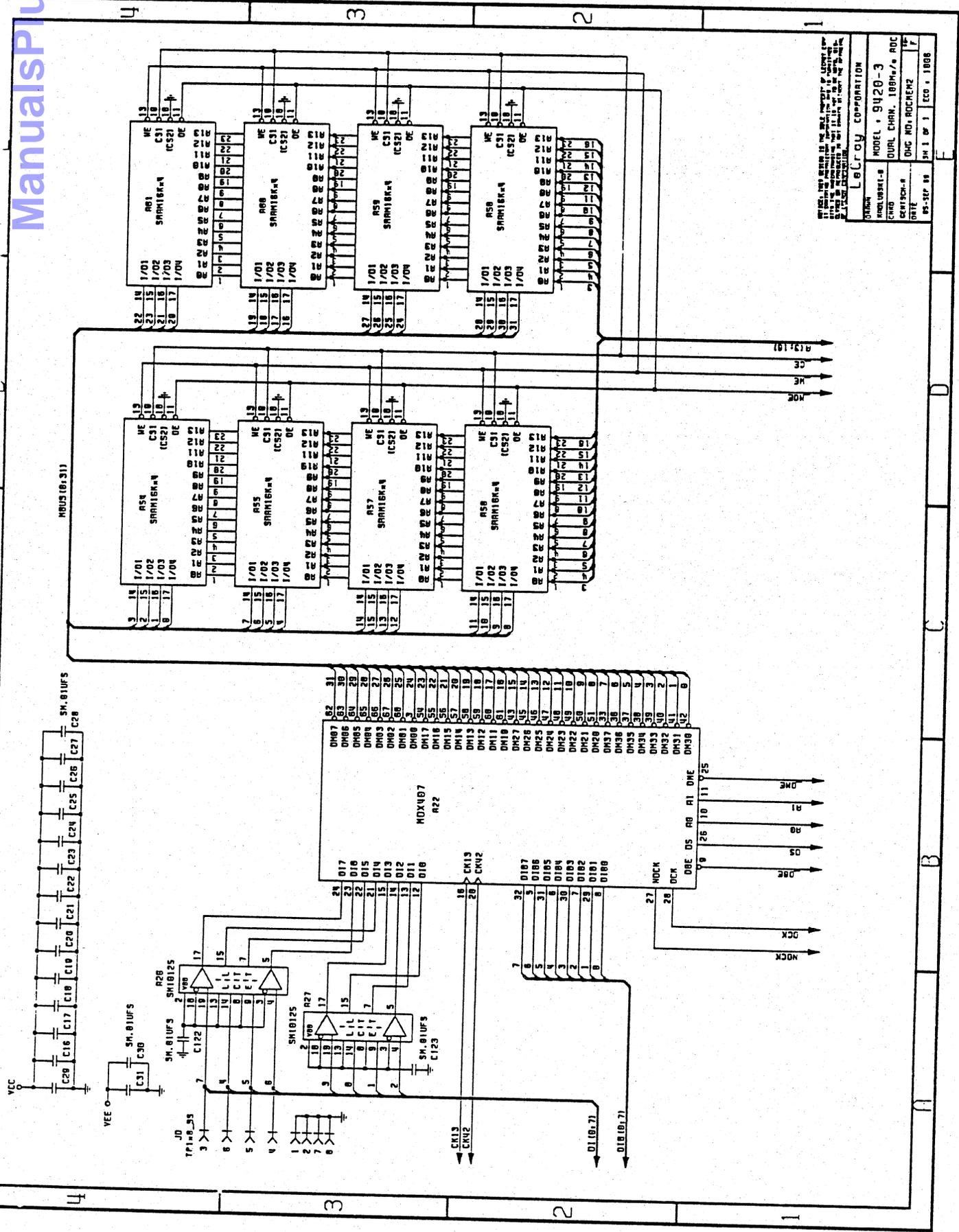
C

D



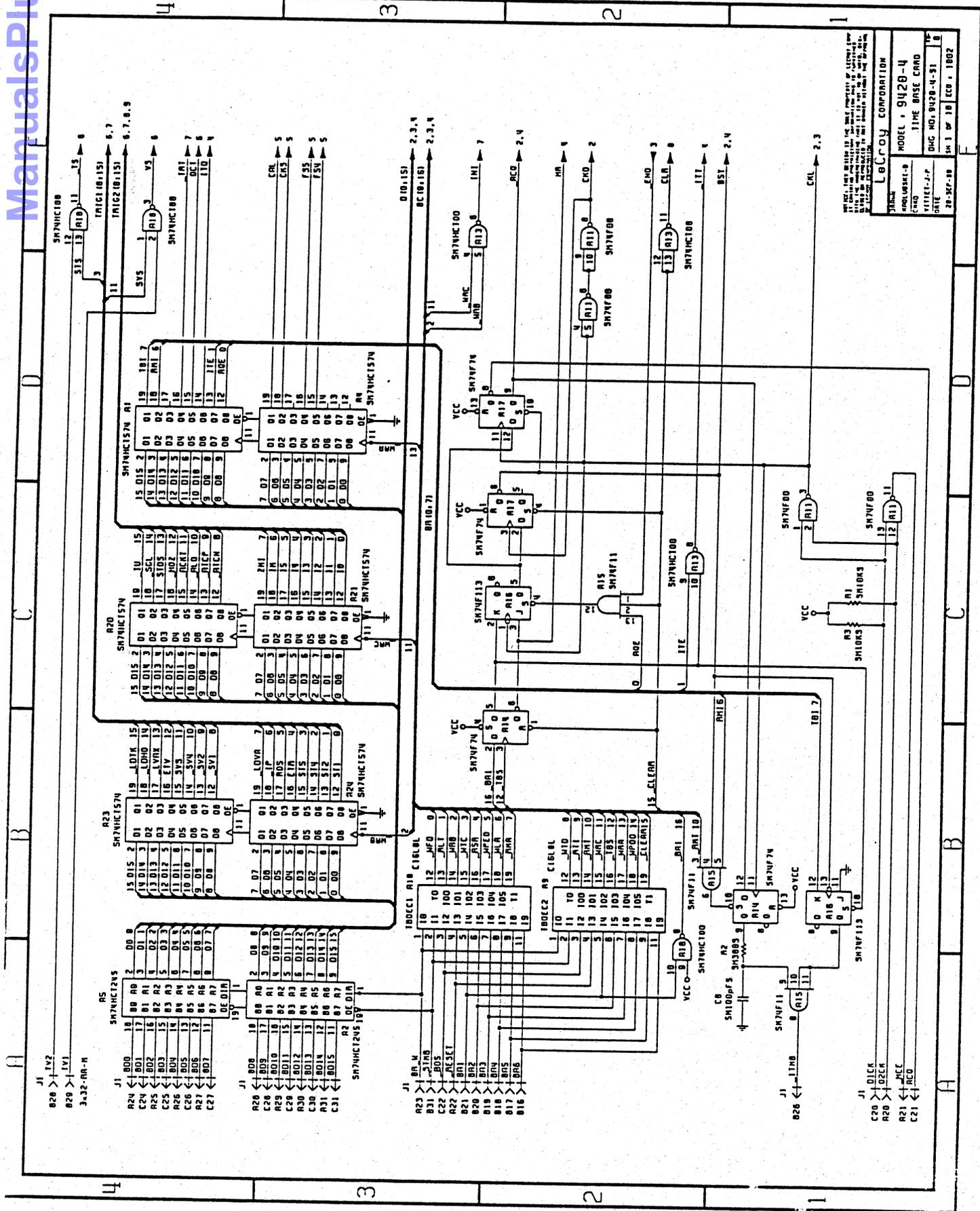
WHILE THIS DEVICE IS THE SOLE PROPERTY OF LECROY, INC. IT IS LOANED TO YOU BY THE USER AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

LECROY CORPORATION
 MODEL 9420-3
 DUAL CHAN. 180KHz/4 ADC
 DHC NO. ROCMEM1
 DATE 85-07-08



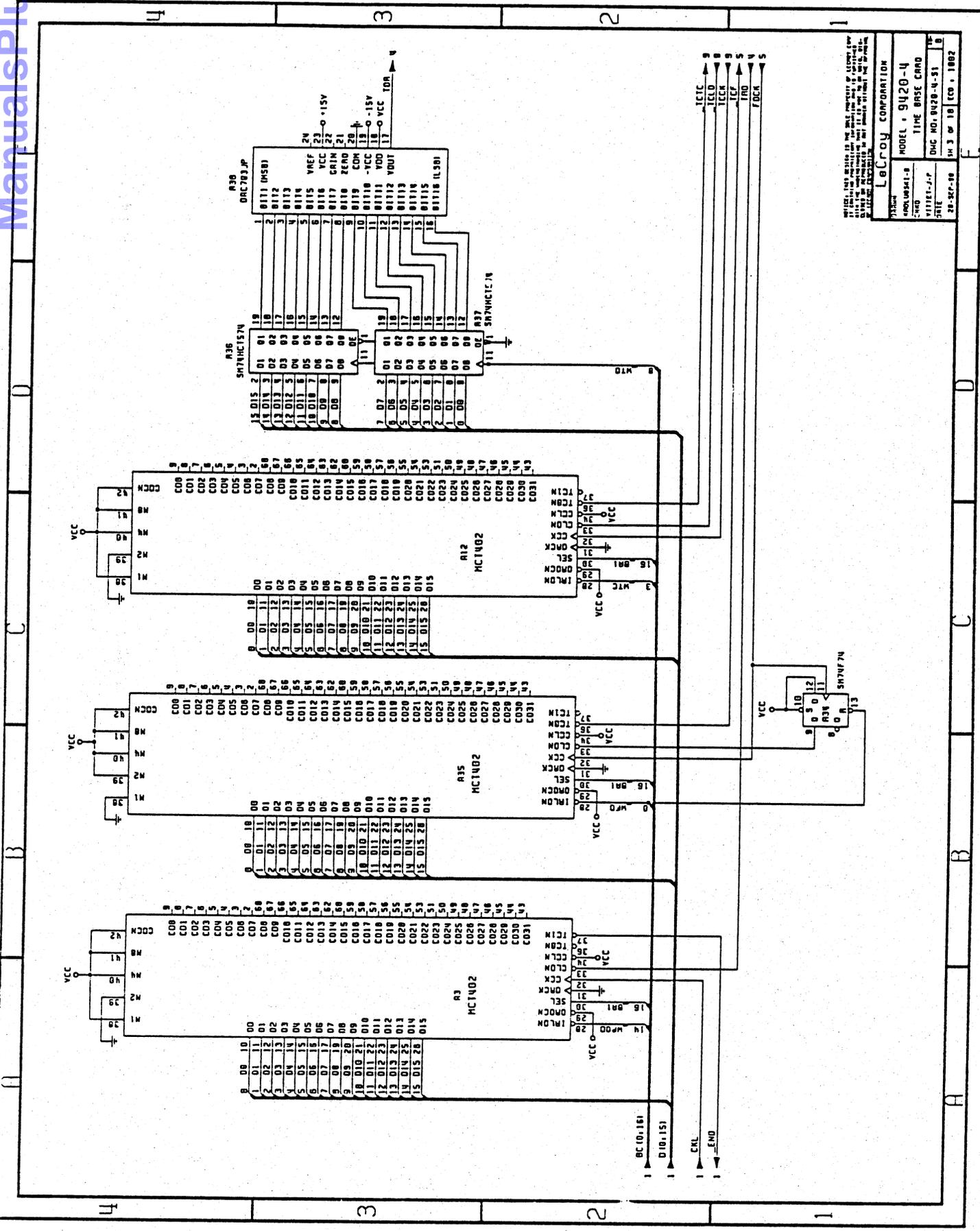
MODEL 9420-3
 DUAL CHAN. 100MHz ADC
 DMC NO. ROCHEM2
 95-302 010
 SH 1 OF 1
 ECO - 1008

LeRoy CORPORATION
 11000 W. 11th St., Suite 100, Denver, CO 80231
 (303) 751-1100



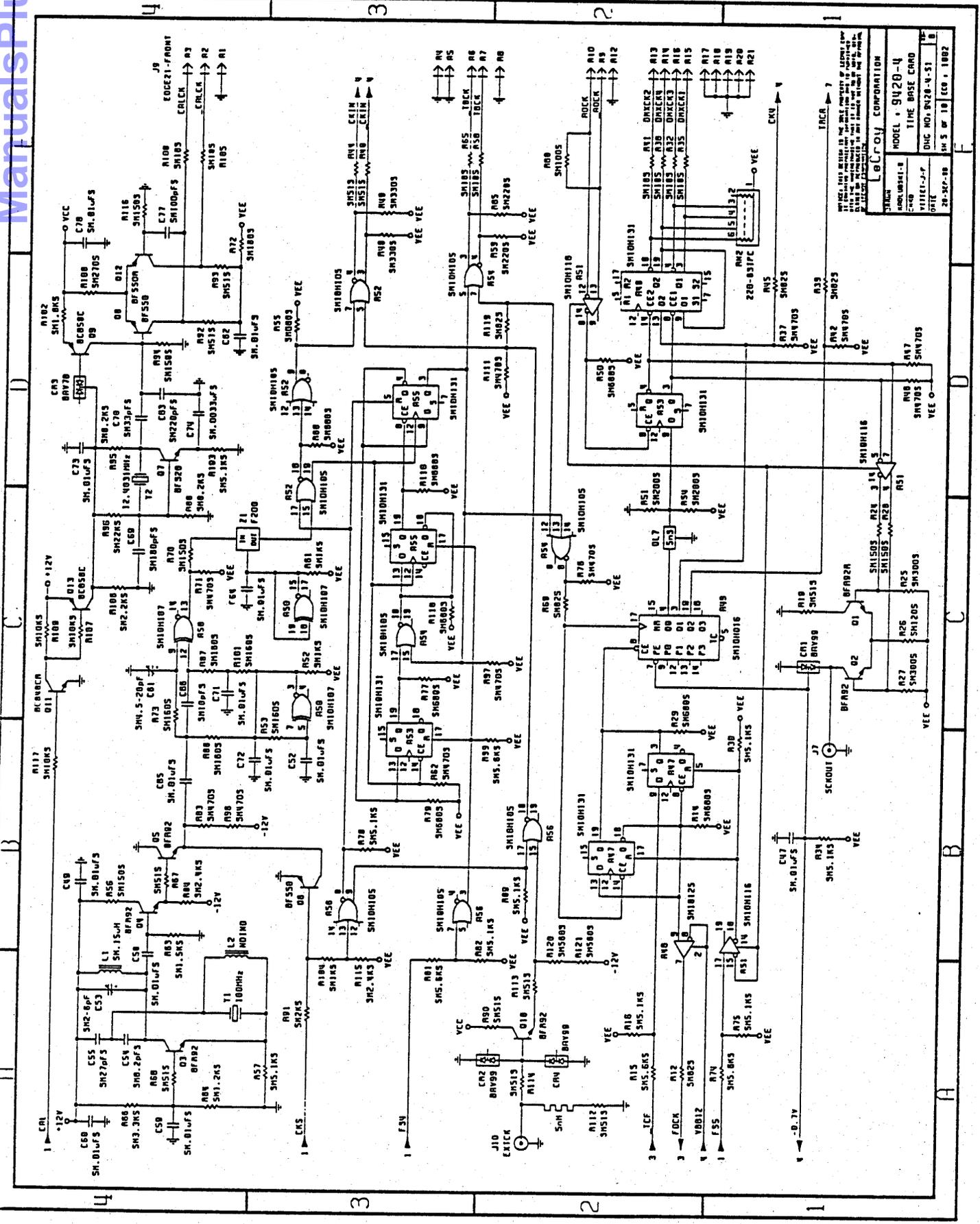
L6CROOY CORPORATION
 MODEL 9420-4
 TIME BASE CARD
 DHC NO. 9420-4-51
 28-SEP-68 SH 1 OF 10 ECU 1 1802

- J1 < 800
- J1 < 801
- J1 < 802
- J1 < 803
- J1 < 804
- J1 < 805
- J1 < 806
- J1 < 807
- J1 < 808
- J1 < 809
- J1 < 810
- J1 < 811
- J1 < 812
- J1 < 813
- J1 < 814
- J1 < 815
- J1 < 816
- J1 < 817
- J1 < 818
- J1 < 819
- J1 < 820
- J1 < 821
- J1 < 822
- J1 < 823
- J1 < 824
- J1 < 825
- J1 < 826
- J1 < 827
- J1 < 828
- J1 < 829
- J1 < 830
- J1 < 831
- J1 < 832
- J1 < 833
- J1 < 834
- J1 < 835
- J1 < 836
- J1 < 837
- J1 < 838
- J1 < 839
- J1 < 840
- J1 < 841
- J1 < 842
- J1 < 843
- J1 < 844
- J1 < 845
- J1 < 846
- J1 < 847
- J1 < 848
- J1 < 849
- J1 < 850
- J1 < 851
- J1 < 852
- J1 < 853
- J1 < 854
- J1 < 855
- J1 < 856
- J1 < 857
- J1 < 858
- J1 < 859
- J1 < 860
- J1 < 861
- J1 < 862
- J1 < 863
- J1 < 864
- J1 < 865
- J1 < 866
- J1 < 867
- J1 < 868
- J1 < 869
- J1 < 870
- J1 < 871
- J1 < 872
- J1 < 873
- J1 < 874
- J1 < 875
- J1 < 876
- J1 < 877
- J1 < 878
- J1 < 879
- J1 < 880
- J1 < 881
- J1 < 882
- J1 < 883
- J1 < 884
- J1 < 885
- J1 < 886
- J1 < 887
- J1 < 888
- J1 < 889
- J1 < 890
- J1 < 891
- J1 < 892
- J1 < 893
- J1 < 894
- J1 < 895
- J1 < 896
- J1 < 897
- J1 < 898
- J1 < 899
- J1 < 900
- J1 < 901
- J1 < 902
- J1 < 903
- J1 < 904
- J1 < 905
- J1 < 906
- J1 < 907
- J1 < 908
- J1 < 909
- J1 < 910
- J1 < 911
- J1 < 912
- J1 < 913
- J1 < 914
- J1 < 915
- J1 < 916
- J1 < 917
- J1 < 918
- J1 < 919
- J1 < 920
- J1 < 921
- J1 < 922
- J1 < 923
- J1 < 924
- J1 < 925
- J1 < 926
- J1 < 927
- J1 < 928
- J1 < 929
- J1 < 930
- J1 < 931
- J1 < 932
- J1 < 933
- J1 < 934
- J1 < 935
- J1 < 936
- J1 < 937
- J1 < 938
- J1 < 939
- J1 < 940
- J1 < 941
- J1 < 942
- J1 < 943
- J1 < 944
- J1 < 945
- J1 < 946
- J1 < 947
- J1 < 948
- J1 < 949
- J1 < 950
- J1 < 951
- J1 < 952
- J1 < 953
- J1 < 954
- J1 < 955
- J1 < 956
- J1 < 957
- J1 < 958
- J1 < 959
- J1 < 960
- J1 < 961
- J1 < 962
- J1 < 963
- J1 < 964
- J1 < 965
- J1 < 966
- J1 < 967
- J1 < 968
- J1 < 969
- J1 < 970
- J1 < 971
- J1 < 972
- J1 < 973
- J1 < 974
- J1 < 975
- J1 < 976
- J1 < 977
- J1 < 978
- J1 < 979
- J1 < 980
- J1 < 981
- J1 < 982
- J1 < 983
- J1 < 984
- J1 < 985
- J1 < 986
- J1 < 987
- J1 < 988
- J1 < 989
- J1 < 990
- J1 < 991
- J1 < 992
- J1 < 993
- J1 < 994
- J1 < 995
- J1 < 996
- J1 < 997
- J1 < 998
- J1 < 999
- J1 < 1000



MODEL 9420-4
 TIME BASE CARD
 DAC MODEL 9420-4-S1
 DATE 18
 20-SEP-80 SH 3 OF 10 ECO 1002

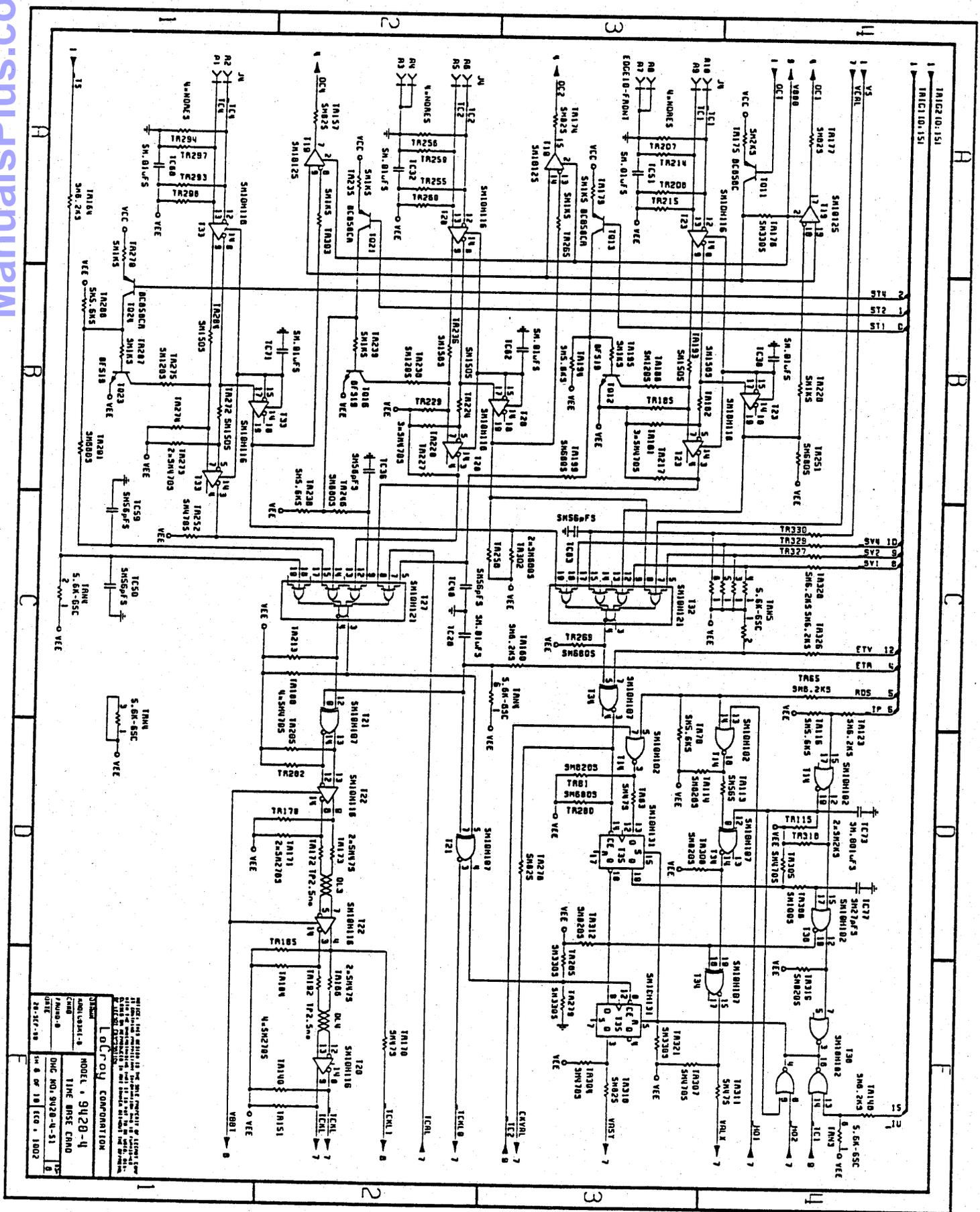
Labroy Corporation
 11000 15th Street, N.W.
 Atlanta, Georgia 30328
 (404) 251-1000



MODEL 9420-4
TIME BASE CARD
DHC NO. 9420-4-S1
REV. 5 OF 10 (EO + 1002)

GE-COY CORPORATION
SUNNYVALE, CALIF. 94088
SUNNYVALE, CALIF. 94088
SUNNYVALE, CALIF. 94088
SUNNYVALE, CALIF. 94088

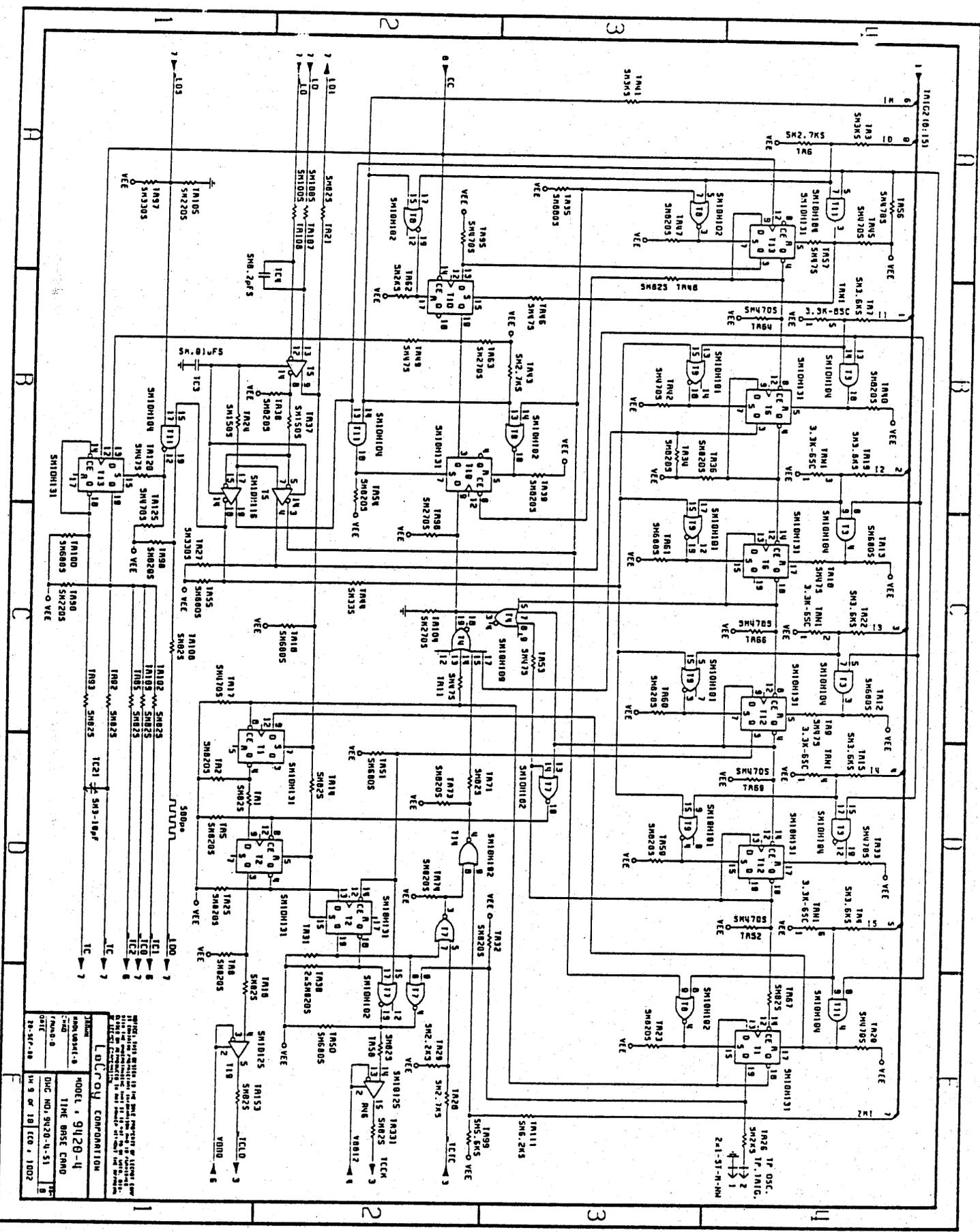
REPLACE THIS LABEL IN THE AREA INDICATED BY DOTTED LINE
IF THE LABEL IS DAMAGED OR MISSING, CONTACT THE MANUFACTURER FOR REPLACEMENT LABELS.
THIS LABEL IS THE PROPERTY OF GE-COY CORPORATION AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.



MODEL 9128-4
 TIME BASE CIRCUIT
 DMC NO. 9128-4-S1
 REV. 8 OF 18 (EO. 1002)

LORROY CORPORATION
 2400 W. 10TH AVE.
 DENVER, CO. 80202
 303-447-1818

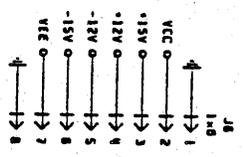
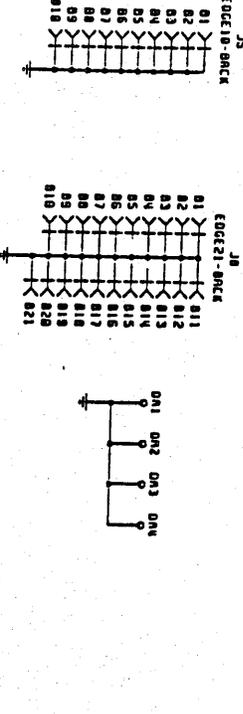
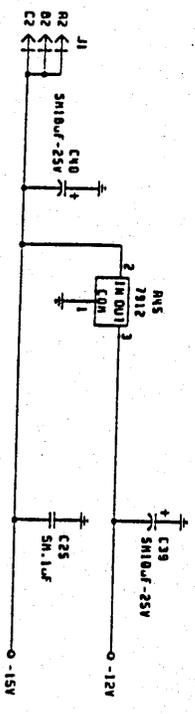
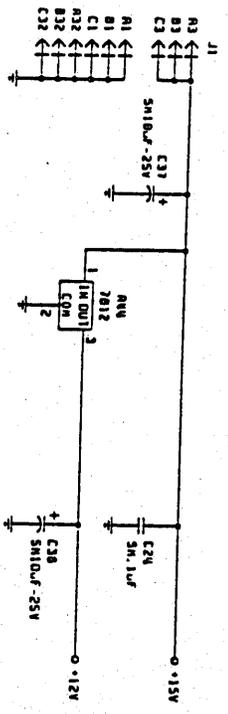
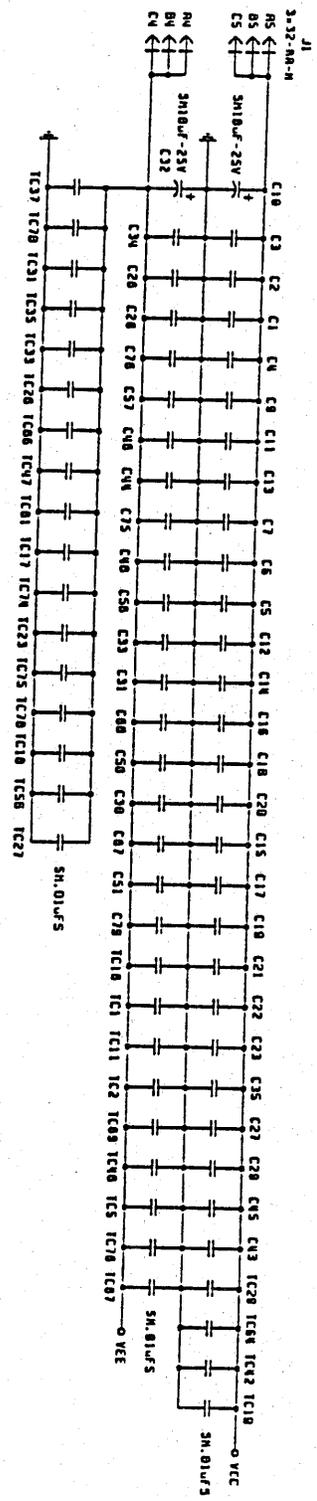
NOTICE: THIS MANUAL IS THE PROPERTY OF LORROY CORPORATION. IT IS LOANED TO YOU BY THE COMPANY AND IS TO BE RETURNED TO THE COMPANY WHEN YOU ARE THROUGH WITH IT. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.



MODEL 9420-4
11ME ROSE CRAND
DHC NO. 9420-4-51
REV. 10-1002

Lincroy COMPARATOR

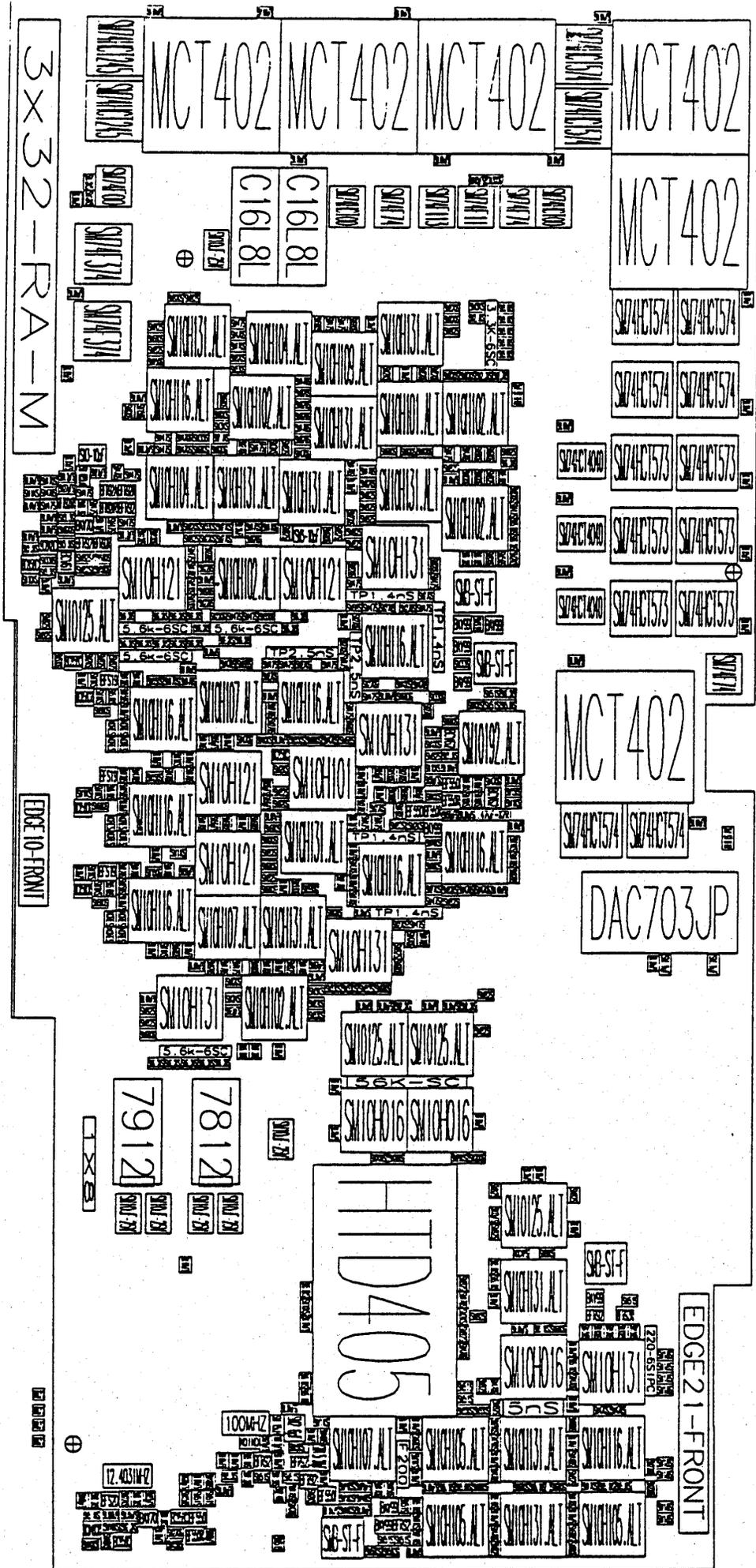
100-44-10



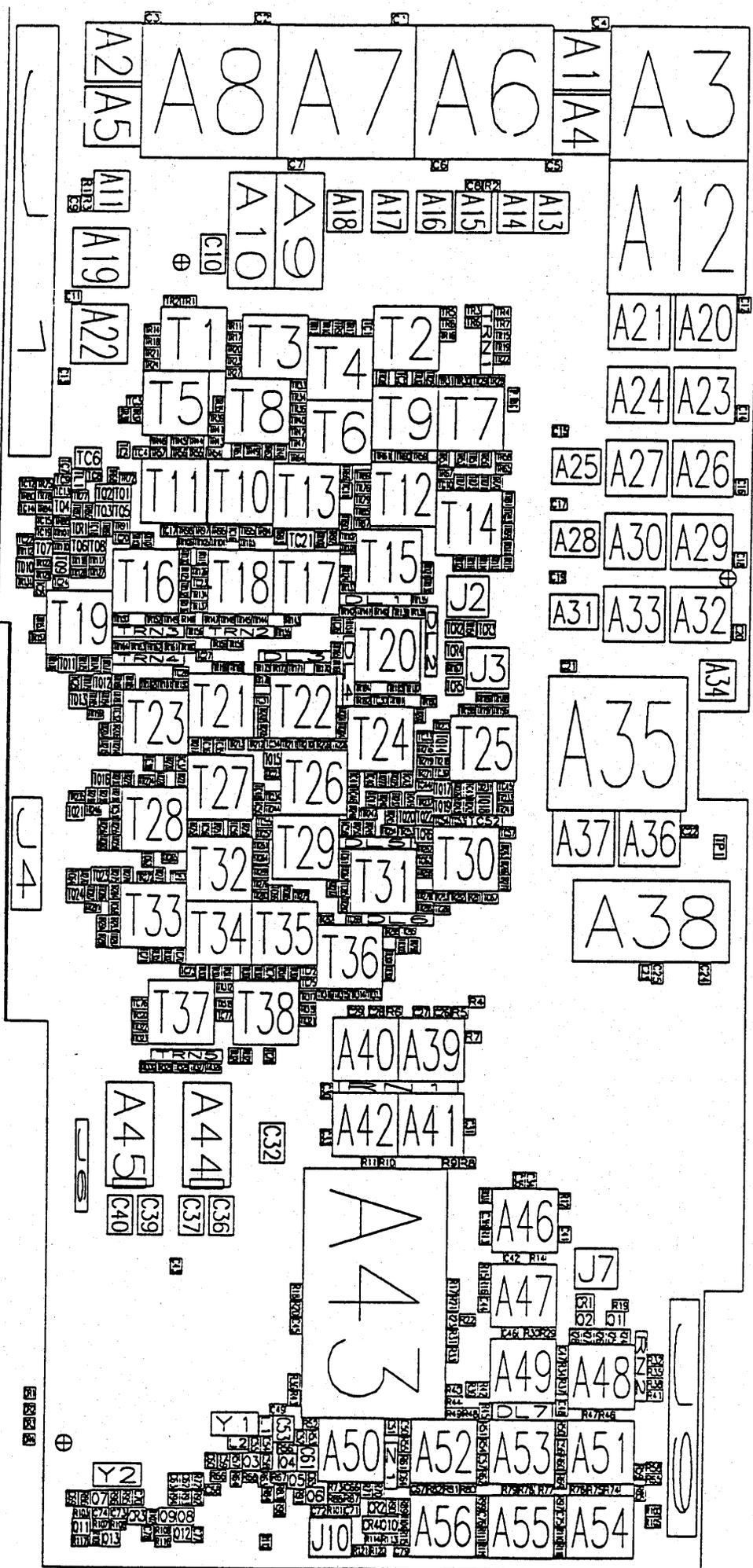
THE INFORMATION CONTAINED IN THIS MANUAL IS THE PROPERTY OF LECROY CORPORATION. IT IS LOANED TO YOU BY THE COMPANY AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

LECROY CORPORATION
 MODEL: 9120-4
 TIME BASE CARD
 DDC NO. 8420-4-51
 20-474-18 (C) 1982

9420_4 Rev:B



9420_4 Rev: B



7

C4

Y1

Y2

A1	SM200178574	SM74HCT574	SOIC_20
A2	SM207878245	SM74HCT245	SOIC_20
A3	SM200160402	MCT402	PLCC_68
A4	SM200178574	SM74HCT574	SOIC_20
A5	SM207878245	SM74HCT245	SOIC_20
A6	SM200160402	MCT402	PLCC_68
A7	SM200160402	MCT402	PLCC_68
A8	SM200160402	MCT402	PLCC_68
A9	205750000	Cl6L8L	DIP20
A10	205750000	Cl6L8L	DIP20
A11	SM200172000	SM74F00	SOIC_14
A12	SM200160402	MCT402	PLCC_68
A13	SM200178000	SM74HCT00	SOIC_14
A14	SM200172074	SM74F74	SOIC_14
A15	SM200172011	SM74F11	SOIC_14
A16	SM200172113	SM74F113	SOIC_14
A17	SM200172074	SM74F74	SOIC_14
A18	SM200178000	SM74HCT00	SOIC_14
A19	SM200172374	SM74F374	SOIC_20
A20	SM200178574	SM74HCT574	SOIC_20
A21	SM200178574	SM74HCT574	SOIC_20
A22	SM200172374	SM74F374	SOIC_20
A23	SM200178574	SM74HCT574	SOIC_20
A24	SM200178574	SM74HCT574	SOIC_20
A25	SM200278040	SM74HCT4040	SOIC_16
A26	SM200478573	SM74HCT573	SOIC_20
A27	SM200478573	SM74HCT573	SOIC_20
A28	SM200278040	SM74HCT4040	SOIC_16
A29	SM200478573	SM74HCT573	SOIC_20
A30	SM200478573	SM74HCT573	SOIC_20
A31	SM200278040	SM74HCT4040	SOIC_16
A32	SM200478573	SM74HCT573	SOIC_20
A33	SM200478573	SM74HCT573	SOIC_20
A34	SM200172074	SM74F74	SOIC_14
A35	SM200160402	MCT402	PLCC_68
A36	SM200178574	SM74HCT574	SOIC_20
A37	SM200178574	SM74HCT574	SOIC_20
A38	207281703	DAC703JP	DIP24
A39	SM207360125	SM10125.ALT	PLCC_20
A40	SM207360125	SM10125.ALT	PLCC_20
A41	SM200267016	SM10H016	PLCC_20
A42	SM200267016	SM10H016	PLCC_20
A43	HTD405	HTD405	HTD405
A44	208570812	7812	TO220
A45	208570912	7912	TO220
A46	SM207360125	SM10125.ALT	PLCC_20
A47	SM200167131	SM10H131.ALT	PLCC_20
A48	SM200167131	SM10H131	PLCC_20
A49	SM200267016	SM10H016	PLCC_20
A50	SM200167107	SM10H107.ALT	PLCC_20
A51	SM207460116	SM10H116.ALT	PLCC_20
A52	SM200167105	SM10H105.ALT	PLCC_20
A53	SM200167131	SM10H131.ALT	PLCC_20
A54	SM200167105	SM10H105.ALT	PLCC_20
A55	SM200167131	SM10H131.ALT	PLCC_20
A56	SM200167105	SM10H105.ALT	PLCC_20

C1	SM661207103	SM.01uFS	SM0805
C2	SM661207103	SM.01uFS	SM0805
C3	SM661207103	SM.01uFS	SM0805
C4	SM661207103	SM.01uFS	SM0805
C5	SM661207103	SM.01uFS	SM0805
C6	SM661207103	SM.01uFS	SM0805
C7	SM661207103	SM.01uFS	SM0805
C8	SM661255101	SM100pFS	SM0805
C9	SM661207103	SM.01uFS	SM0805
C10	SM666247106	SM10uF-25V	SMCAPD
C11	SM661207103	SM.01uFS	SM0805
C12	SM661207103	SM.01uFS	SM0805
C13	SM661207103	SM.01uFS	SM0805
C14	SM661207103	SM.01uFS	SM0805
C15	SM661207103	SM.01uFS	SM0805
C16	SM661207103	SM.01uFS	SM0805
C17	SM661207103	SM.01uFS	SM0805
C18	SM661207103	SM.01uFS	SM0805
C19	SM661207103	SM.01uFS	SM0805
C20	SM661207103	SM.01uFS	SM0805
C21	SM661207103	SM.01uFS	SM0805
C22	SM661207103	SM.01uFS	SM0805
C23	SM661207103	SM.01uFS	SM0805
C24	SM661127104	SM.1uF	SM1206
C25	SM661127104	SM.1uF	SM1206
C26	SM661207103	SM.01uFS	SM0805
C27	SM661207103	SM.01uFS	SM0805
C28	SM661207103	SM.01uFS	SM0805
C29	SM661207103	SM.01uFS	SM0805
C30	SM661207103	SM.01uFS	SM0805
C31	SM661207103	SM.01uFS	SM0805
C32	SM666247106	SM10uF-25V	SMCAPD
C33	SM661207103	SM.01uFS	SM0805
C34	SM661207103	SM.01uFS	SM0805
C35	SM661207103	SM.01uFS	SM0805
C36	SM666247106	SM10uF-25V	SMCAPD
C37	SM666247106	SM10uF-25V	SMCAPD
C38	SM661255330	SM33pFS	SM0805
C39	SM666247106	SM10uF-25V	SMCAPD
C40	SM666247106	SM10uF-25V	SMCAPD
C41	SM661207103	SM.01uFS	SM0805
C42	NOCAPS	NOCAPS	SM0805
C43	SM661207103	SM.01uFS	SM0805
C44	SM661207103	SM.01uFS	SM0805
C45	SM661207103	SM.01uFS	SM0805
C46	SM661207103	SM.01uFS	SM0805
C47	SM661207103	SM.01uFS	SM0805
C48	SM661207103	SM.01uFS	SM0805
C49	SM661207103	SM.01uFS	SM0805
C50	SM661207103	SM.01uFS	SM0805
C51	SM661207103	SM.01uFS	SM0805
C52	SM661207103	SM.01uFS	SM0805
C53	SM158043006	SM2-6pF	SMCAPVAR
C54	SM661250082	SM8.2pFS	SM0805
C55	SM661255270	SM27pFS	SM0805
C56	SM661207103	SM.01uFS	SM0805

C57	SM661207103	SM.01uFS	SM0805
C58	SM661207103	SM.01uFS	SM0805
C59	SM661207103	SM.01uFS	SM0805
C60	SM661207103	SM.01uFS	SM0805
C61	SM158043020	SM4.5-20pF	SMCAPVAR
C62	SM661207103	SM.01uFS	SM0805
C63	SM661255221	SM220pFS	SM0805
C64	SM661207103	SM.01uFS	SM0805
C65	SM661207103	SM.01uFS	SM0805
C66	SM661255100	SM10pFS	SM0805
C67	SM661207103	SM.01uFS	SM0805
C68	SM661207103	SM.01uFS	SM0805
C69	SM661255181	SM180pFS	SM0805
C70	SM661255330	SM33pFS	SM0805
C71	SM661207103	SM.01uFS	SM0805
C72	SM661207103	SM.01uFS	SM0805
C73	SM661207103	SM.01uFS	SM0805
C74	SM661205332	SM.0033uFS	SM0805
C75	SM661207103	SM.01uFS	SM0805
C76	SM661207103	SM.01uFS	SM0805
C77	SM661255101	SM100pFS	SM0805
C78	SM661207103	SM.01uFS	SM0805
C79	SM661207103	SM.01uFS	SM0805
CR1	SM236030099	BAV99	SOT23
CR2	SM236030099	BAV99	SOT23
CR3	SM232120070	BAV70	SOT23
CR4	SM236030099	BAV99	SOT23
DL1	839450430	TP1.4nS	SIP6RES
DL2	839450430	TP1.4nS	SIP6RES
DL3	839450420	TP2.5nS	SIP6RES
DL4	839450420	TP2.5nS	SIP6RES
DL5	839450430	TP1.4nS	SIP6RES
DL6	839450430	TP1.4nS	SIP6RES
DL7	290120005	5nS	BEL_DELAY
DR1	\$NULL	DRILL2_2	DRILL2_2
DR2	\$NULL	DRILL2_2	DRILL2_2
DR3	\$NULL	DRILL2_2	DRILL2_2
DR4	\$NULL	DRILL2_2	DRILL2_2
J1	454610096	3x32-RA-M	CONN3X32_RA_M
J2	402610002	SMB-ST-F	SMB_ST_F
J3	402610002	SMB-ST-F	SMB_ST_F
J4	\$NULL	EDGE10-FRONT	EDGE10_FRONT
J5	\$NULL	EDGE10-BACK	EDGE10_BACK
J6	403181008	LX8	HD1R8P
J7	402610002	SMB-ST-F	SMB_ST_F
J8	\$NULL	EDGE21-BACK	EDGE21_BACK
J9	\$NULL	EDGE21-FRONT	EDGE21_FRONT
J10	402610002	SMB-ST-F	SMB_ST_F
L1	SM300546151	SM.15uH	SMSELF
L2	NOIND	NOIND	SMSELF
Q1	SM270040092	BFR92R	SOT23
Q2	SM270030092	BFR92	SOT23
Q3	SM270030092	BFR92	SOT23
Q4	SM270030092	BFR92	SOT23
Q5	SM270030092	BFR92	SOT23
Q6	SM275030550	BF550	SOT23

Q7	SM270030020	BFS20	SOT23
Q8	SM275030550	BF550	SOT23
Q9	SM275330858	BC858C	SOT23
Q10	SM270030092	BFR92	SOT23
Q11	SM270340848	BC848CR	SOT23
Q12	SM275040550	BF550R	SOT23
Q13	SM275330858	BC858C	SOT23
R1	SM652101103	SM10KS	SM0805
R2	SM652101301	SM300S	SM0805
R3	SM652101103	SM10KS	SM0805
R4	SM652101820	SM82S	SM0805
R5	SM652101222	SM2.2KS	SM0805
R6	SM652101222	SM2.2KS	SM0805
R7	SM652101820	SM82S	SM0805
R8	SM652101201	SM200S	SM0805
R9	SM652101201	SM200S	SM0805
R10	SM652101201	SM200S	SM0805
R11	SM652101201	SM200S	SM0805
R12	SM652101820	SM82S	SM0805
R13	SM652101820	SM82S	SM0805
R14	SM652101681	SM680S	SM0805
R15	SM652101562	SM5.6KS	SM0805
R16	SM652101512	SM5.1KS	SM0805
R17	SM652101820	SM82S	SM0805
R18	SM652101562	SM5.6KS	SM0805
R19	SM652101510	SM51S	SM0805
R20	SM652101103	SM10KS	SM0805
R21	SM652101471	SM470S	SM0805
R22	SM652101820	SM82S	SM0805
R23	SM652101202	SM2KS	SM0805
R24	SM652101151	SM150S	SM0805
R25	SM652101301	SM300S	SM0805
R26	SM652101121	SM120S	SM0805
R27	SM652101301	SM300S	SM0805
R28	SM652101151	SM150S	SM0805
R29	SM652101681	SM680S	SM0805
R30	SM652101512	SM5.1KS	SM0805
R31	SM652101820	SM82S	SM0805
R32	SM652101180	SM18S	SM0805
R33	SM652101471	SM470S	SM0805
R34	SM652101512	SM5.1KS	SM0805
R35	SM652101180	SM18S	SM0805
R36	SM652101562	SM5.6KS	SM0805
R37	SM652101471	SM470S	SM0805
R38	SM652101180	SM18S	SM0805
R39	SM652101820	SM82S	SM0805
R40	SM652101510	SM51S	SM0805
R41	SM652101180	SM18S	SM0805
R42	SM652101471	SM470S	SM0805
R43	SM652101512	SM5.1KS	SM0805
R44	SM652101510	SM51S	SM0805
R45	SM652101820	SM82S	SM0805
R46	SM652101471	SM470S	SM0805
R47	SM652101471	SM470S	SM0805
R48	SM652101331	SM330S	SM0805
R49	SM652101331	SM330S	SM0805

R50	SM652101681	SM680S	SM0805
R51	SM652101201	SM200S	SM0805
R52	SM652101102	SM1KS	SM0805
R53	SM652101161	SM160S	SM0805
R54	SM652101201	SM200S	SM0805
R55	SM652101681	SM680S	SM0805
R56	SM652101151	SM150S	SM0805
R57	SM652101512	SM5.1KS	SM0805
R58	SM652101180	SM18S	SM0805
R59	SM652101221	SM220S	SM0805
R60	SM652101101	SM100S	SM0805
R61	SM652101102	SM1KS	SM0805
R62	SM652101471	SM470S	SM0805
R63	SM652101152	SM1.5KS	SM0805
R64	SM652101122	SM1.2KS	SM0805
R65	SM652101180	SM18S	SM0805
R66	SM652101332	SM3.3KS	SM0805
R67	SM652101510	SM51S	SM0805
R68	SM652101510	SM51S	SM0805
R69	SM652101820	SM82S	SM0805
R70	SM652101151	SM150S	SM0805
R71	SM652101471	SM470S	SM0805
R72	SM652101181	SM180S	SM0805
R73	SM652101161	SM160S	SM0805
R74	SM652101562	SM5.6KS	SM0805
R75	SM652101512	SM5.1KS	SM0805
R76	SM652101471	SM470S	SM0805
R77	SM652101681	SM680S	SM0805
R78	SM652101512	SM5.1KS	SM0805
R79	SM652101681	SM680S	SM0805
R80	SM652101681	SM680S	SM0805
R81	SM652101562	SM5.6KS	SM0805
R82	SM652101512	SM5.1KS	SM0805
R83	SM652101471	SM470S	SM0805
R84	SM652101242	SM2.4KS	SM0805
R85	SM652101221	SM220S	SM0805
R86	SM652101822	SM8.2KS	SM0805
R87	SM652101161	SM160S	SM0805
R88	SM652101161	SM160S	SM0805
R89	SM652101512	SM5.1KS	SM0805
R90	SM652101510	SM51S	SM0805
R91	SM652101202	SM2KS	SM0805
R92	SM652101510	SM51S	SM0805
R93	SM652101510	SM51S	SM0805
R94	SM652101151	SM150S	SM0805
R95	SM652101822	SM8.2KS	SM0805
R96	SM652101223	SM22KS	SM0805
R97	SM652101471	SM470S	SM0805
R98	SM652101471	SM470S	SM0805
R99	SM652101562	SM5.6KS	SM0805
R100	SM652101180	SM18S	SM0805
R101	SM652101161	SM160S	SM0805
R102	SM652101182	SM1.8KS	SM0805
R103	SM652101512	SM5.1KS	SM0805
R104	SM652101102	SM1KS	SM0805
R105	SM652101180	SM18S	SM0805

R106	SM652101222	SM2.2KS	SM0805
R107	SM652101103	SM10KS	SM0805
R108	SM652101271	SM270S	SM0805
R109	SM652101103	SM10KS	SM0805
R110	SM652101681	SM680S	SM0805
R111	SM652101471	SM470S	SM0805
R112	SM652101510	SM51S	SM0805
R113	SM652101510	SM51S	SM0805
R114	SM652101510	SM51S	SM0805
R115	SM652101242	SM2.4KS	SM0805
R116	SM652101151	SM150S	SM0805
R117	SM652101103	SM10KS	SM0805
R118	SM652101681	SM680S	SM0805
R119	SM652101820	SM82S	SM0805
R120	SM652101561	SM560S	SM0805
R121	SM652101561	SM560S	SM0805
RN1	190042563	56K-SC	SIP10RES
RN2	190642221	220-6SIPC	SIP6RES
T1	SM200167131	SM10H131.ALT	PLCC_20
T2	SM200167131	SM10H131.ALT	PLCC_20
T3	SM200167104	SM10H104.ALT	PLCC_20
T4	SM200167109	SM10H109.ALT	PLCC_20
T5	SM207460116	SM10H116.ALT	PLCC_20
T6	SM200167131	SM10H131.ALT	PLCC_20
T7	SM200167102	SM10H102.ALT	PLCC_20
T8	SM200167102	SM10H102.ALT	PLCC_20
T9	SM200160101	SM10H101.ALT	PLCC_20
T10	SM200167131	SM10H131.ALT	PLCC_20
T11	SM200167104	SM10H104.ALT	PLCC_20
T12	SM200167131	SM10H131.ALT	PLCC_20
T13	SM200167131	SM10H131.ALT	PLCC_20
T14	SM200167102	SM10H102.ALT	PLCC_20
T15	SM200167131	SM10H131	PLCC_20
T16	SM200167121	SM10H121	PLCC_20
T17	SM200167121	SM10H121	PLCC_20
T18	SM200167102	SM10H102.ALT	PLCC_20
T19	SM207360125	SM10125.ALT	PLCC_20
T20	SM207460116	SM10H116.ALT	PLCC_20
T21	SM200167107	SM10H107.ALT	PLCC_20
T22	SM207460116	SM10H116.ALT	PLCC_20
T23	SM207460116	SM10H116.ALT	PLCC_20
T24	SM200167131	SM10H131	PLCC_20
T25	SM207160192	SM10192.ALT	PLCC_20
T26	SM200160101	SM10H101	PLCC_20
T27	SM200167121	SM10H121	PLCC_20
T28	SM207460116	SM10H116.ALT	PLCC_20
T29	SM200167131	SM10H131.ALT	PLCC_20
T30	SM207460116	SM10H116.ALT	PLCC_20
T31	SM207460116	SM10H116.ALT	PLCC_20
T32	SM200167121	SM10H121	PLCC_20
T33	SM207460116	SM10H116.ALT	PLCC_20
T34	SM200167107	SM10H107.ALT	PLCC_20
T35	SM200167131	SM10H131.ALT	PLCC_20
T36	SM200167131	SM10H131	PLCC_20
T37	SM200167131	SM10H131	PLCC_20
T38	SM200167102	SM10H102.ALT	PLCC_20

TA1	\$NULL	AREA	AREA
TC1	SM661207103	SM.01uFS	SM0805
TC2	SM661207103	SM.01uFS	SM0805
TC3	SM661207103	SM.01uFS	SM0805
TC4	SM661250082	SM8.2pFS	SM0805
TC5	SM661207103	SM.01uFS	SM0805
TC6	SM158044010	SM3-10pF	SMCAPVAR
TC7	SM661207103	SM.01uFS	SM0805
TC8	SM661255270	SM27pFS	SM0805
TC9	SM661250082	SM8.2pFS	SM0805
TL1	SM300446330	SM.033uH	SMSELF
TP1	454340002	2x1-ST-M-NW	CONN2X1_ST_M_NW
TQ1	SM270040092	BFR92R	SOT23
TQ2	SM270130092	BFR92A	SOT23
TQ3	SM270140092	BFR92AR	SOT23
TQ4	SM270140092	BFR92AR	SOT23
TQ5	SM270030092	BFR92	SOT23
TQ6	SM270030092	BFR92	SOT23
TQ7	SM270330848	BC848C	SOT23
TQ8	SM270040092	BFR92R	SOT23
TQ9	SM289240061	BCV61	SOT143
TR1	SM652101820	SM82S	SM0805
TR2	SM652101821	SM820S	SM0805
TR3	SM652101302	SM3KS	SM0805
TR4	SM652101362	SM3.6KS	SM0805
TR5	SM652101821	SM820S	SM0805
TR6	SM652101272	SM2.7KS	SM0805
TR7	SM652101362	SM3.6KS	SM0805
TR8	SM652101821	SM820S	SM0805
TR9	SM652101470	SM47S	SM0805
TC10	SM661207103	SM.01uFS	SM0805
TC11	SM661207103	SM.01uFS	SM0805
TC12	SM661207103	SM.01uFS	SM0805
TC13	SM661255270	SM27pFS	SM0805
TC14	SM661207103	SM.01uFS	SM0805
TC15	SM661207103	SM.01uFS	SM0805
TC16	SM661207103	SM.01uFS	SM0805
TC17	SM661207103	SM.01uFS	SM0805
TC18	SM661250047	SM4.7pFS	SM0805
TC19	SM661207103	SM.01uFS	SM0805
TC20	SM661250047	SM4.7pFS	SM0805
TC21	SM158044010	SM3-10pF	SMCAPVAR
TC22	SM661207103	SM.01uFS	SM0805
TC23	SM661207103	SM.01uFS	SM0805
TC24	SM661207103	SM.01uFS	SM0805
TC25	SM661207103	SM.01uFS	SM0805
TC26	SM661207103	SM.01uFS	SM0805
TC27	SM661207103	SM.01uFS	SM0805
TC28	SM661207103	SM.01uFS	SM0805
TC29	SM661207103	SM.01uFS	SM0805
TC30	SM661207102	SM.001uFS	SM0805
TC31	SM661207103	SM.01uFS	SM0805
TC32	SM661207103	SM.01uFS	SM0805
TC33	SM661207103	SM.01uFS	SM0805
TC34	SM661207103	SM.01uFS	SM0805
TC35	SM661207103	SM.01uFS	SM0805

TC36	SM661255560	SM56pFS	SM0805
TC37	SM661207103	SM.01uFS	SM0805
TC38	SM661207103	SM.01uFS	SM0805
TC39	SM661207102	SM.001uFS	SM0805
TC40	SM661255560	SM56pFS	SM0805
TC41	SM661207102	SM.001uFS	SM0805
TC42	SM661207103	SM.01uFS	SM0805
TC43	SM661207103	SM.01uFS	SM0805
TC44	SM661255560	SM56pFS	SM0805
TC45	SM661207103	SM.01uFS	SM0805
TC46	SM661207103	SM.01uFS	SM0805
TC47	SM661207103	SM.01uFS	SM0805
TC48	SM661255560	SM56pFS	SM0805
TC49	SM661255560	SM56pFS	SM0805
TC50	SM661255560	SM56pFS	SM0805
TC51	SM661207103	SM.01uFS	SM0805
TC52	103336474	.47uF-X7R	LMONO
TC53	SM661207103	SM.01uFS	SM0805
TC54	SM661255560	SM56pFS	SM0805
TC55	SM661207102	SM.001uFS	SM0805
TC56	SM661207103	SM.01uFS	SM0805
TC57	SM661207103	SM.01uFS	SM0805
TC58	SM661250082	SM8.2pFS	SM0805
TC59	SM661255560	SM56pFS	SM0805
TC60	SM661207103	SM.01uFS	SM0805
TC61	SM661207103	SM.01uFS	SM0805
TC62	SM661207103	SM.01uFS	SM0805
TC63	SM661255560	SM56pFS	SM0805
TC64	SM661207103	SM.01uFS	SM0805
TC65	SM661207102	SM.001uFS	SM0805
TC66	SM661207103	SM.01uFS	SM0805
TC67	SM661207103	SM.01uFS	SM0805
TC68	SM661207103	SM.01uFS	SM0805
TC69	SM661207103	SM.01uFS	SM0805
TC70	SM661207103	SM.01uFS	SM0805
TC71	SM661207103	SM.01uFS	SM0805
TC72	SM661255270	SM27pFS	SM0805
TC73	SM661207102	SM.001uFS	SM0805
TC74	SM661207103	SM.01uFS	SM0805
TC75	SM661207103	SM.01uFS	SM0805
TC76	SM661207103	SM.01uFS	SM0805
TC77	SM661255270	SM27pFS	SM0805
TC78	SM661207103	SM.01uFS	SM0805
TCR1	SM232120070	BAV70	SOT23
TCR2	SM236030099	BAV99	SOT23
TCR3	SM236030099	BAV99	SOT23
TCR4	SM236030099	BAV99	SOT23
TCR5	SM236030099	BAV99	SOT23
TCR6	SM236030099	BAV99	SOT23
TQ10	SM275330858	BC858C	SOT23
TQ11	SM275330858	BC858C	SOT23
TQ12	SM270030019	BFS19	SOT23
TQ13	SM275340858	BC858CR	SOT23
TQ14	SM289240062	BCV62	SOT143
TQ15	SM275330858	BC858C	SOT23
TQ16	SM270030019	BFS19	SOT23

TQ17	SM275030550	BF550	SOT23
TQ18	SM289240062	BCV62	SOT143
TQ19	SM275040550	BF550R	SOT23
TQ20	SM275030550	BF550	SOT23
TQ21	SM275340858	BC858CR	SOT23
TQ22	SM275040550	BF550R	SOT23
TQ23	SM270030019	BFS19	SOT23
TQ24	SM275340858	BC858CR	SOT23
TR10	SM652101470	SM47S	SM0805
TR11	SM652101470	SM47S	SM0805
TR12	SM652101681	SM680S	SM0805
TR13	SM652101681	SM680S	SM0805
TR14	SM652101820	SM82S	SM0805
TR15	SM652101362	SM3.6KS	SM0805
TR16	SM652101820	SM82S	SM0805
TR17	SM652101471	SM470S	SM0805
TR18	SM652101681	SM680S	SM0805
TR19	SM652101362	SM3.6KS	SM0805
TR20	SM652101471	SM470S	SM0805
TR21	SM652101820	SM82S	SM0805
TR22	SM652101362	SM3.6KS	SM0805
TR23	SM652101821	SM820S	SM0805
TR24	SM652101151	SM150S	SM0805
TR25	SM652101821	SM820S	SM0805
TR26	SM652101202	SM2KS	SM0805
TR27	SM652101331	SM330S	SM0805
TR28	SM652101272	SM2.7KS	SM0805
TR29	SM652101222	SM2.2KS	SM0805
TR30	SM652101821	SM820S	SM0805
TR31	SM652101821	SM820S	SM0805
TR32	SM652101821	SM820S	SM0805
TR33	SM652101471	SM470S	SM0805
TR34	SM652101821	SM820S	SM0805
TR35	SM652101681	SM680S	SM0805
TR36	SM652101821	SM820S	SM0805
TR37	SM652101151	SM150S	SM0805
TR38	SM652101821	SM820S	SM0805
TR39	SM652101821	SM820S	SM0805
TR40	SM652101821	SM820S	SM0805
TR41	SM652101302	SM3KS	SM0805
TR42	SM652101471	SM470S	SM0805
TR43	SM652101272	SM2.7KS	SM0805
TR44	SM652101330	SM33S	SM0805
TR45	SM652101471	SM470S	SM0805
TR46	SM652101470	SM47S	SM0805
TR47	SM652101821	SM820S	SM0805
TR48	SM652101820	SM82S	SM0805
TR49	SM652101470	SM47S	SM0805
TR50	SM652101681	SM680S	SM0805
TR51	SM652101681	SM680S	SM0805
TR52	SM652101471	SM470S	SM0805
TR53	SM652101470	SM47S	SM0805
TR54	SM652101821	SM820S	SM0805
TR55	SM652101681	SM680S	SM0805
TR56	SM652101471	SM470S	SM0805
TR57	SM652101470	SM47S	SM0805

TR58	SM652101820	SM82S	SM0805
TR59	SM652101821	SM820S	SM0805
TR60	SM652101821	SM820S	SM0805
TR61	SM652101681	SM680S	SM0805
TR62	SM652101202	SM2KS	SM0805
TR63	SM652101271	SM270S	SM0805
TR64	SM652101471	SM470S	SM0805
TR65	SM652101622	SM6.2KS	SM0805
TR66	SM652101471	SM470S	SM0805
TR67	SM652101820	SM82S	SM0805
TR68	SM652101471	SM470S	SM0805
TR69	SM652101471	SM470S	SM0805
TR70	SM652101562	SM5.6KS	SM0805
TR71	SM652101820	SM82S	SM0805
TR72	SM652101470	SM47S	SM0805
TR73	SM652101821	SM820S	SM0805
TR74	SM652101821	SM820S	SM0805
TR75	SM652101471	SM470S	SM0805
TR76	SM652101821	SM820S	SM0805
TR77	SM652101470	SM47S	SM0805
TR78	SM652101471	SM470S	SM0805
TR79	SM652101820	SM82S	SM0805
TR80	SM652101102	SM1KS	SM0805
TR81	SM652101821	SM820S	SM0805
TR82	SM653125033	SM3.3S	SM0805
TR83	SM652101470	SM47S	SM0805
TR84	SM652101470	SM47S	SM0805
TR85	SM652101820	SM82S	SM0805
TR86	SM652101470	SM47S	SM0805
TR87	SM652101820	SM82S	SM0805
TR88	SM653125033	SM3.3S	SM0805
TR89	SM652101470	SM47S	SM0805
TR90	SM652101221	SM220S	SM0805
TR91	SM652101470	SM47S	SM0805
TR92	SM652101820	SM82S	SM0805
TR93	SM652101820	SM82S	SM0805
TR94	SM652101471	SM470S	SM0805
TR95	SM652101471	SM470S	SM0805
TR96	SM652101271	SM270S	SM0805
TR97	SM652101331	SM330S	SM0805
TR98	SM652101821	SM820S	SM0805
TR99	SM652101562	SM5.6KS	SM0805
TRN1	190642332	3.3K-6SC	SIP6RES
TRN2	190642562	5.6k-6SC	SIP6RES
TRN3	190642562	5.6k-6SC	SIP6RES
TRN4	190642562	5.6k-6SC	SIP6RES
TRN5	190642562	5.6k-6SC	SIP6RES
TR100	SM652101681	SM680S	SM0805
TR101	SM652101821	SM820S	SM0805
TR102	SM652101820	SM82S	SM0805
TR103	SM652101821	SM820S	SM0805
TR104	SM652101271	SM270S	SM0805
TR105	SM652101221	SM220S	SM0805
TR106	SM652101820	SM82S	SM0805
TR107	SM652101101	SM100S	SM0805
TR108	SM652101101	SM100S	SM0805

TR109	SM652101820	SM82S	SM0805
TR110	SM652101332	SM3.3KS	SM0805
TR111	SM652101622	SM6.2KS	SM0805
TR112	SM652101332	SM3.3KS	SM0805
TR113	SM652101560	SM56S	SM0805
TR114	SM652101821	SM820S	SM0805
TR115	SM652101202	SM2KS	SM0805
TR116	SM652101562	SM5.6KS	SM0805
TR117	SM652101181	SM180S	SM0805
TR118	SM652101820	SM82S	SM0805
TR119	SM652101221	SM220S	SM0805
TR120	SM652101470	SM47S	SM0805
TR121	SM652101821	SM820S	SM0805
TR122	SM652101331	SM330S	SM0805
TR123	SM652101622	SM6.2KS	SM0805
TR124	SM652101821	SM820S	SM0805
TR125	SM652101471	SM470S	SM0805
TR126	SM652101221	SM220S	SM0805
TR127	SM652101181	SM180S	SM0805
TR128	SM652101820	SM82S	SM0805
TR129	SM652101332	SM3.3KS	SM0805
TR130	SM652101470	SM47S	SM0805
TR131	SM652101103	SM10KS	SM0805
TR132	SM652101331	SM330S	SM0805
TR133	SM652101470	SM47S	SM0805
TR134	SM652101821	SM820S	SM0805
TR135	SM652101271	SM270S	SM0805
TR136	SM652101331	SM330S	SM0805
TR137	SM652101221	SM220S	SM0805
TR138	SM652101470	SM47S	SM0805
TR139	SM652101271	SM270S	SM0805
TR140	SM652101271	SM270S	SM0805
TR141	SM652101470	SM47S	SM0805
TR142	SM652101680	SM68S	SM0805
TR143	SM652101622	SM6.2KS	SM0805
TR144	SM652101331	SM330S	SM0805
TR145	SM652101470	SM47S	SM0805
TR146	SM652101470	SM47S	SM0805
TR147	SM652101221	SM220S	SM0805
TR148	SM652101622	SM6.2KS	SM0805
TR149	SM652101622	SM6.2KS	SM0805
TR150	SM652101622	SM6.2KS	SM0805
TR151	SM652101271	SM270S	SM0805
TR152	SM652101622	SM6.2KS	SM0805
TR153	SM652101820	SM82S	SM0805
TR154	SM652101330	SM33S	SM0805
TR155	SM652101622	SM6.2KS	SM0805
TR156	SM652101622	SM6.2KS	SM0805
TR157	SM652101820	SM82S	SM0805
TR158	SM652101622	SM6.2KS	SM0805
TR159	SM652101622	SM6.2KS	SM0805
TR160	SM652101622	SM6.2KS	SM0805
TR161	SM652101622	SM6.2KS	SM0805
TR162	SM652101622	SM6.2KS	SM0805
TR163	SM652101622	SM6.2KS	SM0805
TR164	SM652101622	SM6.2KS	SM0805

TR165	SM652101271	SM270S	SM0805
TR166	SM652101470	SM47S	SM0805
TR167	SM652101330	SM33S	SM0805
TR168	SM652101680	SM68S	SM0805
TR169	SM652101471	SM470S	SM0805
TR170	SM652101470	SM47S	SM0805
TR171	SM652101271	SM270S	SM0805
TR172	SM652101470	SM47S	SM0805
TR173	SM652101470	SM47S	SM0805
TR174	SM652101820	SM82S	SM0805
TR175	SM652101202	SM2KS	SM0805
TR176	SM652101331	SM330S	SM0805
TR177	SM652101820	SM82S	SM0805
TR178	SM652101271	SM270S	SM0805
TR179	SM652101102	SM1KS	SM0805
TR180	SM652101471	SM470S	SM0805
TR181	SM652101471	SM470S	SM0805
TR182	SM652101151	SM150S	SM0805
TR183	SM652101101	SM100S	SM0805
TR184	SM652101271	SM270S	SM0805
TR185	SM652101471	SM470S	SM0805
TR186	SM652101121	SM120S	SM0805
TR187	SM652101471	SM470S	SM0805
TR188	SM652101622	SM6.2KS	SM0805
TR189	SM652101510	SM51S	SM0805
TR190	SM652101331	SM330S	SM0805
TR191	SM652101681	SM680S	SM0805
TR192	SM652101470	SM47S	SM0805
TR193	SM652101151	SM150S	SM0805
TR194	SM652101562	SM5.6KS	SM0805
TR195	SM652101102	SM1KS	SM0805
TR196	SM652101562	SM5.6KS	SM0805
TR197	SM652101510	SM51S	SM0805
TR198	SM652101101	SM100S	SM0805
TR199	SM652101681	SM680S	SM0805
TR200	SM652101271	SM270S	SM0805
TR201	SM652101470	SM47S	SM0805
TR202	SM652101271	SM270S	SM0805
TR203	SM652101681	SM680S	SM0805
TR204	SM652101681	SM680S	SM0805
TR205	SM652101271	SM270S	SM0805
TR206	NORES	NORES	SM0805
TR207	NORES	NORES	SM0805
TR208	SM652101680	SM68S	SM0805
TR209	SM652101471	SM470S	SM0805
TR210	SM652101681	SM680S	SM0805
TR211	SM652101331	SM330S	SM0805
TR212	SM652101103	SM10KS	SM0805
TR213	SM652101471	SM470S	SM0805
TR214	NORES	NORES	SM0805
TR215	NORES	NORES	SM0805
TR216	SM652101101	SM100S	SM0805
TR217	SM652101471	SM470S	SM0805
TR218	SM652101332	SM3.3KS	SM0805
TR219	SM652101820	SM82S	SM0805
TR220	SM652101102	SM1KS	SM0805

TR221	SM652101103	SM10KS	SM0805
TR222	SM652101331	SM330S	SM0805
TR223	SM652101202	SM2KS	SM0805
TR224	SM652101151	SM150S	SM0805
TR225	SM652101271	SM270S	SM0805
TR226	SM652101162	SM1.6KS	SM0805
TR227	SM652101471	SM470S	SM0805
TR228	SM652101471	SM470S	SM0805
TR229	SM652101471	SM470S	SM0805
TR230	SM652101121	SM120S	SM0805
TR231	SM652101471	SM470S	SM0805
TR232	SM652101681	SM680S	SM0805
TR233	SM652101151	SM150S	SM0805
TR234	SM652101820	SM82S	SM0805
TR235	SM652101102	SM1KS	SM0805
TR236	SM652101151	SM150S	SM0805
TR237	SM652101101	SM100S	SM0805
TR238	SM652101562	SM5.6KS	SM0805
TR239	SM652101102	SM1KS	SM0805
TR240	SM652101391	SM390S	SM0805
TR241	SM652101102	SM1KS	SM0805
TR242	SM652101103	SM10KS	SM0805
TR243	SM652101103	SM10KS	SM0805
TR244	SM652101821	SM820S	SM0805
TR245	SM652101181	SM180S	SM0805
TR246	SM652101681	SM680S	SM0805
TR247	SM652101271	SM270S	SM0805
TR248	SM652101271	SM270S	SM0805
TR249	SM652101470	SM47S	SM0805
TR250	SM652101470	SM47S	SM0805
TR251	SM652101681	SM680S	SM0805
TR252	SM652101471	SM470S	SM0805
TR253	SM652101202	SM2KS	SM0805
TR254	SM652101820	SM82S	SM0805
TR255	NORES	NORES	SM0805
TR256	NORES	NORES	SM0805
TR257	SM652101681	SM680S	SM0805
TR258	SM652101681	SM680S	SM0805
TR259	NORES	NORES	SM0805
TR260	NORES	NORES	SM0805
TR261	SM652101821	SM820S	SM0805
TR262	SM652101101	SM100S	SM0805
TR263	SM652101102	SM1KS	SM0805
TR264	SM652101820	SM82S	SM0805
TR265	SM652101102	SM1KS	SM0805
TR266	SM652101471	SM470S	SM0805
TR267	SM652101471	SM470S	SM0805
TR268	SM652101101	SM100S	SM0805
TR269	SM652101681	SM680S	SM0805
TR270	SM652101102	SM1KS	SM0805
TR271	SM652101821	SM820S	SM0805
TR272	SM652101151	SM150S	SM0805
TR273	SM652101471	SM470S	SM0805
TR274	SM652101471	SM470S	SM0805
TR275	SM652101121	SM120S	SM0805
TR276	SM652101820	SM82S	SM0805

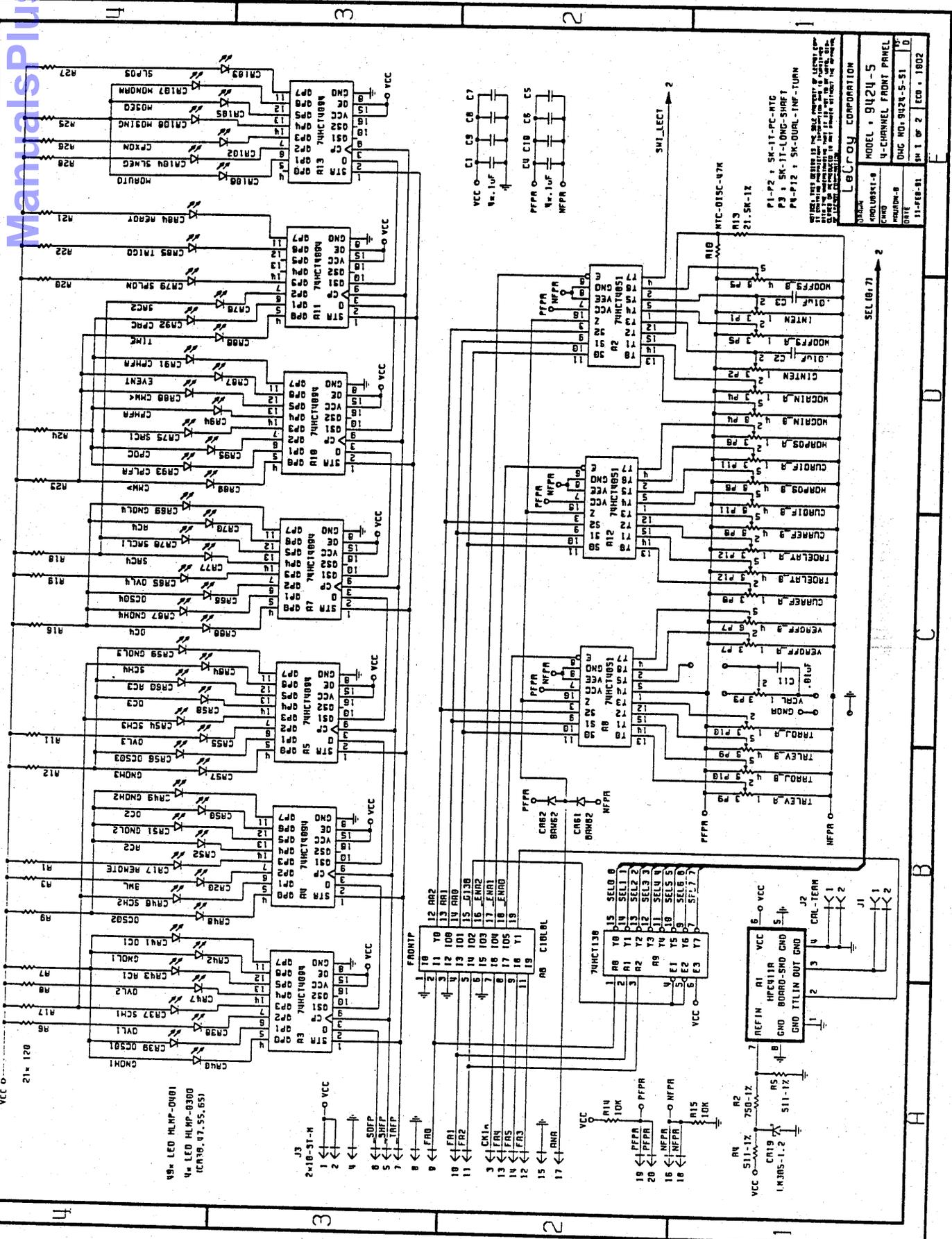
TR277	SM652101272	SM2.7KS	SM0805
TR278	SM652101271	SM270S	SM0805
TR279	SM652101331	SM330S	SM0805
TR280	SM652101681	SM680S	SM0805
TR281	SM652101471	SM470S	SM0805
TR282	SM652101471	SM470S	SM0805
TR283	SM652101821	SM820S	SM0805
TR284	SM652101151	SM150S	SM0805
TR285	SM652101331	SM330S	SM0805
TR286	SM652101562	SM5.6KS	SM0805
TR287	SM652101102	SM1KS	SM0805
TR288	SM652101470	SM47S	SM0805
TR289	SM652101820	SM82S	SM0805
TR290	SM652101471	SM470S	SM0805
TR291	SM652101681	SM680S	SM0805
TR292	SM652101821	SM820S	SM0805
TR293	NORES	NORES	SM0805
TR294	NORES	NORES	SM0805
TR295	SM652101470	SM47S	SM0805
TR296	SM652101271	SM270S	SM0805
TR297	NORES	NORES	SM0805
TR298	NORES	NORES	SM0805
TR299	SM652101471	SM470S	SM0805
TR300	SM652101471	SM470S	SM0805
TR301	SM652101820	SM82S	SM0805
TR302	SM652101681	SM680S	SM0805
TR303	SM652101102	SM1KS	SM0805
TR304	SM652101471	SM470S	SM0805
TR305	SM652101471	SM470S	SM0805
TR306	SM652101101	SM100S	SM0805
TR307	SM652101471	SM470S	SM0805
TR308	SM652101821	SM820S	SM0805
TR309	SM652101681	SM680S	SM0805
TR310	SM652101820	SM82S	SM0805
TR311	SM652101470	SM47S	SM0805
TR312	SM652101821	SM820S	SM0805
TR313	SM552101681	SM680S	SM0805
TR314	SM652101820	SM82S	SM0805
TR315	SM652101331	SM330S	SM0805
TR316	SM652101331	SM330S	SM0805
TR317	SM652101302	SM3KS	SM0805
TR318	SM652101202	SM2KS	SM0805
TR319	SM652101821	SM820S	SM0805
TR320	SM652101820	SM82S	SM0805
TR321	SM652101331	SM330S	SM0805
TR322	SM652101820	SM82S	SM0805
TR323	SM652101681	SM680S	SM0805
TR324	SM652101562	SM5.6KS	SM0805
TR325	SM652101622	SM6.2KS	SM0805
TR326	SM652101622	SM6.2KS	SM0805
TR327	SM652101622	SM6.2KS	SM0805
TR328	SM652101622	SM6.2KS	SM0805
TR329	SM652101622	SM6.2KS	SM0805
TR330	SM652101622	SM6.2KS	SM0805
TR331	SM652101820	SM82S	SM0805
TP. TRIG.	454340002	2x1-ST-M-NW	CONN2X1_ST_M_NW

Y1
Y2
Z1

310062100
310060012
839450440

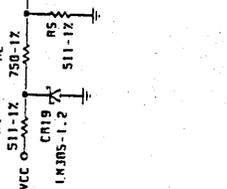
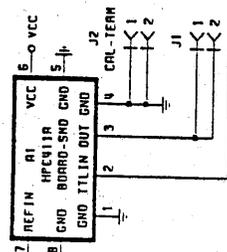
100MHZ
12.4031MHZ
F200

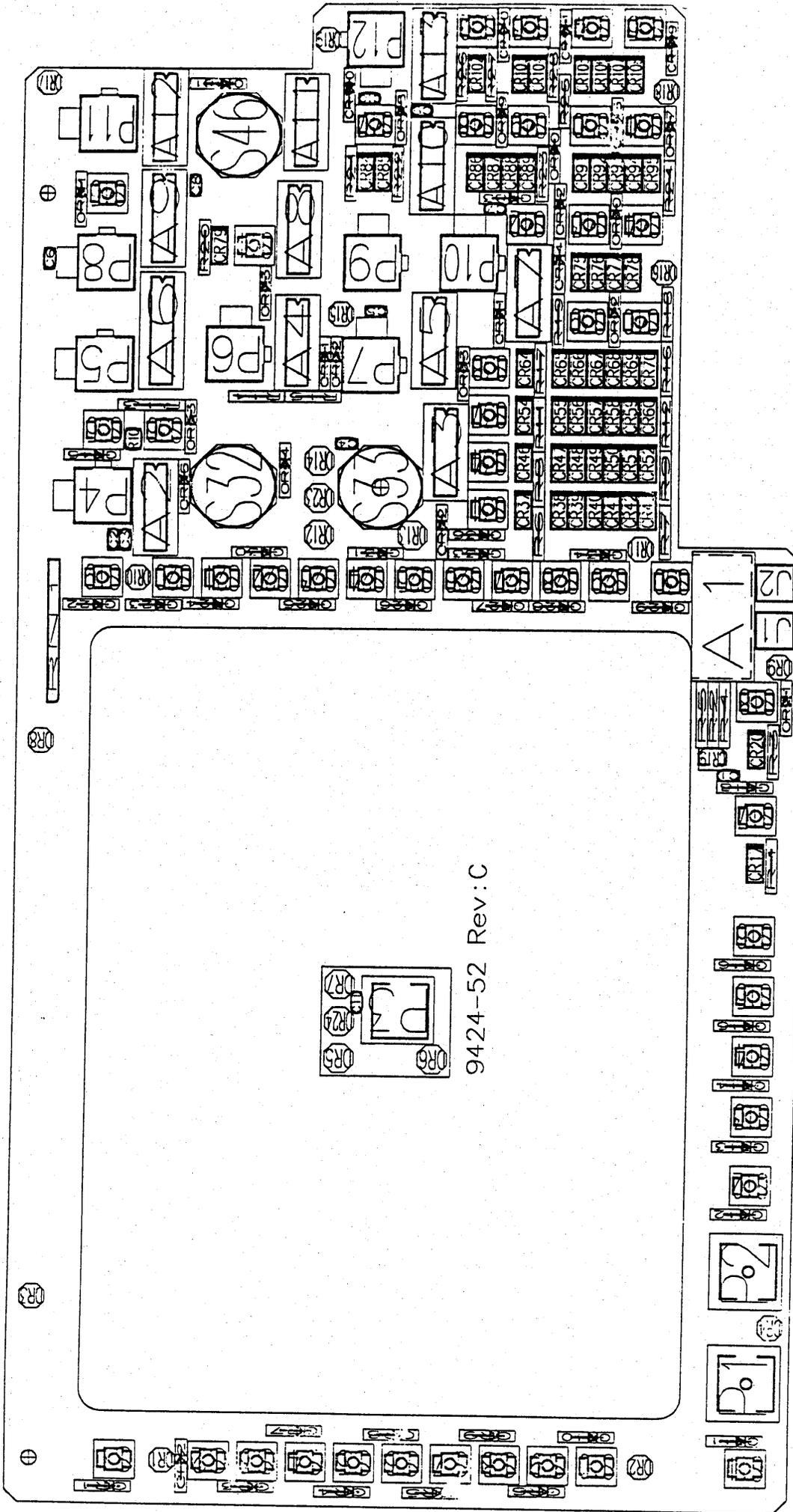
CRYSTAL_NC18
CRYSTAL_NC18
F100



MODEL 9424-5
 4-CHANNEL FRONT PANEL
 DATE 11-FEB-91
 SH 1 OF 2 ECD 1802
 Leclroy CORPORATION
 11-FEB-91
 DATE 11-FEB-91
 SH 1 OF 2 ECD 1802

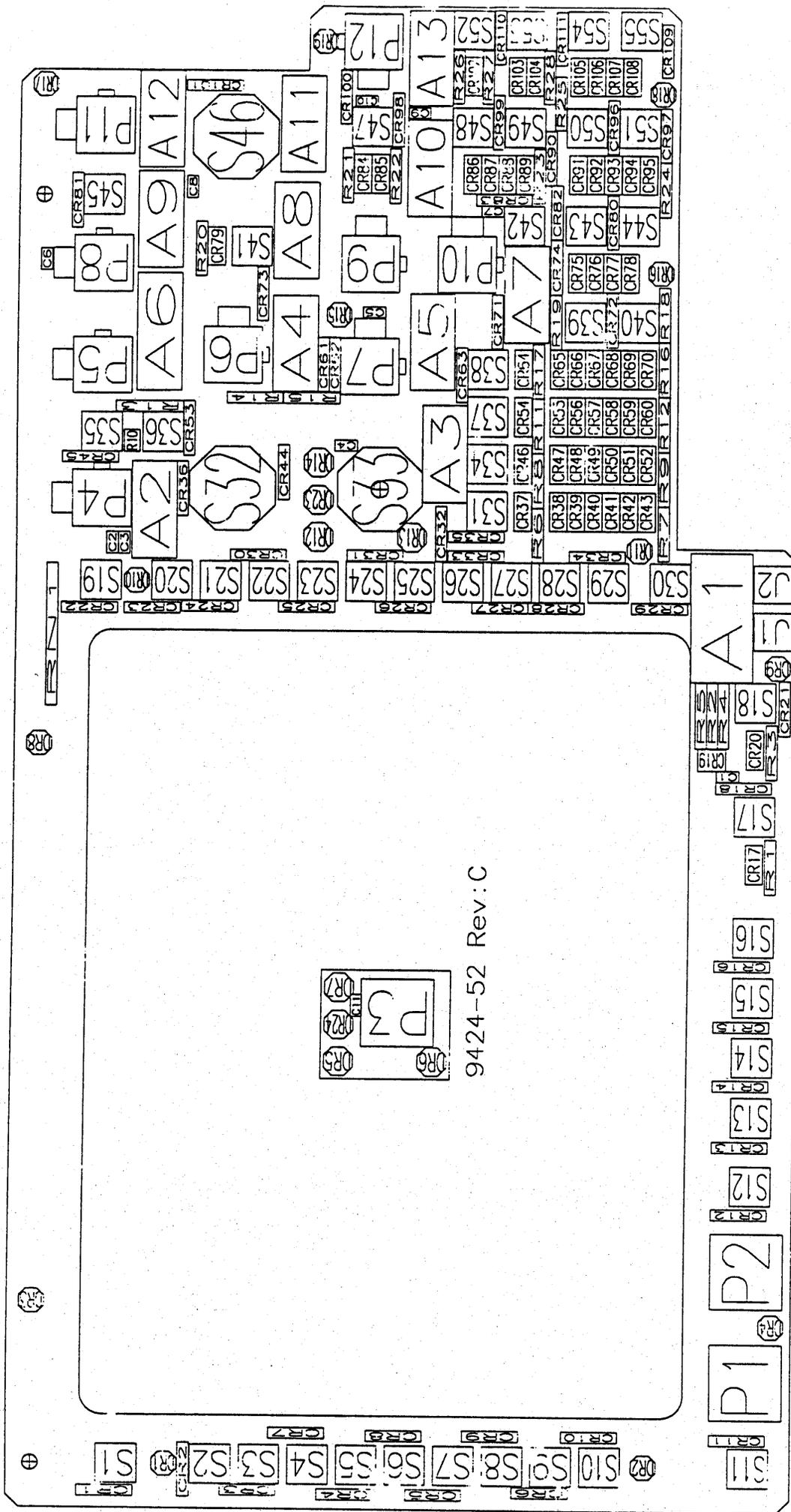
- 16x LED HLMP-0801
- 4x LED HLMP-0300 (CR10, 07, 55, 65)
- 2x 10-31-M
- 1x SUPP
- 1x SHIP
- 1x TRIP
- 1x FRONTP





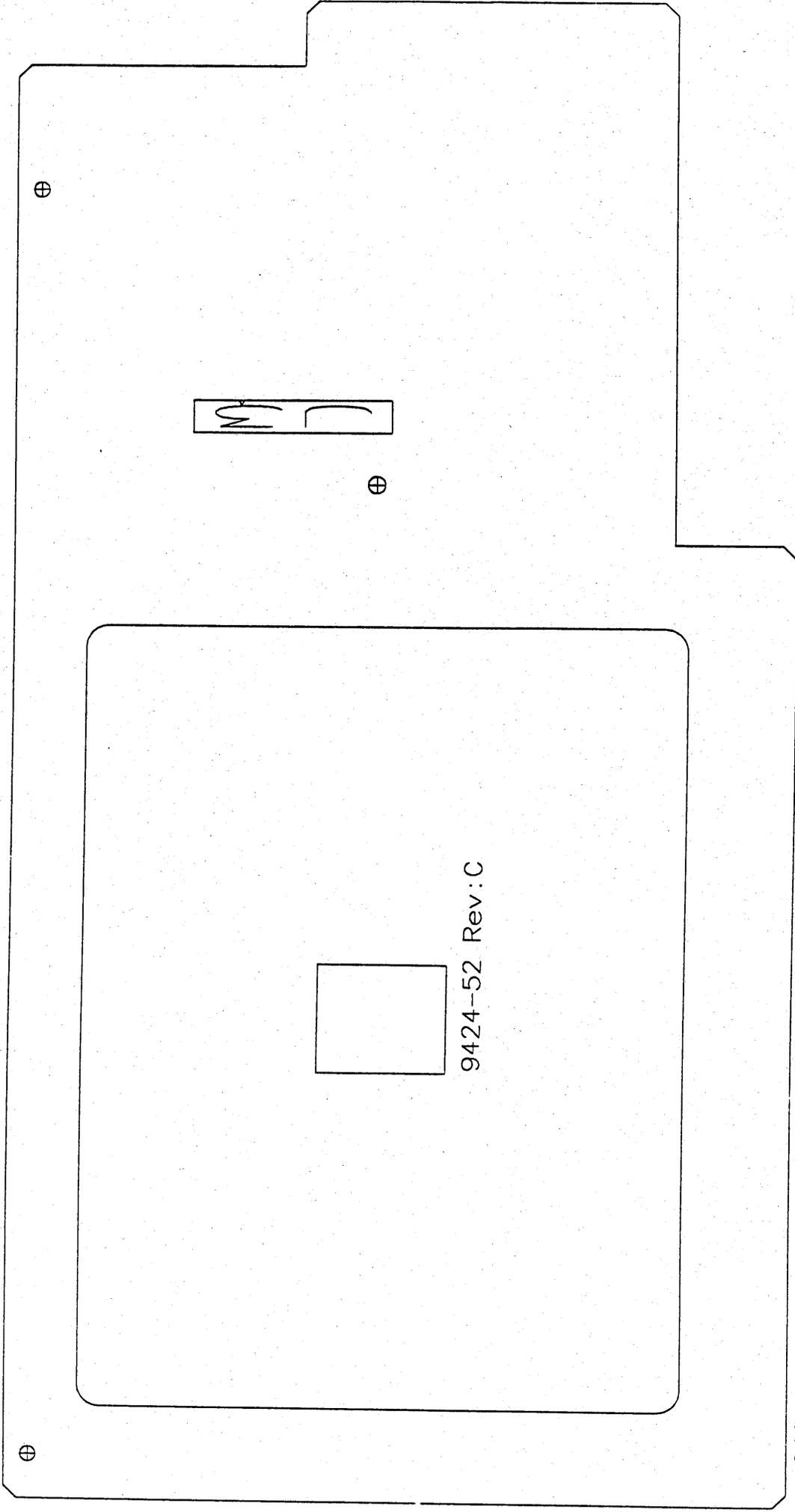
9424-52 Rev:C

9424-51 Rev:C

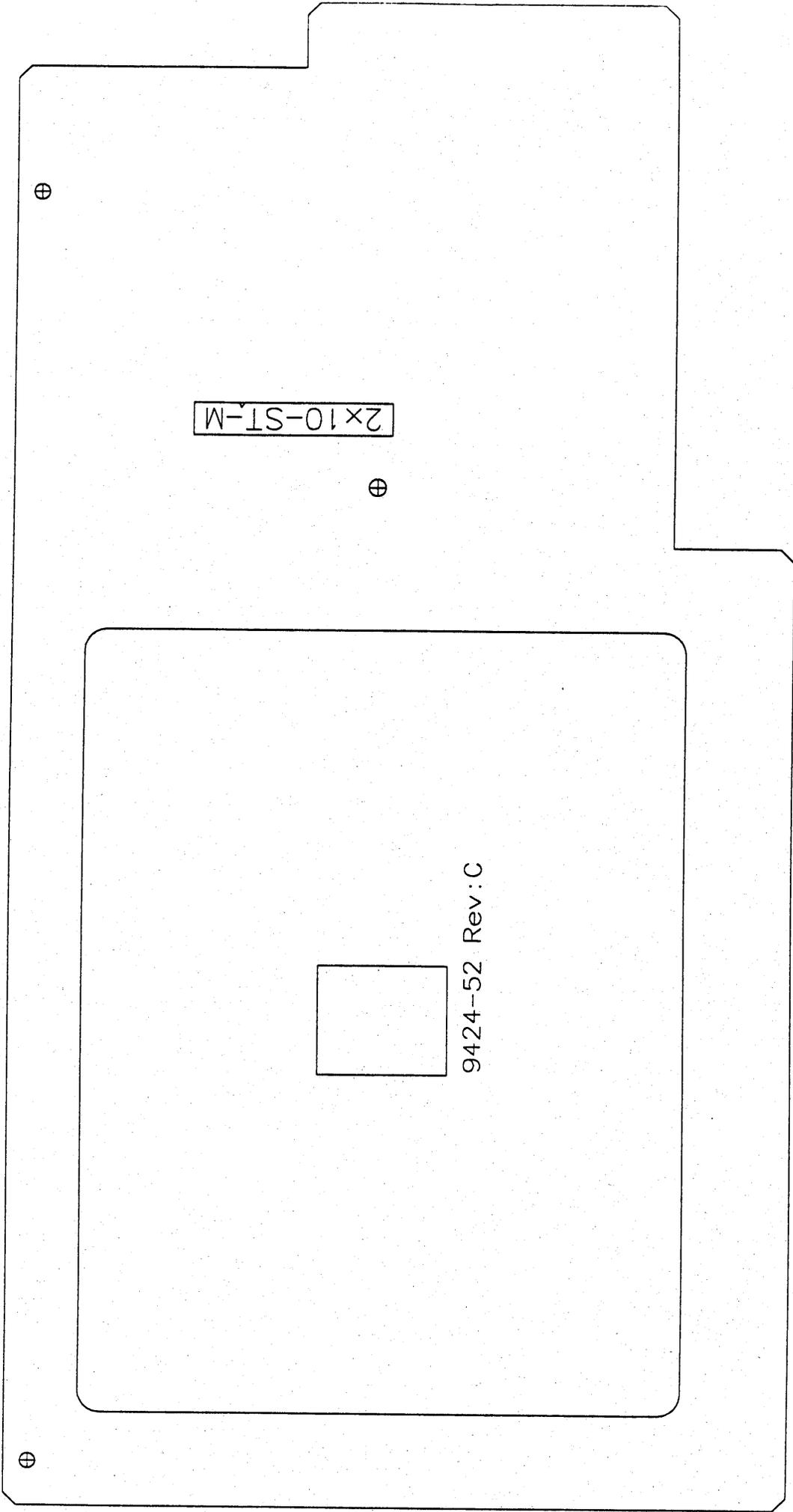


9424-52 Rev:C

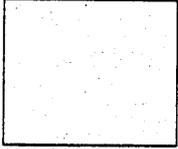
9424-51 Rev:C



9424-51 Rev:C



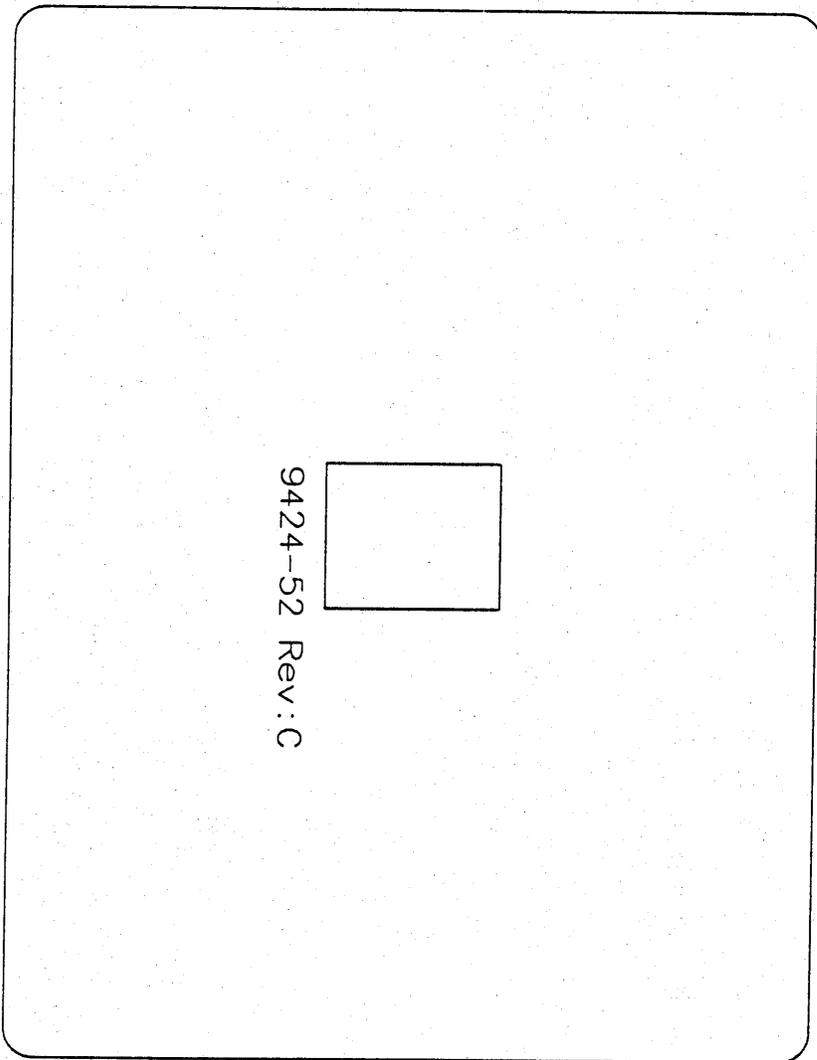
2x10-ST-M



9424-52 Rev:C

9424-51 Rev:C

9424-51 Rev:C



9424-52 Rev:C

454211020

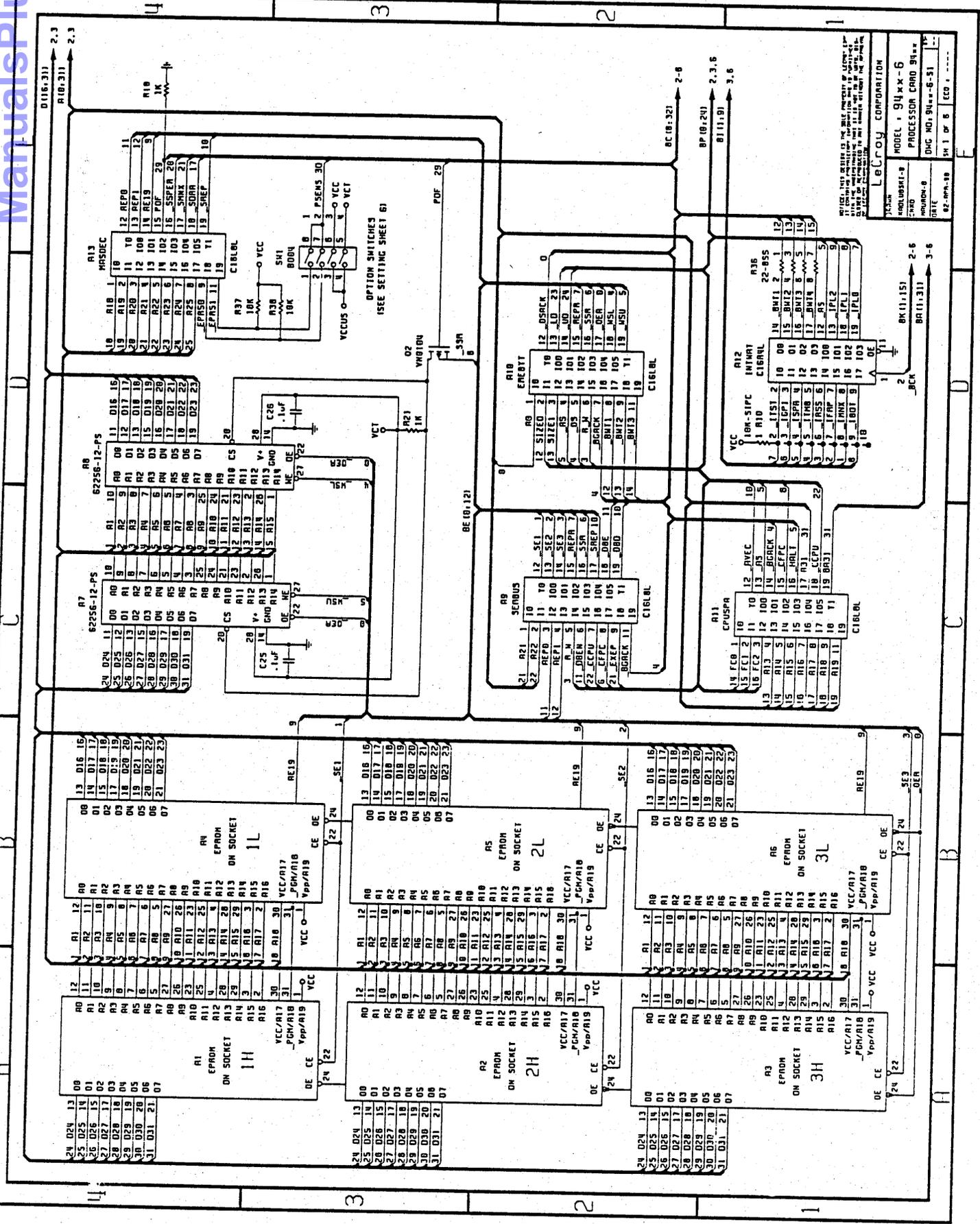


A1	HPC411AIH	HPC411A	HPC411	2166620	-7754620	1
A2	207345051	74HCT4051-PS	DIP16	6629400	6134100	1
A3	205644094	74HCT4094-PS	DIP16	7962900	-452120	1
A4	205644094	74HCT4094-PS	DIP16	10515600	2971800	1
A5	205644094	74HCT4094-PS	DIP16	10566400	-152400	1
A6	205750000	C16L8L	DIP20	11036300	6045200	1
A7	205644094	74HCT4094-PS	DIP16	11686540	-2283460	1
A8	207345051	74HCT4051-PS	DIP16	13157200	2971800	1
A9	200344138	74HCT138	DIP16	13411200	6045200	1
A10	205644094	74HCT4094-PS	DIP16	14630400	-50800	1
A11	205644094	74HCT4094-PS	DIP16	15646400	2844800	1
A12	207345051	74HCT4051-PS	DIP16	15748000	6045200	1
A13	205644094	74HCT4094-PS	DIP16	17208500	-50800	1
C1	103427104	.1uF	SMONOBP	-368300	-7404100	1
C2	103327103	.01uF	SMONOBP	5107940	6703060	1
C3	103327103	.01uF	SMONOBP	5105400	6433820	1
C4	103427104	.1uF	SMONOBP	7264400	1295400	1
C5	103427104	.1uF	SMONOBP	10363200	927100	1
C6	103427104	.1uF	SMONOBP	11468100	8229600	1
C7	103427104	.1uF	SMONOBP	12750800	-2006600	1
C8	103427104	.1uF	SMONOBP	13411200	4953000	1
C9	103427104	.1uF	SMONOBP	15024100	-304800	1
C10	103427104	.1uF	SMONOBP	15303500	901700	1
C11	103327103	.01uF	SMONOBP	-5880100	1066800	1
J1	709450511	CAL-TERM	CAL TERMINAL	2745740	-8298180	1
J2	709450511	CAL-TERM	CAL TERMINAL	3845560	-8298180	1
J3	454211020	2x10-ST-M	CONN2X10 ST M	7950200	3746500	2
P1	184437502	5K-1T-PC-MTG	POT_9400_5_M5	-14244320	-7137400	1
P2	184437502	5K-1T-PC-MTG	POT_9400_5_M5	-11645900	-7137400	1
P3	184427502	5K-1T-LONG-SHAFT-PS	POT_9400_5_M4	-5689600	830580	1
P4	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	6253480	7711440	1
P5	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	9354820	7711440	1
P6	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	10111740	3746500	1
P7	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	9862820	645160	1 2
P8	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	11752580	7711440	1
P9	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	12260580	645160	1
P10	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	12260580	-1554480	1
P11	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	14952980	7711440	1
P12	184417502	5K-DUAL-INF-TURN	POT_9400_5_M3	15938500	1153160	1
R1	161225121	120	RES05	-1953260	-8270240	1
R2	168531381	'750-1%'	RES07	406400	-6908800	1
R3	161225121	120	RES05	-314960	-8280400	1
R4	168531365	'511-1%'	RES07	1676400	-7162800	1
R5	168531365	'511-1%'	RES07	1676400	-6654800	1
R6	161225121	120	RES05	4686300	-2946400	1
R7	161225121	120	RES05	4737100	-5791200	1
R8	161225121	120	RES05	5956300	-2946400	1
R9	161225121	120	RES05	6007100	-5791200	1
R10	169416473	NTC-DISC-47K	NTC DISC	7467600	6273800	1
R11	161225121	120	RES05	7226300	-2946400	1
R12	161225121	120	RES05	7277100	-5791200	1
R13	168531521	'21.5K-1%'	RES07	8140700	6515100	1
R14	161225103	10K	RES05	8356600	4013200	1
R15	161225103	10K	RES05	8356600	1701800	1
R16	161225121	120	RES05	8547100	-5791200	1
R17	161225121	120	RES05	9512300	-2946400	1
R18	161225121	120	RES05	9829800	-5791200	1
R19	161225121	120	RES05	10650220	-3337560	1
R20	161225121	120	RES05	12357100	4737100	1
R21	161225121	120	RES05	14071600	1435100	1
R22	161225121	120	RES05	14058900	355600	1
R23	161225121	120	RES05	14071600	-2933700	1
R24	161225121	120	RES05	13766800	-5791200	1
R25	161225121	120	RES05	14757400	-3403600	1
R26	161225121	120	RES05	16395700	-1066800	1
R27	161225121	120	RES05	16395700	-1739900	1

R28	161225121	120	RES05	16395700	-3136900
S1	416161002	SW-P-SPST	SW_P_SPST	-16880840	6118860
S2	416161002	SW-P-SPST	SW_P_SPST	-16880840	3995420
S3	416161002	SW-P-SPST	SW_P_SPST	-16880840	2895600
S4	416161002	SW-P-SPST	SW_P_SPST	-16880840	1795780
S5	416161002	SW-P-SPST	SW_P_SPST	-16880840	695960 1
S6	416161002	SW-P-SPST	SW_P_SPST	-16880840	-403860
S7	416161002	SW-P-SPST	SW_P_SPST	-16880840	-1503680
S8	416161002	SW-P-SPST	SW_P_SPST	-16880840	-2603500
S9	416161002	SW-P-SPST	SW_P_SPST	-16880840	-3703320
S10	416161002	SW-P-SPST	SW_P_SPST	-16880840	-4803140
S11	416161002	SW-P-SPST	SW_P_SPST	-16880840	-8153400
S12	416161002	SW-P-SPST	SW_P_SPST	-10279380	-8153400
S13	416161002	SW-P-SPST	SW_P_SPST	-8679180	-8153400
S14	416161002	SW-P-SPST	SW_P_SPST	-7279640	-8153400
S15	416161002	SW-P-SPST	SW_P_SPST	-5880100	-8153400
S16	416161002	SW-P-SPST	SW_P_SPST	-4480560	-8153400
S17	416161002	SW-P-SPST	SW_P_SPST	-1678940	-8153400
S18	416161002	SW-P-SPST	SW_P_SPST	967740	-8153400 1
S19	416161002	SW-P-SPST	SW_P_SPST	3718560	6695440 1
S20	416161002	SW-P-SPST	SW_P_SPST	3718560	5095240 1
S21	416161002	SW-P-SPST	SW_P_SPST	3718560	3995420 1
S22	416161002	SW-P-SPST	SW_P_SPST	3718560	2895600 1
S23	416161002	SW-P-SPST	SW_P_SPST	3718560	1795780 1
S24	416161002	SW-P-SPST	SW_P_SPST	3718560	695960 1
S25	416161002	SW-P-SPST	SW_P_SPST	3718560	-403860 1
S26	416161002	SW-P-SPST	SW_P_SPST	3718560	-1503680 1
S27	416161002	SW-P-SPST	SW_P_SPST	3718560	-2603500 1
S28	416161002	SW-P-SPST	SW_P_SPST	3718560	-3703320 1
S29	416161002	SW-P-SPST	SW_P_SPST	3718560	-4803140 1
S30	416161002	SW-P-SPST	SW_P_SPST	3718560	-6202680 1
S31	416161002	SW-P-SPST	SW_P_SPST	5369560	-2052320 1
S32	412001012	SW-ROT-12	SW_ROT_12	6248400	4650740 1
S33	412001012	SW-ROT-12	SW_ROT_12	6248400	1300480 1
S34	416161002	SW-P-SPST	SW_P_SPST	6469380	-2052320 1
S35	416161002	SW-P-SPST	SW_P_SPST	7167880	6695440 1
S36	416161002	SW-P-SPST	SW_P_SPST	7167880	5321300 1
S37	416161002	SW-P-SPST	SW_P_SPST	7569200	-2052320 1
S38	416161002	SW-P-SPST	SW_P_SPST	8669020	-2052320 1
S39	416161002	SW-P-SPST	SW_P_SPST	9768840	-4254500 1
S40	416161002	SW-P-SPST	SW_P_SPST	9768840	-5453380 1
S41	416161002	SW-P-SPST	SW_P_SPST	11518900	3345180 1
S42	416161002	SW-P-SPST	SW_P_SPST	12019280	-2854960
S43	416161002	SW-P-SPST	SW_P_SPST	12019280	-4254500
S44	416161002	SW-P-SPST	SW_P_SPST	12019280	-5453380
S45	416161002	SW-P-SPST	SW_P_SPST	12019280	-5453380
S46	412001012	SW-ROT-12	SW_ROT_12	12717780	6695440 1
S47	416161002	SW-P-SPST	SW_P_SPST	14450060	4650740 1
S48	416161002	SW-P-SPST	SW_P_SPST	14317980	645160 1
S49	416161002	SW-P-SPST	SW_P_SPST	14317980	-1653540
S50	416161002	SW-P-SPST	SW_P_SPST	14317980	-2854960
S51	416161002	SW-P-SPST	SW_P_SPST	14317980	-4254500
S52	416161002	SW-P-SPST	SW_P_SPST	14317980	-5453380
S53	416161002	SW-P-SPST	SW_P_SPST	16619220	-1653540
S54	416161002	SW-P-SPST	SW_P_SPST	16619220	-2854960
S55	416161002	SW-P-SPST	SW_P_SPST	16619220	-4254500
CR1	230020062	BAW62	SW_P_SPST	16619220	-5453380
CR2	230020062	BAW62	DO35	-17145000	7137400
CR3	230020062	BAW62	DO35	-17145000	4864100
CR4	230020062	BAW62	DO35	-17106900	3911600
CR5	230020062	BAW62	DO35	-17195800	1714500
CR6	230020062	BAW62	DO35	-17195800	-292100
CR7	230020062	BAW62	DO35	-17119600	-2692400
CR8	230020062	BAW62	DO35	-15760700	2819400
CR9	230020062	BAW62	DO35	-15824200	609600 1
CR10	230020062	BAW62	DO35	-15811500	-1574800
			DO35	-15811500	-3797300

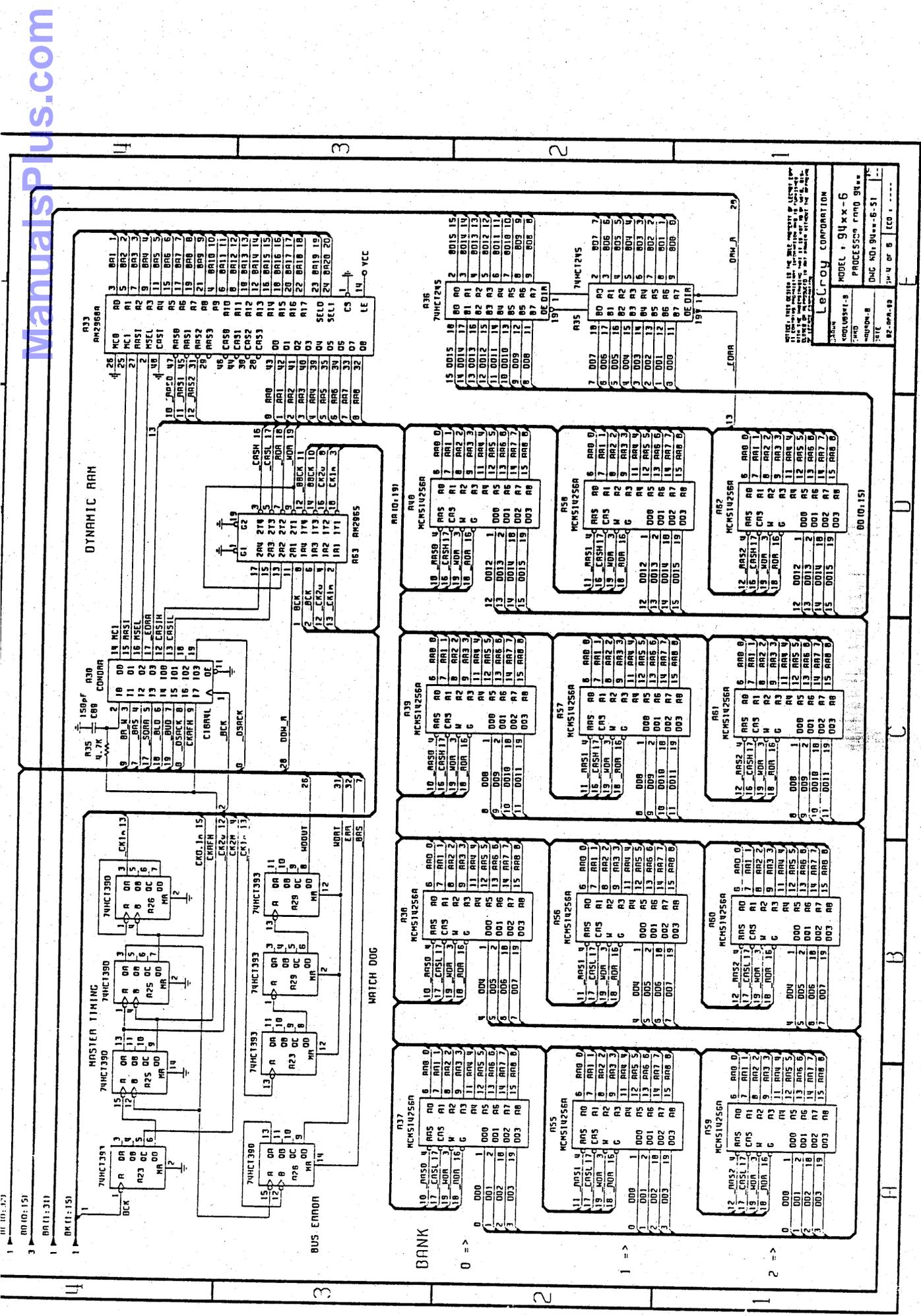
CR11	230020062	BAW62	DO35	-15849600	-7137400
CR12	230020062	BAW62	DO35	-10566400	-7137400
CR13	230020062	BAW62	DO35	-8991600	-7137400
CR14	230020062	BAW62	DO35	-7569200	-7137400
CR15	230020062	BAW62	DO35	-6197600	-7137400
CR16	230020062	BAW62	DO35	-4775200	-7137400
CR17	256443401	LED-HLMP-0401	LED_RECT	-2527300	-7899400
CR18	230020062	BAW62	DO35	-640080	-7137400
CR19	208590385	LM385-1.2	TO92	76200	-6718300
CR20	256443401	LED-HLMP-0401	LED_RECT	121920	-7899400
CR21	230020062	BAW62	DO35	703580	-8564880
CR22	230020062	BAW62	DO35	3467100	7708900
CR23	230020062	BAW62	DO35	3467100	6299200
CR24	230020062	BAW62	DO35	3505200	5003800
CR25	230020062	BAW62	DO35	3505200	2806700
CR26	230020062	BAW62	DO35	3505200	609600
CR27	230020062	BAW62	DO35	3505200	-1587500
CR28	230020062	BAW62	DO35	3505200	-2857500
CR29	230020062	BAW62	DO35	3505200	-5194300
CR30	230020062	BAW62	DO35	4711700	3911600
CR31	230020062	BAW62	DO35	4711700	1257300
CR32	230020062	BAW62	DO35	4711700	-762000
CR33	230020062	BAW62	DO35	4711700	-1041400
CR34	230020062	BAW62	DO35	4711700	-3784600
CR35	230020062	BAW62	DO35	5156200	-1041400
CR36	230020062	BAW62	DO35	5727700	5118100
CR37	256443401	LED-HLMP-0401	LED_RECT	5623560	-2600960
CR38	256243300	LED-HLMP-0300	LED_RECT	5623560	-3403600
CR39	256443401	LED-HLMP-0401	LED_RECT	5623560	-3802380
CR40	256443401	LED-HLMP-0401	LED_RECT	5623560	-4201160
CR41	256443401	LED-HLMP-0401	LED_RECT	5623560	-4599940
CR42	256443401	LED-HLMP-0401	LED_RECT	5623560	-4998720
CR43	256443401	LED-HLMP-0401	LED_RECT	5623560	-5397500
CR44	230020062	BAW62	DO35	6121400	2832100
CR45	230020062	BAW62	DO35	6959600	7708900
CR46	256443401	LED-HLMP-0401	LED_RECT	6723380	-2600960
CR47	256243300	LED-HLMP-0300	LED_RECT	6723380	-3403600
CR48	256443401	LED-HLMP-0401	LED_RECT	6723380	-3802380
CR49	256443401	LED-HLMP-0401	LED_RECT	6723380	-4201160
CR50	256443401	LED-HLMP-0401	LED_RECT	6723380	-4599940
CR51	256443401	LED-HLMP-0401	LED_RECT	6723380	-4998720
CR52	256443401	LED-HLMP-0401	LED_RECT	6723380	-5397500
CR53	230020062	BAW62	DO35	7124700	4978400
CR54	256443401	LED-HLMP-0401	LED_RECT	7823200	-2600960
CR55	256243300	LED-HLMP-0300	LED_RECT	7823200	-3403600
CR56	256443401	LED-HLMP-0401	LED_RECT	7823200	-3802380
CR57	256443401	LED-HLMP-0401	LED_RECT	7823200	-4201160
CR58	256443401	LED-HLMP-0401	LED_RECT	7823200	-4599940
CR59	256443401	LED-HLMP-0401	LED_RECT	7823200	-4998720
CR60	256443401	LED-HLMP-0401	LED_RECT	7823200	-5397500
CR61	230020062	BAW62	DO35	8623300	1955800
CR62	230020062	BAW62	DO35	8623300	1701800
CR63	230020062	BAW62	DO35	8407400	-1206500
CR64	256443401	LED-HLMP-0401	LED_RECT	8923020	-2600960
CR65	256243300	LED-HLMP-0300	LED_RECT	8923020	-3403600
CR66	256443401	LED-HLMP-0401	LED_RECT	8923020	-3802380
CR67	256443401	LED-HLMP-0401	LED_RECT	8923020	-4201160
CR68	256443401	LED-HLMP-0401	LED_RECT	8923020	-4599940
CR69	256443401	LED-HLMP-0401	LED_RECT	8923020	-4998720
CR70	256443401	LED-HLMP-0401	LED_RECT	8923020	-5397500
CR71	230020062	BAW62	DO35	9652000	-2006600
CR72	230020062	BAW62	DO35	9690100	-4610100
CR73	230020062	BAW62	DO35	10274300	3340100
CR74	230020062	BAW62	DO35	10922000	-3340100
CR75	256443401	LED-HLMP-0401	LED_RECT	11173460	-3802380
CR76	256443401	LED-HLMP-0401	LED_RECT	11173460	-4201160

CR77	256443401	LED-HLMP-0401	LED_RECT	11173460	-4599940
CR78	256443401	LED-HLMP-0401	LED_RECT	11173460	-4998720
CR79	256443401	LED-HLMP-0401	LED_RECT	11772900	4399280 1
CR80	230020062	BAW62	DO35	11976100	-4610100
CR81	230020062	BAW62	DO35	12458700	7543800 1
CR82	230020062	BAW62	DO35	12204700	-3340100
CR83	230020062	BAW62	DO35	13004800	-1625600
CR84	256443401	LED-HLMP-0401	LED_RECT	13472160	1097280 1
CR85	256443401	LED-HLMP-0401	LED_RECT	13472160	698500 1
CR86	256443401	LED-HLMP-0401	LED_RECT	13472160	-1402080
CR87	256443401	LED-HLMP-0401	LED_RECT	13472160	-1800860
CR88	256443401	LED-HLMP-0401	LED_RECT	13472160	-2199640
CR89	256443401	LED-HLMP-0401	LED_RECT	13472160	-2598420
CR90	230020062	BAW62	DO35	13474700	-3187700
CR91	256443401	LED-HLMP-0401	LED_RECT	13472160	-3802380
CR92	256443401	LED-HLMP-0401	LED_RECT	13472160	-4201160
CR93	256443401	LED-HLMP-0401	LED_RECT	13472160	-4599940
CR94	256443401	LED-HLMP-0401	LED_RECT	13472160	-4998720
CR95	256443401	LED-HLMP-0401	LED_RECT	13472160	-5397500
CR96	230020062	BAW62	DO35	14211300	-4597400
CR97	230020062	BAW62	DO35	14020800	-5791200
CR98	230020062	BAW62	DO35	14351000	304800 1
CR99	230020062	BAW62	DO35	14312900	-1993900
CR100	230020062	BAW62	DO35	14884400	1498600 1
CR101	230020062	BAW62	DO35	15646400	4991100 1
CR102	256443401	LED-HLMP-0401	LED_RECT	15773400	-1399540
CR103	256443401	LED-HLMP-0401	LED_RECT	15773400	-2400300
CR104	256443401	LED-HLMP-0401	LED_RECT	15773400	-2799080
CR105	256443401	LED-HLMP-0401	LED_RECT	15773400	-3802380
CR106	256443401	LED-HLMP-0401	LED_RECT	15773400	-4201160
CR107	256443401	LED-HLMP-0401	LED_RECT	15773400	-4599940
CR108	256443401	LED-HLMP-0401	LED_RECT	15773400	-4998720
CR109	230020062	BAW62	DO35	16012160	-5798820
CR110	230020062	BAW62	DO35	16319500	-2006600
CR111	230020062	BAW62	DO35	16294100	-3403600
DR1	\$NULL	DRILL2_5	DRILL2_5	-16499840	5298440
DR2	\$NULL	DRILL2_5	DRILL2_5	-16499840	-5527040
DR3	\$NULL	DRILL2_5	DRILL2_5	-12700000	8298180
DR4	\$NULL	DRILL2_5	DRILL2_5	-13200380	-8399780
DR5	\$NULL	DRILL3	DRILL3	-7061200	1465580 1
DR6	\$NULL	DRILL3	DRILL3	-7063740	-668020 1
DR7	\$NULL	DRILL3	DRILL3	-5334000	1465580 1
DR8	\$NULL	DRILL2_5	DRILL2_5	299720	8298180 1
DR9	\$NULL	DRILL2_5	DRILL2_5	2148840	-8399780 1
DR10	\$NULL	DRILL2_5	DRILL2_5	4099560	6149340 1
DR11	\$NULL	DRILL2_5	DRILL2_5	4848860	-5247640 1
DR12	\$NULL	DRILL3	DRILL3	5130800	2047240 1
DR13	\$NULL	DRILL3	DRILL3	5130800	-86360 1
DR14	\$NULL	DRILL3	DRILL3	6858000	2047240 1
DR15	\$NULL	DRILL2_5	DRILL2_5	10299700	1597660 1
DR16	\$NULL	DRILL2_5	DRILL2_5	11297920	-5699760
DR17	\$NULL	DRILL2_5	DRILL2_5	15648940	8298180 1
DR18	\$NULL	DRILL2_5	DRILL2_5	15499080	-5699760
DR19	\$NULL	DRILL2_5	DRILL2_5	16697960	1998980 1
DR23	\$NULL	DRILL3	DRILL3	5994400	2047240 1
DR24	\$NULL	DRILL3	DRILL3	-6197600	1465580 1
RN1	190001001	SIP13RES	SIP13RES	1320800	8039100 1



NOTICE: THIS DRAWING IS THE SOLE PROPERTY OF LECROY CORPORATION. IT IS TO BE USED ONLY 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, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

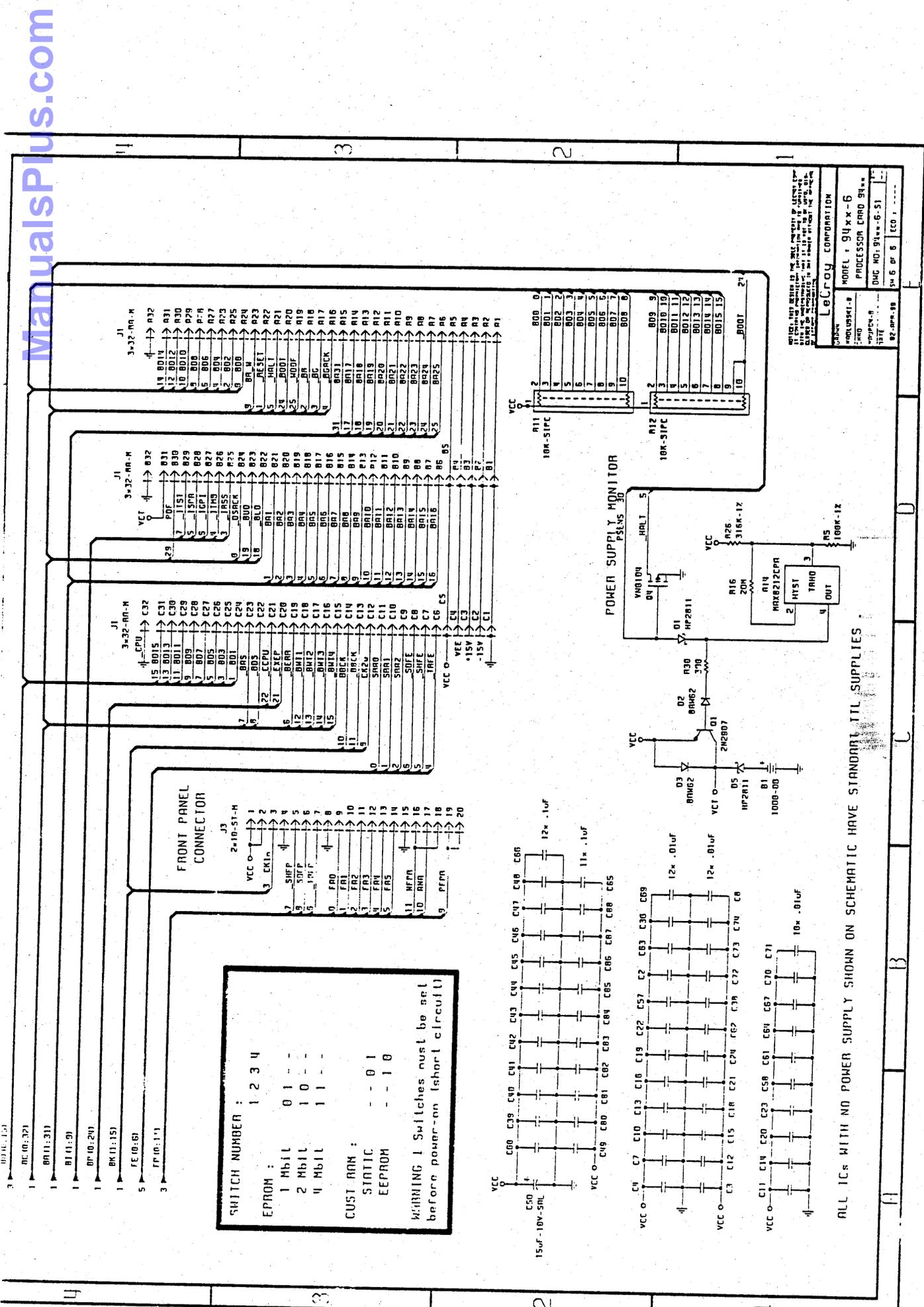
LECROY CORPORATION
 MODEL: 94xx-6
 PROCESSOR CARD 94xx-6
 DMC NO. 94xx-6-51
 02-000-10 SH 1 of 6 ECU: -



THIS DRAWING IS THE PROPERTY OF LUCAS
 IT IS TO BE USED ONLY FOR THE PROJECT 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.

DATE: 02-MAR-82
 DRAWN BY: J. H. ...
 CHECKED BY: ...
 APPROVED BY: ...

LEROY CORPORATION
 MODEL: 94xx-6
 PROCESSOR: rano 94xx
 DATE: 02-MAR-82



SWITCH NUMBER: 1 2 3 4

EPROM:

1 Mbit	0 1 - -
2 Mbit	1 0 - -
4 Mbit	1 1 - -

CUSTOM:

STATIC	- - 0 1
EEPROM	- - 1 0

WARNING: Switches must be set before power-on (short circuit!)

ALL ICs WITH NO POWER SUPPLY SHOWN ON SCHEMATIC HAVE STANDARD TTL SUPPLIES.

LeCroy CORPORATION

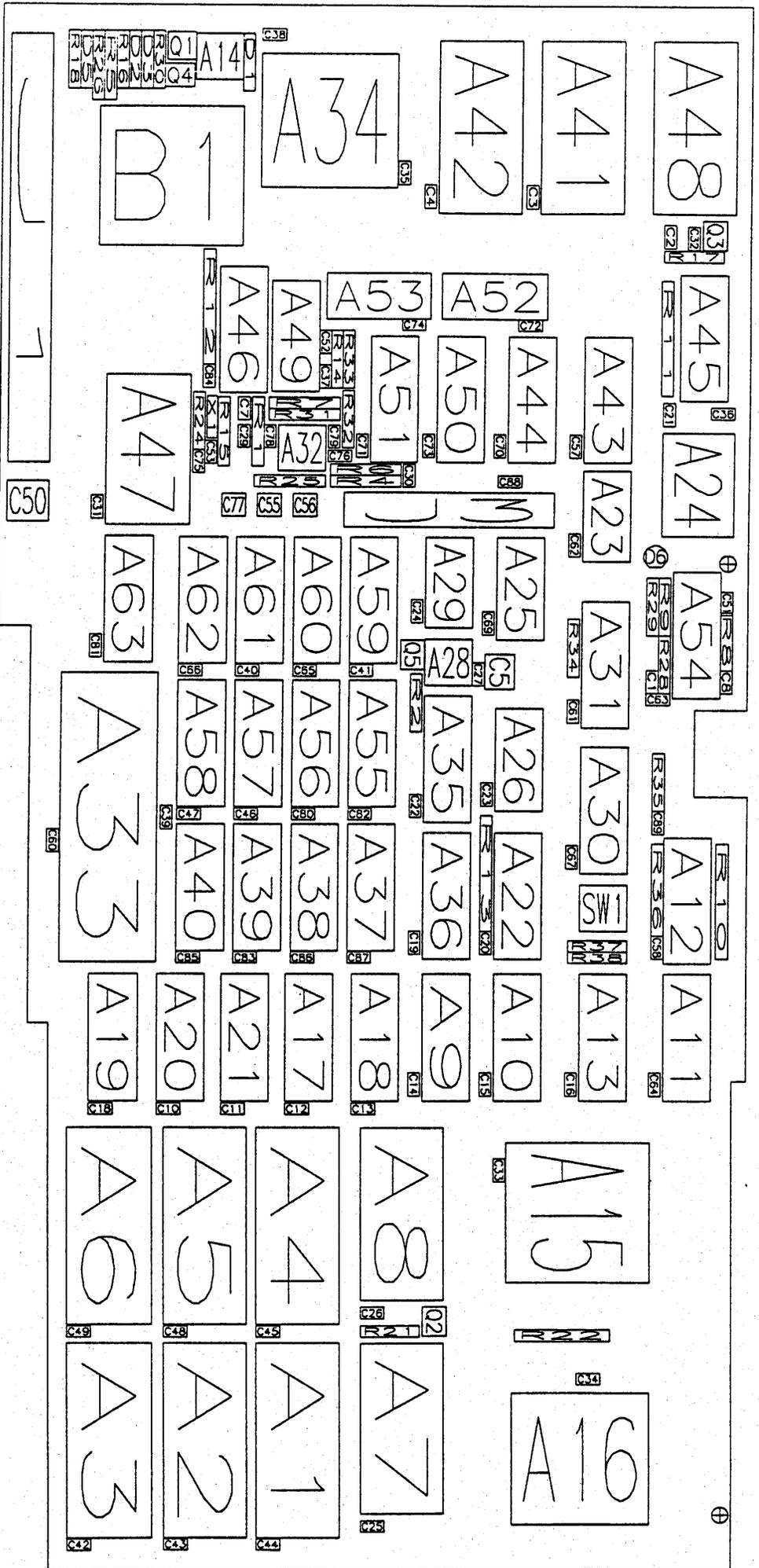
MODEL: 94xx-6

PROCESSOR CARD 94xx

DATE: 02-APR-88

REV: 6

ECO: 1



94XX_6 Rev:A

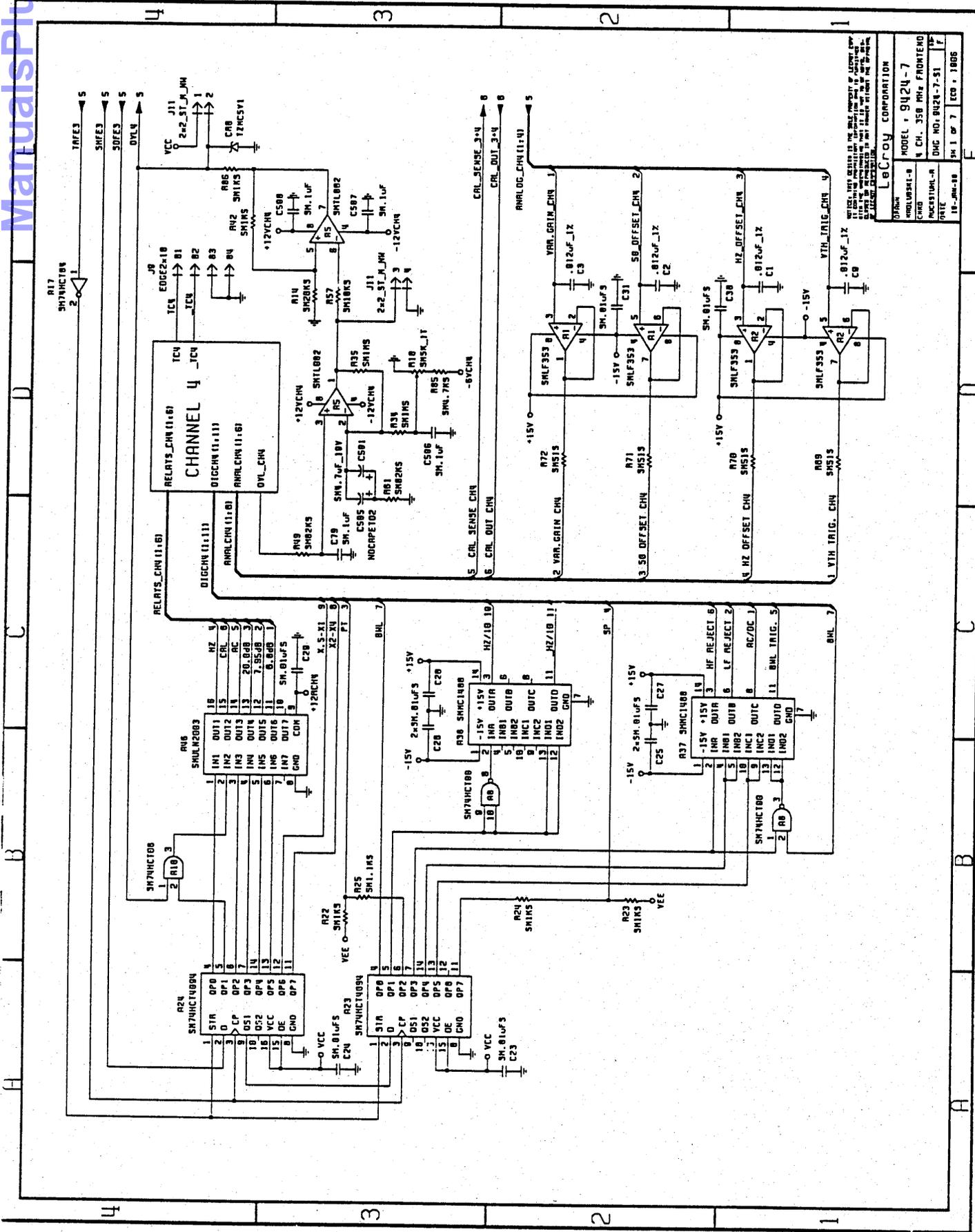
A1	EPROM	EPROM	DIP32
A2	EPROM	EPROM	DIP32
A3	EPROM	EPROM	DIP32
A4	EPROM	EPROM	DIP32
A5	EPROM	EPROM	DIP32
A6	EPROM	EPROM	DIP32
A7	205271256	62256-12-PS	DIP28
A8	205271256	62256-12-PS	DIP28
A9	205750000	C16L8L	DIP20
A10	205750000	C16L8L	DIP20
A11	205750000	C16L8L	DIP20
A12	205750000	C16R4L	DIP20
A13	205750000	C16L8L	DIP20
A14	208618212	MAX8212CPA	DIP8
A15	SM207668020	MC68020FE	QUAD_FP_132P
A16	SM207668881	MC68881FN	PLCC_68
A17	207472245	74HCT245	DIP20
A18	207472245	74HCT245	DIP20
A19	207472245	74HCT245	DIP20
A20	207472245	74HCT245	DIP20
A21	207472245	74HCT245	DIP20
A22	207472245	74HCT245	DIP20
A23	200430393	74HCT393	DI14
A24	309041016	K1100A-16MHZ	\$1100_QUARTZ
A25	200440390	74HCT390	DIP16
A26	200440390	74HCT390	DI16
A28	208517705	7705	DIP8
A29	200430393	74HCT393	DI14
A30	205750000	C16R4L	DIP20
A31	205750000	C16R4L	DIP20
A32	208011007	LM358	DIP8
A33	227792968	AM2968A	DIP48
A34	MNX401	MNX401	PLCC_68
A35	207472245	74HCT245	DIP20
A36	207472245	74HCT245	DIP20
A37	205254256	MCM514256A	DIP20
A38	205254256	MCM514256A	DIP20
A39	205254256	MCM514256A	DIP20
A40	205254256	MCM514256A	DIP20
A41	205272064	6264-10	DIP28
A42	205272064	6264-10	DIP28
A43	205750000	C16L8L	DIP20
A44	205750000	C16L8L	DIP20
A45	205750000	C16R4L	DIP20
A46	207472245	74HCT245	DIP20
A47	200480167	58167A	\$DIP24
A48	205271256	62256-12-PS	DIP28
A49	207367576	AD7576JN	DI18
A50	205750000	C16R4L	DIP20
A51	205750000	C16L8L	DIP20
A52	200344174	74HCT174	DI16
A53	205640165	74HCT165	DI16
A54	205750000	C16L8L	DIP20
A55	205254256	MCM514256A	DIP20
A56	205254256	MCM514256A	DIP20
A57	205254256	MCM514256A	DIP20

A58	205254256	MCM514256A	DIP20
A59	205254256	MCM514256A	DIP20
A60	205254256	MCM514256A	DIP20
A61	205254256	MCM514256A	DIP20
A62	205254256	MCM514256A	DIP20
A63	207172965	AM2965	DIP20
A_1	\$NULL	ICT	ICT
A_2	\$NULL	ICT	ICT
A_3	\$NULL	ICT	ICT
A_4	\$NULL	ICT	ICT
A_26	\$NULL	ICT	ICT
A_27	\$NULL	ICT	ICT
A_28	\$NULL	ICT	ICT
A_29	\$NULL	ICT	ICT
A_30	\$NULL	ICT	ICT
BI	312660030	1000-0B	BAT 1000
C1	103327103	.01uF	SMONOBP
C2	103327103	.01uF	SMONOBP
C3	103327103	.01uF	SMONOBP
C4	103327103	.01uF	SMONOBP
C5	147436033	33uF-16V-AL-RA	TCAP
C7	103327103	.01uF	SMONOBP
C8	103327103	.01uF	SMONOBP
C10	103327103	.01uF	SMONOBP
C11	103327103	.01uF	SMONOBP
C12	103327103	.01uF	SMONOBP
C13	103327103	.01uF	SMONOBP
C14	103327103	.01uF	SMONOBP
C15	103327103	.01uF	SMONOBP
C16	103327103	.01uF	SMONOBP
C18	103327103	.01uF	SMONOBP
C19	103327103	.01uF	SMONOBP
C20	103327103	.01uF	SMONOBP
C21	103327103	.01uF	SMONOBP
C22	103327103	.01uF	SMONOBP
C23	103327103	.01uF	SMONOBP
C24	103327103	.01uF	SMONOBP
C25	103427104	.1uF	SMONOBP
C26	103427104	.1uF	SMONOBP
C27	103427104	.1uF	SMONOBP
C29	103327103	.01uF	SMONOBP
C30	103427104	.1uF	SMONOBP
C31	103427104	.1uF	SMONOBP
C32	103427104	.1uF	SMONOBP
C33	103427104	.1uF	SMONOBP
C34	103427104	.1uF	SMONOBP
C35	103427104	.1uF	SMONOBP
C36	103327103	.01uF	SMONOBP
C37	103427104	.1uF	SMONOBP
C38	103327103	.01uF	SMONOBP
C39	103427104	.1uF	SMONOBP
C40	103427104	.1uF	SMONOBP
C41	103427104	.1uF	SMONOBP
C42	103427104	.1uF	SMONOBP
C43	103427104	.1uF	SMONOBP
C44	103427104	.1uF	SMONOBP

C45	103427104	.1uF	SMONOBP
C46	103427104	.1uF	SMONOBP
C47	103427104	.1uF	SMONOBP
C48	103427104	.1uF	SMONOBP
C49	103427104	.1uF	SMONOBP
C50	142214156	15uF-10V-SAL	LTCAP
C51	102412151	150pF	SMONO
C52	103427104	.1uF	SMONOBP
C53	102412220	22pF	SMONO
C55	146354107	100uF-10V-AL-RA	TDCAP
C56	146354107	100uF-10V-AL-RA	TDCAP
C57	103327103	.01uF	SMONOBP
C58	103327103	.01uF	SMONOBP
C60	103427104	.1uF	SMONOBP
C61	103327103	.01uF	SMONOBP
C62	103327103	.01uF	SMONOBP
C63	103327103	.01uF	SMONOBP
C64	103327103	.01uF	SMONOBP
C65	103427104	.1uF	SMONOBP
C66	103427104	.1uF	SMONOBP
C67	103327103	.01uF	SMONOBP
C69	103327103	.01uF	SMONOBP
C70	103327103	.01uF	SMONOBP
C71	103327103	.01uF	SMONOBP
C72	103327103	.01uF	SMONOBP
C73	103327103	.01uF	SMONOBP
C74	103327103	.01uF	SMONOBP
C75	102412100	10pF	SMONO
C76	102412331	330pF	SMONO
C77	146354107	100uF-10V-AL-RA	TDCAP
C78	103427104	.1uF	SMONOBP
C79	103327103	.01uF	SMONOBP
C80	103427104	.1uF	SMONOBP
C81	103427104	.1uF	SMONOBP
C82	103427104	.1uF	SMONOBP
C83	103427104	.1uF	SMONOBP
C84	103427104	.1uF	SMONOBP
C85	103427104	.1uF	SMONOBP
C86	103427104	.1uF	SMONOBP
C87	103427104	.1uF	SMONOBP
C88	103427104	.1uF	SMONOBP
C89	102412151	150pF	SMONO
CKP	\$NULL	ICT	ICT
D1	253010811	HP2811	DO35
D2	230020062	BAW62	DO35
D3	230020062	BAW62	DO35
D5	253010811	HP2811	DO35
D6	256233209	TIL-209A	\$LED_1
DS	\$NULL	ICT	ICT
D_0	\$NULL	ICT	ICT
D_1	\$NULL	ICT	ICT
D_2	\$NULL	ICT	ICT
D_3	\$NULL	ICT	ICT
D_4	\$NULL	ICT	ICT
D_5	\$NULL	ICT	ICT
D_6	\$NULL	ICT	ICT

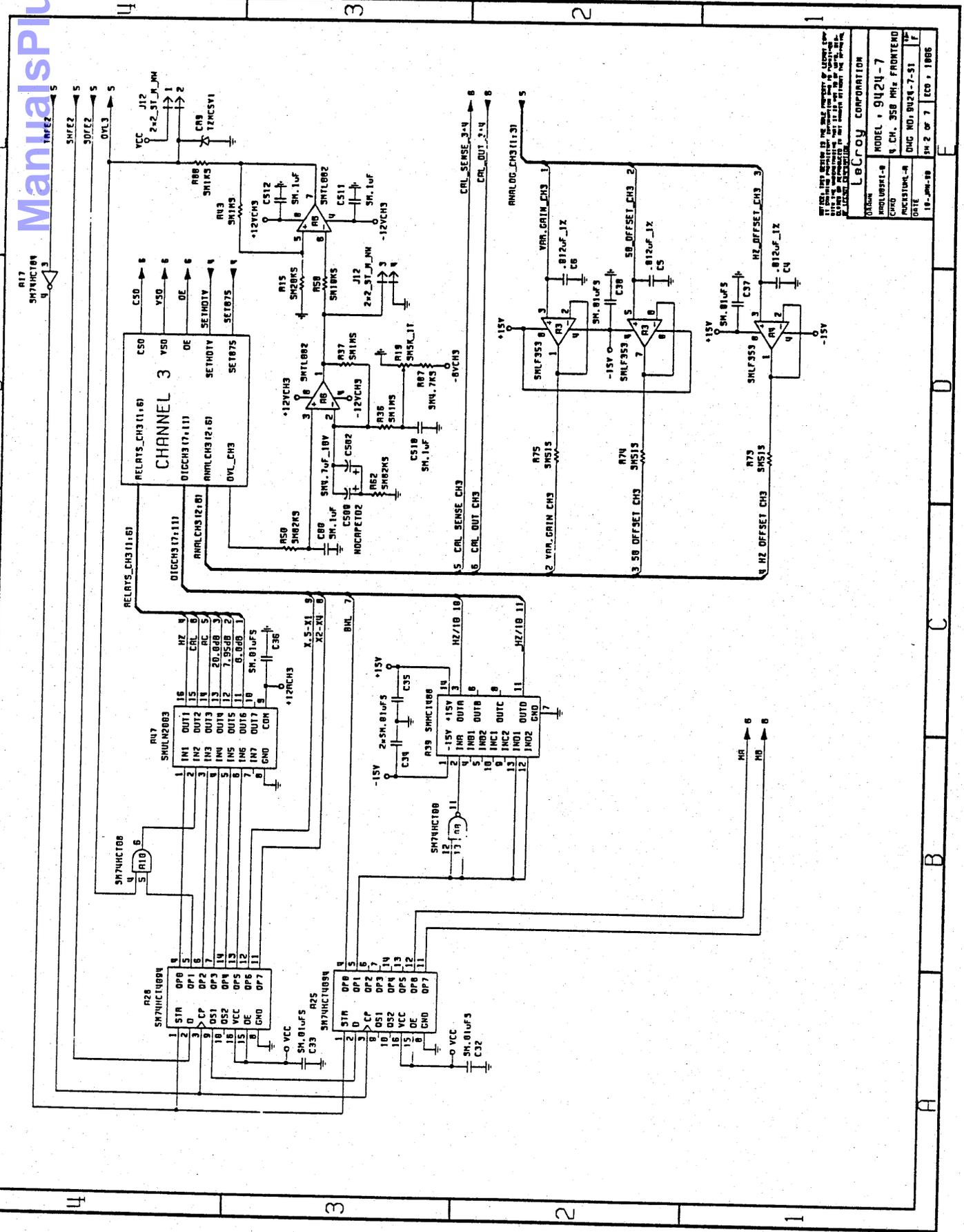
D_7	\$NULL	ICT	ICT
D_8	\$NULL	ICT	ICT
D_9	\$NULL	ICT	ICT
D_10	\$NULL	ICT	ICT
D_11	\$NULL	ICT	ICT
D_12	\$NULL	ICT	ICT
D_13	\$NULL	ICT	ICT
D_14	\$NULL	ICT	ICT
D_15	\$NULL	ICT	ICT
D_16	\$NULL	ICT	ICT
D_17	\$NULL	ICT	ICT
D_18	\$NULL	ICT	ICT
D_19	\$NULL	ICT	ICT
D_20	\$NULL	ICT	ICT
D_21	\$NULL	ICT	ICT
D_22	\$NULL	ICT	ICT
D_23	\$NULL	ICT	ICT
D_24	\$NULL	ICT	ICT
D_25	\$NULL	ICT	ICT
D_26	\$NULL	ICT	ICT
D_27	\$NULL	ICT	ICT
D_28	\$NULL	ICT	ICT
D_29	\$NULL	ICT	ICT
D_30	\$NULL	ICT	ICT
D_31	\$NULL	ICT	ICT
DSACK0	\$NULL	ICT	ICT
J1	454610096	ICT	ICT
J3	454211020	3x32-RA-M	CONN3X32_RA_M
MA0	\$NULL	2x10-ST-M	CONN2X10_ST_M
MA1	\$NULL	ICT	ICT
MA2	\$NULL	ICT	ICT
MA3	\$NULL	ICT	ICT
MA4	\$NULL	ICT	ICT
MA5	\$NULL	ICT	ICT
MA6	\$NULL	ICT	ICT
MA7	\$NULL	ICT	ICT
MA8	\$NULL	ICT	ICT
MA9	\$NULL	ICT	ICT
MDO	\$NULL	ICT	ICT
MD1	\$NULL	ICT	ICT
MD2	\$NULL	ICT	ICT
MD3	\$NULL	ICT	ICT
MD4	\$NULL	ICT	ICT
MD5	\$NULL	ICT	ICT
MD6	\$NULL	ICT	ICT
MD7	\$NULL	ICT	ICT
MD8	\$NULL	ICT	ICT
MD9	\$NULL	ICT	ICT
MA10	\$NULL	ICT	ICT
MA11	\$NULL	ICT	ICT
MA12	\$NULL	ICT	ICT
MA13	\$NULL	ICT	ICT
MA14	\$NULL	ICT	ICT
MD10	\$NULL	ICT	ICT
MD11	\$NULL	ICT	ICT
MD12	\$NULL	ICT	ICT

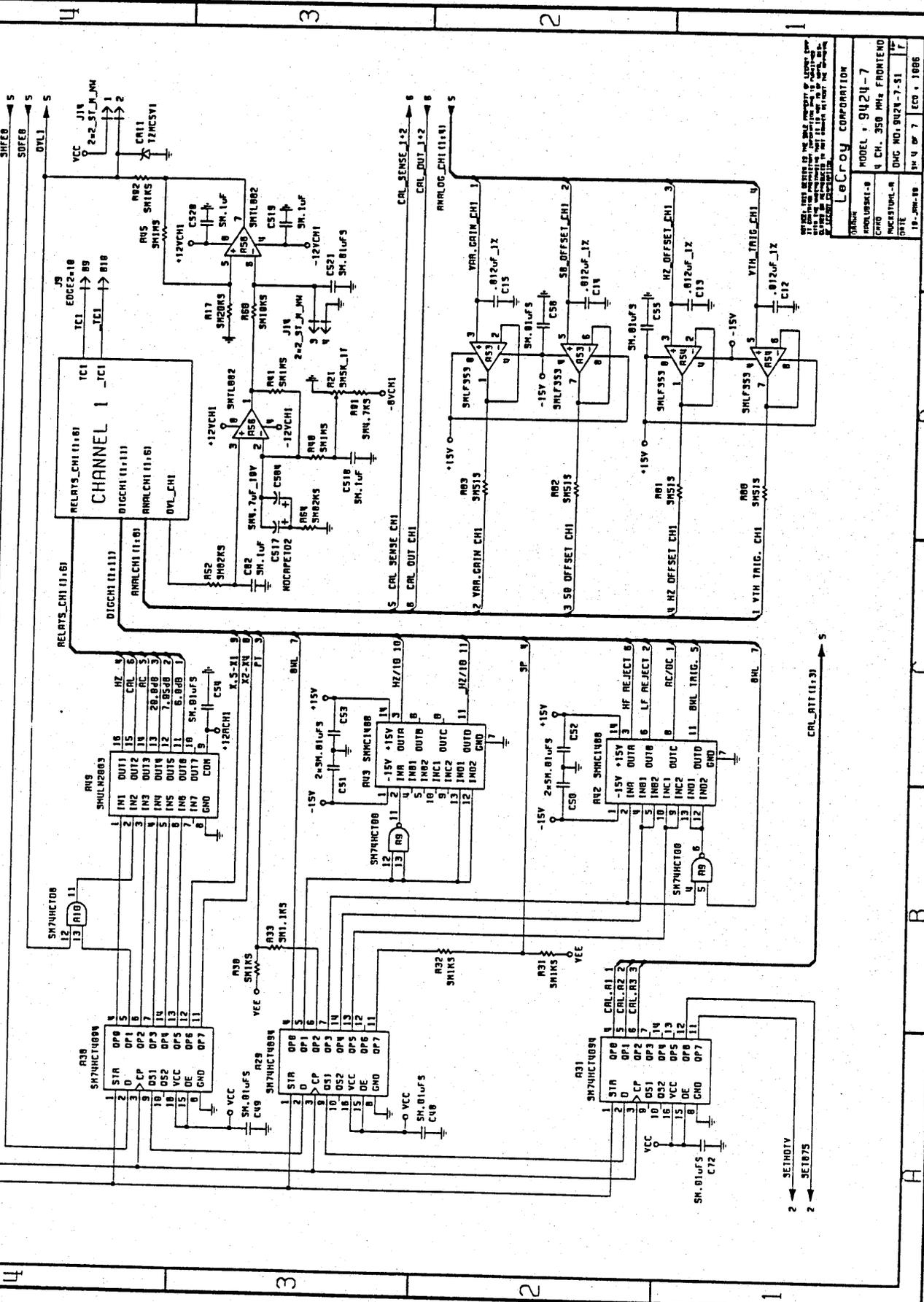
MD13	\$NULL	ICT	ICT
MD14	\$NULL	ICT	ICT
MD15	\$NULL	ICT	ICT
Q1	275110001	2n2907	ICT
Q2	280170104	vn0104	TO18
Q3	280170104	vn0104	TO92
Q4	280170104	vn0104	TO92
Q5	280170104	vn0104	TO92
R1	168531401	vn0104	TO92
R2	161225102	'1.21K-1%'	RES07
R4	168531585	1K	RES05
R5	168531585	'100K-1%'	RES07
R6	168531585	'100K-1%'	RES07
R7	168531585	'100K-1%'	RES07
R8	168531229	'19.6-1%'	RES07
R8	161225103	10K	RES07
R9	161225103	10K	RES05
RW	\$NULL	ICT	RES05
R10	190042103	10K-SIPC	ICT
R11	190042103	10K-SIPC	SIP10RES
R12	190042103	10K-SIPC	SIP10RES
R13	190042103	10K-SIPC	SIP10RES
R14	161225027	2.7	SIP10RES
R15	168531601	'147K-1%'	RES05
R16	161225206	20M	RES07
R17	161225102	1K	RES05
R18	161225102	1K	RES05
R21	161225102	1K	RES05
R22	190842102	1K	RES05
R24	161225206	1K-8SIPC	RES05
R25	168531449	20M	SIP8RES
R26	168531633	'3.83K-1%'	RES05
R28	161225391	'316K-1%'	RES07
R29	161225391	390	RES07
R30	161225391	390	RES05
R31	168531389	390	RES05
R32	161225027	'909-1%'	RES05
R33	161225102	2.7	RES07
R34	161225102	1K	RES05
R35	161225102	1K	RES05
R36	161225472	4.7K	RES05
R37	190832220	22-8SS	RES05
R38	161225103	10K	SIP8RES
R38	161225103	10K	RES05
R W	\$NULL	10K	RES05
SW1	411430002	ICT	ICT
SIZE0	\$NULL	BD04	DIP8
SIZE1	\$NULL	ICT	ICT
X1	310111032	ICT	ICT
_AS	\$NULL	32.768KHz	ICT
_DS	\$NULL	ICT	MX 1V
_CEM	\$NULL	ICT	ICT
_ECS	\$NULL	ICT	ICT
_EOS	\$NULL	ICT	ICT
_OEM	\$NULL	ICT	ICT
_RMC	\$NULL	ICT	ICT
_WEM	\$NULL	ICT	ICT
_CFPC	\$NULL	ICT	ICT
		ICT	ICT



NOTES: THIS CIRCUIT IS THE SOLE PROPERTY OF LEICROY CORPORATION. IT IS TO BE USED ONLY FOR THE PURPOSES AND CONDITIONS SPECIFIED IN THE ORIGINAL ORDER. NO PART OF THIS DOCUMENT 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.

Leicroy CORPORATION
 MODEL 9424-7
 CH. 358 MHz FRONTEND
 DMC NO. BU24-7-51
 SH. 1 OF 7 ECO - 1895





THIS IC IS THE PROPERTY OF SHIMADZU CORPORATION. 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	9424-7
MODEL	9424-7
CH	CH. 358 MHz FRONTEND
INSTRUM	DHC MO. BU24-7-51
DATE	10-200-88
REV	ECO 1-1988

SHIMADZU CORPORATION

J18
2-20, ST_A

1 OVL4
2 OVL3
3 OVL2
4 OVL1
5 LSYNC
6 TV2
7 TV1

8 SHF1
9 SHF2
10 SHF3
11 TRF1
12 TRF2
13 TRF3

14 SOF1
15 SOF2
16 SOF3

17 SHF1
18 SHF2
19 SHF3
20 TRF1
21 TRF2
22 TRF3

23 SOF1
24 SOF2
25 SOF3

193
194
195

196
197
198
199
200
201
202
203
204
205
206

207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226

227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500

501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600

601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700

701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800

801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900

901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100

1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200

1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300

1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400

1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500

1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600

1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700

1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800

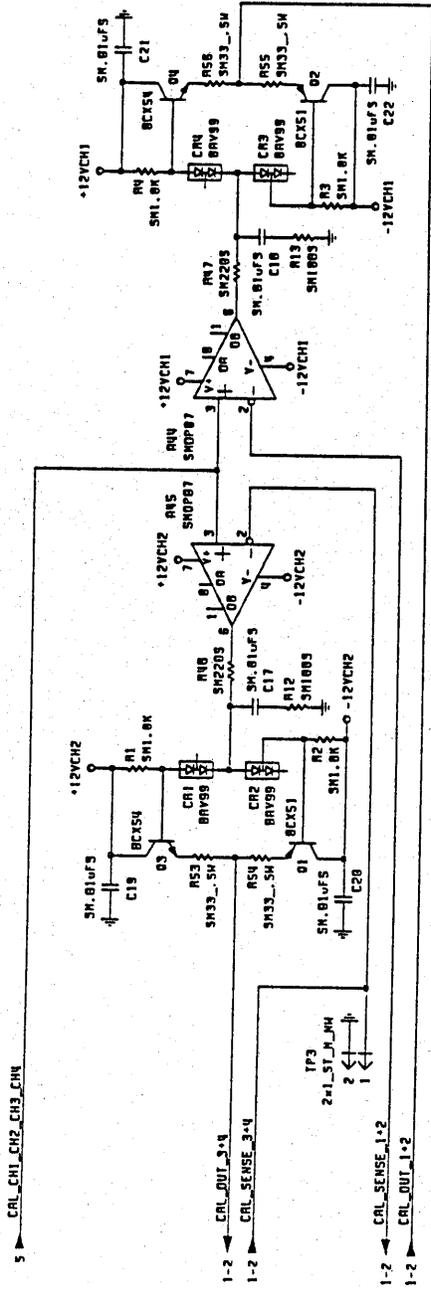
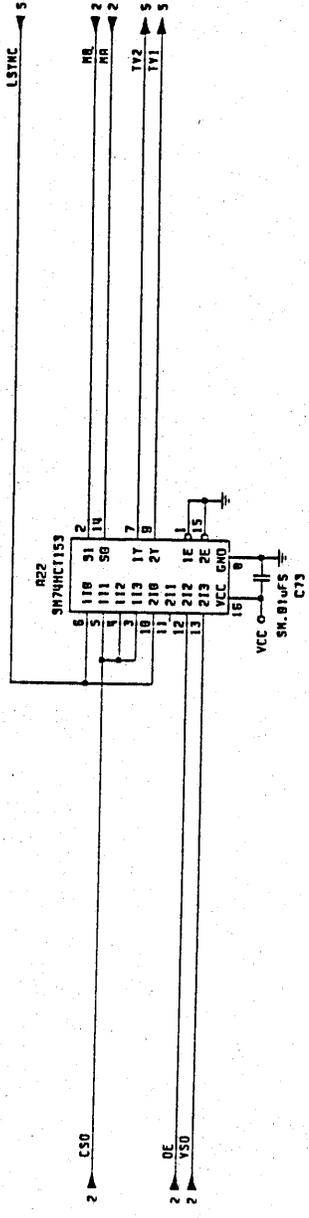
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900

1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100

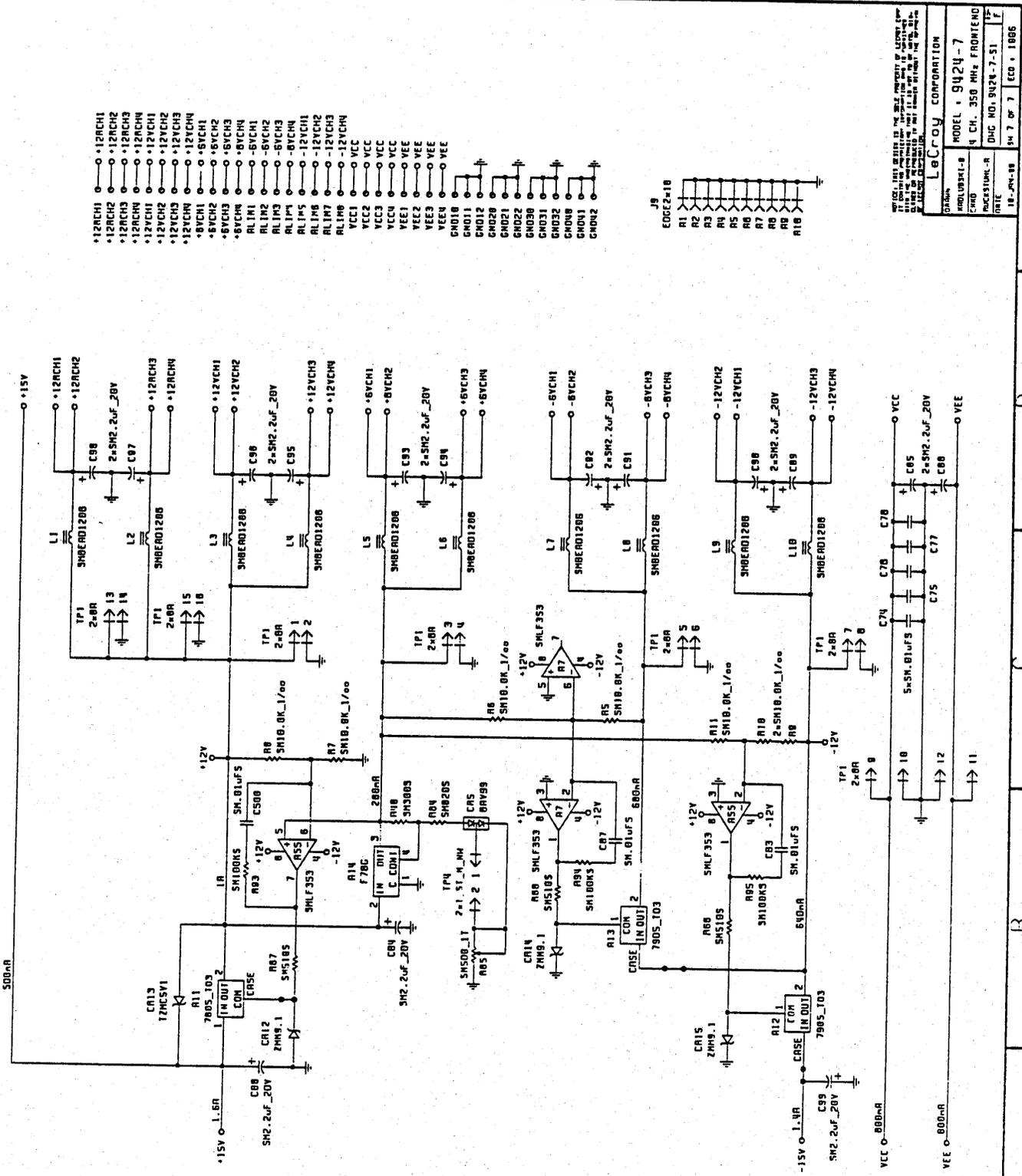
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200

2201
2202
2203
2204
2205
2206
2207

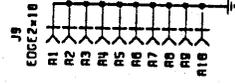


WHICH THEY BELIEVE IS THE ONLY COMPANY OF ITS KIND...
 IT CONTAINS THE MOST COMPLETE AND ACCURATE INFORMATION...
 WHICH IS REPRODUCED IN THE ORIGINAL FORM...
 WITHOUT ALTERATION.

STRAW	MODEL 9424-7
MANUFACTURER	TELECRY CORP.
DATE	18-JAN-88
REV	1
CH	358 MHz FRONTEND
DOC NO	9424-7-S1
ECO	1956

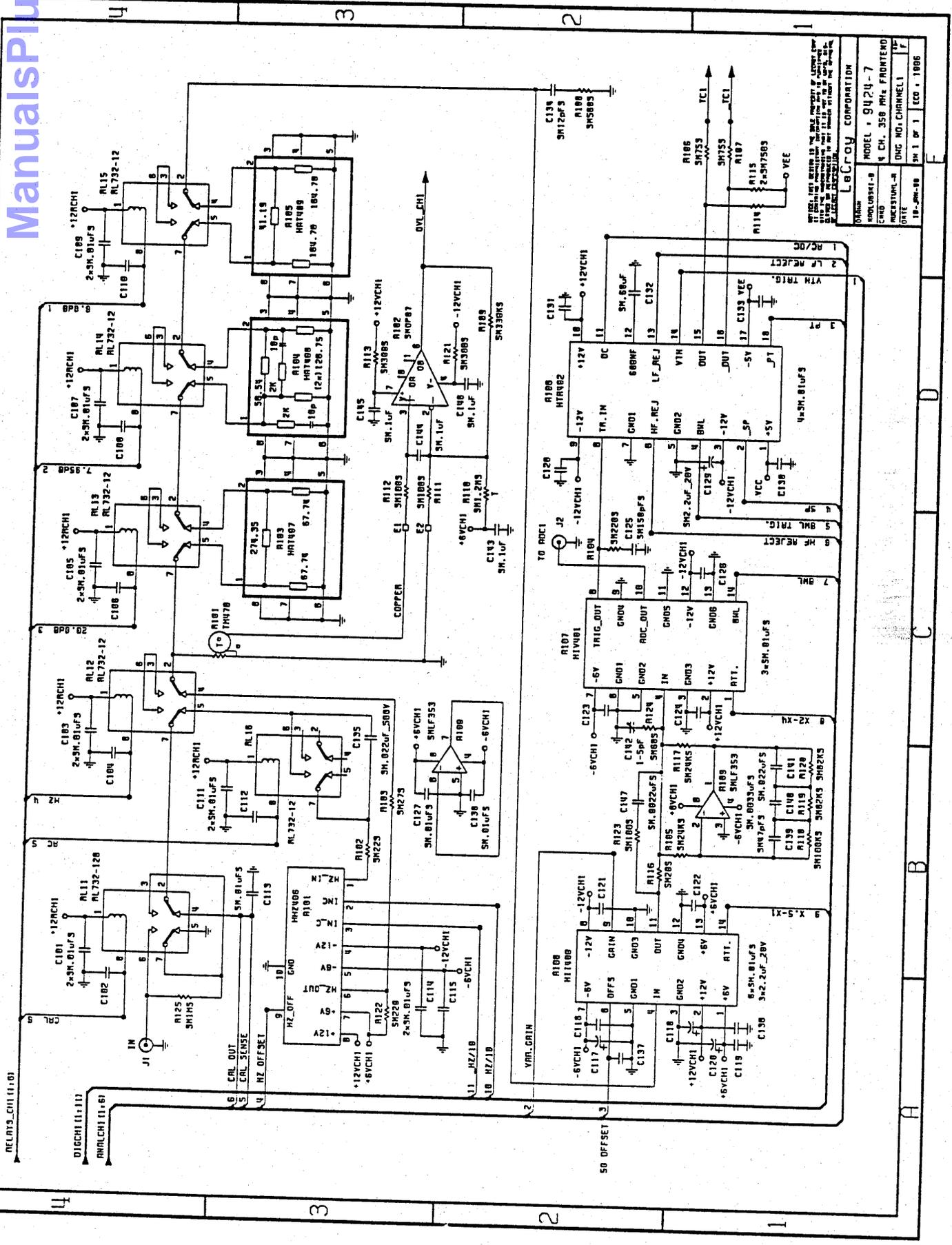


- *12RCH1 ○ +12RCH1
- *12RCH2 ○ +12RCH2
- *12RCH3 ○ +12RCH3
- *12RCH4 ○ +12RCH4
- *12VCH1 ○ +12VCH1
- *12VCH2 ○ +12VCH2
- *12VCH3 ○ +12VCH3
- *12VCH4 ○ +12VCH4
- *8VCH1 ○ +8VCH1
- *8VCH2 ○ +8VCH2
- *8VCH3 ○ +8VCH3
- *8VCH4 ○ +8VCH4
- AL1R2 ○ -8VCH1
- AL1R3 ○ -8VCH2
- AL1R4 ○ -8VCH3
- AL1R5 ○ -8VCH4
- AL1R6 ○ -12VCH1
- AL1R7 ○ -12VCH2
- AL1R8 ○ -12VCH3
- AL1R9 ○ -12VCH4
- VCC1 ○ VCC
- VCC2 ○ VCC
- VCC3 ○ VCC
- VCC4 ○ VCC
- VEE1 ○ VEE
- VEE2 ○ VEE
- VEE3 ○ VEE
- VEE4 ○ VEE
- VEE5 ○ VEE
- GN010 ○
- GN011 ○
- GN012 ○
- GN020 ○
- GN021 ○
- GN022 ○
- GN030 ○
- GN031 ○
- GN032 ○
- GN033 ○
- GN034 ○
- GN035 ○
- GN036 ○
- GN037 ○
- GN038 ○
- GN039 ○
- GN040 ○



NOTES: THIS DRAWING IS THE PROPERTY OF LEACROY CORPORATION. IT IS TO BE USED ONLY FOR THE MANUFACTURE OF LEACROY EQUIPMENT. 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.

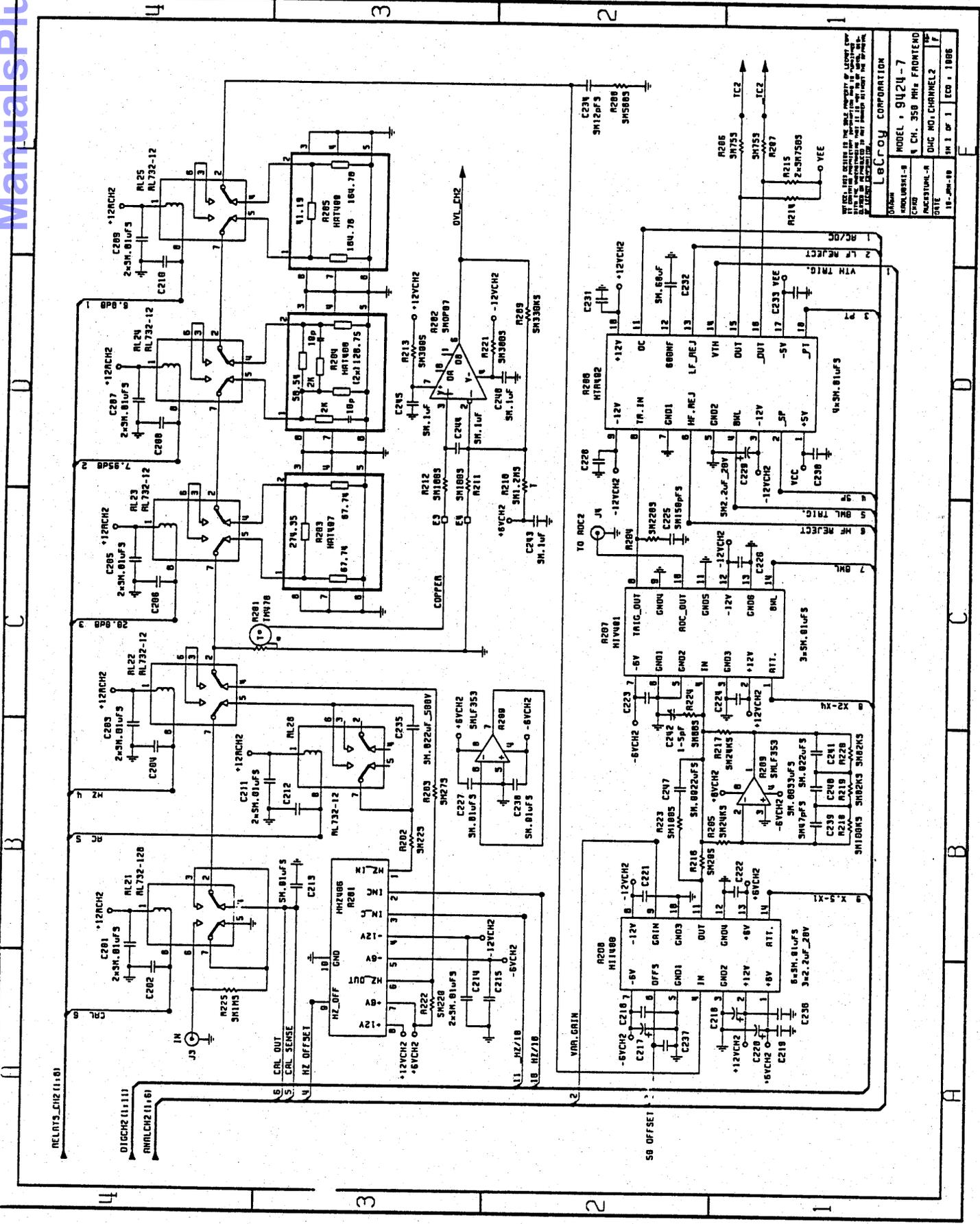
LeCroy CORPORATION
 MODEL 9424-7
 4 CH. 350 MHz FRONTEND
 DWG NO. 9424-7-S1
 DATE 18-JUN-88 BY 7 OF 7 ECD 1 1986

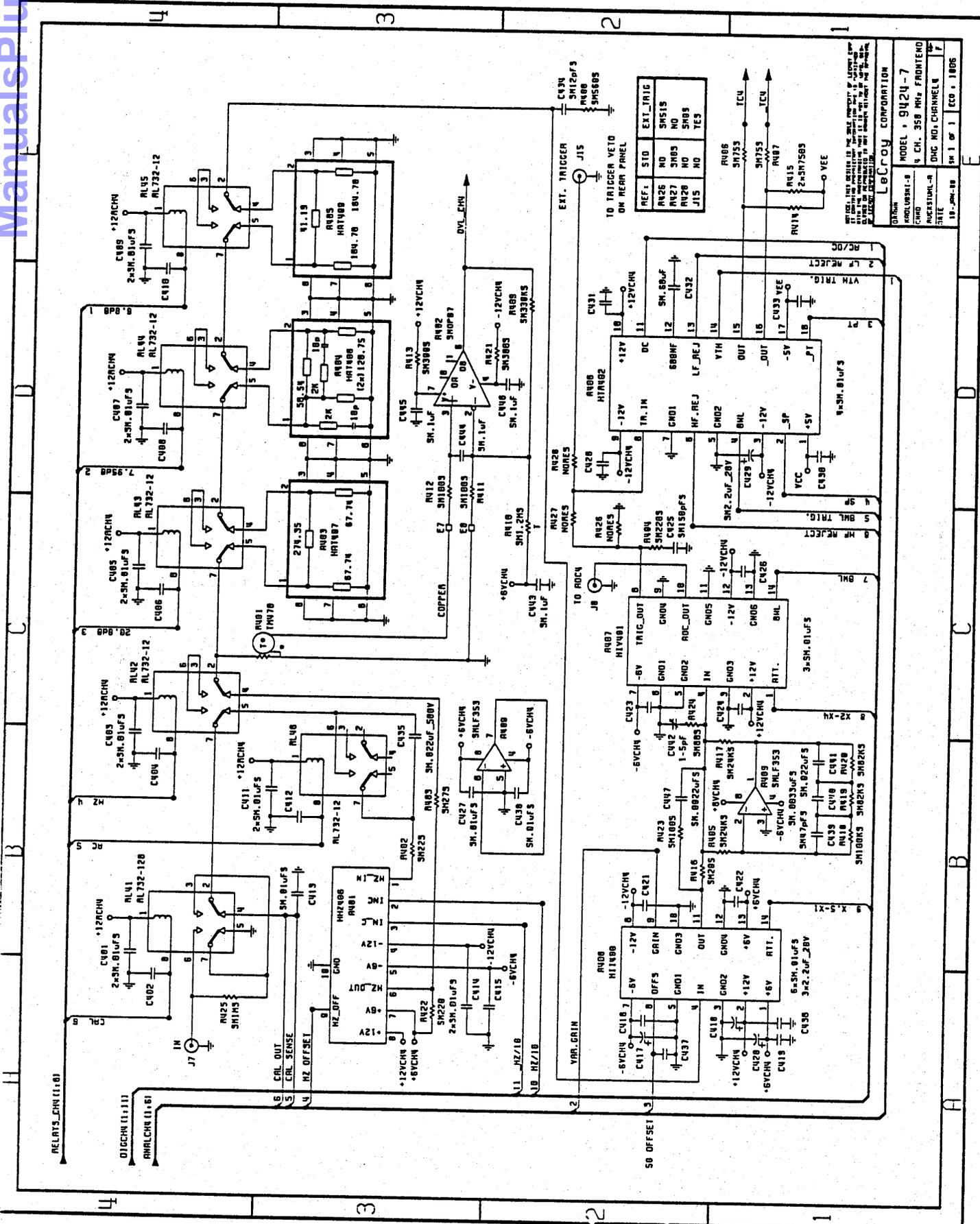


THIS UNIT IS THE PROPERTY OF LEICROY CORPORATION
 IT IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS
 DESIGNED AND SHOULD NOT BE REPAIRED OR MODIFIED
 WITHOUT THE WRITTEN PERMISSION OF LEICROY CORPORATION
 MODEL 9424-7
 CH. 358 MR. FRONTEND
 INSTRUCTION-3
 DWG NO. CHANNEL 1
 18-30-88
 SH 1 OF 1
 ECN 1086

DATE	18-30-88
REV	1
BY	CH. 358 MR. FRONTEND
CHKD	INSTRUCTION-3
APP'D	DWG NO. CHANNEL 1
DATE	18-30-88
REV	1
BY	CH. 358 MR. FRONTEND
CHKD	INSTRUCTION-3
APP'D	DWG NO. CHANNEL 1

LEICROY CORPORATION

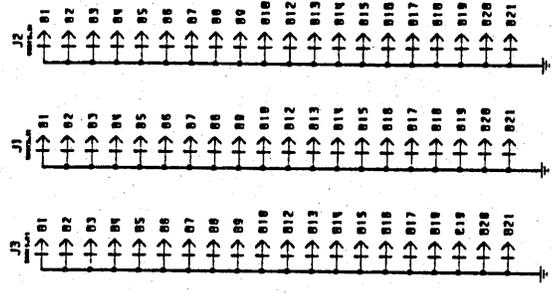
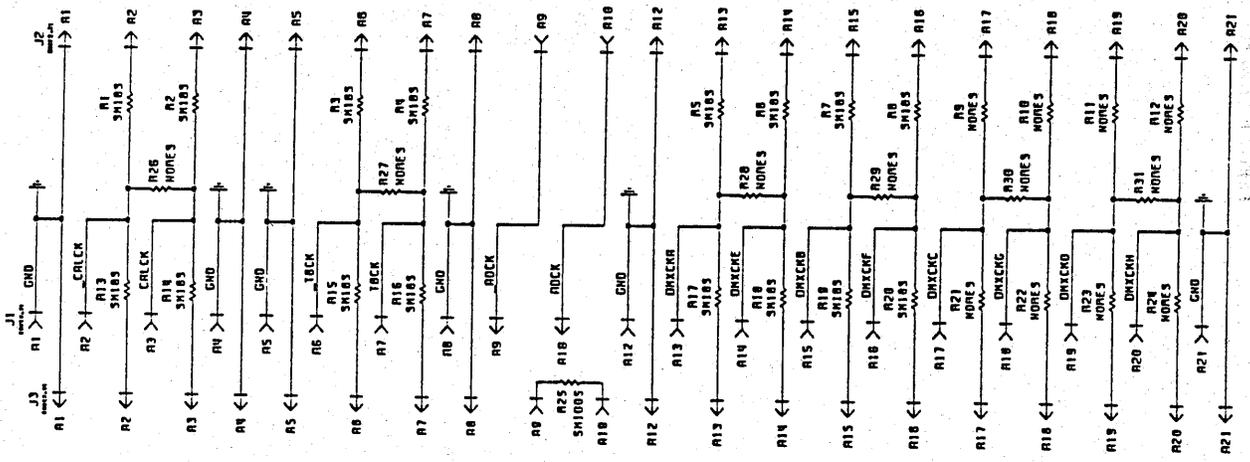




REF.	STD	EXT.	TRIG
RV26	NO	SM515	
RV27	SM85	NO	
RV28	NO	SM85	
J15	NO	YES	

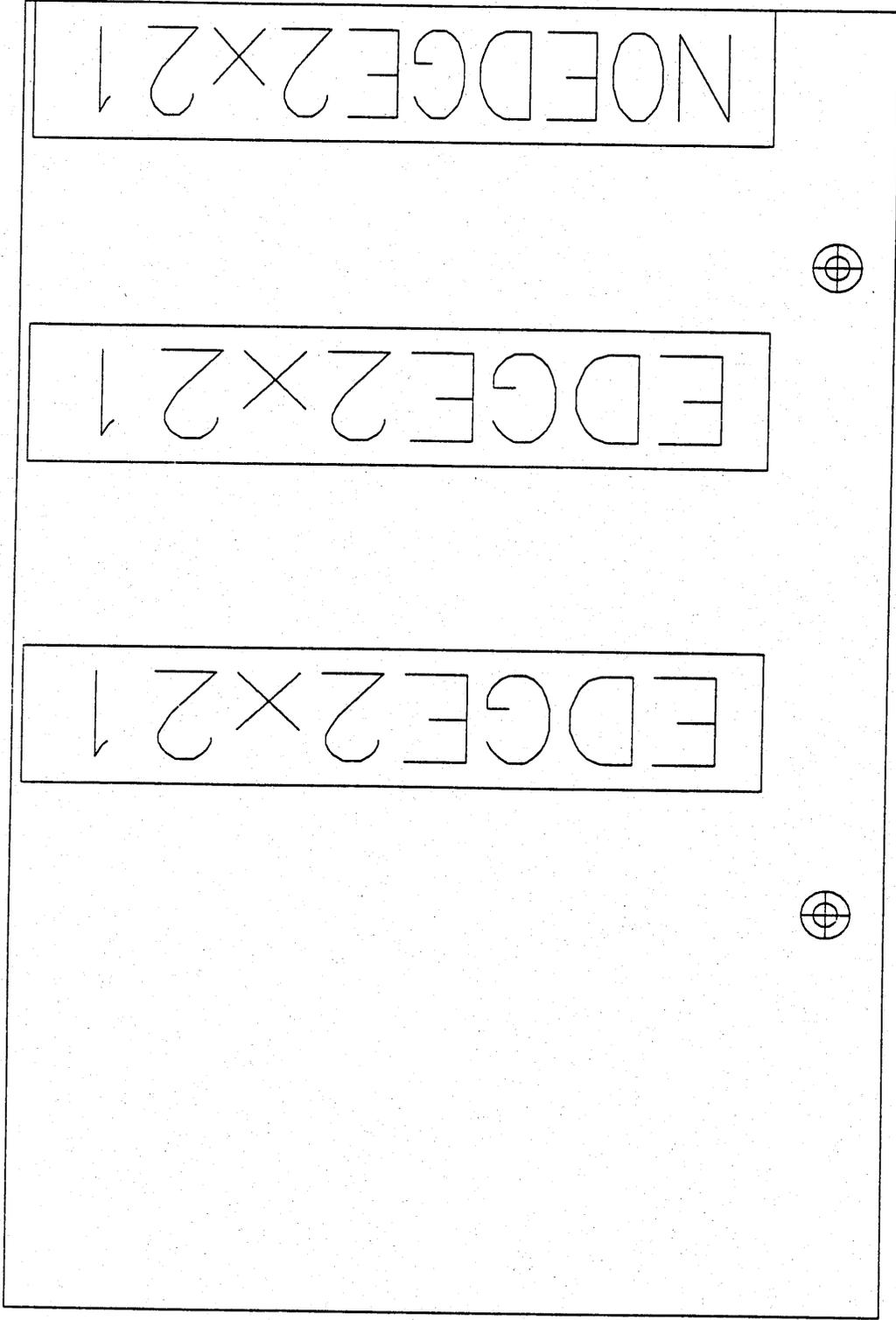
THIS UNIT SHALL BE OPERATED ONLY IF USED IN ACCORDANCE WITH THE INSTRUCTIONS AND CAUTIONS CONTAINED IN THE OPERATING MANUAL AND SERVICE MANUAL FOR THE MODEL 9424-7 OSCILLOSCOPE.

LeCroy CORPORATION
 MODEL 9424-7
 CH. 350 MHz FRONTEND
 SUCCESSOR-A
 DATE 10-20-88
 SH 1 OF 1 ECO 1006

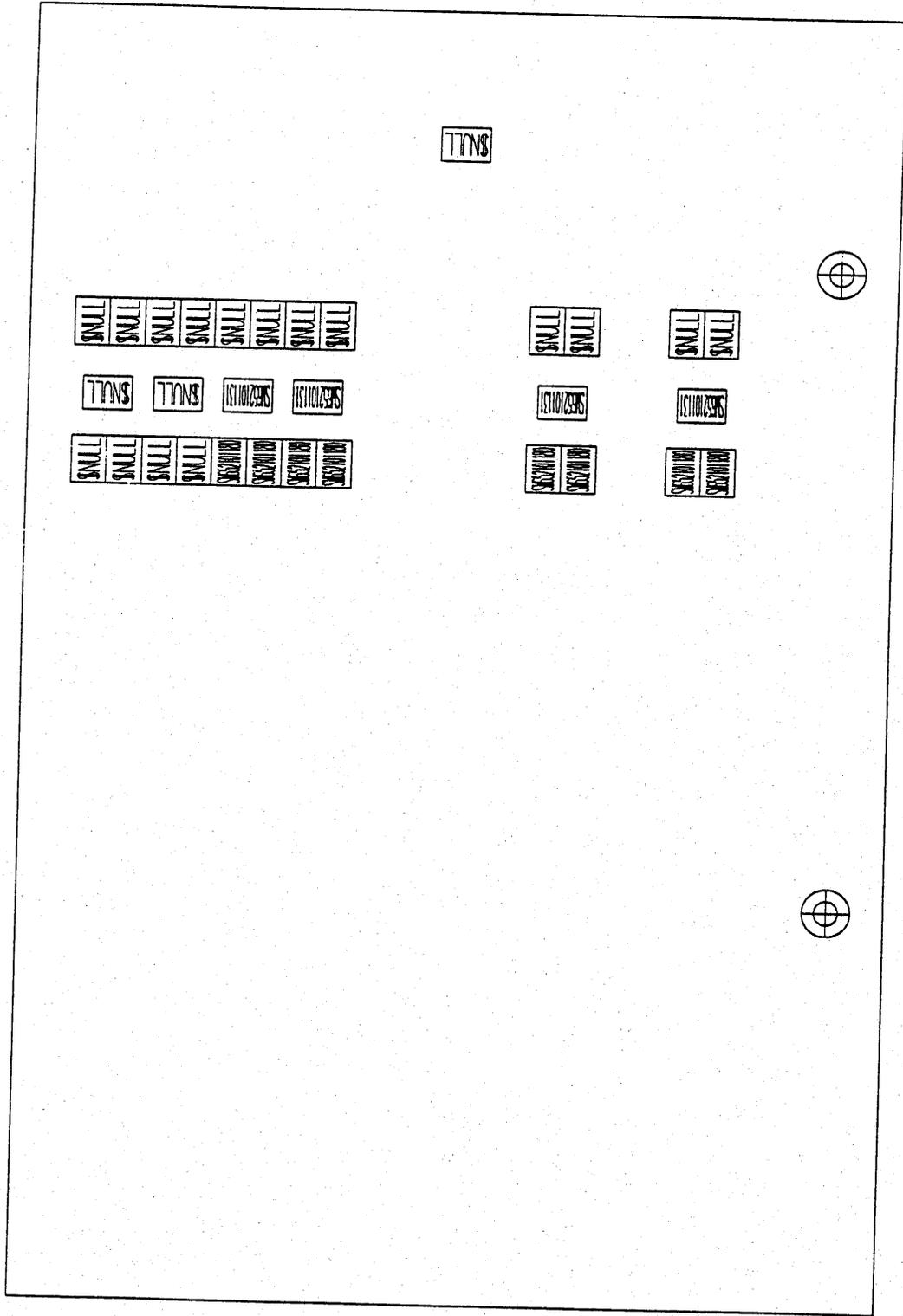


100% FULLY TESTED BY THE MANUFACTURER'S QUALITY CONTROL DEPARTMENT.
 ALL PARTS ARE GUARANTEED TO BE NEW UNLESS OTHERWISE SPECIFIED.
 ALL PARTS ARE GUARANTEED TO BE NEW UNLESS OTHERWISE SPECIFIED.
 ALL PARTS ARE GUARANTEED TO BE NEW UNLESS OTHERWISE SPECIFIED.

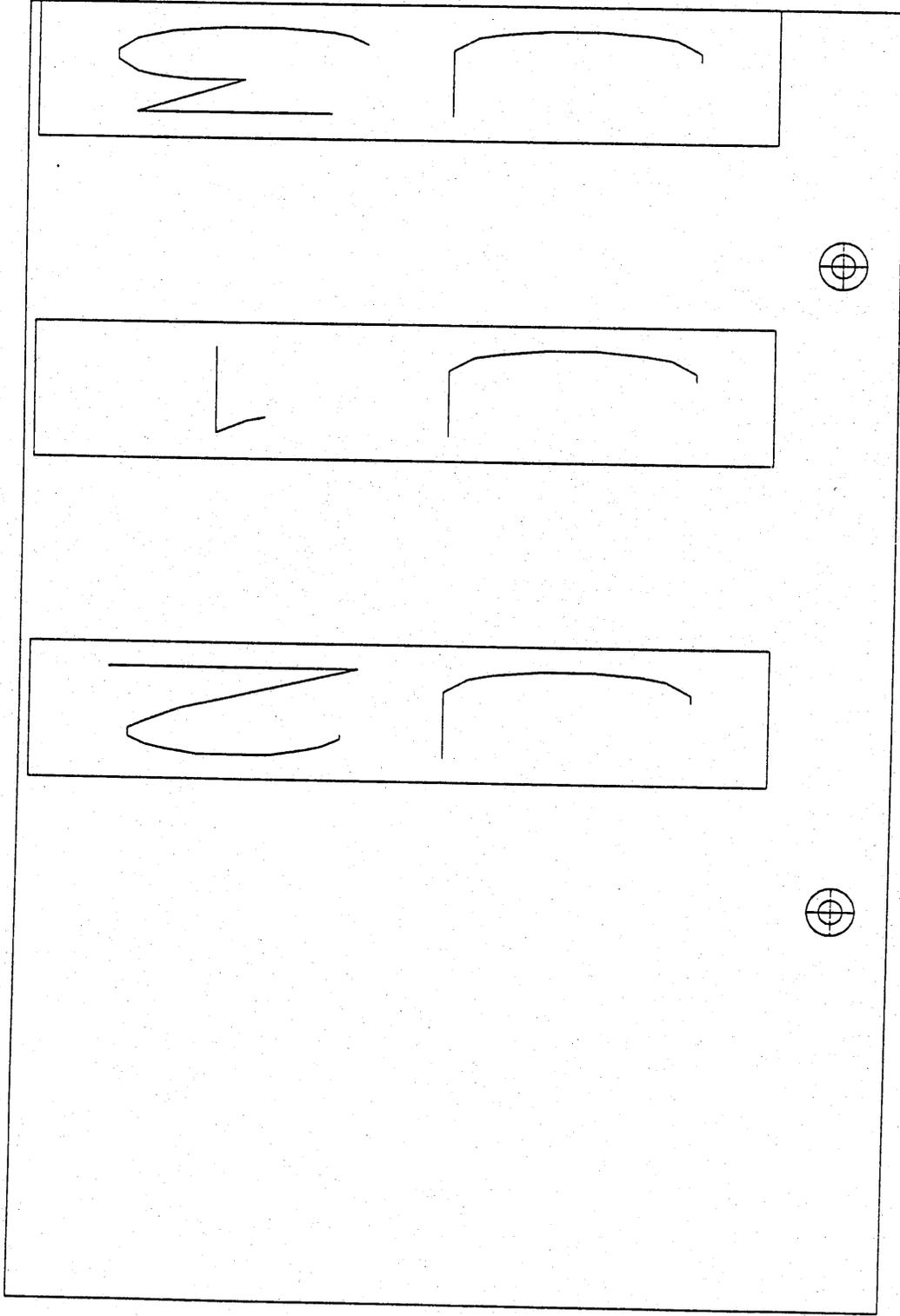
LeRoy CORPORATION
 MODEL 9124-B
 CLOCK BUS
 DMC NO. 9124-B-51
 SH. 1 OF 1
 DEC. 1, 1988



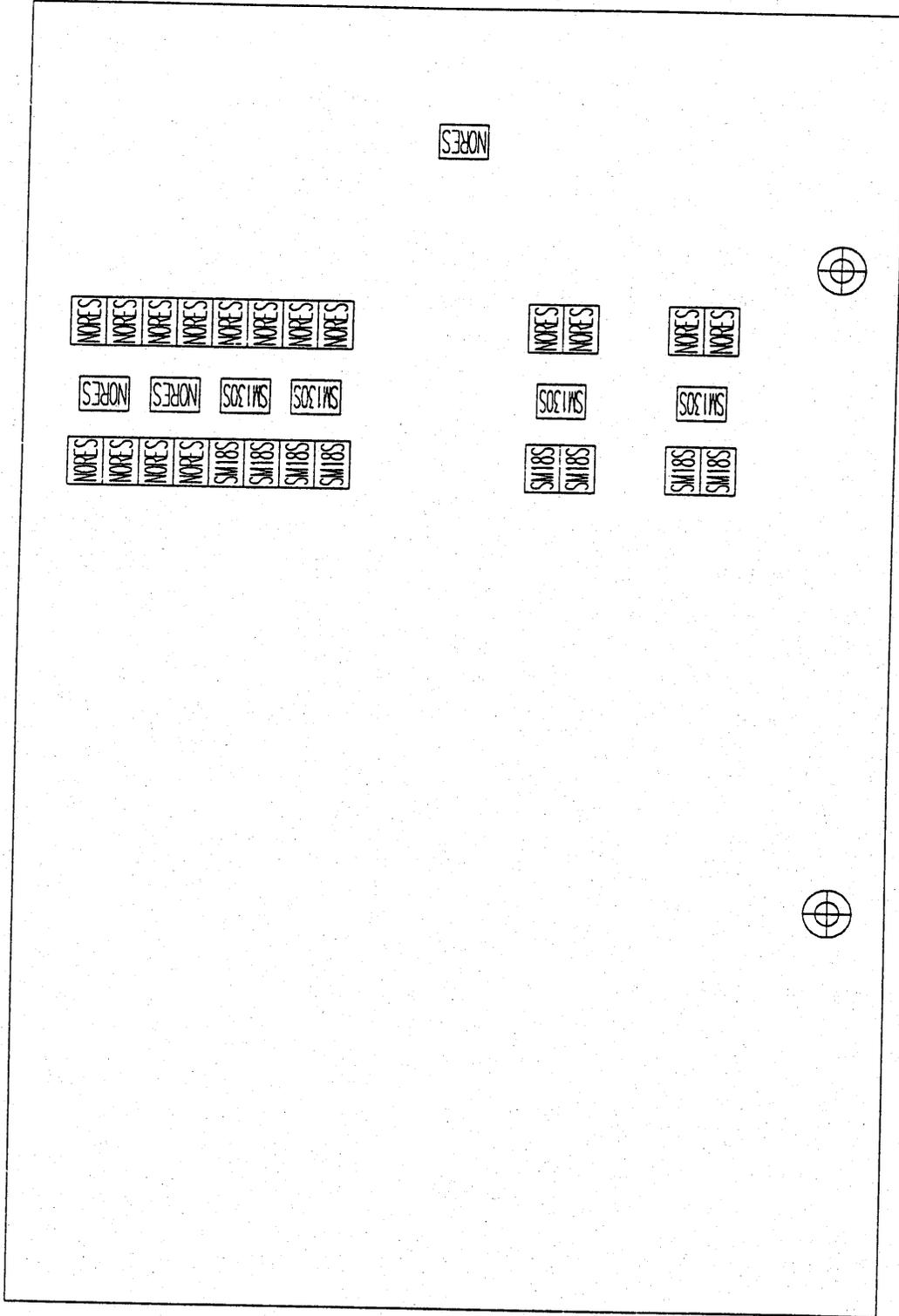
\$9420_8 Rev:B



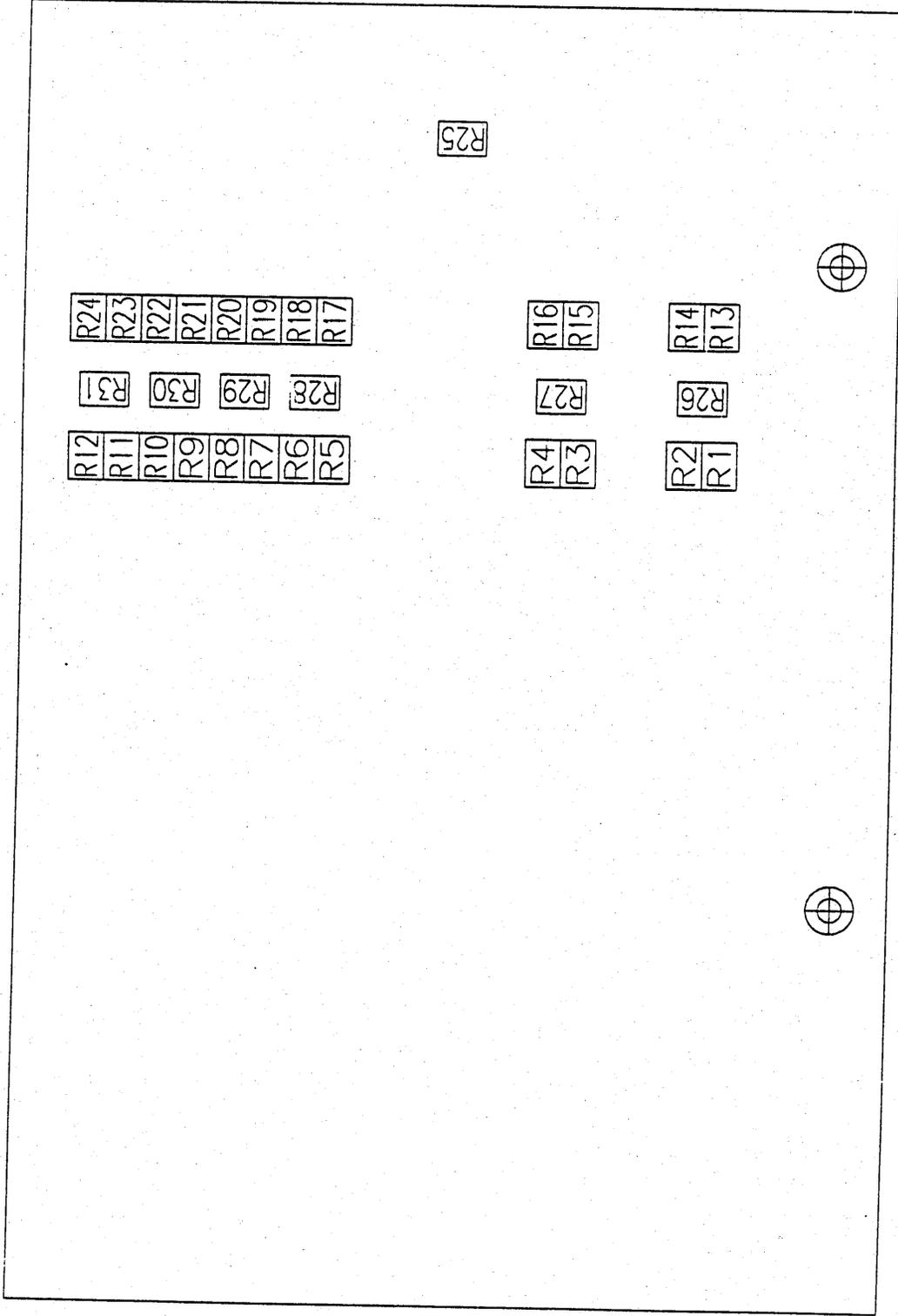
\$9420_8 Rev:B



\$9420_8 Rev : B



\$9420_8 Rev:B



\$9420_8 Rev:B

J1	454150021	EDGE2x21	EDGE2X21
J2	454150021	EDGE2x21	EDGE2X21
J3	\$NULL	NOEDGE2x21	EDGE2X21
R1	SM652101180	SM18S	SM0805
R2	SM652101180	SM18S	SM0805
R3	SM652101180	SM18S	SM0805
R4	SM652101180	SM18S	SM0805
R5	SM652101180	SM18S	SM0805
R6	SM652101180	SM18S	SM0805
R7	SM652101180	SM18S	SM0805
R8	SM652101180	SM18S	SM0805
R9	\$NULL	NORES	SM0805
R10	\$NULL	NORES	SM0805
R11	\$NULL	NORES	SM0805
R12	\$NULL	NORES	SM0805
R13	\$NULL	NORES	SM0805
R14	\$NULL	NORES	SM0805
R15	\$NULL	NORES	SM0805
R16	\$NULL	NORES	SM0805
R17	\$NULL	NORES	SM0805
R18	\$NULL	NORES	SM0805
R19	\$NULL	NORES	SM0805
R20	\$NULL	NORES	SM0805
R21	\$NULL	NORES	SM0805
R22	\$NULL	NORES	SM0805
R23	\$NULL	NORES	SM0805
R24	\$NULL	NORES	SM0805
R25	\$NULL	NORES	SM0805
R26	SM652101131	SM130S	SM0805
R27	SM652101131	SM130S	SM0805
R28	SM652101131	SM130S	SM0805
R29	SM652101131	SM130S	SM0805
R30	\$NULL	NORES	SM0805
R31	\$NULL	NORES	SM0805

Chapter 7

MECHANICAL PARTS

Table of contents:

- 7.1 Top view of the 9424
- 7.2 Side view
- 7.3 Parts description
- 7.4 Front panel view
- 7.5 Front panel description and part number
- 7.6 Rear panel view
- 7.7 Rear panel description

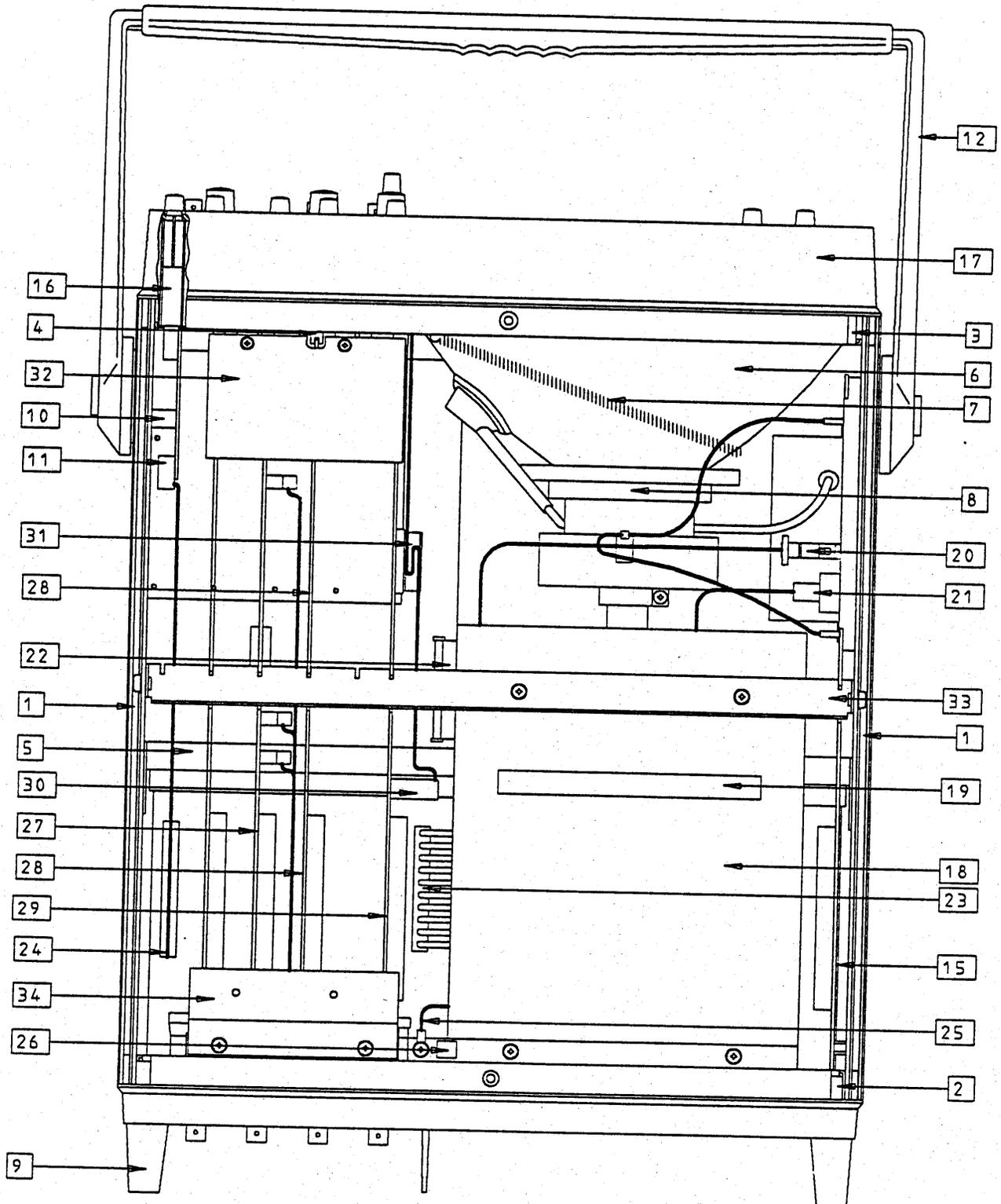


Figure 7.1

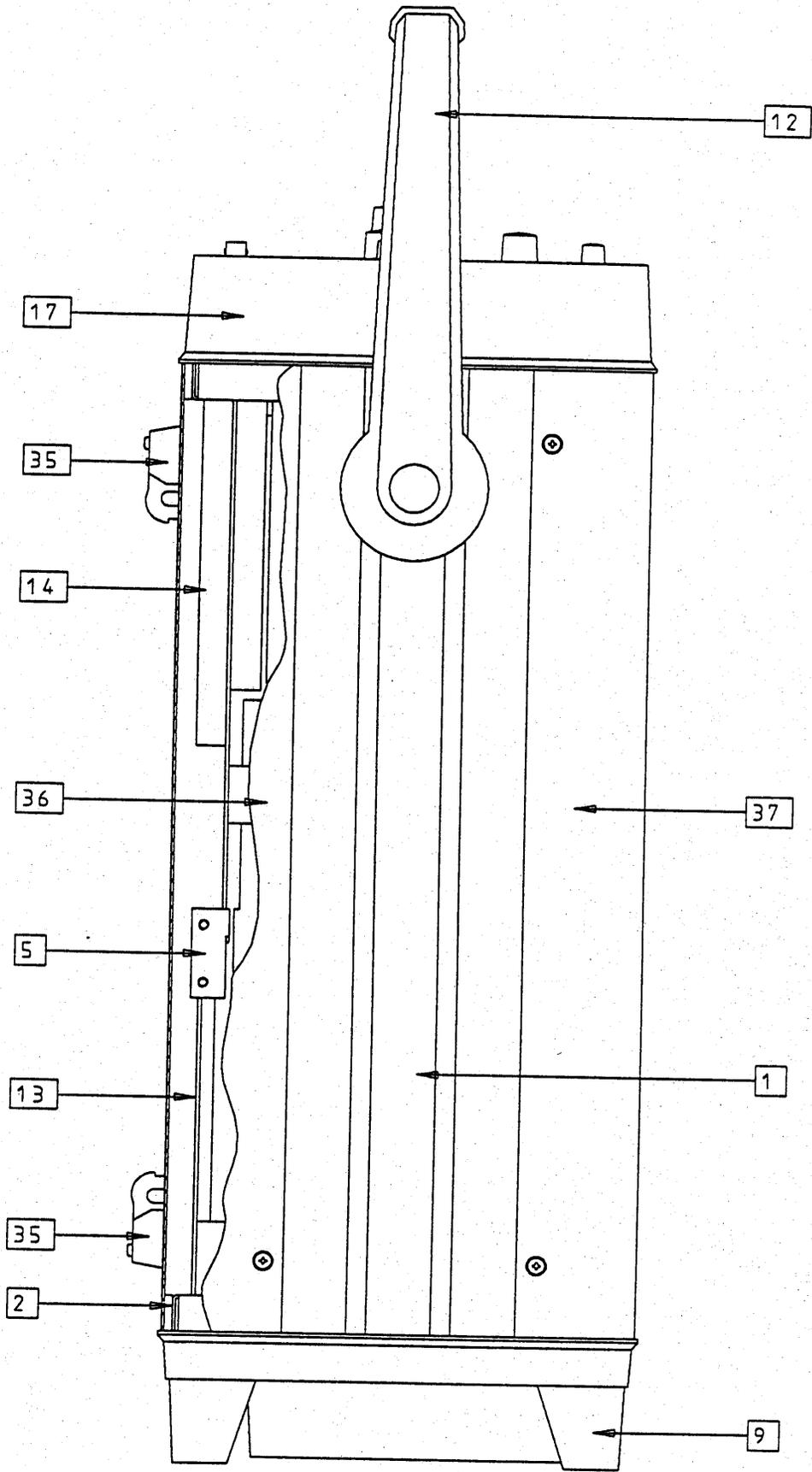
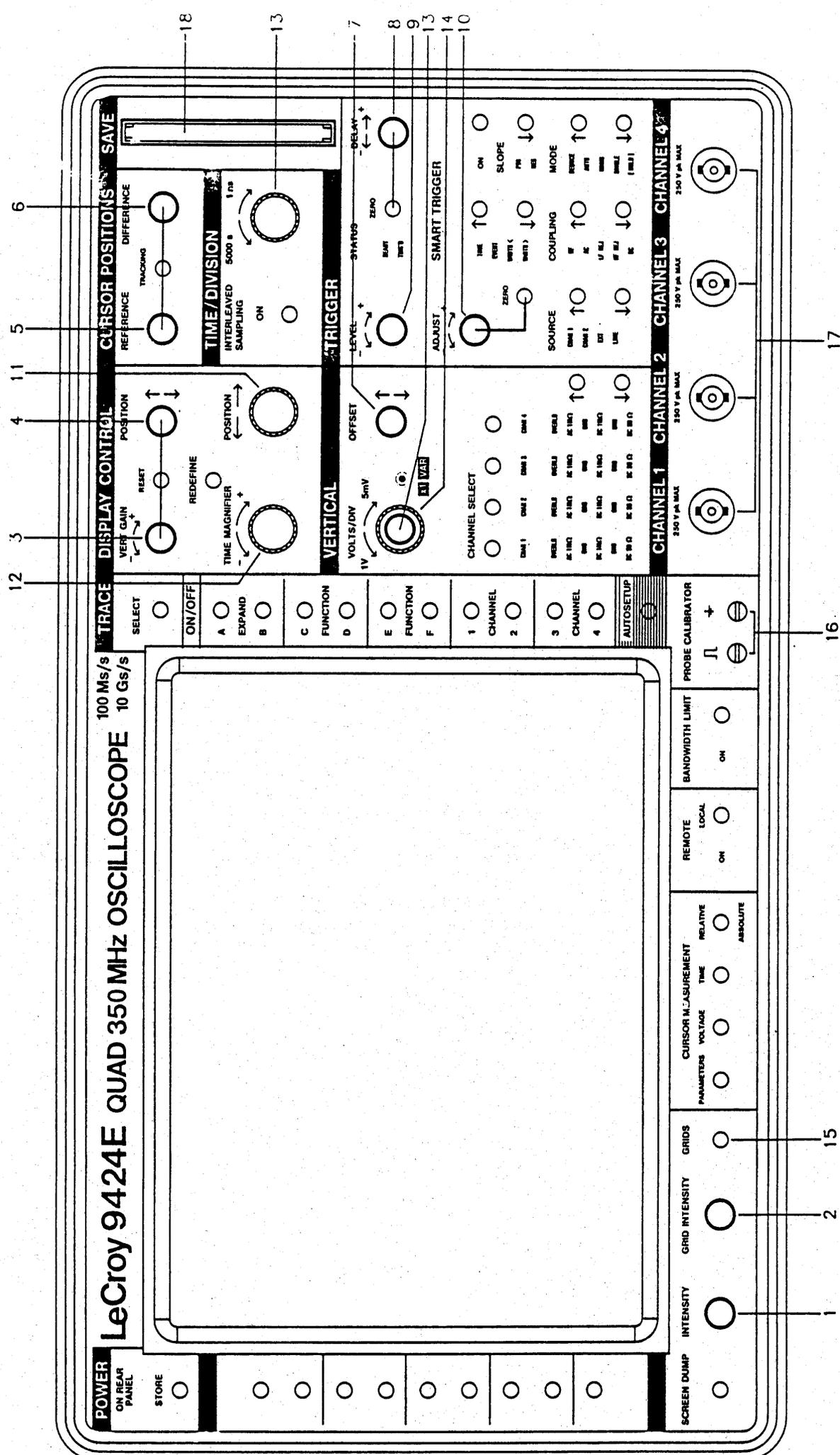


Figure 7.2

ASSEMBLAGE SEQUENCE OF PARTS				SCREWS		WASHERS		NUTS	
POS	DESCRIPTION	PART NUMBER	QTY						
1	SIDE PANEL	709 424 021	2						
2	REAR SUPPORT	709 424 041	1	550 440 108	4	551 440 300	4		
3	DISPLAY SUPPORT	709 424 031	1	550 440 108	4	551 440 300	4		
4	CARD GUIDE	530 410 001	5	550 430 104	10	551 430 300	10		
5	MOTHER CARD SUPPORT	709 424 051	1	550 440 108	4	551 440 300	4		
6	CRT ORANGE	321 220 009	1	550 440 416	4	554 440 202	4	552 440 100	4
						709 450 071	4		
7	SPRING EXT TYPE 190mm	554 310 001	1						
8	DEFLECTION YOKE	300 090 001	1						
9	REAR PANEL FOR 9424	F9424-9	1	550 440 406	6				
10	SPACER INSERT GUIDE	709 424 098	1	550 440 120	1	551 440 300	1	709 424 011	1
11	SUPPORT FOR MC	F9424-2	1						
12	HANDLE	530 301 005	1	550 440 120	2			709 424 011	2
13	94XX-1 WITH MC LOGIC	F9424-1	1	550 430 106	4	551 430 300	4		
14	QUAD CHANNEL FRONTEND	F9424-7	1	550 430 106	2	551 430 300	5		
				550 430 108	3				
15	DISPLAY CARD FOR 94XX	F9450-2	1	550 430 106	4	551 430 300	4		
16	INSERTION GUIDE MC	709 424 098	1						
17	QUAD CHANNEL FP CARD	F9424-5	1	550 440 406	6				
18	POWER SUPPLY 9451-1	315 040 015	1	550 440 105	4	551 440 300	4		
				550 440 506	2				
19	LABEL "DANGER---ONLY	377 051 005	1						
20	DISPLAY POWER CABLE	780 210 030	1						
21	CRT CABLE	780 299 025	1						
22	FRONTEND BASE CABLE	780 231 120	1						
23	BASE CARD POWER CABLE	780 220 015	1						
24	MEMORY CARD CABLE	780 231 131	1						
25	GROUND CABLE	780 544 512	1						
26	LABEL GROUND SYMBOL	377 131 001	1						
27	TIMEBASE CARD	F9420-4	1						
28	DUAL CHANNEL ADC	F9420-3	2						
29	PROCESSOR CARD	F9424-6	1						
30	FRONT PANEL CABLE	780 411 236	1						
31	CABLE CLIP AD BACK	594 230 002	1						
32	CLOCK-BUS	F9424-8	1	550 430 106	2	551 430 300	2		
33	POWER SUPPLY SUPPORT	709 424 061	1	550 430 106	2	551 430 300	2		
34	CARD RETAINER	709 424 095	1	550 440 108	2	551 440 300	2		
35	FOOT	530 010 024	4	550 440 110	4	551 440 300	4	552 440 100	4
36	LOWER COVER	709 424 081	1	550 440 708	4	551 440 501	4		
37	UPPER COVER	709 424 071	1	550 440 708	4	551 440 501	4		

Figure 7.3



LeCroy 9424E QUAD 350 MHz OSCILLOSCOPE

100 Ms/s
10 Gs/s

TRACE DISPLAY CONTROL CURSOR POSITIONS SAVE

SELECT
ON/OFF

VERT GAIN
RESET
REDEFINE
POSITION

REFERENCE
TRACKING
DIFFERENCE

TIME/DIVISION
INTERLEAVED
5000 B
SAMPLING
ON

VERTICAL

VOLTS/DIV
5mV
VAR

TRIGGER

LEVEL
STATUS
ZERO
DELAY

CHANNEL SELECT

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

SMART TRIGGER

ADJUST
ZERO
SLOPE
MODE

AUTOSSETUP

SCREEN DUMP

GRID INTENSITY

CURSOR MEASUREMENT
PARAMETERS
VOLTAGE
TIME
RELATIVE
ABSOLUTE

BANDWIDTH LIMIT
ON

REMOTE
LOCAL
ON

PROBE CALIBRATOR

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

SOURCE
COUPLING
MODE

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

POWER ON REAR PANEL

STORE

SCREEN DUMP

GRID INTENSITY

CURSOR MEASUREMENT
PARAMETERS
VOLTAGE
TIME
RELATIVE
ABSOLUTE

BANDWIDTH LIMIT
ON

REMOTE
LOCAL
ON

PROBE CALIBRATOR

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

SOURCE
COUPLING
MODE

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

100 Ms/s
10 Gs/s

SELECT
ON/OFF

VERT GAIN
RESET
REDEFINE
POSITION

REFERENCE
TRACKING
DIFFERENCE

TIME/DIVISION
INTERLEAVED
5000 B
SAMPLING
ON

VERTICAL

VOLTS/DIV
5mV
VAR

TRIGGER

LEVEL
STATUS
ZERO
DELAY

CHANNEL SELECT

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

SMART TRIGGER

ADJUST
ZERO
SLOPE
MODE

AUTOSSETUP

SCREEN DUMP

GRID INTENSITY

CURSOR MEASUREMENT
PARAMETERS
VOLTAGE
TIME
RELATIVE
ABSOLUTE

BANDWIDTH LIMIT
ON

REMOTE
LOCAL
ON

POWER ON REAR PANEL

STORE

SCREEN DUMP

GRID INTENSITY

CURSOR MEASUREMENT
PARAMETERS
VOLTAGE
TIME
RELATIVE
ABSOLUTE

BANDWIDTH LIMIT
ON

REMOTE
LOCAL
ON

PROBE CALIBRATOR

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

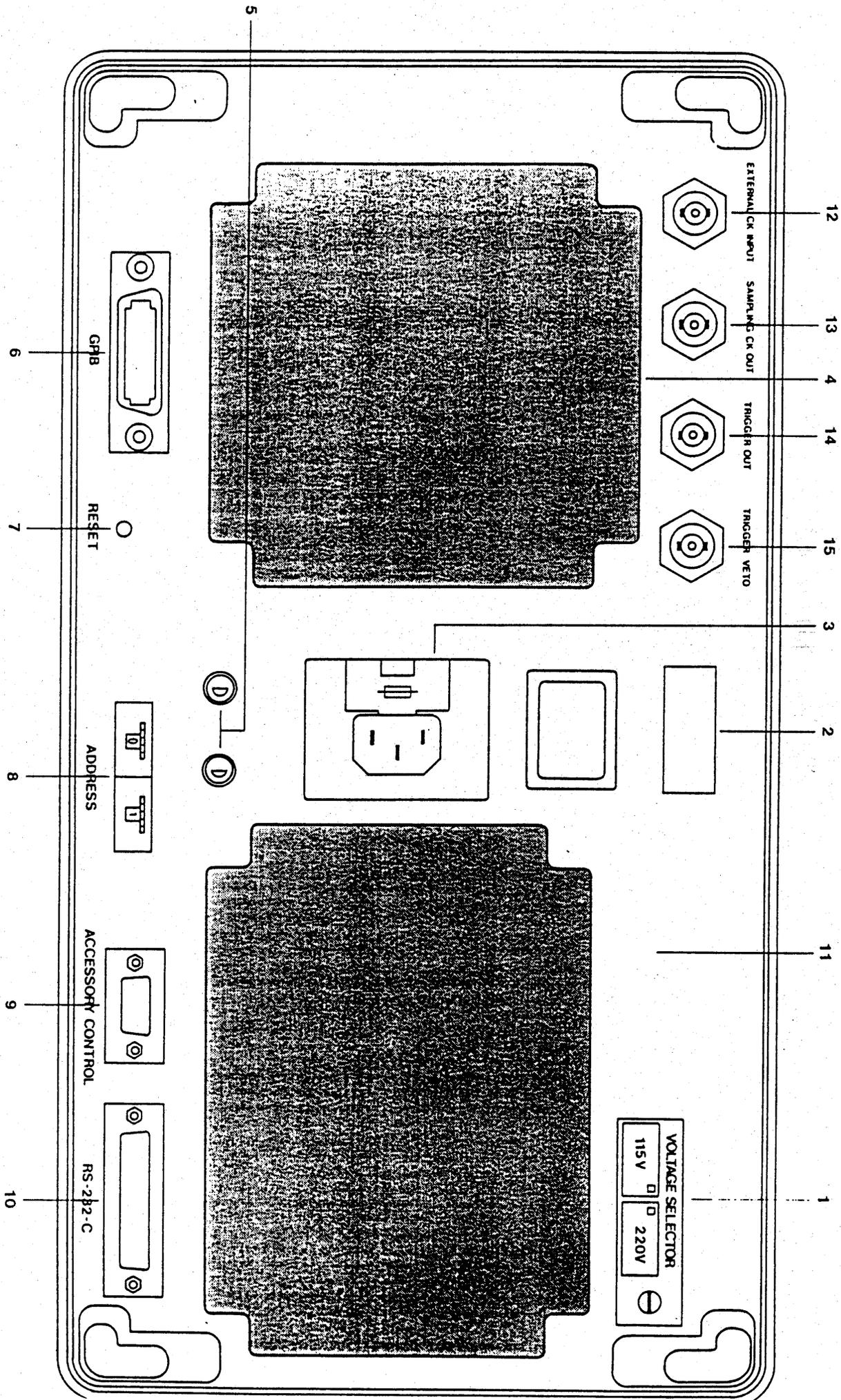
SOURCE
COUPLING
MODE

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

7.5 Front Panel description and part number

	<u>Function:</u>	<u>Description:</u>	<u>Part number:</u>
1)	Intensity	RES VAR cond plastic 5K knob for 1/8" shaft CAP for 021-1110 or 2215	184 437 502 536 168 003 536 068 006
2)	Grid intensity	Idem	
3)	Vert gain	RES VAR cond plastic 5K knob for 1/8" shaft CAP for knob 020-2215	184 417 502 536 168 001 536 068 003
4)	Position	Idem	
5)	Reference	Idem	
6)	Difference	Idem	
7)	Ch1, Ch2, Ch3, Ch4 offset	Idem	
8)	Delay	Idem	
9)	Level	Idem	
10)	Adjust	Idem	
11)	Position	RES VAR cond plastic 5K knob for 1/8" shaft CAP for 020-3215 or 3415	184 417 502 536 168 002 536 068 005
12)	Time magnifier	Switch ROT M/stop 12 pins knob for 1/8" shaft CAP for knob 020-3215 or 3415	412 001 012 536 068 001 536 068 005
13)	Time/division	Idem	
14)	Channel volts/div variable gain	RES VARI cond plastic 5K knob 1/8" shaft CAP for knob 020-2215 Switch Rot M/stop 12 pins	184 427 502 536 068 002 536 068 003 412 001 012
15)	Grids idem for all the other push button	Switch push button SPST Push switch extender	416 161 002 709 450 523

16)	Probe calibrator		HPC 411 AIH
17)	Ch1,Ch2,Ch3,Ch4	COMM CO.AX	402 110 302
18)	Memory card option:	128K Memory card option	334 049 070
	- 94XX-MC02	Lithium battery	312 682 325
	- 94XX-MC04	512K Memory card	334 049 090



Rear Panel

REAR PANEL DESCRIPTION AND PART NUMBER			
POS	DESCRIPTION	PART NUMBER	QTY
1	VOLTAGE SELECTOR COVER	709 424 911	1
	SCREW SELECTOR COVER	709 424 941	1
2	SERIAL NUMBER PLATE	709 450 913	1
	TAPPING SCREWS W/U-TREAD	554 500 001	2
3	FUSE NORMAL BLOWING 250V/5A	433 162 251	2
4	FAN AXIAL 12V	530 409 125	1
	SCREWS CYL INT HEX M4x12	550 440 412	4
	FLAT WASHERS M4	551 440 100	4
	WASHERS SHAKEPROOF M4	551 440 400	4
5	POWER SUPPLY F9451-1	315 040 015	1
	SCREWS FLAT HD PHIL M4x6	550 440 506	2
6	RTANGLE PCB CONN FEM 24	453 520 024	1
7	SWITCH PUSHBUT (MON) SPDT	416 132 008	1
8	SWITCHES ROTARY BCD-1248	412 022 022	2
9	HDR SOLD TAIL/MALE 9	454 611 009	1
10	HDR SOLD TAIL/MALE 25	454 611 025	1
11	REAR PANEL 94XX-9	709 424 901	1
12	BNC-SMD CABLE 45	780 249 945	1
13	BNC-SMD CABLE 45	780 249 945	1
14	BNC-SMD CABLE 27	780 259 927	1
15	BNC-SMD CABLE 27	780 259 927	1

Chapter 8

Parts List

Chapter 8

Parts List

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 1
 FINISHED GOODS--MANUFACTURED

PART: 9424
 DESC: 350 MHz QUAD CH. 100 Ms/s DSO UOM: EA SC: M REV: B

COMPONENT PART	DESCRIPTION	ITEM RV	ST NUMBR	QTY SC	PER UM	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION	
										ASSEMBLY
ACCESSORIES-9424	ACCESSORIES FOR 9424	D	11	R	EA	1.00	1.000	02/05/89	99/99/99	
F9420-3	DUAL CHANNEL 130 Ms/s ADC	E	3	R	EA	2.00	1.000	00/00/00	99/99/99	
F9420-4	TIMEBASE CARD	B	4	R	EA	1.00	1.000	00/00/00	99/99/99	
F9424-1	94xx-1 WITH MEMORY CARD LOGIC	C	1	R	EA	1.00	1.000	05/10/90	99/99/99	
F9424-2	SUPPORT FOR MEMORY CARD	A	12	R	EA	1.00	1.000	11/01/91	99/99/99	
F9424-5	QUAD CHANNEL FRONT PANEL CARD	E	5	R	EA	1.00	1.000	00/00/00	99/99/99	
F9424-6	PROCESSOR CARD	D	6	R	EA	1.00	1.000	02/06/89	99/99/99	
F9424-8	CLOCK-BUS	A	8	R	EA	1.00	1.000	17/02/89	99/99/99	
F9424E-7	QUAD CHANNEL 350 MHz FRONTEND	G	7	R	EA	1.00	1.000	16/05/90	99/99/99	
F9424E-9	REAR PANEL FOR 9424E	D	9	R	EA	1.00	1.000	16/05/90	99/99/99	
F9450-2	DISPLAY CARD FOR 94xx	K	2	R	EA	1.00	1.000	00/00/00	99/99/99	
M9424E	MECHANICAL FOR 9424E	C	10	R	EA	1.00	1.000	16/05/90	99/99/99	

MFG,RE,290,2 LeCroy Division ITI Production Database
23-DEC-1992 08:45

PLANT CODE: ITI_GVA

REQUESTER: CHRISTIAN
PAGE NO:

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 23/12/92

CLASS CODE: 2
SUBASSEMBLIES

PART: ACCESSORIES-9424

DESC: ACCESSORIES FOR 9424

UOM: EA SC: R REV: D

COMPONENT PART	DESCRIPTION	ITEM		ST	QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV	NUMBR						
407099008	PLUG FOR AC LINE -ENGLAND	10	P	EA	0.05	1.000	00/00/00	99/99/99	
433162251	FUSE SLOW BLOW 250V 5A	18	P	EA	2.00	1.000	13/08/92	99/99/99	
589202100	AC CORD/PLUG FOR FRANCE	8	P	EA	0.20	1.000	00/00/00	99/99/99	
589202200	AC CORD/PLUG FOR GERMANY	9	P	EA	0.25	1.000	00/00/00	99/99/99	
589203100	AC CORD/"SEV-ASE" PLUG	7	P	EA	0.05	1.000	00/00/00	99/99/99	
589203218	AC CORD/US-CANADA PLUG	6	P	EA	0.45	1.000	00/00/00	99/99/99	
597940011	SHIPPING CARTON 9400	2	B	EA	1.00	1.000	01/03/90	99/99/99	
597940014	PLASTIC BAG FOR 94XX & 93XX	4	B	EA	2.00	1.000	00/00/00	99/99/99	
597940015	MANUAL/ACCESSORY CTN 9400	5	B	EA	2.00	1.000	07/12/89	99/99/99	
597942403	SHIPPING INSERT (REAR) 9424	12	B	EA	2.00	1.000	01/03/90	99/99/99	
709424091	DSO COVER 9424	D	14	B	EA	1.00	1.000	31/01/90	99/99/99
9424-OM-E	9424 OPERATOR'S MANUAL - ENG.	15	B	EA	1.00	1.000	14/06/90	99/99/99	
94XX-RCM-E	94XX SERIES REMOTE CONTROL MAN	17	B	EA	1.00	1.000	20/11/90	99/99/99	
P9020	PROBE DC-300MHZ 10:1 (TESTED)	1	R	EA	4.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2

SUBASSEMBLIES

PART: F9420-3

DESC: DUAL CHANNEL 100 Ms/s ADC UOM: EA SC: R REV: E

COMPONENT PART	DESCRIPTION	ITEM RV	ST NUMBER	QTY SC	PER UM	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
190642221	RESISTOR NETWORK 220 OHMS	4	P	EA	2.00	1.000	00/00/00	99/99/99	
190642471	RESISTOR NETWORK 470 OHMS	5	P	EA	4.00	1.000	00/00/00	99/99/99	
205271256	IC 32K X 8 RAM 62256-12	10	P	EA	8.00	1.000	00/00/00	99/99/99	
205750000	IC AND-OR GATE ARRAY 16V8	300	P	EA	3.00	1.000	03/05/90	99/99/99	SEE PAL PROG. PROGRAMM ON PC
207200200	IC 8-BIT FLASH ADC 77200	14	P	EA	2.00	1.000	00/00/00	99/99/99	
208122002	IC VOLT REG POS UA7805	20	P	EA	1.00	1.000	00/00/00	99/99/99	
208123002	IC +12 VOLT REG LM340T-12	24	P	EA	1.00	1.000	00/00/00	99/99/99	
208124003	IC VOLT REG NEG LM320T-12	23	P	EA	1.00	1.000	00/00/00	99/99/99	
208590336	IC VOLT REFERENCE LM336	22	P	EA	1.00	1.000	00/00/00	99/99/99	
280170104	TRANSISTOR FET N VN0104N3	33	P	EA	2.00	1.000	00/00/00	99/99/99	
290120006	DELAY LINE 6 N-SEC	34	P	EA	1.00	1.000	00/00/00	99/99/99	
309040040	CRYSTAL OSCILLATOR 40MHZ	36	P	EA	1.00	1.000	00/00/00	99/99/99	
400410046	IC SOCKET GRID TYP 46	76	P	EA	2.00	1.000	10/05/89	99/99/99	
400412068	IC SOCKET GRID TYP 68-PIN	37	P	EA	1.00	1.000	09/01/89	99/99/99	
402610002	CONN CO-AX PC MTG SMB	38	P	EA	2.00	1.000	00/00/00	99/99/99	
403181008	HEADER STRT BREAKAW 8-PIN	39	P	EA	2.00	1.000	00/00/00	99/99/99	
454610096	HDR DIP SOLD TO MALE 96	41	P	EA	1.00	1.000	00/00/00	99/99/99	
500460006	INSULATOR THERMAFILM	42	P	EA	3.00	1.000	00/00/00	99/99/99	
550430104	SCREW CYL HD PHIL M3X4	44	P	EA	3.00	1.000	00/00/00	99/99/99	
585252354	RIVET HOLLOW 2,5X9MM	45	P	EA	2.00	1.000	00/00/00	99/99/99	
590681001	PIN EDGE CLIP STRAIGHT	72	P	EA	6.00	1.000	01/01/88	99/99/99	
709450321	HEAT SINK FOR FADC	A	77	B	EA	2.00	1.000	27/06/89	99/99/99
719420303	PC BD PREASS'Y 9420-3	B	69	B	EA	1.00	1.000	00/00/00	99/99/99
719450423	PC BD PREASS'Y 9450-42	C	73	B	EA	1.00	1.000	01/01/88	99/99/99
HS599011061	ADHESIVE (THERMAL COND) 709	78	P	ML	0.04	1.000	27/06/89	99/99/99	
HS410	HYB SAMPLE & HOLD HSH410	C	70	B	EA	2.00	1.000	00/00/00	99/99/99
IDX407	IC DEMULTIPLEXER MDX407	18	P	EA	2.00	1.000	00/00/00	99/99/99	
INX401	ICMIN MAX GATEARR. MNX401	71	B	EA	1.00	1.000	00/00/00	99/99/99	
M185457102	RES VARI CERMET 1 K	74	P	EA	2.00	1.000	28/02/89	99/99/99	
M185457103	RES VARI CERMET 10 K	1	P	EA	3.00	1.000	00/00/00	99/99/99	
M185457202	RES VARI CERMET 2 K	2	P	EA	3.00	1.000	00/00/00	99/99/99	
M200167105	IC 2-3-2 OR/NOR 10H105	6	P	EA	1.00	1.000	00/00/00	99/99/99	
M200172000	IC 2-INPUT NAND 74F00	7	P	EA	1.00	1.000	00/00/00	99/99/99	
M200178002	IC 2-INPUT NOR HCT02	8	P	EA	1.00	1.000	00/00/00	99/99/99	
M205217198	IC 16KX4BIT SRAM 7198S35	9	P	EA	16.00	1.000	00/00/00	99/99/99	
M207162965	IC MEMORY DRIVER 2965	12	P	EA	2.00	1.000	00/00/00	99/99/99	
M207179244	IC BUF/LINE DRIV HCT244	13	P	EA	3.00	1.000	00/00/00	99/99/99	
M207360125	IC TRANSLATO MC10125	15	P	EA	5.00	1.000	00/00/00	99/99/99	
M207460116	IC LINE RECEIVER 10H116	16	P	EA	2.00	1.000	00/00/00	99/99/99	
M207878245	IC BUS TRANSCVR HCT 245	17	P	EA	2.00	1.000	00/00/00	99/99/99	
M207972157	IC DATA SEL/MUX 74F157A	19	P	EA	4.00	1.000	00/00/00	99/99/99	
M208470358	IC DUAL OP AMP 358D	21	P	EA	3.00	1.000	00/00/00	99/99/99	
M227060320	IC DIG SIG PROC 320C25	25	P	EA	1.00	1.000	09/01/89	99/99/99	
M232022822	DIODE ARRAY SCHTTKY 2822	26	P	EA	2.00	1.000	00/00/00	99/99/99	
M236030099	DIODE SO-PKG BAV99	27	P	EA	3.00	1.000	00/00/00	99/99/99	
M270030092	TRANSISTOR NPN BFR92	28	P	EA	2.00	1.000	00/00/00	99/99/99	
M270040092	TRANSISTOR NPN BFR92R	29	P	EA	2.00	1.000	00/00/00	99/99/99	
M270330848	TRANSISTOR NPN BC848C	30	P	EA	2.00	1.000	00/00/00	99/99/99	
M275030092	TRANSISTOR PNP BFT92	31	P	EA	2.00	1.000	00/00/00	99/99/99	
M275330858	TRANSISTOR PNP BC858C	32	P	EA	2.00	1.000	00/00/00	99/99/99	
M300327102	INDUCTOR WOUND FERRITE 1UH	35	P	EA	6.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9420-3
 DESC: DUAL CHANNEL 100 Ms/s ADC

UOM: EA SC: R REV: E

COMPONENT PART	DESCRIPTION	ITEM		QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
		RV NUMBER	ST SC					
SM652101100	RES CHIP (E24) 1% 10 OHMS	46	P EA	3.00	1.000	00/00/00	99/99/99	
SM652101101	RES CHIP (E24) 1% 100 OHM	47	P EA	3.00	1.000	00/00/00	99/99/99	
SM652101103	RES CHIP (E24) 1% 10 K	48	P EA	4.00	1.000	00/00/00	99/99/99	
SM652101122	RES CHIP (E24) 1% 1.2 K	49	P EA	7.00	1.000	00/00/00	99/99/99	
SM652101151	RES CHIP (E24) 1% 150 OHM	50	P EA	4.00	1.000	00/00/00	99/99/99	
SM652101201	RES CHIP (E24) 1% 200 OHM	51	P EA	3.00	1.000	00/00/00	99/99/99	
SM652101222	RES CHIP (E24) 1% 2.2 K	52	P EA	2.00	1.000	00/00/00	99/99/99	
SM652101240	RES CHIP (E24) 1% 24 OHMS	53	P EA	9.00	1.000	00/00/00	99/99/99	
SM652101241	RES CHIP (E24) 1% 240 OHM	54	P EA	2.00	1.000	00/00/00	99/99/99	
SM652101272	RES CHIP (E24) 1% 2.7 K	55	P EA	2.00	1.000	00/00/00	99/99/99	
SM652101332	RES CHIP (E24) 1% 3.3 K	56	P EA	6.00	1.000	00/00/00	99/99/99	
SM652101390	RES CHIP (E24) 1% 39 OHMS	57	P EA	10.00	1.000	00/00/00	99/99/99	
SM652101392	RES CHIP (E24) 1% 3.9 K	58	P EA	2.00	1.000	00/00/00	99/99/99	
SM652101471	RES CHIP (E24) 1% 470 OHM	59	P EA	8.00	1.000	00/00/00	99/99/99	
SM652101510	RES CHIP (E24) 1% 51 OHMS	60	P EA	10.00	1.000	00/00/00	99/99/99	
SM652101681	RES CHIP (E24) 1% 680 OHM	61	P EA	4.00	1.000	00/00/00	99/99/99	
SM652101820	RES CHIP (E24) 1% 82 OHMS	62	P EA	6.00	1.000	00/00/00	99/99/99	
SM652101821	RES CHIP (E24) 1% 820 OHM	75	P EA	1.00	1.000	03/04/89	99/99/99	
SM661127104	CAP CERA CHIP 20% .1 UF	63	P EA	34.00	1.000	26/06/89	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF	64	P EA	69.00	1.000	00/00/00	99/99/99	
SM661255220	CAP CERA CHIP 5% 22 PF	65	P EA	1.00	1.000	00/00/00	99/99/99	
SM666237476	CAP MOLD TANT CHIP 47 UF	66	P EA	7.00	1.000	00/00/00	99/99/99	
SM666247106	CAP MOLD TANT CHIP 10 UF	67	P EA	4.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

PLANT CODE: ITI_GVA

REQUESTER: CHRISTIAN
 PAGE NO:

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9420-4
 DESC: TIMEBASE CARD

UOM: EA SC: R REV: B

COMPONENT PART	DESCRIPTION	ITEM RV NUMBER	ST SC	QTY PER UM	PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
103336474	CAP CERA MONO 50V .47UF	1	P	EA	1.00	1.000	00/00/00	99/99/99	
190042563	RESISTOR NETWORK 56K	6	P	EA	1.00	1.000	00/00/00	99/99/99	
190642221	RESISTOR NETWORK 220 OHMS	7	P	EA	1.00	1.000	00/00/00	99/99/99	
190642332	RESISTOR NETWORK 3.3 K	8	P	EA	1.00	1.000	00/00/00	99/99/99	
190642562	RESISTOR NETWORK 5.6 K	9	P	EA	4.00	1.000	00/00/00	99/99/99	
205750000	IC AND-OR GATE ARRAY 16V8	300	P	EA	2.00	1.000	03/05/90	99/99/99	
207281703	IC MONO DAC 16 BIT 703JP	31	P	EA	1.00	1.000	00/00/00	99/99/99	SEE PAL PROG. PROGRAMM ON PC
208123002	IC +12 VOLT REG LM340T-12	36	P	EA	1.00	1.000	20/09/90	99/99/99	
208124003	IC VOLT REG NEG LM320T-12	35	P	EA	1.00	1.000	00/00/00	99/99/99	
290120005	DELAY LINE 5NS	53	P	EA	1.00	1.000	00/00/00	99/99/99	
310060012	CRYSTAL 10PPM 12.4031MHZ	58	P	EA	1.00	1.000	00/00/00	99/99/99	
310062100	CRYSTAL 10PPM 100MHZ	59	P	EA	1.00	1.000	00/00/00	99/99/99	
402610002	CONN CO-AX PC MTG SMB	60	P	EA	4.00	1.000	00/00/00	99/99/99	
403181008	HEADER STRT BREAKAW 8-PIN	61	P	EA	1.00	1.000	00/00/00	99/99/99	
454340002	HDR MALE PIN TO WW 02	62	P	EA	2.00	1.000	00/00/00	99/99/99	
454610096	HDR DIP SOLD TO MALE 96	63	P	EA	1.00	1.000	00/00/00	99/99/99	
554435401	RIVET "RIVSCREW" M 3.5	64	P	EA	2.00	1.000	28/11/89	99/99/99	
585252354	RIVET HOLLOW 2,5X9MM	68	P	EA	2.00	1.000	00/00/00	99/99/99	
690000000	PINS/CLIP ON	125	P	EA	3.00	1.000	00/00/00	99/99/99	
690681001	PIN EDGE CLIP STRAIGHT	127	P	EA	36.00	1.000	14/11/88	99/99/99	
719420403	PC BD PREASS'Y 9420-4	B 129	B	EA	1.00	1.000	00/00/00	99/99/99	
719450413	PC BD PREASS'Y 9450-41	B 130	B	EA	1.00	1.000	00/00/00	99/99/99	
719450423	PC BD PREASS'Y 9450-42	C 131	B	EA	2.00	1.000	14/11/88	99/99/99	
719450433	PC BD PREASS'Y 9450-43	C 132	B	EA	4.00	1.000	14/11/88	99/99/99	
FTD405	HYBID TIME DIGIT. HTD405	A 133	B	EA	1.00	1.000	00/00/00	99/99/99	
SM158043006	CAP VARIABLE 2 - 6 PF	2	P	EA	1.00	1.000	00/00/00	99/99/99	
SM158043020	CAP VARIABLE 4.5-20 PF	3	P	EA	1.00	1.000	00/00/00	99/99/99	
SM158044010	CAP VARIABLE 3-10PF	5	P	EA	3.00	1.000	00/00/00	99/99/99	
SM200160101	IC OR/NOR GATE 10H101	10	P	EA	2.00	1.000	00/00/00	99/99/99	
M200160402	IC 16-BIT SCALER MCT402	11	P	EA	6.00	1.000	00/00/00	99/99/99	
M200167102	IC NOR GATE 10H102	12	P	EA	5.00	1.000	00/00/00	99/99/99	
M200167104	IC 2-IN AND GATE 10H104	13	P	EA	2.00	1.000	00/00/00	99/99/99	
M200167105	IC 2-3-2 OR/NOR 10H105	14	P	EA	3.00	1.000	00/00/00	99/99/99	
M200167107	IC 2-IN EXCL OR/NOR10H107	15	P	EA	3.00	1.000	00/00/00	99/99/99	
M200167109	IC 4-5 IN OR/NOR 10H109	16	P	EA	1.00	1.000	00/00/00	99/99/99	
M200167121	IC OR-AND/O-A-INV 10H121	17	P	EA	4.00	1.000	00/00/00	99/99/99	
M200167131	IC M-S TYP D FLOP 10H131	18	P	EA	16.00	1.000	00/00/00	99/99/99	
M200172000	IC 2-INPUT NAND 74F00	19	P	EA	1.00	1.000	00/00/00	99/99/99	
M200172011	IC 3-INPUT AND 74F11	20	P	EA	1.00	1.000	00/00/00	99/99/99	
M200172074	IC D-TYP FLOP 74F74	21	P	EA	3.00	1.000	00/00/00	99/99/99	
M200172113	IC J-K TYP FLOP 74F113	22	P	EA	1.00	1.000	00/00/00	99/99/99	
M200172374	IN D-TYP FLOP 74F374	23	P	EA	2.00	1.000	00/00/00	99/99/99	
M200178000	IC 2-INPUT NAND HCT00	24	P	EA	2.00	1.000	00/00/00	99/99/99	
M200178574	IC D-TYP FLOP HCT 574	25	P	EA	8.00	1.000	00/00/00	99/99/99	
M200267016	IC BINARY COUNTER 10H016	26	P	EA	3.00	1.000	00/00/00	99/99/99	
M200278040	IC COUNTER HCT4040	27	P	EA	3.00	1.000	00/00/00	99/99/99	
M200478573	IC D-TYP LATCH 74HCT573	28	P	EA	6.00	1.000	00/00/00	99/99/99	
M207160192	IC BUS DRIV MC10192	30	P	EA	1.00	1.000	00/00/00	99/99/99	
M207360125	IC TRANSLATO MC10125	32	P	EA	4.00	1.000	00/00/00	99/99/99	
M207460116	IC LINE RECEIVER 10H116	33	P	EA	9.00	1.000	00/00/00	99/99/99	
M207878245	IC BUS TRANSCVR HCT 245	34	P	EA	2.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

PLANT CODE: ITI_GVA

REQUESTER: CHRISTIA
 PAGE NO:

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9420-4
 DESC: TIMEBASE CARD

UOM: EA SC: R REV: B

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV NUMBR	SC UM					
SM232120070	DIODE ARRAY BAV70	37	P EA		2.00	1.000	00/00/00	99/99/99
SM236030099	DIODE SO-PKG BAV99	38	P EA		8.00	1.000	00/00/00	99/99/99
SM270030019	TRANSISTOR NPN BFS19	39	P EA		3.00	1.000	00/00/00	99/99/99
SM270030020	TRANSISTOR NPN BFS20	40	P EA		1.00	1.000	00/00/00	99/99/99
SM270030092	TRANSISTOR NPN BFR92	41	P EA		7.00	1.000	00/00/00	99/99/99
SM270040092	TRANSISTOR NPN BFR92R	42	P EA		3.00	1.000	00/00/00	99/99/99
SM270130092	TRANSISTOR NPN BFR92A	43	P EA		1.00	1.000	00/00/00	99/99/99
SM270140092	TRANSISTOR NPN BFR92AR	44	P EA		2.00	1.000	00/00/00	99/99/99
SM270330848	TRANSISTOR NPN BC848C	45	P EA		1.00	1.000	00/00/00	99/99/99
SM270340848	TRANSISTOR NPN 848CR	46	P EA		1.00	1.000	00/00/00	99/99/99
SM275030550	TRANSISTOR PNP BF550	47	P EA		4.00	1.000	00/00/00	99/99/99
SM275040550	TRANSISTOR PNP BF550R	48	P EA		3.00	1.000	00/00/00	99/99/99
SM275330858	TRANSISTOR PNP BC858C	49	P EA		5.00	1.000	00/00/00	99/99/99
SM275340858	TRANSISTOR PNP 858CR	50	P EA		3.00	1.000	00/00/00	99/99/99
SM289240061	TRANSISTOR NPN BCV61	51	P EA		1.00	1.000	00/00/00	99/99/99
SM289240062	TRANSISTOR ARRAY BCV62	52	P EA		2.00	1.000	00/00/00	99/99/99
SM300446150	INDUCTOR .015UH	54	P EA		2.00	1.000	00/00/00	99/99/99
SM300446330	INDUCTOR .033 UH	55	P EA		1.00	1.000	00/00/00	99/99/99
SM300546151	INDUCTOR .15 UH	56	P EA		1.00	1.000	00/00/00	99/99/99
SM652101101	RES CHIP (E24) 1% 100 OHM	69	P EA		10.00	1.000	20/09/90	99/99/99
SM652101102	RES CHIP (E24) 1% 1 K	70	P EA		15.00	1.000	00/00/00	99/99/99
SM652101103	RES CHIP (E24) 1% 10 K	71	P EA		11.00	1.000	00/00/00	99/99/99
SM652101121	RES CHIP (E24) 1% 120 OHM	72	P EA		4.00	1.000	00/00/00	99/99/99
SM652101122	RES CHIP (E24) 1% 1.2 K	73	P EA		1.00	1.000	00/00/00	99/99/99
SM652101151	RES CHIP (E24) 1% 150 OHM	74	P EA		15.00	1.000	00/00/00	99/99/99
SM652101152	RES CHIP (E24) 1% 1.5 K	134	P EA		1.00	1.000	21/11/88	99/99/99
SM652101161	RES CHIP (E24) 1% 160 OHM	75	P EA		5.00	1.000	00/00/00	99/99/99
SM652101162	RES CHIP (E24) 1% 1.6 K	76	P EA		1.00	1.000	00/00/00	99/99/99
SM652101180	RES CHIP (E24) 1% 18 OHMS	77	P EA		8.00	1.000	00/00/00	99/99/99
SM652101181	RES CHIP (E24) 1% 180 OHM	78	P EA		4.00	1.000	00/00/00	99/99/99
SM652101182	RES CHIP (E24) 1% 1.8 K	79	P EA		1.00	1.000	00/00/00	99/99/99
SM652101201	RES CHIP (E24) 1% 200 OHM	80	P EA		6.00	1.000	00/00/00	99/99/99
SM652101202	RES CHIP (E24) 1% 2 K	81	P EA		9.00	1.000	00/00/00	99/99/99
SM652101221	RES CHIP (E24) 1% 220 OHM	82	P EA		8.00	1.000	00/00/00	99/99/99
SM652101222	RES CHIP (E24) 1% 2.2 K	83	P EA		4.00	1.000	00/00/00	99/99/99
SM652101223	RES CHIP (E24) 1% 22 K	84	P EA		1.00	1.000	00/00/00	99/99/99
SM652101242	RES CHIP (E24) 1% 2.4 K	85	P EA		2.00	1.000	01/01/88	99/99/99
SM652101271	RES CHIP (E24) 1% 270 OHM	86	P EA		20.00	1.000	00/00/00	99/99/99
SM652101272	RES CHIP (E24) 1% 2.7 K	87	P EA		4.00	1.000	00/00/00	99/99/99
SM652101301	RES CHIP (E24) 1% 300 OHM	88	P EA		3.00	1.000	00/00/00	99/99/99
SM652101302	RES CHIP (E24) 1% 3 K	89	P EA		3.00	1.000	00/00/00	99/99/99
SM652101330	RES CHIP (E24) 1% 33 OHMS	90	P EA		3.00	1.000	00/00/00	99/99/99
SM652101331	RES CHIP (E24) 1% 330 OHM	91	P EA		17.00	1.000	00/00/00	99/99/99
SM652101332	RES CHIP (E24) 1% 3.3 K	92	P EA		5.00	1.000	00/00/00	99/99/99
SM652101362	RES CHIP (E24) 1% 3.6 K	93	P EA		5.00	1.000	00/00/00	99/99/99
SM652101391	RES CHIP (E24) 1% 390 OHM	136	P EA		1.00	1.000	21/11/88	99/99/99
SM652101470	RES CHIP (E24) 47 OHMS	94	P EA		32.00	1.000	20/09/90	99/99/99
SM652101471	RES CHIP (E24) 1% 470 OHM	95	P EA		54.00	1.000	00/00/00	99/99/99
SM652101510	RES CHIP (E24) 1% 51 OHMS	96	P EA		13.00	1.000	00/00/00	99/99/99
SM652101512	RES CHIP (E24) 1% 5.1 K	97	P EA		10.00	1.000	00/00/00	99/99/99
SM652101560	RES CHIP (E24) 1% 56 OHM	98	P EA		1.00	1.000	00/00/00	99/99/99

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9420-4
 DESC: TIMEBASE CARD

UOM: EA SC: R REV: B

COMPONENT PART	DESCRIPTION	ITEM RV NUMBER	ST SC	QTY UM	PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
SM652101561	RES CHIP (E24) 1% 560 OHM	99	P	EA		2.00	1.000	00/00/00	99/99/99
SM652101562	RES CHIP (E24) 1% 5.6 K	100	P	EA		14.00	1.000	20/09/90	99/99/99
SM652101622	RES CHIP (E24) 1% 6.2 K	101	P	EA		24.00	1.000	00/00/00	99/99/99
SM652101680	RES CHIP (E24) 1% 68 OHMS	102	P	EA		3.00	1.000	20/09/90	99/99/99
SM652101681	RES CHIP (E24) 1% 680 OHM	103	P	EA		35.00	1.000	00/00/00	99/99/99
SM652101820	RES CHIP (E24) 1% 82 OHMS	105	P	EA		45.00	1.000	20/09/90	99/99/99
SM652101821	RES CHIP (E24) 1% 820 OHM	106	P	EA		36.00	1.000	00/00/00	99/99/99
SM652101822	RES CHIP (E24) 1% 8.2 K	107	P	EA		2.00	1.000	00/00/00	99/99/99
SM653125033	RES THICK FILM 5% 3.3 OHM	108	P	EA		2.00	1.000	01/01/88	99/99/99
SM661127104	CAP CERA CHIP 20% .1 UF	109	P	EA		2.00	1.000	26/06/89	99/99/99
SM661186180	CAP CERA CHIP 10% 18 PF	110	P	EA		2.00	1.000	00/00/00	99/99/99
SM661205332	CAP CERA CHIP 10% 3300 PF	122	P	EA		1.00	1.000	20/09/90	99/99/99
SM661207102	CAP CERA CHIP 10% .001UF	111	P	EA		6.00	1.000	00/00/00	99/99/99
SM661207103	CAP CERA CHIP 20% .01UF	112	P	EA		109.00	1.000	00/00/00	99/99/99
SM661250047	CAP CERA CHIP 4.7 PF	113	P	EA		2.00	1.000	00/00/00	99/99/99
SM661250082	CAP CERA CHIP .1% 8.2 PF	114	P	EA		4.00	1.000	00/00/00	99/99/99
SM661255100	CAP CERA CHIP 10PF	115	P	EA		1.00	1.000	00/00/00	99/99/99
SM661255101	CAP CERA CHIP 5% 100 PF	116	P	EA		2.00	1.000	00/00/00	99/99/99
SM661255181	CAP CERA CHIP 5% 180 PF	118	P	EA		1.00	1.000	00/00/00	99/99/99
SM661255221	CAP CERA CHIP 5% 220 PF	119	P	EA		1.00	1.000	00/00/00	99/99/99
SM661255270	CAP CERA CHIP 27PF	120	P	EA		5.00	1.000	00/00/00	99/99/99
SM661255330	CAP CERA CHIP 5% 33 PF	121	P	EA		2.00	1.000	00/00/00	99/99/99
SM661255560	CAP CERA CHIP 56PF	123	P	EA		9.00	1.000	00/00/00	99/99/99
SM666247106	CAP MOLD TANT CHIP 10 UF	124	P	EA		6.00	1.000	00/00/00	99/99/99

BILL OF MATERIALS REPORT

PLANT CODE: ITI_GVA

REQUESTER: CHRISTIA
PAGE NO:

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 23/12/92

CLASS CODE: 2
SUBASSEMBLIES
PART: F9424-1
DESC: 94xx-1 WITH MEMORY CARD LOGIC UOM: EA SC: R REV: C

COMPONENT PART	DESCRIPTION	ITEM RV NUMBER	ST SC	QTY PER UM	PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
102484471	CAP CERA DISC 100V 470 PF	1	P	EA		1.00	1.000	00/00/00	99/99/99
103327103	CAP CERA MONO 50V .01 UF	2	P	EA		35.00	1.000	14/02/92	99/99/99
103427104	CAP CERA MONO 100V .1 UF	3	P	EA		2.00	1.000	00/00/00	99/99/99
142214156	CAP TANT DIP CASE 15 UF	4	P	EA		2.00	1.000	00/00/00	99/99/99
142714685	CAP TANT DIP CASE 6.8UF	5	P	EA		2.00	1.000	00/00/00	99/99/99
146634106	CAP MINI ALUM 20% 10 UF	6	P	EA		2.00	1.000	00/00/00	99/99/99
147436033	CAP ALUM METAL CAN 33 UF	7	P	EA		4.00	1.000	00/00/00	99/99/99
161225101	RES COMP 1/8W 5% 100 OHMS	8	P	EA		1.00	1.000	00/00/00	99/99/99
161225103	RES COMP 1/8W 5% 10 K	9	P	EA		3.00	1.000	15/10/90	99/99/99
161225274	RES CARBON FILM 270 K	10	P	EA		1.00	1.000	00/00/00	99/99/99
161225302	RES COMP 1/8W 5% 3 K	11	P	EA		2.00	1.000	00/00/00	99/99/99
161225395	RES CARBON FILM 3.9 MEG	12	P	EA		1.00	1.000	00/00/00	99/99/99
161225471	RES COMP 1/8W 5% 470 OHMS	13	P	EA		1.00	1.000	00/00/00	99/99/99
161225683	RES COMP 1/8W 5% 68 K	62	P	EA		3.00	1.000	15/10/90	99/99/99
181447104	RES VARI CERMET 100 K	14	P	EA		2.00	1.000	00/00/00	99/99/99
190042103	RESISTOR NETWORK 10 K	15	P	EA		2.00	1.000	00/00/00	99/99/99
190042104	RESISTOR NETWORK 100K	16	P	EA		2.00	1.000	00/00/00	99/99/99
190832102	RES NETWORK 1 K	17	P	EA		1.00	1.000	00/00/00	99/99/99
190832103	RESISTOR NETWORK 10K	18	P	EA		1.00	1.000	00/00/00	99/99/99
190832471	RESISTOR NETWORK 470 OHMS	19	P	EA		2.00	1.000	00/00/00	99/99/99
200331074	IC DUAL FLOP 74HCT74	20	P	EA		1.00	1.000	00/00/00	99/99/99
200340173	IC D-TYP FLOP HCT173	21	P	EA		2.00	1.000	00/00/00	99/99/99
200373374	IC D-TYP FLOP 74HCT374	22	P	EA		2.00	1.000	00/00/00	99/99/99
200440040	IC12-ST BIN COUNT HCT4040	23	P	EA		1.00	1.000	00/00/00	99/99/99
200440102	IC COWN COUNT. 74HCT40102	24	P	EA		1.00	1.000	00/00/00	99/99/99
205277202	FIFO 1024X9 BITS	25	P	EA		1.00	1.000	00/00/00	99/99/99
205750000	IC AND-OR GATE ARRAY 16V8	300	P	EA		7.00	1.000	03/05/90	99/99/99
207171541	IC BUFFER/LINE DRI.HCT541	29	P	EA		9.00	1.000	00/00/00	99/99/99
207197210	IC BUS INTERF CONTR 7210	30	P	EA		1.00	1.000	00/00/00	99/99/99
207280703	IC 16-BIT DAC 703	31	P	EA		1.00	1.000	00/00/00	99/99/99
207440232	IC XMTR/RCVR MAX 232	32	P	EA		1.00	1.000	00/00/00	99/99/99
207470160	IC OCTAL BUS XCVR 75160A	33	P	EA		1.00	1.000	00/00/00	99/99/99
207470161	IC OCTL BUS XCEIR 75161A	34	P	EA		1.00	1.000	00/00/00	99/99/99
207472245	IC BUS TRNSCVR HCT249	35	P	EA		4.00	1.000	00/00/00	99/99/99
207552661	IC INTERFACE 2661A	36	P	EA		1.00	1.000	00/00/00	99/99/99
230020062	DIODE SWITCHING BAW62	37	P	EA		16.00	1.000	00/00/00	99/99/99
253010835	DIODE HOT CARRIER HP2835	38	P	EA		3.00	1.000	00/00/00	99/99/99
309040005	CRYSTAL OSCIL. 4.9152MHZ	39	P	EA		1.00	1.000	00/00/00	99/99/99
400331020	SOCKET IC ST DIP-20	40	P	EA		1.00	1.000	00/00/00	99/99/99
400412068	IC SOCKET GRID TYP 68-PIN	41	P	EA		1.00	1.000	00/00/00	99/99/99
403950002	POLARIZING KEY	42	P	EA		4.00	1.000	00/00/00	99/99/99
412022022	SWITCH ROTARY BCD-1248	43	P	EA		2.00	1.000	00/00/00	99/99/99
416132008	SWITCH PUSHBUT (MOM) SPDT	44	P	EA		1.00	1.000	00/00/00	99/99/99
453521024	CONN RT ANGLE IEEE FEM 24	45	P	EA		1.00	1.000	06/11/91	99/99/99
454110010	HDR SOLD TAIL/MALE PIN 10	46	P	EA		1.00	1.000	00/00/00	99/99/99
454211040	HDR SOLD TAIL TO MALE 40	47	P	EA		2.00	1.000	00/00/00	99/99/99
454320096	HDR DIP SOLD TO FEM 96	48	P	EA		6.00	1.000	00/00/00	99/99/99
454510009	CONN RT ANGLE MALE W/UNC 9	49	P	EA		1.00	1.000	23/11/92	99/99/99
454510025	CONN RT ANGLE MALE W/INC 25	50	P	EA		1.00	1.000	23/11/92	99/99/99
530040006	BUZZER 85DB 4 TO 7V	52	P	EA		1.00	1.000	00/00/00	99/99/99
550130108	SCREW CYL HD M3X8	53	P	EA		6.00	1.000	26/06/90	99/99/99

SEE PAL PROG. PROGRAMM ON PC

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2

SUBASSEMBLIES

PART: F9424-1

DESC: 94xx-1 WITH MEMORY CARD LOGIC UOM: EA SC: R REV: C

COMPONENT PART	DESCRIPTION	ITEM RV NUMBER	SC	ST UM	QTY PER ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
551430400	WASHER SHAKEPROOF M3	61	P	EA	4.00	1.000	06/11/91	99/99/99	
554630100	THREADED INSERT M3X1.5	60	P	EA	4.00	1.000	06/11/91	99/99/99	
585252236	RIVET HOLLOW 2.5X6MM	57	P	EA	12.00	1.000	00/00/00	99/99/99	
719424103	PC BD PREASS'Y 9424-1	B 58	B	EA	1.00	1.000	00/00/00	99/99/99	
MCL404	IC MEM GATE ARRAY MCL404	59	P	EA	1.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9424-2
 DESC: SUPPORT FOR MEMORY CARD

UOM: EA SC: R REV: A

COMPONENT PART	DESCRIPTION	ITEM		ST	QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION	
		RV	NUMBER							SC
103427104	CAP CERA MONO 100V .1 UF			1	P	EA	1.00	1.000	00/00/00	99/99/99
190642103	RESISTOR NETWORK 10 K			6	P	EA	1.00	1.000	07/11/90	99/99/99
200331027	IC 3-IN POS-NOR 74HC27			7	P	EA	1.00	1.000	12/11/90	99/99/99
403950002	POLARIZING KEY			5	P	EA	2.00	1.000	11/04/90	99/99/99
404500068	CONN BD TO BD 68 POS			4	P	EA	1.00	1.000	07/11/90	99/99/99
454611040	HDR DIP SOLD TO MALE 40			2	P	EA	1.00	1.000	00/00/00	99/99/99
550130108	SCREW CYL HD M3X8			8	P	EA	2.00	1.000	07/12/90	99/99/99
552130101	NUT HEX M3			9	P	EA	2.00	1.000	07/12/90	99/99/99
585252354	RIVET HOLLOW 2,5X9MM			10	P	EA	2.00	1.000	07/12/90	99/99/99
719424203	PC BD PREASS'Y 9424-2	E		3	B	EA	1.00	1.000	00/00/00	99/99/99

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2

SUBASSEMBLIES

PART: F9424-5

DESC: QUAD CHANNEL FRONT PANEL CARD UOM: EA SC: R REV: E

COMPONENT PART	DESCRIPTION	ITEM RV NUMBR	SC	ST QTY PER UM ASSEMBLY	YIELD FACTR	EFFECTIV DATE	INACTIVE DATE	REFERENCE INFORMATION
103327103	CAP CERA MONO 50V .01 UF	13	P	EA	3.00	1.000	06/02/89	99/99/99
103427104	CAP CERA MONO 100V .1 UF	14	P	EA	8.00	1.000	24/01/89	99/99/99
161225103	RES COMP 1/8W 5% 10 K	15	P	EA	2.00	1.000	24/01/89	99/99/99
161225121	RES COMP 1/8W 5% 120 OHMS	16	P	EA	21.00	1.000	24/01/89	99/99/99
168531365	RES PREC RN55D 511 OHMS	17	P	EA	2.00	1.000	24/01/89	99/99/99
168531381	RES PREC RN55D 750 OHMS	18	P	EA	1.00	1.000	24/01/89	99/99/99
168531521	RES PREC RN55D 21.5 K	19	P	EA	1.00	1.000	24/01/89	99/99/99
169416473	RESISTOR DISC NTC 47 K	20	P	EA	1.00	1.000	24/01/89	99/99/99
184417502	RES VARI COND PLASTIC 5 K	21	P	EA	9.00	1.000	24/01/89	99/99/99
184427502	RES VARI COND PLASTIC 5 K	22	P	EA	1.00	1.000	24/01/89	99/99/99
184437502	RES VARI COND PLASTIC 5 K	23	P	EA	2.00	1.000	24/01/89	99/99/99
190001001	RES NETWORK SPECIAL	24	P	EA	1.00	1.000	24/01/89	99/99/99
200344138	IC DECODER 3TO8 74HCT138	25	P	EA	1.00	1.000	24/01/89	99/99/99
205644094	IC 8-BIT SHIFT REGHCT4094	26	P	EA	7.00	1.000	24/01/89	99/99/99
205750000	IC AND-OR GATE ARRAY 16V8	300	P	EA	1.00	1.000	03/05/90	99/99/99
207345051	IC MUX/DEMUX HCT4051	28	P	EA	3.00	1.000	24/01/89	99/99/99
208590385	IC VOLT REF LM385	29	P	EA	1.00	1.000	24/01/89	99/99/99
230020062	DIODE SWITCHING BAW62	30	P	EA	57.00	1.000	24/01/89	99/99/99
256243300	DIODE LED RED HLMP-0300	31	P	EA	4.00	1.000	24/01/89	99/99/99
256443421	DIODE LED YEL HLMP-0421	32	P	EA	49.00	1.000	24/01/89	99/99/99
403950002	POLARIZING KEY	44	P	EA	2.00	1.000	06/02/89	99/99/99
412001012	SWITCH ROT N/STOP 12-PINS	33	P	EA	3.00	1.000	24/01/89	99/99/99
416161003	SWITCH PUSHBUTTON SPST	34	P	EA	52.00	1.000	24/01/89	99/99/99
454211020	HDR SOLD TAIL TO MALE 20	35	P	EA	1.00	1.000	24/01/89	99/99/99
536068001	KNOB FOR 6MM SHAFT	1001	P	EA	3.00	1.000	02/05/89	99/99/99
536068002	KNOB FOR 3MM SHAFT	1002	P	EA	1.00	1.000	02/05/89	99/99/99
536068003	CAP (FOR KNOB 020-2215)	1003	P	EA	9.00	1.000	02/05/89	99/99/99
536068005	CAP FOR 020-3215 OR -3415	1004	P	EA	3.00	1.000	02/05/89	99/99/99
536068006	CAP FOR 021-1110 OR -2215	1005	P	EA	2.00	1.000	02/05/89	99/99/99
536168001	KNOB FOR 1/8" SHAFT	1006	P	EA	8.00	1.000	03/05/89	99/99/99
536168002	KNOB FOR 1/8" SHAFT	1007	P	EA	1.00	1.000	02/05/89	99/99/99
536168003	KNOB FOR 1/8" SHAFT	1008	P	EA	2.00	1.000	02/05/89	99/99/99
50430106	SCREW CYL HD PHIL M3X6	36	P	EA	8.00	1.000	01/03/92	99/99/99
51430300	WASHER SHAKEPROOF M3	37	P	EA	8.00	1.000	01/03/92	99/99/99
53230108	SPACER HEX M3X8MM	38	P	EA	4.00	1.000	01/03/92	99/99/99
54422004	SCREW SELF TAPPING PHIL HD	1009	P	EA	13.00	1.000	01/03/90	99/99/99
09400511	LED COVER 9400-5	A	39	B EA	53.00	1.000	24/01/89	99/99/99
09450511	CALIBR.TERMIN. 9450-5		40	B EA	2.00	1.000	24/01/89	99/99/99
09450523	PUSH SWITCH EXTENDER	D	41	B EA	52.00	1.000	24/01/89	99/99/99
19424513	PC BD PREASS'Y 9424-51	C	42	B EA	1.00	1.000	24/01/89	99/99/99
19424523	PC BD PREASS'Y 9424-52	C	43	B EA	1.00	1.000	24/01/89	99/99/99
29424521	SPRING CONTACT		45	P EA	1.00	1.000	14/08/89	99/99/99
P9424-5	COMPLETED FRONT PANEL 9424-5	B	1000	R EA	0.75	1.000	16/05/90	99/99/99
P9424E-5	COMPLETED FRONT PANEL 9424E-5	B	1010	R EA	0.25	1.000	16/05/90	99/99/99
PC411A1H	PROBE CALIBRATOR	A	1	R EA	1.00	1.000	02/05/89	99/99/99

SEE PAL PROG. PROGRAMM ON PC

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9424-6
 DESC: PROCESSOR CARD

UOM: EA SC: R REV: D

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV	NUMBER SC					
102412100	CAP CERA DISC 100V 10 PF	4	P EA	1.00	1.000	00/00/00	99/99/99	
102412220	CAP CERA DISC 100V 22 PF	6	P EA	1.00	1.000	00/00/00	99/99/99	
103327103	CAP CERA MONO 50V .01 UF	1	P EA	35.00	1.000	14/02/92	99/99/99	
103427104	CAP CERA MONO 100V .1 UF	2	P EA	35.00	1.000	00/00/00	99/99/99	
103506331	CAP CERA MONO 100V 330 PF	7	P EA	1.00	1.000	00/00/00	99/99/99	
103625151	CAP CERA MONO 100V 150 PF	5	P EA	2.00	1.000	00/00/00	99/99/99	
142214156	CAP TANT DIP CASE 15 UF	8	P EA	1.00	1.000	00/00/00	99/99/99	
146354107	CAP MINI ALUM 20% 100 UF	9	P EA	3.00	1.000	00/00/00	99/99/99	
147436033	CAP ALUM METAL CAN 33 UF	10	P EA	1.00	1.000	00/00/00	99/99/99	
161225027	RES COMP 1/8W 5% 2.7 OHMS	3	P EA	2.00	1.000	00/00/00	99/99/99	
161225102	RES COMP 1/8W 5% 1 K	11	P EA	6.00	1.000	27/11/89	99/99/99	
161225103	RES COMP 1/8W 5% 10 K	12	P EA	4.00	1.000	00/00/00	99/99/99	
161225206	RES CARBON FILM 20 MEG	13	P EA	2.00	1.000	00/00/00	99/99/99	
161225391	RES COMP 1/8W 5% 390 OHMS	14	P EA	3.00	1.000	00/00/00	99/99/99	
161225472	RES COMP 1/8W 5% 4.7 K	15	P EA	1.00	1.000	00/00/00	99/99/99	
168531229	RES PREC RN55D 19.6 OHMS	16	P EA	1.00	1.000	00/00/00	99/99/99	
168531389	RES PREC RN55D 909 OHMS	17	P EA	1.00	1.000	00/00/00	99/99/99	
168531401	RES PREC RN55D 1.21 K	18	P EA	1.00	1.000	00/00/00	99/99/99	
168531449	RES PREC RN55D 3.83 K	19	P EA	1.00	1.000	00/00/00	99/99/99	
168531585	RES PREC RN55D 100 K	20	P EA	3.00	1.000	00/00/00	99/99/99	
168531601	RES PREC RN55D 147 K	21	P EA	1.00	1.000	00/00/00	99/99/99	
168531633	RES PREC RN55D 316 K	22	P EA	1.00	1.000	00/00/00	99/99/99	
190042103	RESISTOR NETWORK 10 K	23	P EA	4.00	1.000	00/00/00	99/99/99	
190832220	RESISTOR NETWORK 22 OHMS	24	P EA	1.00	1.000	00/00/00	99/99/99	
190842102	RES NETWORK 1 K	25	P EA	1.00	1.000	00/00/00	99/99/99	
200344174	IC HEX D-FLOP 74HCT174	26	P EA	1.00	1.000	00/00/00	99/99/99	
200430393	IC BIN COUNTER HCT393	27	P EA	2.00	1.000	00/00/00	99/99/99	
200440390	IC DEC COUNTER 74HCT390	28	P EA	2.00	1.000	00/00/00	99/99/99	
200480167	IC REAL TIME CLOCK 58167	29	P EA	1.00	1.000	00/00/00	99/99/99	
205254256	IC 256 X 4 RAM 424256C	65	P EA	12.00	1.000	00/00/00	99/99/99	
205271256	IC 32K X 8 RAM 62256-12	30	P EA	2.00	1.000	00/00/00	99/99/99	
205272064	IC8192X8 RAM 6264LP-10	31	P EA	2.00	1.000	00/00/00	99/99/99	
205301000	UV E-PROM CMOS 1MBIT	32	P EA	6.00	1.000	00/00/00	99/99/99	SEE EPROM PROG. PROGRAMM ON PC
205640165	IC SHIFT REG HCT165	33	P EA	1.00	1.000	00/00/00	99/99/99	
205750000	IC AND-OR GATE ARRAY 16V8	300	P EA	12.00	1.000	03/05/90	99/99/99	SEE PAL PROG. PROGRAMM ON PC
207172965	IC MEMORY DRIVER 2965	66	P EA	1.00	1.000	00/00/00	99/99/99	
207367576	IC 8-BIT ADC AD7576	36	P EA	1.00	1.000	00/00/00	99/99/99	
207472245	IC BUS TRANSVR HCT245	37	P EA	9.00	1.000	00/00/00	99/99/99	
208011007	IC DUAL OP AMP LM358N	38	P EA	1.00	1.000	00/00/00	99/99/99	
208517705	IC VOLTAGE REG 7705	39	P EA	1.00	1.000	00/00/00	99/99/99	
208618212	IC VOLT DETECTOR 8212	40	P EA	1.00	1.000	00/00/00	99/99/99	
227792968	IC RAM CONTROLLER 2968A	64	P EA	1.00	1.000	00/00/00	99/99/99	
230020062	DIODE SWITCHING BAW62	45	P EA	2.00	1.000	00/00/00	99/99/99	
253010811	DIODE SCHOTTKY BAR HP2811	43	P EA	2.00	1.000	00/00/00	99/99/99	
256233209	DIODE LED (RED)	44	P EA	1.00	1.000	00/00/00	99/99/99	
275110001	TRANSISTOR PNP 2N2907A	46	P EA	1.00	1.000	00/00/00	99/99/99	
280170104	TRANSISTOR FET N VN0104N3	47	P EA	4.00	1.000	27/11/89	99/99/99	
309041016	CRYSTAL OSCILLATOR 16MHZ	48	P EA	1.00	1.000	00/00/00	99/99/99	
310111032	CRYSTAL RESONATOR 32KH	49	P EA	1.00	1.000	00/00/00	99/99/99	
312660030	BATTERY PC MTG LITH 3V	50	P EA	1.00	1.000	00/00/00	99/99/99	
400331020	SOCKET IC ST DIP-20	51	P EA	1.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9424-6
 DESC: PROCESSOR CARD

UOM: EA SC: R REV: D

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV NUMBER	SC UM ASSEMBLY					
100360028	SOCKET IC ST DIP-28	52	P EA	1.00	1.000	00/00/00	99/99/99	
100360032	SOCKET IC ST DIP-32	53	P EA	6.00	1.000	00/00/00	99/99/99	
103950002	POLARIZING KEY	57	P EA	2.00	1.000	00/00/00	99/99/99	
111430002	SWITCH ROCKER PC MTG (4)	58	P EA	1.00	1.000	00/00/00	99/99/99	
154211020	HDR SOLD TAIL TO MALE 20	59	P EA	1.00	1.000	00/00/00	99/99/99	
154610096	HDR DIP SOLD TO MALE 96	60	P EA	1.00	1.000	00/00/00	99/99/99	
1585252354	RIVET HOLLOW 2,5X9MM	61	P EA	2.00	1.000	00/00/00	99/99/99	
7194XX603	PC BD PREASS'Y 94xx-6	A 62	B EA	1.00	1.000	14/06/90	99/99/99	
7194XX603	ICMIN MAX GATEARR. MNX401	63	B EA	1.00	1.000	00/00/00	99/99/99	
SM207668020	IC 32-BIT U-PROC 68020	41	P EA	1.00	1.000	14/06/90	99/99/99	
SM207668881	IC CO-PROCESSOR 68881	42	P EA	1.00	1.000	14/06/90	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 23/12/92

CLASS CODE: 2
SUBASSEMBLIES
PART: F9424-8
DESC: CLOCK-BUS

UOM: EA SC: R REV: A

COMPONENT PART	DESCRIPTION	ITEM		ST	QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV	NUMBER						
454150021	HDR SOLD TAIL/PC EDG21		1	P	EA	3.00	1.000	00/00/00	99/99/99
719420803	PC BD PREASS'Y 9420-8	B	2	B	EA	1.00	1.000	00/00/00	99/99/99
SM652101101	RES CHIP (E24) 1% 100 OHM		4	P	EA	1.00	1.000	18/09/92	99/99/99
SM652101180	RES CHIP (E24) 1% 18 OHMS		5	P	EA	16.00	1.000	18/09/92	99/99/99

ManualsPlus.com

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9424E-7
 DESC: QUAD CHANNEL 350 MHZ FRONTEND UOM: EA SC: R REV: G

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD EFFECTIV		INACTIVE	REFERENCE INFORMATION
		RV	SC		UM	FACTR		
124471123	CAP POLYPROP 1% .012 UF	3	P	EA	16.00	1.000	00/00/00	99/99/99
158849010	CAP VARIABLE 1 - 5 PF	4	P	EA	4.00	1.000	00/00/00	99/99/99
161335560	RES COMP 1/4W 5% 56 OHMS	76	P	EA	1.00	1.000	27/11/91	99/99/99
208144001	IC ADJ POS VOLT REG UA78G	5	P	EA	1.00	1.000	00/00/00	99/99/99
208197805	IC VOLT REG POS 7805	6	P	EA	1.00	1.000	00/00/00	99/99/99
208197905	IC VOLT REG NEG 7905	7	P	EA	2.00	1.000	00/00/00	99/99/99
208911881	IC SYNC SEPARATOR 1881	9	P	EA	1.00	1.000	00/00/00	99/99/99
402110302	CONN CO-AX PC MTG BNC	1	P	EA	4.00	1.000	10/08/89	99/99/99
402610002	CONN CO-AX PC MTG SMB	100	P	EA	1.00	1.000	26/01/90	99/99/99
403950002	POLARIZING KEY	2	P	EA	2.00	1.000	00/00/00	99/99/99
430441732	RELAY 2 FORM CDPDT	10	P	EA	24.00	1.000	14/02/92	99/99/99
454150010	HDR SOLD TAIL/PC EDG10	11	P	EA	1.00	1.000	00/00/00	99/99/99
454211040	HDR SOLD TAIL TO MALE 40	12	P	EA	1.00	1.000	00/00/00	99/99/99
454312004	HDR MALE PIN TO WW (2X2)4	13	P	EA	4.00	1.000	00/00/00	99/99/99
454314016	HDR DIP SOLD TO MALE 16	14	P	EA	1.00	1.000	00/00/00	99/99/99
454340002	HDR MALE PIN TO WW 02	15	P	EA	2.00	1.000	00/00/00	99/99/99
500360204	INSULATOR FOR TO-3	1007	P	EA	3.00	1.000	02/05/89	99/99/99
500560001	INSULATOR MICA FOR TO-220	75	P	EA	1.00	1.000	13/12/89	99/99/99
500860442	INSULATOR FOR TO-3	1008	P	EA	3.00	1.000	02/05/89	99/99/99
550425106	SCREW CYL HD PHIL M2.5X6	1004	P	EA	5.00	1.000	02/05/89	99/99/99
550425520	SCREW FLAT HD PHIL 2.5X20	1005	P	EA	15.00	1.000	02/05/89	99/99/99
550430105	SCREW CYL HD PHIL M3X5	1009	P	EA	1.00	1.000	13/12/89	99/99/99
555440514	THREADED INSERT 4-40X1/16	17	P	EA	6.00	1.000	00/00/00	99/99/99
560440008	SCREW PHILIPS 4-40X1/2	1006	P	EA	6.00	1.000	02/05/89	99/99/99
709424711	UPPER RF SHIELD	A	1000	B EA	1.00	1.000	02/05/89	99/99/99
709424721	LOWER RF SHIELD	A	1001	B EA	1.00	1.000	02/05/89	99/99/99
709424731	FRONT RF SHIELD	A	1002	B EA	1.00	1.000	02/05/89	99/99/99
709424741	HEAT SINK	A	1003	B EA	1.00	1.000	02/05/89	99/99/99
709450771	THERMO-COUPLE 2	A	69	B EA	4.00	1.000	07/06/89	99/99/99
719424703	PC BD PRESS'Y 9424-7	E	19	B EA	1.00	1.000	00/00/00	99/99/99
780261129	SMB-SMC CABLE 29		20	B EA	4.00	1.000	00/00/00	99/99/99
424E-7-SUB	SUBCONTRACTOR BOM FOR F9424E-7	A	28	R EA	0.00	1.000	00/00/00	99/99/99
HAT407	HYBRID ATTENUATOR HAT407		21	B EA	4.00	1.000	00/00/00	99/99/99
HAT408	HYBRID ATTENUATOR HAT408		22	B EA	4.00	1.000	00/00/00	99/99/99
HAT409	HYBRID ATTENUATOR HAT409		23	B EA	4.00	1.000	00/00/00	99/99/99
HCL413-IH	COMPLETED BOARD HCL413-IH	A	8	R EA	1.00	1.000	18/05/90	99/99/99
HZ406A	HYBRID AMPLIFIER HZ406A	F	24	R EA	4.00	1.000	00/00/00	99/99/99
HII400A-S	HYB AMP HII400A-S ITI	B	25	B EA	4.00	1.000	00/00/00	99/99/99
HIV401A-S	HYB AMP HIV401A-S ITI	A	26	B EA	4.00	1.000	00/00/00	99/99/99
HTR402-S	HYBRID TRIGGER HTR402-S ITI	D	27	B EA	3.00	1.000	00/00/00	99/99/99
M168659489	RES METAL FILM .1% 10 K		29	P EA	7.00	1.000	00/00/00	99/99/99
M185457501	RES VARI CERMET 500 OHMS		31	P EA	1.00	1.000	00/00/00	99/99/99
M185457502	RES VARI CERMET 5 K		71	P EA	4.00	1.000	03/11/89	99/99/99
M200178000	IC 2-INPUT NAND HCT00		32	P EA	2.00	1.000	00/00/00	99/99/99
M200178004	IC HEX INVERTER HCT04		33	P EA	1.00	1.000	00/00/00	99/99/99
M200178008	IC 2-INPUT AND HCT08		34	P EA	1.00	1.000	00/00/00	99/99/99
M200178138	IC 3-8 LINE DECOD HCT 138		35	P EA	2.00	1.000	00/00/00	99/99/99
M200178139	IC 2-TO-4-LINE DEC HCT139		36	P EA	2.00	1.000	00/00/00	99/99/99
M205616094	IC 8-ST.SHIFT REG HCT4094		37	P EA	9.00	1.000	00/00/00	99/99/99
M207171488	IC QUAD LINE DRIVER 1488		38	P EA	7.00	1.000	00/00/00	99/99/99
M207770201	IC ANALOG SWITCH DG201		39	P EA	5.00	1.000	03/11/89	99/99/99

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9424E-7
 DESC: QUAD CHANNEL 350 MHZ FRONTEND UOM: EA SC: R REV: G

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV NUMBER	SC UM					
SM207978153	IC 4-INPUT MUX HCT153	40	P EA	1.00	1.000	00/00/00	99/99/99	
SM208470007	IC OP AMP 0P-07	41	P EA	6.00	1.000	00/00/00	99/99/99	
SM208470082	IC J-FET OP AMP 082C	42	P EA	4.00	1.000	00/00/00	99/99/99	
SM208470351	IC J-FET OP AMP 351	43	P EA	2.00	1.000	00/00/00	99/99/99	
SM208470353	IC DUAL OP AMP 353	44	P EA	14.00	1.000	00/00/00	99/99/99	
SM236030099	DIODE SO-PKG BAV99	45	P EA	5.00	1.000	00/00/00	99/99/99	
SM240050051	DIODE ZENER TZM-C-5V1	47	P EA	5.00	1.000	00/00/00	99/99/99	
SM240050091	DIODE ZENER ZMM9.1	48	P EA	3.00	1.000	00/00/00	99/99/99	
SM270080054	TRANSISTOR NPN BCX54	49	P EA	2.00	1.000	00/00/00	99/99/99	
SM275080051	TRANSISTOR PNP BCX51	50	P EA	2.00	1.000	00/00/00	99/99/99	
SM289772003	TRANSISTOR ARRAY 2003	51	P EA	4.00	1.000	00/00/00	99/99/99	
SM301502001	BEAD (FERRITE CHIP)	52	P EA	10.00	1.000	00/00/00	99/99/99	
SM653185182	RES THICK FILM 1.8 K	53	P EA	4.00	1.000	00/00/00	99/99/99	
SM653185221	RES THICK FILM 220 OHMS	74	P EA	4.00	1.000	04/12/89	99/99/99	
SM653505330	RES THICK FILM 33 OHMS	54	P EA	4.00	1.000	00/00/00	99/99/99	
SM654101000	CHIP JUMPER ZERO OHMS	73	P EA	2.00	1.000	26/01/90	99/99/99	
SM661127104	CAP CERA CHIP 20% .1 UF	55	P EA	34.00	1.000	26/06/89	99/99/99	
SM661205222	CAP CERA CHIP 5% 2200 PF	67	P EA	4.00	1.000	00/00/00	99/99/99	
SM661205332	CAP CERA CHIP 10% 3300 PF	58	P EA	4.00	1.000	00/00/00	99/99/99	
SM661207103	CAP CERA CHIP 20% .01UF	56	P EA	185.00	1.000	03/11/89	99/99/99	
SM661207223	CAP CERA CHIP 20% .022 UF	57	P EA	4.00	1.000	00/00/00	99/99/99	
SM661255151	CAP CERA CHIP 5% 150 PF	66	P EA	4.00	1.000	00/00/00	99/99/99	
SM661255470	CAP CERA CHIP 47PF	65	P EA	4.00	1.000	00/00/00	99/99/99	
SM661255821	CAP CERA CHIP 5% 820 PF	59	P EA	1.00	1.000	00/00/00	99/99/99	
SM661256120	CAP CERA CHIP 10% 12 PF	60	P EA	4.00	1.000	00/00/00	99/99/99	
SM661486223	CAP CERA CHIP 10 % .022UF	61	P EA	4.00	1.000	00/00/00	99/99/99	
SM661506684	CAP CERA CHIP 10% .68UF	62	P EA	3.00	1.000	00/00/00	99/99/99	
SM666317475	CAP MOLD TANT CHIP 4.7 UF	68	P EA	4.00	1.000	07/06/89	99/99/99	
SM666327225	CAP MOLD TANT CHIP 2.2 UF	64	P EA	31.00	1.000	00/00/00	99/99/99	

ManualsPlus.com

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9424E-9
 DESC: REAR PANEL FOR 9424E

UOM: EA SC: R REV: D

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION	
		RV NUMBR	SC						UM
205750000	IC AND-OR GATE ARRAY 16V8	300	P	EA	2.00	1.000	03/05/90	99/99/99	SEE PAL PROG. PROGRAMM ON PC
455021018	CONNECTOR PIN (FEMALE)	1003	P	EA	2.00	1.000	00/00/00	99/99/99	
455210002	BLOCK FOR CRIMP MALE PIN2	1004	P	EA	1.00	1.000	00/00/00	99/99/99	
530409125	FAN AXIAL 12V DC	1005	P	EA	1.00	1.000	13/07/89	99/99/99	
550440412	SCREW CYL INT HEX	1016	P	EA	4.00	1.000	02/05/89	99/99/99	
551440100	FLAT WASHER M4	1012	P	EA	4.00	1.000	00/00/00	99/99/99	
551440400	WASHER SHAKEPROOF M4	1013	P	EA	4.00	1.000	00/00/00	99/99/99	
554500001	TAPPING SCREW W/U-THREAD	1018	P	EA	2.00	1.000	02/05/89	99/99/99	
709424903	LABEL 9424E-9	A 1019	B	EA	1.00	1.000	26/01/90	99/99/99	
709424911	VOLTAGE SELECTOR COVER	A 1001	B	EA	1.00	1.000	00/00/00	99/99/99	
709424933	SERIAL NUMBER PLATE	A 1002	B	EA	1.00	1.000	24/01/91	99/99/99	
709424941	SCREW FOR SELECTOR COVER	A 1014	B	EA	1.00	1.000	02/05/89	99/99/99	
709424951	BNC HEADER	A 1015	B	EA	1.00	1.000	02/05/89	99/99/99	
7094XX903	LABEL FUSE 5A FOR 94XX	D 1020	B	EA	1.00	1.000	13/08/92	99/99/99	
780249945	BNC-SMD CABLE 45	1006	B	EA	3.00	1.000	26/01/90	99/99/99	
780259927	BNC-SMB CABLE 27	1007	B	EA	1.00	1.000	26/01/90	99/99/99	
RP94XX-9	REAR PANEL 94XX-9	A 1000	R	EA	1.00	1.000	26/12/90	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 23/12/92

CLASS CODE: 2
SUBASSEMBLIES
PART: F9450-2
DESC: DISPLAY CARD FOR 94xx

UOM: EA SC: R REV: K

COMPONENT PART	DESCRIPTION	ITEM		ST	QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV	NUMBR						
102412100	CAP CERA DISC 100V 10 PF	168	P	EA	1.00	1.000	03/07/90	99/99/99	
102412101	CAP CERA DISC 100V 100PF	164	P	EA	2.00	1.000	31/05/89	99/99/99	
102412120	CAP CERA DISC 100V 12 PF	165	P	EA	10.00	1.000	31/05/89	99/99/99	
102412220	CAP CERA DISC 100V 22 PF	4	P	EA	1.00	1.000	00/00/00	99/99/99	
102412470	CAP CERA DISC 100V 47 PF	5	P	EA	5.00	1.000	00/00/00	99/99/99	
102412560	CAP CERA DISC 100V 56 PF	6	P	EA	1.00	1.000	00/00/00	99/99/99	
102484821	CAP CERA DISC 100V 820 PF	7	P	EA	1.00	1.000	00/00/00	99/99/99	
102940502	CAP CERA DISC 1KV .005 UF	8	P	EA	5.00	1.000	30/01/92	99/99/99	
103327102	CAP CERA MONO 50V .001 UF	10	P	EA	2.00	1.000	00/00/00	99/99/99	
103327103	CAP CERA MONO 50V .01 UF	9	P	EA	56.00	1.000	14/02/92	99/99/99	
103327224	CAP CERA MONO 50V .22UF	11	P	EA	2.00	1.000	00/00/00	99/99/99	
103427104	CAP CERA MONO 100V .1 UF	12	P	EA	4.00	1.000	00/00/00	99/99/99	
103437334	CAP CERA MONO 100V .33 UF	13	P	EA	8.00	1.000	00/00/00	99/99/99	
124171623	CAP POLYSTYR 1 1/2 .062 UF	14	P	EA	2.00	1.000	00/00/00	99/99/99	
142714685	CAP TANT DIP CASE 6.8UF	15	P	EA	1.00	1.000	00/00/00	99/99/99	
146544471	CAP MINI ALUM 20% 470UF	16	P	EA	4.00	1.000	00/00/00	99/99/99	
146634106	CAP MINI ALUM 20% 10 UF	17	P	EA	18.00	1.000	00/00/00	99/99/99	
146754470	CAP MINI ALUM 20% 47 UF	18	P	EA	1.00	1.000	00/00/00	99/99/99	
147634102	CAP MINI ALUM 20% 1000 UF	19	P	EA	1.00	1.000	00/00/00	99/99/99	
161030000	RES COMP ZERO OHM	170	P	EA	1.00	1.000	30/01/92	99/99/99	
161335100	RES COMP 1/4W 5% 10 OHMS	20	P	EA	1.00	1.000	00/00/00	99/99/99	
161335101	RES COMP 1/4W 5% 100 OHMS	21	P	EA	4.00	1.000	30/01/92	99/99/99	
161335102	RES COMP 1/4W 5% 1 K	22	P	EA	16.00	1.000	00/00/00	99/99/99	
161335103	RES COMP 1/4W 5% 10 K	23	P	EA	12.00	1.000	00/00/00	99/99/99	
161335104	RES COMP 1/4W 5% 100 K	24	P	EA	8.00	1.000	00/00/00	99/99/99	
161335105	RES COMP 1/4W 5% 1 MEG	25	P	EA	2.00	1.000	00/00/00	99/99/99	
161335122	RES COMP 1/4W 5% 1.2 K	26	P	EA	5.00	1.000	00/00/00	99/99/99	
161335132	RES COMP 1/4W 5% 1.3 K	27	P	EA	1.00	1.000	00/00/00	99/99/99	
161335161	RES COMP 1/4W 5% 160 OHMS	28	P	EA	1.00	1.000	00/00/00	99/99/99	
161335202	RES COMP 1/4W 5% 2 K	29	P	EA	6.00	1.000	00/00/00	99/99/99	
161335203	RES COMP 1/4W 5% 20 K	30	P	EA	2.00	1.000	00/00/00	99/99/99	
161335204	RES COMP 1/4W 5% 200 K	31	P	EA	1.00	1.000	00/00/00	99/99/99	
161335221	RES COMP 1/4W 5% 220 OHMS	32	P	EA	8.00	1.000	00/00/00	99/99/99	
161335223	RES COMP 1/4W 5% 22 K	33	P	EA	1.00	1.000	00/00/00	99/99/99	
161335241	RES COMP 1/4W 5% 240 OHMS	34	P	EA	8.00	1.000	00/00/00	99/99/99	
161335242	RES COMP 1/4W 5% 2.4 K	35	P	EA	4.00	1.000	00/00/00	99/99/99	
161335271	RES COMP 1/4W 5% 270 OHMS	36	P	EA	2.00	1.000	00/00/00	99/99/99	
161335272	RES COMP 1/4W 5% 2.7 K	37	P	EA	2.00	1.000	00/00/00	99/99/99	
161335273	RES COMP 1/4W 5% 27 K	38	P	EA	1.00	1.000	00/00/00	99/99/99	
161335302	RES COMP 1/4W 5% 3 K	39	P	EA	7.00	1.000	00/00/00	99/99/99	
161335331	RES COMP 1/4W 5% 330 OHMS	40	P	EA	1.00	1.000	00/00/00	99/99/99	
161335332	RES COMP 1/4W 5% 3.3 K	160	P	EA	6.00	1.000	12/04/89	99/99/99	
161335333	RES COMP 1/4W 5% 33 K	42	P	EA	2.00	1.000	00/00/00	99/99/99	
161335362	RES COMP 1/4W 5% 3.6 K	43	P	EA	3.00	1.000	00/00/00	99/99/99	
161335394	RES COMP 1/4W 5% 390 K	44	P	EA	4.00	1.000	00/00/00	99/99/99	
161335471	RES COMP 1/4W 5% 470 OHMS	45	P	EA	14.00	1.000	00/00/00	99/99/99	
161335472	RES COMP 1/4W 5% 4.7 K	46	P	EA	2.00	1.000	00/00/00	99/99/99	
161335473	RES COMP 1/4W 5% 47 K	47	P	EA	1.00	1.000	00/00/00	99/99/99	
161335510	RES COMP 1/4W 5% 51 OHMS	48	P	EA	4.00	1.000	00/00/00	99/99/99	
161335511	RES COMP 1/4W 5% 510 OHMS	49	P	EA	1.00	1.000	00/00/00	99/99/99	
161335512	RES COMP 1/4W 5% 5.1 K	161	P	EA	7.00	1.000	12/04/89	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9450-2
 DESC: DISPLAY CARD FOR 94xx

UOM: EA SC: R REV: K

COMPONENT PART	DESCRIPTION	ITEM RV NUMBR	ST QTY PER SC UM ASSEMBLY	YIELD EFFECTIV FACTR DATE	INACTIVE DATE	REFERENCE INFORMATION
161335560	RES COMP 1/4W 5% 56 OHMS	163 P	EA	4.00 1.000	30/05/89 99/99/99	
161335565	RES COMP 1/4W 5% 5.6 MEG	51 P	EA	2.00 1.000	00/00/00 99/99/99	
161335621	RES COMP 1/4W 5% 620 OHMS	52 P	EA	2.00 1.000	00/00/00 99/99/99	
161335622	RES COMP 1/4W 5% 6.2 K	53 P	EA	2.00 1.000	00/00/00 99/99/99	
161335623	RES COMP 1/4W 5% 62 K	54 P	EA	1.00 1.000	00/00/00 99/99/99	
161335681	RES COMP 1/4W 5% 680 OHMS	55 P	EA	1.00 1.000	00/00/00 99/99/99	
161335682	RES COMP 1/4W 5% 6.8 K	56 P	EA	2.00 1.000	00/00/00 99/99/99	
161335752	RES COMP 1/4W 5% 7.5 K	57 P	EA	7.00 1.000	00/00/00 99/99/99	
161335753	RES COMP 1/4W 5% 75 K	58 P	EA	3.00 1.000	00/00/00 99/99/99	
161335821	RES COMP 1/4W 5% 820 OHMS	59 P	EA	2.00 1.000	00/00/00 99/99/99	
161335912	RES COMP 1/4W 5% 9.1 K	60 P	EA	1.00 1.000	00/00/00 99/99/99	
161445102	RES COMP 1/2W 5% 1K	61 P	EA	1.00 1.000	00/00/00 99/99/99	
161445560	RES CARBON FILM 56 OHMS	62 P	EA	1.00 1.000	00/00/00 99/99/99	
165375824	RES METAL FILM HV 820 K	63 P	EA	1.00 1.000	00/00/00 99/99/99	
168031022	RES METAL FILM 2.2 OHMS	64 P	EA	26.00 1.000	00/00/00 99/99/99	
168035125	RES METAL FILM HV 1.2 MEG	65 P	EA	1.00 1.000	00/00/00 99/99/99	
168045336	RES HV 33M	66 P	EA	1.00 1.000	00/00/00 99/99/99	
168531365	RES PREC RN55D 511 OHMS	67 P	EA	4.00 1.000	00/00/00 99/99/99	
168531385	RES PREC RN55D 825 OHMS	68 P	EA	2.00 1.000	00/00/00 99/99/99	
168531401	RES PREC RN55D 1.21 K	69 P	EA	7.00 1.000	00/00/00 99/99/99	
168531445	RES PREC RN55D 3.48K	70 P	EA	1.00 1.000	00/00/00 99/99/99	
168531447	RES PREC RN55D 3.65 K	71 P	EA	1.00 1.000	00/00/00 99/99/99	
168531453	RES PREC RN55D 4.22 K	72 P	EA	1.00 1.000	00/00/00 99/99/99	
168531471	RES PREC RN55D 6.49 K	169 P	EA	2.00 1.000	03/07/90 99/99/99	
168531495	RES PREC RN55D 11.5K	74 P	EA	3.00 1.000	00/00/00 99/99/99	
168531541	RES PREC RN55D 34.8 K	75 P	EA	1.00 1.000	00/00/00 99/99/99	
172137022	RES WIREWOUND .22 OHMS	76 P	EA	1.00 1.000	00/00/00 99/99/99	
180487103	RES VARI CERMET 10K	77 P	EA	2.00 1.000	00/00/00 99/99/99	
180487202	RES VARI CERMET 2K	78 P	EA	1.00 1.000	00/00/00 99/99/99	
180487205	RES VARI CERMET 2 MEG	79 P	EA	2.00 1.000	00/00/00 99/99/99	
180487501	RES VARI CERMET 500 OHMS	80 P	EA	2.00 1.000	00/00/00 99/99/99	
180487502	RES VARI CERMET 5K	81 P	EA	5.00 1.000	00/00/00 99/99/99	
190042222	RESISTOR NETWORK 2.2 K	82 P	EA	5.00 1.000	00/00/00 99/99/99	
190842222	RESISTOR NETWORK 2.2 K	83 P	EA	1.00 1.000	00/00/00 99/99/99	
200440040	IC12-ST BIN COUNT HCT4040	84 P	EA	1.00 1.000	00/00/00 99/99/99	
205271256	IC 32K X 8 RAM 62256-12	85 P	EA	2.00 1.000	00/00/00 99/99/99	
205370256	IC UV E-PROM 27256G-25	86 P	EA	2.00 1.000	00/00/00 99/99/99	PROGRAMMED WITH SPEED_CX PROGRAMMED WITH SPEED_CX SEE PAL PROG. PROGRAMM ON PC
205750000	IC AND-OR GATE ARRAY 16V8	300 P	EA	4.00 1.000	03/05/90 99/99/99	
207174244	IC OCTAL BUFFER HCT244	89 P	EA	2.00 1.000	00/00/00 99/99/99	
207270312	IC 12-BIT C/A CONV DAC312	90 P	EA	2.00 1.000	00/00/00 99/99/99	
207472245	IC BUS TRANSVR HCT245	91 P	EA	2.00 1.000	00/00/00 99/99/99	
208011005	IC VOLT FOLLOWER LM310N	92 P	EA	2.00 1.000	00/00/00 99/99/99	
208031010	IC QUAD DIFF COMP LM339N	93 P	EA	1.00 1.000	00/00/00 99/99/99	
208041001	IC 8-BIT DAC MONODAC-08EQ	94 P	EA	3.00 1.000	00/00/00 99/99/99	
208041524	IC PULSE WIDTH MODUL 3524	95 P	EA	1.00 1.000	00/00/00 99/99/99	
208110353	IC DUAL OP AMP LF353N	96 P	EA	2.00 1.000	00/00/00 99/99/99	
208116365	IC OP AMP LM6365	97 P	EA	2.00 1.000	00/00/00 99/99/99	
208130347	IC QUAD JFET OP AMP LF347	98 P	EA	1.00 1.000	00/00/00 99/99/99	
208590336	IC VOLT REFERENCE LM336	99 P	EA	2.00 1.000	00/00/00 99/99/99	
30110005	DIODE SWITCHING 1N4448	100 P	EA	14.00 1.000	00/00/00 99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
AS OF 23/12/92

CLASS CODE: 2
SUBASSEMBLIES
PART: F9450-2
DESC: DISPLAY CARD FOR 94xx

UOM: EA SC: R REV: K

COMPONENT PART	DESCRIPTION	ITEM		ST QTY PER	YIELD EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV NUMBR	SC				
230150045	DIODE PICOAMPERE BAV 45	101	P	EA	2.00	1.000	00/00/00 99/99/99
232990641	DIODE ARRAY (HV CASCADE)	102	P	EA	1.00	1.000	00/00/00 99/99/99
235040060	DIODE RECTIFIER LM60	103	P	EA	1.00	1.000	00/00/00 99/99/99
235820030	DIODE RECTIFIER EGP30D	104	P	EA	1.00	1.000	00/00/00 99/99/99
235930816	DIODE RECTIFIER 1A MR816	105	P	EA	1.00	1.000	00/00/00 99/99/99
240225720	DIODE ZENER 18V 1N720A	106	P	EA	2.00	1.000	00/00/00 99/99/99
240413755	DIODE ZENER 7.5V 1N755A	108	P	EA	2.00	1.000	26/10/90 99/99/99
240415754	DIODE ZENER 6.8V 1N754A	107	P	EA	2.00	1.000	00/00/00 99/99/99
240425751	DIODE ZENER 5.1V 1N751A	109	P	EA	1.00	1.000	00/00/00 99/99/99
240425752	DIODE ZENER 5.6V 1N752A	110	P	EA	1.00	1.000	00/00/00 99/99/99
240425758	DIODE ZENER 10V 1N758A	111	P	EA	1.00	1.000	00/00/00 99/99/99
240513977	DIODE ZENER 47V 1N977B	112	P	EA	1.00	1.000	00/00/00 99/99/99
253010835	DIODE HOT CARRIER HP2835	113	P	EA	15.00	1.000	00/00/00 99/99/99
270110003	TRANSISTOR NPN PN2222A	162	P	EA	3.00	1.000	12/04/89 99/99/99
270170001	TRANSISTOR NPN 2N5770	115	P	EA	17.00	1.000	00/00/00 99/99/99
270170002	TRANSISTOR NPN 2N5962	116	P	EA	21.00	1.000	00/00/00 99/99/99
275110001	TRANSISTOR PNP 2N2907A	117	P	EA	4.00	1.000	00/00/00 99/99/99
275170001	TRANSISTOR PNP 2N5087	118	P	EA	5.00	1.000	00/00/00 99/99/99
275170002	TRANSISTOR PNP 2N5771	119	P	EA	16.00	1.000	00/00/00 99/99/99
280180001	TRANSISTOR FET "N" U1897	120	P	EA	3.00	1.000	00/00/00 99/99/99
280190513	TRANSISTOR FET "N" IRF513	121	P	EA	2.00	1.000	00/00/00 99/99/99
280190642	TRANSISTOR FET "N" IRF642	122	P	EA	1.00	1.000	00/00/00 99/99/99
280190830	TRANSISTOR FET "N" IRF830	123	P	EA	1.00	1.000	00/00/00 99/99/99
281170001	TRANSISTOR FET "P" 2N5462	124	P	EA	4.00	1.000	00/00/00 99/99/99
281190523	TRANSISTOR FET "P" 9523	125	P	EA	2.00	1.000	00/00/00 99/99/99
301016103	INDUCTOR MOLDED 10 UH	126	P	EA	4.00	1.000	00/00/00 99/99/99
302380480	FILTER CHOKE 2 AMP 48 UH	127	P	EA	1.00	1.000	00/00/00 99/99/99
377051004	LABEL "DANGER HI VOLTAGE"	128	P	EA	1.00	1.000	00/00/00 99/99/99
400360028	SOCKET IC ST DIP-28	129	P	EA	2.00	1.000	00/00/00 99/99/99
400410121	IC SOCKET GRID TYP 121PIN	130	P	EA	1.00	1.000	00/00/00 99/99/99
429220001	SWITCH THERMAL 1A N.O.	131	P	EA	1.00	1.000	00/00/00 99/99/99
440290001	TRANSFORMER HV SWITCHING	132	B	EA	1.00	1.000	00/00/00 99/99/99
454110003	HDR SOLD TAIL/MALE PIN 3	133	P	EA	2.00	1.000	00/00/00 99/99/99
454111008	HDR SOLD TAIL/MALE PIN 8	134	P	EA	1.00	1.000	00/00/00 99/99/99
454121003	BLOC FOR SOCKETS 3-PIN	135	P	EA	1.00	1.000	00/00/00 99/99/99
454311003	HDR DIP SOLDER TO MALE 3	136	P	EA	2.00	1.000	00/00/00 99/99/99
454610096	HDR DIP SOLD TO MALE 96	137	P	EA	1.00	1.000	00/00/00 99/99/99
454711026	HDR DBL ROW RT ANGL 26	138	P	EA	1.00	1.000	00/00/00 99/99/99
454902001	KEYING PLUG (SNAP IN) BLK	139	P	EA	3.00	1.000	00/00/00 99/99/99
485011001	GROMMET 10MM OD 5MM ID	140	P	EA	1.00	1.000	00/00/00 99/99/99
500110001	TRANSIPAD "SMALL"	148	P	EA	2.00	1.000	01/03/89 99/99/99
500460005	MOUNTING KIT FOR TO-220	141	P	EA	6.00	1.000	00/00/00 99/99/99
550430105	SCREW CYL HD PHIL M3X5	142	P	EA	6.00	1.000	23/10/91 99/99/99
550430106	SCREW CYL HD PHIL M3X6	166	P	EA	4.00	1.000	10/10/89 99/99/99
550440106	SCREW CYL HD PHIL M4X6	144	P	EA	2.00	1.000	00/00/00 99/99/99
550440108	SCREW CYL HD PHIL M4X8	145	P	EA	2.00	1.000	00/00/00 99/99/99
551430300	WASHER SHAKEPROOF M3	146	P	EA	10.00	1.000	23/10/91 99/99/99
551440300	WASHER SHAKEPROOF M4	147	P	EA	4.00	1.000	00/00/00 99/99/99
554435401	RIVET "RIVSCREW" M 3.5	167	P	EA	2.00	1.000	10/10/89 99/99/99
560440004	SCREW PHILLIPS 4-40X1/4	150	P	EA	6.00	1.000	00/00/00 99/99/99
585252354	RIVET HOLLOW 2,5X9MM	151	P	EA	2.00	1.000	00/00/00 99/99/99

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: F9450-2
 DESC: DISPLAY CARD FOR 94xx

UOM: EA SC: R REV: K

COMPONENT PART	DESCRIPTION	ITEM			ST QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV	NUMBR	SC					
709400231	HV MULTIPLIER SUPPORT	A	152	B	EA	1.00	1.000	00/00/00	99/99/99
709450201	HV UPPER COVER		154	B	EA	1.00	1.000	00/00/00	99/99/99
709450211	HV LOWER COVER		155	B	EA	1.00	1.000	00/00/00	99/99/99
709450221	FET SUPPORT		156	B	EA	1.00	1.000	00/00/00	99/99/99
709450231	SPACER HEX M3X6MM		157	B	EA	2.00	1.000	23/10/91	99/99/99
719450203	PC BD PREASS'Y 9450-2	J	158	B	EA	1.00	1.000	31/05/89	99/99/99
MDS403	DISPLAY PROCESSOR MDS403		159	B	EA	1.00	1.000	00/00/00	99/99/99

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: M9424E
 DESC: MECHANICAL FOR 9424E

UOM: EA SC: R REV: C

COMPONENT PART	DESCRIPTION	ITEM		ST	QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION	
		RV	NUMBR							SC
300090001	DEFLECTION YOKE		1	P	EA	1.00	1.000	02/05/89	99/99/99	
315040015	POWER SUPPLY 9451-1		1043	B	EA	1.00	1.000	03/05/89	99/99/99	
321220009	CRT ORANGE 90 DEG DEFL 9"		1019	P	EA	1.00	1.000	00/00/00	99/99/99	
377051005	LABEL "DANGER-----ONLY"	A	1020	P	EA	1.00	1.000	00/00/00	99/99/99	
377131001	LABEL (GROUND SYMBOL)		1041	P	EA	1.00	1.000	01/05/89	99/99/99	
389000000	ADHESIVE APENFIX		1049	P	ME	0.10	1.000	16/11/90	99/99/99	
455020001	CONNECTOR PIN (FEMALE)		2	P	EA	4.00	1.000	02/05/89	99/99/99	
455121003	CONNECTOR HOUSING 3		3	P	EA	2.00	1.000	02/05/89	99/99/99	
455950002	CLAMP WITH STRAIN RELIEF		4	P	EA	2.00	1.000	02/05/89	99/99/99	
485023008	BUMPER (FOOT) BLACK RUBBER		1046	P	EA	4.00	1.000	29/05/89	99/99/99	
530010024	FOOT FOR COMPAC ENCLOSURE		1032	P	EA	4.00	1.000	01/03/89	99/99/99	
530301005	HANDLE (U-SHAPE)		1021	B	EA	1.00	1.000	00/00/00	99/99/99	
530410001	CARD GUIDE NON METALLIC		1022	P	EA	5.00	1.000	00/00/00	99/99/99	
544310001	SPRING EXT TYPE 190 MM		1023	B	EA	1.00	1.000	00/00/00	99/99/99	
550425505	SCREW FLAT HD PHIL M2.5X5		1044	P	EA	1.00	1.000	03/05/89	99/99/99	
550430104	SCREW CYL HD PHIL M3X4		1013	P	EA	10.00	1.000	00/00/00	99/99/99	
550430106	SCREW CYL HD PHIL M3X6		1011	P	EA	14.00	1.000	00/00/00	99/99/99	
550430108	SCREW CYL HD PHIL M3X8		1012	P	EA	3.00	1.000	00/00/00	99/99/99	
550440105	SCREW CYL HD PHIL M4X5		1038	P	EA	4.00	1.000	06/11/89	99/99/99	
550440108	SCREW CYL HD PHIL M4X8		1037	P	EA	15.00	1.000	16/11/90	99/99/99	
550440110	SCREW CYL HD PHIL M4X10		1033	P	EA	5.00	1.000	21/12/90	99/99/99	
550440120	SCREW CYL HD PHIL		1035	P	EA	3.00	1.000	00/00/00	99/99/99	
550440120	SCREW CYL HD PHIL		1053	P	EA	1.00	1.000	18/09/91	99/99/99	
550440406	SCREW CYL INT HEX M4X6		1007	P	EA	12.00	1.000	00/00/00	99/99/99	
550440416	CYL INT HEX M4X16		1024	P	EA	4.00	1.000	00/00/00	99/99/99	
550440506	SCREW FLAT HD PHIL M4X6		1045	P	EA	2.00	1.000	03/05/89	99/99/99	
550440708	SCREW LARGE HEAD M4X8		1010	P	EA	8.00	1.000	00/00/00	99/99/99	
551430300	WASHER SHAKEPROOF M3		1016	P	EA	27.00	1.000	00/00/00	99/99/99	
551440300	WASHER SHAKEPROOF M4		1039	P	EA	24.00	1.000	21/12/90	99/99/99	
551440300	WASHER SHAKEPROOF M4		1054	P	EA	1.00	1.000	18/09/91	99/99/99	
551440400	WASHER SHAKEPROOF M4		1040	P	EA	2.00	1.000	06/11/89	99/99/99	
551440501	WASHER FLAT (SPRING) M4		1025	P	EA	8.00	1.000	00/00/00	99/99/99	
552440100	NUT HEX M4		1015	P	EA	10.00	1.000	00/00/00	99/99/99	
554440202	FLAT WASHER M4		1018	P	EA	4.00	1.000	00/00/00	99/99/99	
594120003	TIEWRAP		5	P	EA	2.00	1.000	02/05/89	99/99/99	
594120003	TIEWRAP		1026	P	EA	5.00	1.000	26/01/90	99/99/99	
594230002	CABLE CLIP ADHESIVE BACK		1047	P	EA	1.00	1.000	04/08/89	99/99/99	
709424011	NUT FOR HANDLE	A	1034	B	EA	3.00	1.000	21/12/90	99/99/99	
709424021	SIDE PANEL	C	1000	B	EA	2.00	1.000	00/00/00	99/99/99	
709424031	DIPLAY SUPPORT	E	1001	B	EA	1.00	1.000	00/00/00	99/99/99	
709424041	REAR SUPPORT	C	1002	B	EA	1.00	1.000	00/00/00	99/99/99	
709424051	MOTHER CARD SUPPORT	B	1003	B	EA	1.00	1.000	00/00/00	99/99/99	
709424061	POWER SUPPLY SUPPORT	A	1004	B	EA	1.00	1.000	00/00/00	99/99/99	
709424071	UPPER COVER	B	1005	B	EA	1.00	1.000	00/00/00	99/99/99	
709424081	LOWER COVER	B	1006	B	EA	1.00	1.000	00/00/00	99/99/99	
709424095	CARD RETAINER	C	1048	B	EA	1.00	1.000	16/11/90	99/99/99	
709424096	INSERTION GUIDE FOR MC	E	1050	B	EA	1.00	1.000	21/12/90	99/99/99	
709424098	SPACER FOR INSERTION GUIDE	A	1051	B	EA	1.00	1.000	21/12/90	99/99/99	
709450071	NEOPRENE WASHER	A	1014	B	EA	4.00	1.000	00/00/00	99/99/99	
780210030	DISPLAY POWER CABLE	A	1028	B	EA	1.00	1.000	00/00/00	99/99/99	
780220015	BASE CARD POWER CABLE	A	1029	B	EA	1.00	1.000	00/00/00	99/99/99	

BILL OF MATERIALS REPORT

SORTED BY ASSEMBLY PART NUMBER, COMPONENT PART NUMBER
 AS OF 23/12/92

CLASS CODE: 2
 SUBASSEMBLIES
 PART: M9424E
 DESC: MECHANICAL FOR 9424E

UOM: EA SC: R REV: C

COMPONENT PART	DESCRIPTION	ITEM		ST	QTY PER	YIELD	EFFECTIV	INACTIVE	REFERENCE INFORMATION
		RV	NUMBR						
780231120	FRONT END BASE CABLE	B	1030	B	EA	1.00	1.000	00/00/00	99/99/99
780231131	MEMORY CARD CABLE	A	1052	B	EA	1.00	1.000	21/12/90	99/99/99
780299025	CRT CABLE	B	1031	B	EA	1.00	1.000	00/00/00	99/99/99
780411236	FRONT PANEL CABLE	A	1027	B	EA	1.00	1.000	23/02/89	99/99/99
780544512	GROUND CABLE	A	1042	B	EA	1.00	1.000	01/05/89	99/99/99

Chapter 9

**Connecting the 9424 to a
plotter or a printer.**

Table of contents

9	Introduction
9.1.1	HP 7470A Plotter
9.1.2	HP 7550A Plotter
9.1.3	Hitachi 672 Graph Plotter (or MSA 672)
9.1.4	Graphtec FP5301 Plotter
9.1.5	Philips PM 8151 Plotter
9.1.6	Philips PM 8153 Plotter
9.1.7	Gould Computagraph Plotter
9.2.1	Centronics Printers (parallel)
9.3.1	Epson FX 80 Printer (RS232)
9.3.2	HP Quiet Jet Printer
9.3.3	Citizen 120 D Printer (RS 232)
9.3.4	HP Laser Jet Printer (RS 232)
9.3.5	HP Think Jet printer (RS 232)
9.3.6	Brother printer M-1509 (RS 232)
9.4.1	HP QuietJet printer (GPIB)
9.4.2	HP Thinkjet (HP 2225A) (GPIB)
9.4.3	HP Paintjet (GPIB)
9.5	Information on GPIB
9.5.1	Introduction
9.5.2	Functions in the GPIB

9. 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.

While the 9400 oscilloscope can only be connected to plotters, the 9424 and all other instruments of the same generation can be with some printers. Possible differences will be described.

HP plotter responses to some RS-232 configuration commands have been modified. Consequently, the 9424 generation DSO support HP plotters of two types. They may however, despite these changes, work with HPGL compatible plotters from other manufacturers.

Before connecting a plotter to a DSO, do not forget to select the appropriate settings in the plotter menu and the RS-232 menu pages.

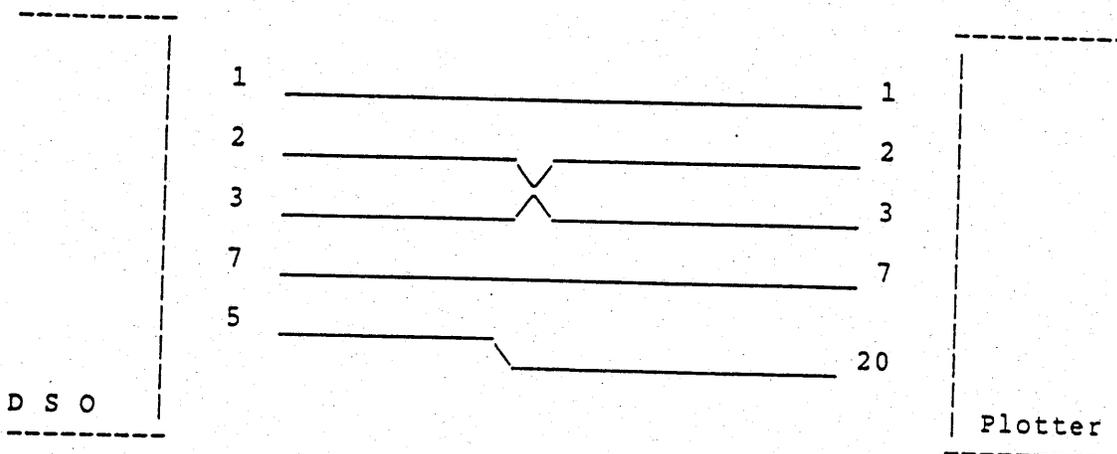
RS-232 connection:

The following settings are assumed for the scope:

Baud rate: 9600
 Character: 8 bits
 Parity: none
 Stop bits: 1

Any exceptions will be mentioned.

A cable with the following pinout can be used in almost every cases:



The cable has D25 connectors with male pins on both sides.

GPIB connection:

To have a plot done through GPIB initiated with the front-panel SCREEN DUMP push-button, you must set the DSO in TALK ONLY mode (by positioning the back-panel switches at an address above 31) and the plotter in LISTEN ONLY mode (see below) before powering on both machines. No controller is needed in this mode.

If a computer controls the GPIB bus, both the scope and the plotter must be set in ADDRESSED mode. The address switches must be under 31 on the scope. In the following list, plotter address 7 is given as an example. Remember that manual plotting is impossible in this mode, only the controller can initiate a plot.

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.

9.1 Plotters

9.1.1 HP 7470A Plotter

Switch setting:

- 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

9.1.2 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, provided it has a female connector on the plotter side.

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.

9.1.3 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 the plotter reset by powering it off and on) before loading a new sheet of paper.

9.1.4 Graphtec FP5301

Switch setting:

- RS-232 Connection:

Switch S1:	1	2	3	4	5	6	7	8
	0	0	0	0/1	0	0	0	0
Switch S2:	1	2	3	4	5	6	7	8
	1/0	0	0	0	1	0	0	0
	(1)							

Switch S3: 1 2 3 4 5 6 7 8
 1 1 1 1 1 0 1 1

- GPIB Connection:

Switch S1: 1 2 3 4 5 6 7 8
 0 0 0 0 0 1 0 1

Switch S2: 1-2 3-4 5-6 7-8 9-10
 0 0 1 1 1

Switch S3: LISTEN ONLY or ADDRESSABLE

Notes:

- (1) select a baud rate factor of 1/16.
- FP5301-UM-151 has an internal switch that select step size. Select .1 mm per step.

9.1.5 Philips PM 8151

- RS-232 Connection:

The cable must be connected to the MODEM (ON LINE) port.

The baud rate will be 2400 baud.

Switches:

S1: OFF (No time sharing)

S2: 2400 bauds

S3: 1 2 3 4 5 6
 V24 free 8 bits 1 stop no par. not used

S4: 1 2 5 6
 OFF free Auto buff. free
 mess. enable
 (no kaut)

3 and 4 are not used

- GPIB Connection:

Switches:

A6: Select LISTEN ONLY (LON) or ADDRESSED MODE (no LON).

A5 A4 A3 A2 A1
 0 0 1 1 1

PP2 and P1 to P3: user selectable.

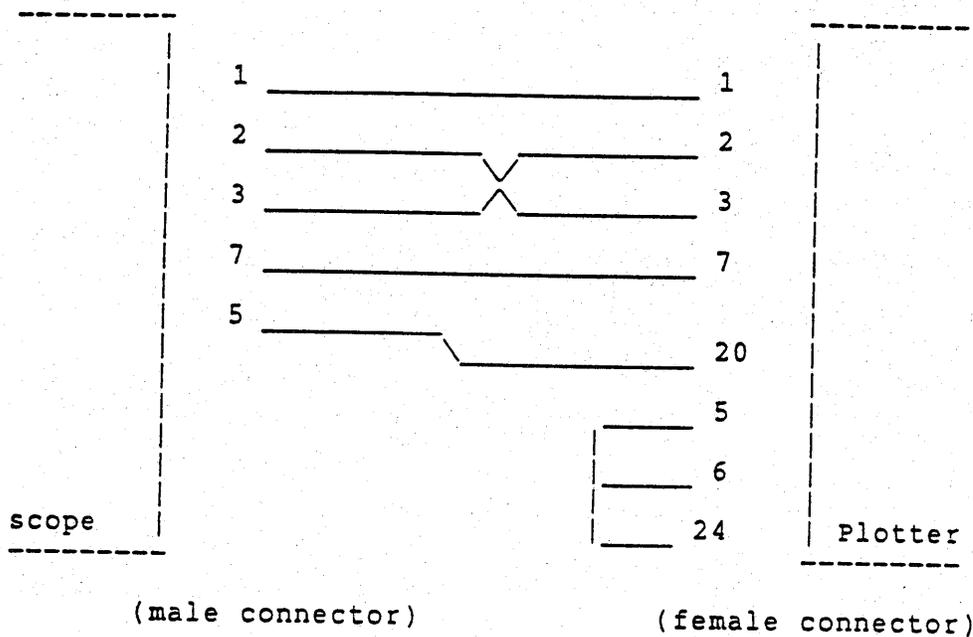
9.1.6 Philips PM 8153

PM 8153 B/1 (GPIB) and PM 8153 S/1 are PM 8151 compatible while PM 8153 B/6 and PM 8153 S/6 are HP 7470A compatible. Select the appropriate mode on the plotter menu page.

9.1.7 Gould computagraph

As the Gould plotter is compatible with the HP 7470A, select this mode on the plotter menu page.

For an RS-232 connection, a special cable is necessary:



This cable must be plugged into the plotter's MODEM port.

9.2 Printers

Only the 9424 generation of DSO will support printers. Exception: the 9400 with the Raster Printer option (option OP03) denoted by a 'P' in its identification string does support the HP ThinkJet. Interfacing is possible through RS-232, GPIB directly and via adapter through CENTRONICS.

9.2.1 CENTRONICS Printers

Most printers use a Centronics Parallel connection which makes direct interconnection impossible. To further confude the issue most PC computers use a 25-pin D connector for both the serial and parallel connections. The only difference being that one connector is equipped with male pins and the other with female pins.

The standard cable supplied between IBM computers and parallel printers has one 25-pin D connector on one end and a Centronics connector on the other end. Because the computer end of the cable is the same as the connector on the 9410, you and your customers might assume they are ready to connect and print NOT TRUE they can connect, but may not be able to print.

Here are some Hints and Things to look for:

1. If the printer has a 25-pin D connector on it then you can be 99% sure it's a serial printer and ready for a direct straight through cable to the 9424.
2. If the printer has a Centronics connector on it then you can be 99% sure it's a parallel printer and will require a Serial to Parallel converter.

The SP-100 Serial to Parallel converter is distributed by:

MICRO MEDIA CORP.
3241 Amber Street
Philadelphia, PA 19134
Telex: (215) 739-0888
Fax: (215) 739- 6466
Cost: \$45.00 (Retail Single Quantity)

and by DISTRELEC in Switzerland.

It has been tested and found to be perfectly suited to converting your customer's parallel printer to work with the 9424.

The converter plugs directly into the Centronics connector on the printer. The other end of this small box (approx. 1" x 3" x 3") has the 25-pin RS-232 connector to allow the connection of a straight through RS-232 cable (male to female) to the 9424. The SP-100 is supplied with a 9-volt power supply that plugs into the Ac power line and converter power input connector. The 8-position Dip-Switch on the side of the converter should be set as follows:

SP-100 Switch 2, 3, 6, 8 ON (Down Position-Toward numbers) others OFF.

The following hard-copy parameters are required on the 9424:

Select Main Menu, Auxiliary Setups, Hardcopy.

Hard Copy:

Select device type: EPSON FX80 OR COMPATIBLE printer.

Hardcopy port: RS-232 (must use 8 bits with printers).

Graphics Density and Plot size are menu selectable.

Select RS-232
 RS-232 Remote Control Port Settings:
 Baud rate:9600
 Characters length (bits): 8
 Parity: none
 Number of stop bits: 1

The following printers and printer switch positions have been tested:

	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	

Note: All Epson and Epson Compatible printers are likely to work if the switches are set properly. (Some experimentation may be required).

The customer must purchase his own accessories since we do not supply them.

Some other available Serial to Parallel converters need power through the RS-232 lines. Do not use them, as we do not guaranty that the serial port is able to furnish enough power.

9.3 RS-232 Printers

9.3.1 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 printers are:
 FX, FX+, JX-80, LQ-800/1000, EX-800 and LQ-25000.
 Otherwise, use DTR/RTS handshake.

9.3.2 HP QUIETjet

9.3.3 CITIZEN 120D

To use this printer with the default RS-232 settings and the default Plotter setting of the 9424, select the following switch configuration:

Dip switch bank 1: all OFF except 3 and 8.
Dip switch bank 2: all OFF.

9.3.4 HP LaserJet (will be supported as of release 2,6)

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.

9.3.5 HP ThinkJet (HP 2225D)

To use printer with the default RS-232 settings 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:

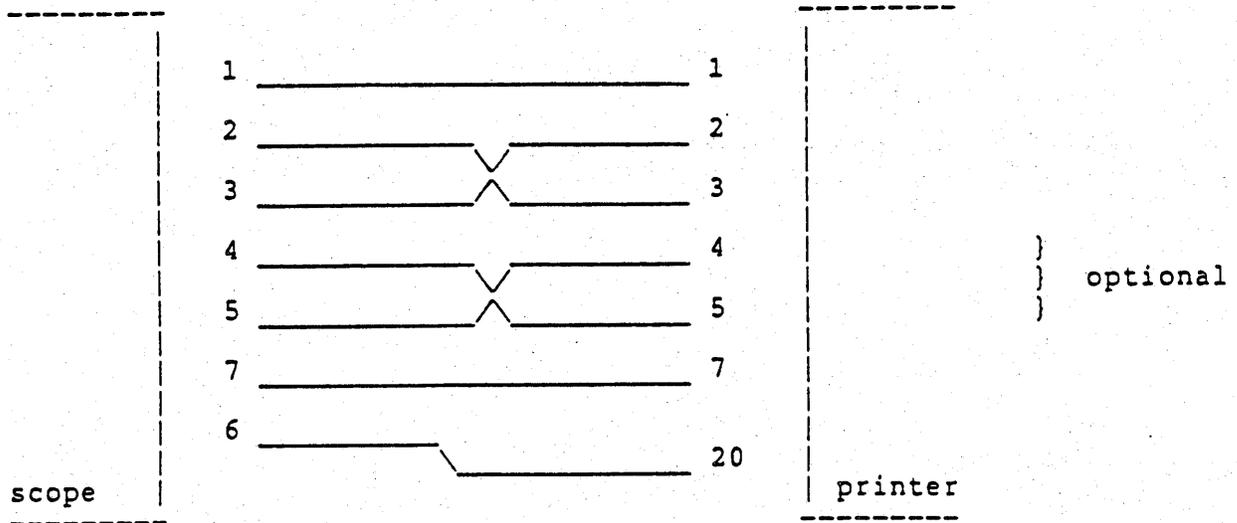
1	2	3	4	5
1	0	0	0	0
(use DTR Handshake)		(8 bits, parity none)		(9600 bauds)

Note: it may be possible that old ThinkJet recognize only the Epson protocol. If it is the case use the EPSON.

9.3.6 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".

Use a cable with 2 male plugs like the following one:



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			

9.4 GPIB Printers

9.4.1 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

9.4.2 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

9.4.3 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"

9.5 Information on GPIB

9.5.1 Introduction

This section is a simple description of the GPIB interface as an aid to understanding the interface in the 9424 DSO: it is not intended as a complete specification of the system.

The GPIB system is designed for the interaction of a number of interacting 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.

9.5.2 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 de-activated 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 9.1, and another way of presenting the system is given in figure 9.2.

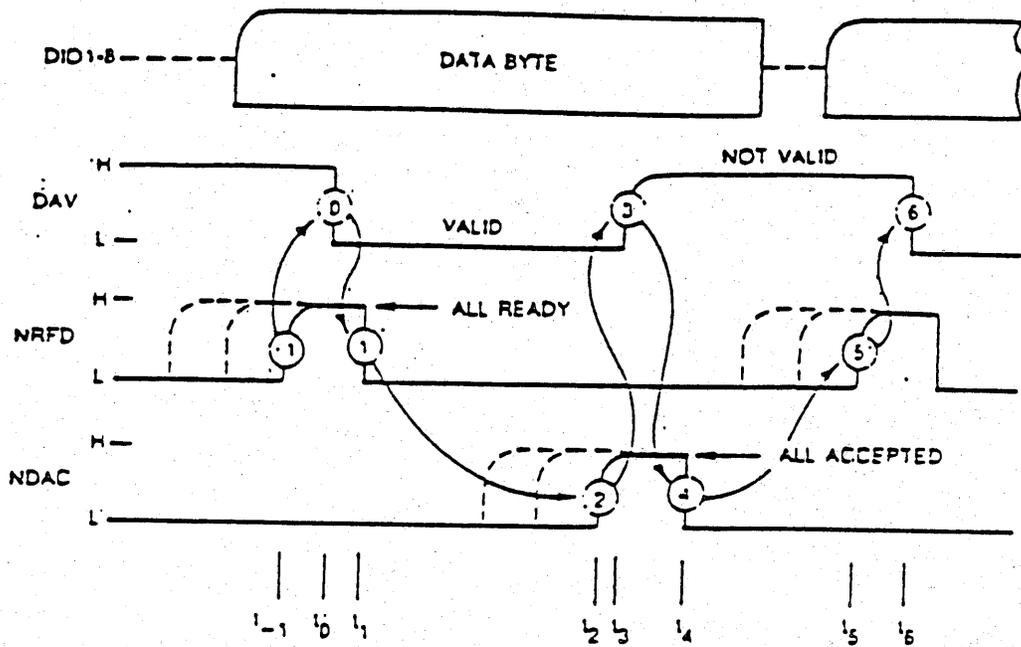
The bus management lines functions as follows:

- 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 Attention; 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 9.1 the signal waveforms are sketched, while figure 9.2 is a flowchart.

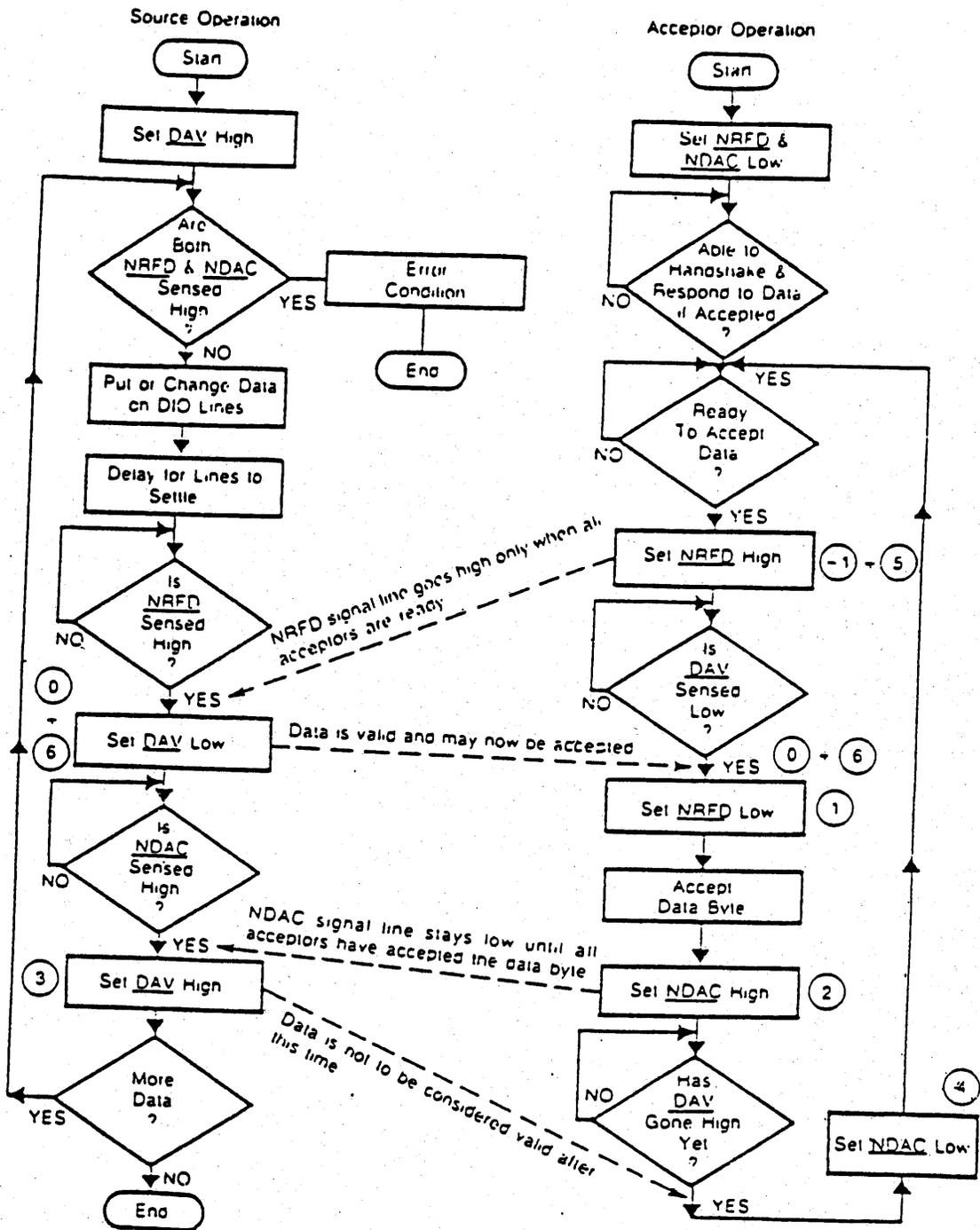


DATA BYTE TRANSFER IN GPIB IEEE-488

Figure 9.1

The handshake timing sequence proceeds as follows:

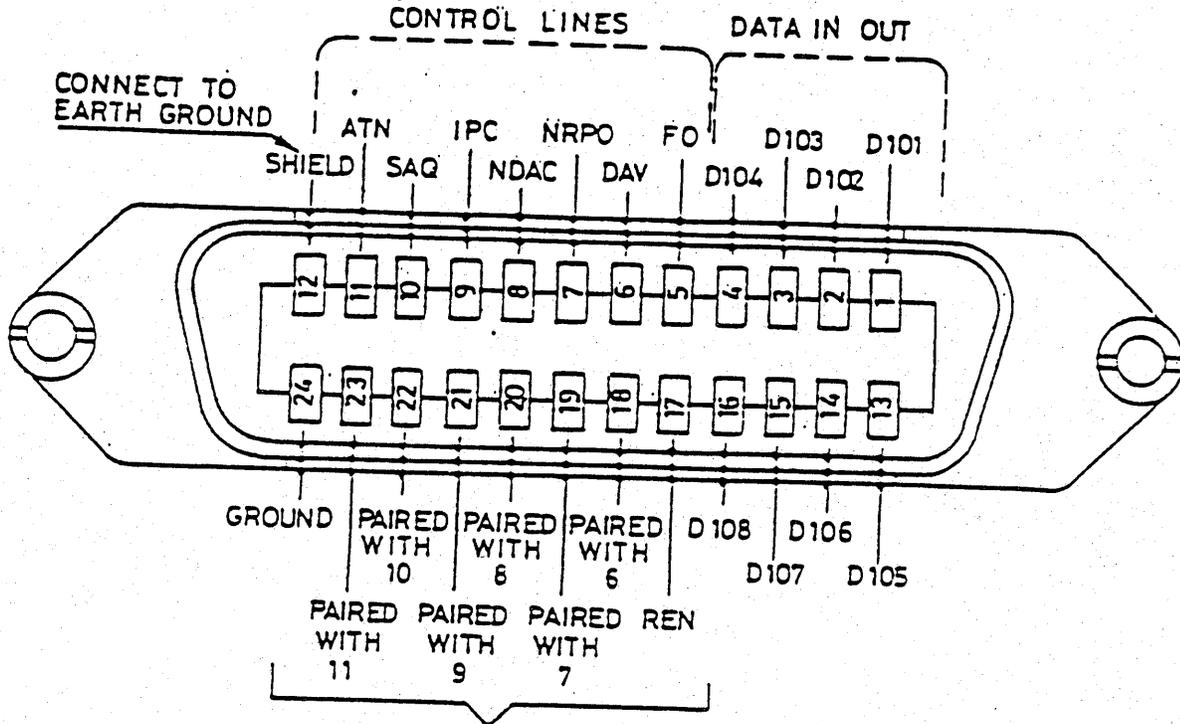
- Preliminary The source checks for presence of listeners and places the next data byte on the data lines DIO1-8.
- t-1 Acceptors one by one become ready for byte. Last one allows NRFD to go high.
- t0 Sources pull down DAV to validate data.
- t1 The first listener to accept the data pulls down NRFD 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.



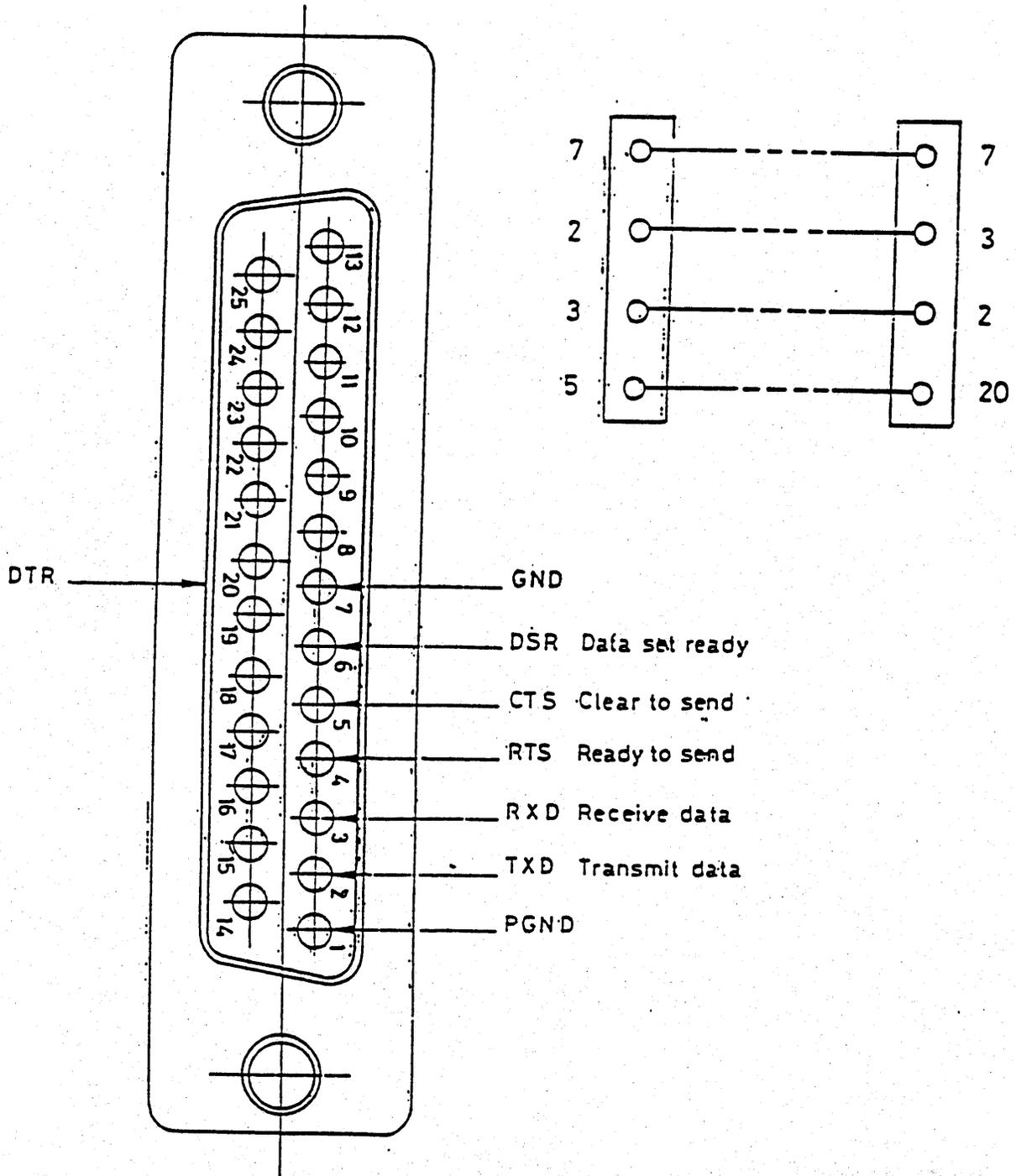
Logical flow of events for Source and Acceptor when transferring data using the handshake process

HANDSHAKE TIMING SEQUENCE IN GPIB IEEE-488

Figure 9.2



Part of twisted pair with opposing pins to be grounded near termination of other wire



RS232-C INTERFACE

APPENDIX A

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
0	00	NUL		
1	01	SOH	^A	GTL - Go To Local
2	02	STX	^B	
3	03	ETX	^C	
4	04	EOT	^D	SDC - Selected Device Clear
5	05	ENQ	^E	PPC - Parallel Poll Configure
6	06	ACK	^F	
7	07	BEL		
8	08	BS		GET - Group Execute Trigger
9	09	HT		TCT - Take Control
10	0A	LF		
11	0B	VT		
12	0C	FF		
13	0D	CR		
14	0E	SO	^N	
15	0F	SI	^O	
16	10	DLE	^P	
17	11	DC1	^Q	LLO - Local Lock Out
18	12	DC2	^R	
19	13	DC3	^S	
20	14	DC4	^T	DCL - Device Clear
21	15	NAK	^U	PPU - Parallel Poll Unconfigure
22	16	SYN	^V	
23	17	ETB	^W	
24	18	CAN	^X	SPE - Serial Poll Enable
25	19	EM	^Y	SPD - Serial Poll Disable
26	1A	SUB		
27	1B	ESC	^[
28	1C	FS	^\	
29	1D	GS]`	
30	1E	RS	~`	
31	1F	US	~_	
32	20	SP	-	MLA - My Listen Address (listen 0)
33	21	!	!	MLA - My Listen Address (listen 1)
34	22	"	"	MLA - My Listen Address (listen 2)
35	23	#	#	MLA - My Listen Address (listen 3)
36	24	\$	\$	MLA - My Listen Address (listen 4)
37	25	%	%	MLA - My Listen Address (listen 5)
38	26	&	&	MLA - My Listen Address (listen 6)
39	27	'	'	MLA - My Listen Address (listen 7)
40	28	((MLA - My Listen Address (listen 8)
41	29))	MLA - My Listen Address (listen 9)
42	2A	*	*	MLA - My Listen Address (listen 10)
43	2B	+	+	MLA - My Listen Address (listen 11)
44	2C	,	,	MLA - My Listen Address (listen 12)
45	2D	-	-	MLA - My Listen Address (listen 13)

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
46	2E	.	.	MLA - My Listen Address (listen 14)
47	2F	/	/	MLA - My Listen Address (listen 15)
48	30	0	0	MLA - My Listen Address (listen 16)
49	31	1	1	MLA - My Listen Address (listen 17)
50	32	2	2	MLA - My Listen Address (listen 18)
51	33	3	3	MLA - My Listen Address (listen 19)
52	34	4	4	MLA - My Listen Address (listen 20)
53	35	5	5	MLA - My Listen Address (listen 21)
54	36	6	6	MLA - My Listen Address (listen 22)
55	37	7	7	MLA - My Listen Address (listen 23)
56	38	8	8	MLA - My Listen Address (listen 24)
57	39	9	9	MLA - My Listen Address (listen 25)
58	3A	:	:	MLA - My Listen Address (listen 26)
59	3B	;	;	MLA - My Listen Address (listen 27)
60	3C	<	<	MLA - My Listen Address (listen 28)
61	3D	=	=	MLA - My Listen Address (listen 29)
62	3E	>	>	MLA - My Listen Address (listen 30)
63	3F	?	?	UNL - Unlisten
64	40	@	@	MTA - My Talk Address (talk 0)
65	41	A	A	MTA - My Talk Address (talk 1)
66	42	B	B	MTA - My Talk Address (talk 2)
67	43	C	C	MTA - My Talk Address (talk 3)
68	44	D	D	MTA - My Talk Address (talk 4)
69	45	E	E	MTA - My Talk Address (talk 5)
70	46	F	F	MTA - My Talk Address (talk 6)
71	47	G	G	MTA - My Talk Address (talk 7)
72	48	H	H	MTA - My Talk Address (talk 8)
73	49	I	I	MTA - My Talk Address (talk 9)
74	4A	J	J	MTA - My Talk Address (talk 10)
75	4B	K	K	MTA - My Talk Address (talk 11)
76	4C	L	L	MTA - My Talk Address (talk 12)
77	4D	M	M	MTA - My Talk Address (talk 13)
78	4E	N	N	MTA - My Talk Address (talk 14)
79	4F	O	O	MTA - My Talk Address (talk 15)
80	50	P	P	MTA - My Talk Address (talk 16)
81	51	Q	Q	MTA - My Talk Address (talk 17)
82	52	R	R	MTA - My Talk Address (talk 18)
83	53	S	S	MTA - My Talk Address (talk 19)
84	54	T	T	MTA - My Talk Address (talk 20)
85	55	U	U	MTA - My Talk Address (talk 21)
86	56	V	V	MTA - My Talk Address (talk 22)
87	57	W	W	MTA - My Talk Address (talk 23)
88	58	X	X	MTA - My Talk Address (talk 24)
89	59	Y	Y	MTA - My Talk Address (talk 25)
90	5A	Z	Z	MTA - My Talk Address (talk 26)
91	5B	[[MTA - My Talk Address (talk 27)
92	5C	\	\	MTA - My Talk Address (talk 28)

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
93	5D]]	MTA - My Talk Address (talk 29) MTA - My Talk Address (talk 30) UNT - Untalk
94	5E]]	
95	5F]]	
96	60	-	-	
97	61	a	a	
98	62	b	b	
99	63	c	c	
100	64	d	d	
101	65	e	e	
102	66	f	f	
103	67	g	g	
104	68	h	h	
105	69	i	i	
106	6A	j	j	
107	6B	k	k	
108	6C	l	l	
109	6D	m	m	
110	6E	n	n	
111	6F	o	o	
112	70	p	p	
113	71	q	q	
114	72	r	r	
115	73	s	s	
116	74	t	t	
117	75	u	u	
118	76	v	v	
119	77	w	w	
120	78	x	x	
121	79	y	y	
122	7A	z	z	
123	7B	{	{	
124	7C			
125	7D	}	}	
126	7E	-	-	
127	7F	NUL		
128	80		Ç	
129	81		Û	
130	82		é	
131	83		â	
132	84		ä	
133	85		à	
134	86		â	
135	87		ç	
136	88		è	
137	89		ë	
138	8A		è	
139	8B		ï	

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
140	8C		í	
141	8D		ì	
142	8E		À	
143	8F		Á	
144	90		Ê	
145	91		æ	
146	92		Æ	
147	93		Ô	
148	94		Ö	
149	95		ò	
150	96		ù	
151	97		ú	
152	98			
153	99		Ö	
154	9A		Ü	
155	9B		Ç	
156	9C		ç	
157	9D		¥	
158	9E		℞	
159	9F		ƒ	
160	A0		á	
161	A1		í	
162	A2		ó	
163	A3		ù	
164	A4		ñ	
165	A5		Ñ	
166	A6		•	
167	A7		•	
168	A8		¿	
169	A9		¿	
170	AA		¿	
171	AB		¿	
172	AC		¿	
173	AD		¿	
174	AE		«	
175	AF		»	
176	B0			
177	B1		⌘	
178	B2		⌘	
179	B3		⌘	
180	B4		⌘	
181	B5		⌘	
182	B6		⌘	
183	B7		⌘	
184	B8		⌘	
185	B9		⌘	
186	BA		⌘	
187	BB		⌘	

Dec	Hex	ASCII char	IBM-PC char	IEEE-488 Multiline Interface Message (Sent with Attention true)
188	BC		␣	
189	BD		␣	
190	BE		␣	
191	BF		␣	
192	C0		␣	
193	C1		␣	
194	C2		␣	
195	C3		␣	
196	C4		␣	
197	C5		␣	
198	C6		␣	
199	C7		␣	
200	C8		␣	
201	C9		␣	
202	CA		␣	
203	CB		␣	
204	CC		␣	
205	CD		␣	
206	CE		␣	
207	CF		␣	
208	D0		␣	
209	D1		␣	
210	D2		␣	
211	D3		␣	
212	D4		␣	
213	D5		␣	
214	D6		␣	
215	D7		␣	
216	D8		␣	
217	D9		␣	
218	DA		␣	
219	DB		␣	
220	DC		␣	
221	DD		␣	
222	DE		␣	
223	DF		␣	
224	E0		α	
225	E1		β	
226	E2		γ	
227	E3		π	
228	E4		Σ	
229	E5		σ	
230	E6		μ	
231	E7		τ	
232	E8		φ	
233	E9			
234	EA		Ω	