

NIM MODEL 623 SERIES

QUAD DISCRIMINATOR

March 1983

A T T E N T I O N

COMMON INHIBIT SHOULD PRECEDE ANALOG INPUT BY
6 NSEC (SEE SECTION 1.5).

MODULE SHOULD NOT BE PLUGGED IN WITH POWER ON.

SEE POCKET IN BACK OF MANUAL FOR SCHEMATICS,
PARTS LISTS, AND ADDITIONAL ADDENDA WITH ANY
CHANGES TO MANUAL.

A T T E N T I O N

GENERAL INFORMATION

PURPOSE

This manual is intended to provide instruction regarding the setup and operation of the covered instruments. In addition, it describes the theory of operation and presents other information regarding its functioning and application.

The Service Documentation should be consulted for the schematics, parts lists and other materials that apply to the specific version of the instrument as identified by its ECO number.

UNPACKING AND INSPECTION

It is recommended that the shipment be thoroughly inspected immediately upon delivery. All material in the container should be checked against the enclosed Packing List and shortages reported promptly. If the shipment is damaged in any way, please notify the Customer Service Department or the local field service office. If the damage is due to mishandling during shipment, you may be requested to assist in contacting the carrier in filing a damage claim.

WARRANTY

LeCroy warrants its instrument products to operate within specifications under normal use and service for a period of one year from the date of shipment. Component products, replacement parts, and repairs are warranted for 90 days. This warranty extends only to the original purchaser. Software is thoroughly tested, but is supplied "as is" with no warranty of any kind covering detailed performance. Accessory products not manufactured by LeCroy are covered by the original equipment manufacturers warranty only.

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 has not been caused by misuse, neglect, accident or abnormal conditions or operations.

The purchaser is responsible for the transportation and insurance charges arising from the return of products to the servicing facility. LeCroy will return all in-warranty products with transportation prepaid.

This warranty is in lieu of all other warranties, express 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 Research System Division Customer Services Department, 700 Chestnut Ridge Road, Chestnut Ridge, New York 10977-6499 (914) 578-6030, or your local field service office.

MAINTENANCE AGREEMENTS

LeCroy offers a selection of customer support service. For example, Blue Ribbon service provides guaranteed three-day turn around on repairs, a direct access number for product application assistance, yearly calibration and the addition of engineering improvements. Maintenance agreements provide extended warranty that allows the customer to budget maintenance costs after the initial warranty has expired. Other services such as installation, training, on-site repair, and addition of engineering improvements are available through specific Supplemental Support Agreements. Please contact the Customer Service Department or the local field service office for details.

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 and the schematics in the Service Documentation. 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.

SOFTWARE LICENSING AGREEMENT

Software products are licensed for a single machine. Under this license you may:

- Copy the software for backup or modification purposes in support of your use of the software on a single machine.
- Modify the software and/or merge it into another program for your use on a single machine.
- Transfer the software and the license to another party if the other party accepts the terms of this agreement and you relinquish all copies, whether in printed or machine readable form, including all modified or merged versions.

TABLE OF CONTENTS

		Page
1	SPECIFICATIONS	
1.1	Technical Data Sheet	
1.2	Front Panel Photograph with Callouts	
1.3	Input Characteristics	1-1
	1.3.1 Threshold Range	1-1
	1.3.2 Threshold Uncertainty	1-1
	1.3.3 Threshold Memory	1-1
	1.3.4 Threshold Calibration	1-2
	1.3.5 623 Series Threshold Hysteresis	1-2
1.4	Input Reflections	1-2
1.5	Common Inhibit	1-3
1.6	Bridged High Impedance Input Factory Option	1-3
1.7	Output Characteristics	1-3
	1.7.1 Output Width	1-4
	1.7.2 Output Width Uncertainty	1-4
	1.7.3 Updating	1-4
1.8	Timing Characteristics	1-4
	1.8.1 Double-Pulse Resolution	1-4
	1.8.2 Tracking Error	1-5
	1.8.3 Slewing	1-5
1.9	Packaging	1-6
1.10	Current Requirements	1-6
1.11	Recommended Use of the NIM Power Bins	1-6
1.12	Input Protection	1-7
Figures for Section 1		
2	TECHNICAL DESCRIPTION	
2.1	General	2-1
2.2	Input and Discriminator	2-1
2.3	Timing Stage	2-2
2.4	Output Stage	2-2
2.5	Internal Power Supplies	2-2
Figures for Section 2		
3	TEST AND CALIBRATION	
3.1	Trouble Shooting	3-1
3.2	Required Recalibration if LD601's are Replaced	3-3

SECTION 1

SPECIFICATIONS

1.3 Input Threshold Characteristics

1.3.1 Threshold Range

The threshold range of 623 Series Octal Discriminators is -30 mV to -1 V. Because the front panel screwdriver-adjustable potentiometer becomes increasingly sensitive as the threshold is increased, it eventually reaches a point (approximately -600 mV) beyond which it becomes difficult to set. Thus beyond the -600 mV level it should be assumed that the discriminator will attain its maximum threshold setting of -1 volt with negligible additional turning of the pot.

The low minimum threshold of the 623 series units makes it possible to use lower gain photomultipliers, lower voltage on phototubes and to drive PM signals over longer cable lengths than would be possible with higher thresholds. Compared with a -50 mV discriminator, for instance, utilizing RG-58 cable, the -30 mV discriminator would permit cable runs 66.7 feet longer than those permitted by a -50 mV discriminator for equal amplitude pulses. In addition, the low minimum threshold helps make it possible for one to back-terminate at the photomultiplier to absorb reflections and high amplitude noise. (In this case, the PM drives 25 Ω , the tube current is shared, and the amplitude is half that of the unterminated system.)

1.3.2 Threshold Uncertainty

Often the threshold of a discriminator is assumed to be strictly that value which is written on a spec sheet or determined by a front panel potentiometer. The actual value can be a strong function of environmental conditions. The external factors with the strongest effect upon the threshold value are the temperature and the power supply voltage. The 623 Series has excellent threshold stability (see Figure 1.1) including less than 0.2%/°C change due to temperature variations.

1.3.3 Threshold Memory

In order for a user to be assured of a well defined threshold value, this value must remain constant for typical conditions encountered. If a discriminator's threshold is affected by previous events, it is said to have threshold memory. To the user, this is an additional threshold uncertainty, since the discriminator's threshold for any given event depends upon the elapsed time from the preceding threshold crossing. In most discriminators, threshold memory (or second pulse sensitivity) becomes much larger as the pulse separation is reduced. The effect can be further aggravated by the amplitude of the initial signal. In some circuits a very large input can effectively paralyze the discriminator for a long period following the overload.

Figure 1.2. shows the threshold memory of the 623 series discriminators for a signal 20 dB over threshold and when the first input is just slightly above threshold.

Note that in both cases the threshold memory effect for the second pulse is within 6% of nominal for all spacing wider than 9 nsec. The second graph (i.e., the one more favorable to the discriminator) shows exceptionally clear response with virtually no effect in evidence above 10.5 nsec.

1.3.4 Threshold Calibration

Determination of the input threshold set by the front panel control has typically required the experimenter to calibrate each change in setting with an external pulse source and oscilloscope. Newer discriminators offer a front panel test point whose DC level is proportional to the actual discriminator threshold. Not only does this allow rapid and simple determination of threshold, but it also allows the experimenter to easily return the threshold level to a previously recorded setting. The convenience, and therefore the usefulness, of this feature is strongly dependent upon the characteristics of this monitor voltage, particularly its linear proportionality with the threshold setting. Figure 1.3 indicates the characteristic curve of monitor voltage vs. threshold for the LeCroy 623 Series Discriminators.

1.3.5 623 Series Threshold Hysteresis

In standard 623 series discriminators, hysteresis is built into the front end, such that every threshold crossing will not trigger the discriminator unless the previous signal has returned to below approximately -15 mV. This avoids multiple pulsing due to, for example, fine structure riding on a flat-topped pulse. Note the examples in Figure 1.4.

In Example A, the pulse shape variations of the input pulse will not retrigger the discriminator even though they cross the threshold level at a time exceeding the double pulse resolution of the unit. In Example B, since the input signal does go back through -15 mV and then once again rises to exceed the -30 mV threshold level, two discriminator outputs would result.

1.4 Input Reflections

Input reflections probably account for the majority of multiple-pulsing problems encountered by users. As discriminator thresholds have become lower, the amount of reflected signal required to retrigger the unit has decreased accordingly. Unless the percentage of input reflections is reduced along with the minimum threshold value, the user finds himself in the situation where multiple-pulsing negates the usefulness of a lower threshold. The input reflections of a discriminator effectively determine the allowable dynamic range of event or noise input signals.

A limited dynamic range may mean that minimum threshold values will have to be set higher to prevent multiple pulsing on noise or large (shower) event signals. In addition, high input reflections also limit the ability of a discriminator to be used to restandardize logic signals which have been degraded by long cables.

Figure 1.5 shows the maximum input voltage and allowable dynamic range as a function of discriminator input reflections.

As is evident, the 623 series discriminators offer a dramatic improvement in input reflection suppression over previously available discriminators. Because of the extremely low reflection coefficient of the 623's (i.e., $<2\%$ for inputs of risetime ≥ 2 nsec), maximum input signal is more than a volt larger than it would be for a unit exhibiting the typical 10% reflections, offering five times increase in the discriminators' dynamic range.

1.5 Common Inhibit

All eight channels of the Model 623B may be disabled by a common front panel NIM input. A time difference of 6 nsec exists between the analog and the inhibit inputs. In order to inhibit, the leading edge of the veto should precede the threshold crossing by 6 ± 1 nsec. The actual time inhibited is 5 nsec shorter than the duration of the veto input.

1.6 Bridged High Impedance Input Factory Option

Certain 623 series modules are offered with bridged high impedance input options. The bridged high impedance inputs permit a user to drive only one cable from the photomultiplier to the discriminator to permit subsequent fast logic decision and pattern recognition to be performed. A popular method in the absence of this discriminator input option is to run two cables, one of which is from the dynode, which then must be inverted before the ADC or discriminator could accept it.

For this bridged input option, the left lower output connector is generally sacrificed to provide the additional input. A silver-colored ring is placed around this connector (as well as around the original input connector) when the unit is modified for this option to signify the fact that there are now two input connectors. In standard usage, the silver-colored ring usually specifies complementary output.

1.7 Output Characteristics

Low Impedance Voltage Output: The Model 623 series discriminators require only one output driver (for 3 outputs) per channel. This driver requires no quiescent current, thereby permitting extremely small average power dissipation while still providing fast output response time. The output amplitude, although somewhat dependent on the number of output loads, will always be more negative than -800 mV in the logic "1" state.

The low impedance voltage output stage response times will be optimum when driving at least two 50 Ω loads.

1.7.1 Output Width

The output pulse width range for the 623 is 6 to 150 nsec. For the 623A the range is 7 to 50 nsec. Both ranges are continuously adjustable via front panel width potentiometers. The control allows coarse adjustment near maximum width and precise adjustment for narrower settings.

1.7.2 Output Width Uncertainty

The output width of most discriminators is a nominal value determined by the front panel potentiometer. Dispersion caused by variation in the discriminator input amplitude (jitter) results in a broadening of the skirts on the timing curve. In the LeCroy 623 series discriminators, this contribution is virtually non-existent as indicated in Figure 1.6.

The other main contributions to output width uncertainty are a function of external conditions in a manner similar to threshold uncertainty. Variations in both temperature and voltage can cause significant changes in output width with undesirable consequences identical to dispersion caused by input amplitude.

Figure 1.7 indicates the uncertainty in output width of the 623 series discriminators as a function of reasonable variations in temperature and supply voltage.

1.7.3 Updating

The LeCroy 623 series discriminators are all updating. In an updating discriminator the output is extended if a second pulse comes in before the first output returns to zero, as long as the second pulse arrives at a time later than the double-pulse resolution of the unit. Thus, the second pulse will be seen by the front end even though an output pulse is still present from the first signal, and that second pulse will cause a new output to be generated and added (in time) to the portion of the original output that already occurred.

1.8 Timing Characteristics

1.8.1 Double-Pulse Resolution

The speed of a discriminator is practically defined by its double-pulse resolution, or the time between the leading edges of the most closely spaced pulse pair for which the discriminator produces two distinct output pulses. Although simple in concept, this specification can be misleading unless the input conditions are precisely defined and performance fully specified. Characteristic curves which describe double-pulse resolution for the 623 series are in Figures 1.8 - 1.10.

Double-Pulse Resolution vs Input Amplitude: The double-pulse resolution of some discriminators is a strong function of the amount overdrive. Typical anomalies include substantial increases in amplitude to achieve minimum pulse pair resolution (which is an effective threshold increase as a function of rate) and/or limited input dynamic range over which the discriminator adheres to specifications. A third effect is equivalent to tracking error. Does a discriminator have 8 nsec DPR if it never produces output pulses spaced more closely than 10 nsec apart? In some cases this effective timing error can be much larger than time shift due to intrinsic slewing or risetime dependent slewing. Figure 1.8 shows the minimum double-pulse resolution of the LeCroy 623 series discriminators as a function of input amplitude from threshold to 10X threshold.

It is worth noting that the 623's maintain a DPR of under 9 nsec for all inputs over the 10:1 dynamic range. Although not featured as part of the general specifications, the double-pulse resolution is much better than specified over most of the measured dynamic range. Also significant is the absence of tracking error at the limit of the discriminator's input performance. Throughout the measured range, the time shift of the output averages 2.54% or approximately 200 psec.

Double-Pulse Resolution vs Input Width: The DPR of a discriminator is a strong function of the duration of the first pulse in an input pair, since this width affects the recovery time allowed the discriminator input stage between the two pulses. If the double-pulse resolution is not linear with input width, it may mean that the discriminator will not respond to the second pulse following an overload photomultiplier signal. The double-pulse resolution vs input width of the 623 series discriminators is shown in Figure 1.9. This figure demonstrates that the discriminator's response is linear with input width and has a fixed recovery time of 4 nsec following an input of any duration.

1.8.2 Tracking Error

The ability of a discriminator to be used for precise timing (coincidence or TOF) in an environment which encounters narrow pulse pair separations is demonstrated by considering the time shift (or tracking error) introduced as the time interval between successive inputs is reduced. In an experiment, tracking error is equivalent to time dispersion as a function of input rate. For many experiments, this can be critical, since it is often in high rate situations that the best timing resolution is required.

Tracking error of the 623 series discriminators as a function of input pulse spacing is indicated in Figure 1.10.

1.8.3 Slewing

For input rates which do not tax the double-pulse resolution of the discriminator the most important characteristic which defines the

fideliity of the discriminator output to the time information in the input signal is slewing. This is defined as variation in the input-to-output time delay of a discriminator with input amplitude. The net measured slewing yielded by a discriminator has two components, one contributed by the discriminator itself (intrinsic slewing) and the other dependent upon the input risetime.

Intrinsic slewing might be defined as the slewing measured with a delta function input. Risetime dependent slewing arises from the fact that the discriminator fires earlier on the leading edge of a large pulse of finite risetime than on one of smaller amplitude with the same risetime. For an extreme range of pulse heights, the maximum contribution is equal to the 0 to 100% risetime of the pulse.

With most discriminators, the largest portion of the slewing occurs in the amplitude region just above threshold. Threshold being defined as the input amplitude that produces 50% triggering. Slewing specifications are frequently given over an input amplitude range from threshold to a specified overload factor (such as 10X threshold).

No commonly accepted standard exists for measuring the slewing characteristics of discriminators. One technique which LeCroy considers relevant to describing a discriminator's timing characteristics is to obtain a time spectrum of shift in input-output delay when a uniform spectrum of pulse heights from below threshold to many times threshold is used to drive the discriminator. Such an input spectrum constitutes a relatively severe test of the discriminator's timing performance for it contains a relatively higher proportion of near threshold pulses than does a usual beam-derived photomultiplier spectrum. It takes into account all aspects of discriminator slewing performance and presents their combined effect in terms of a time dispersion curve such as indicated in Figure 1.11.

1.9 Packaging

The NIM 623 series discriminators are all packaged in a #1 NIM module with LEMO-type connectors. Due to front panel space limitations, the 623's are not offered with BNC connectors. The CAMAC 2623 is packaged in a #2 CAMAC module with LEMO-type connectors.

1.10 Current Requirements

In order to provide an octal discriminator with fast response times and output levels greater than 800 mV, a large amount of supply current is required. The models 623 and 623A require about 11 watts. Therefore, if more than 9 of these units are to be used in a bin, the bin power supply must be capable of providing more than the standard 96 watts. A 200 watt NIM bin (Model 1002) is available from LeCroy.

1.11 Recommended Use of the NIM Power Bins

It is highly recommended any NIM bin be kept at as constant a temperature as possible, using air conditioning and fans to assure

air flow through all modules in every bin. Elimination of large temperature variations removes the possibility of temperature drift effects upon modules and the forced air flow is good insurance against the potential failure of components in the modules due to excessive heating for extended periods of time. Despite the fact that all components are pre-aged and burned-in before insertion into LeCroy modules, and the modules themselves are temperature cycled for days under power between initial test and final test, it is recommended that subjecting any modules to adverse operating conditions be avoided when possible.

1.12 Input Protection

The inputs of 623 series discriminators are protected to 5 A for 0.5 μ sec, clamping at +1 and -7 V. Beyond these voltages the input is no longer terminated in 50 Ω and substantial reflections will occur.

The DC protection is limited by the 0.25 watt dissipation limit on the input resistor, which can be assumed to offer protection against DC signals between -5 V and +5 V.

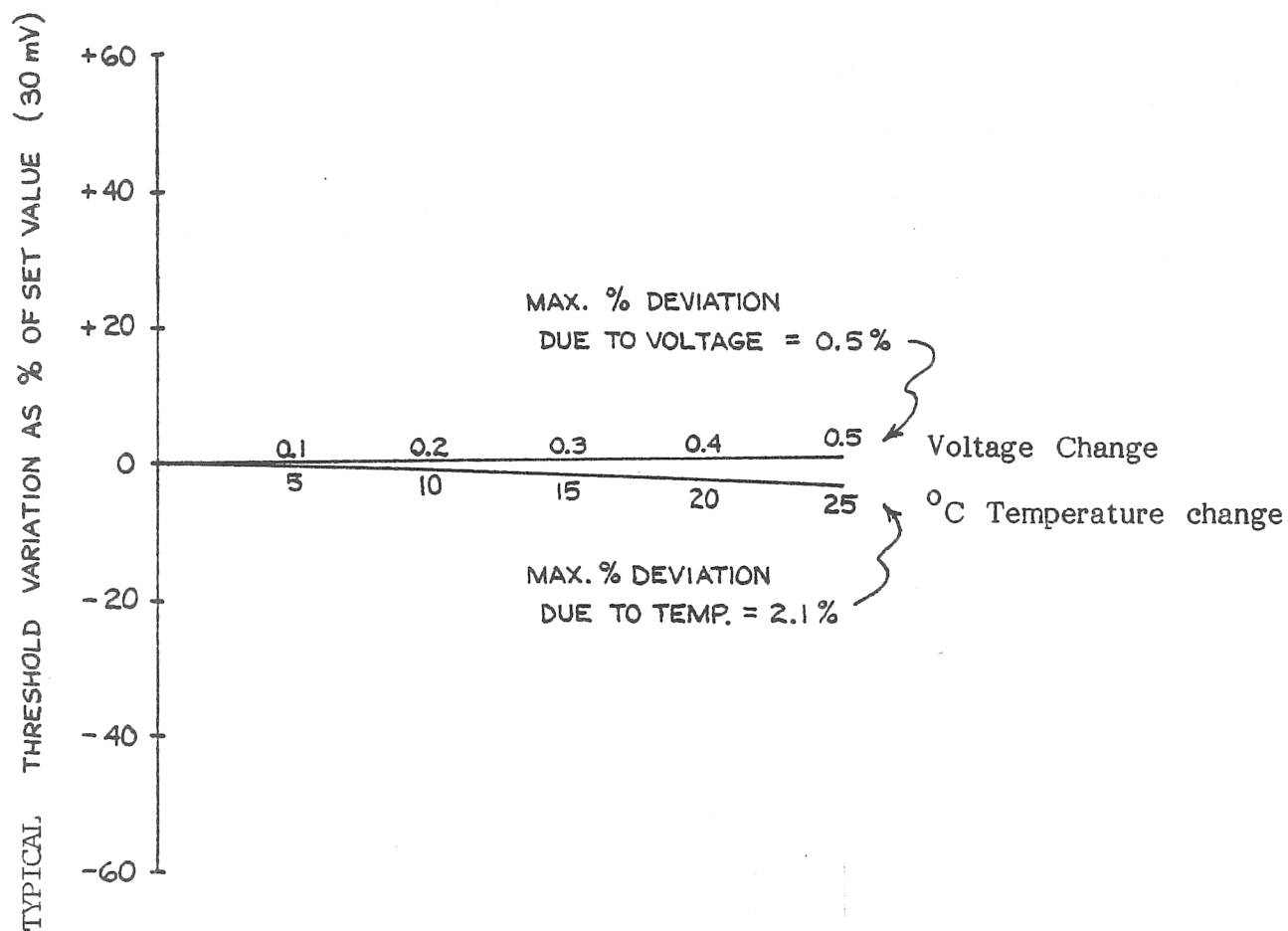


Figure 1.1

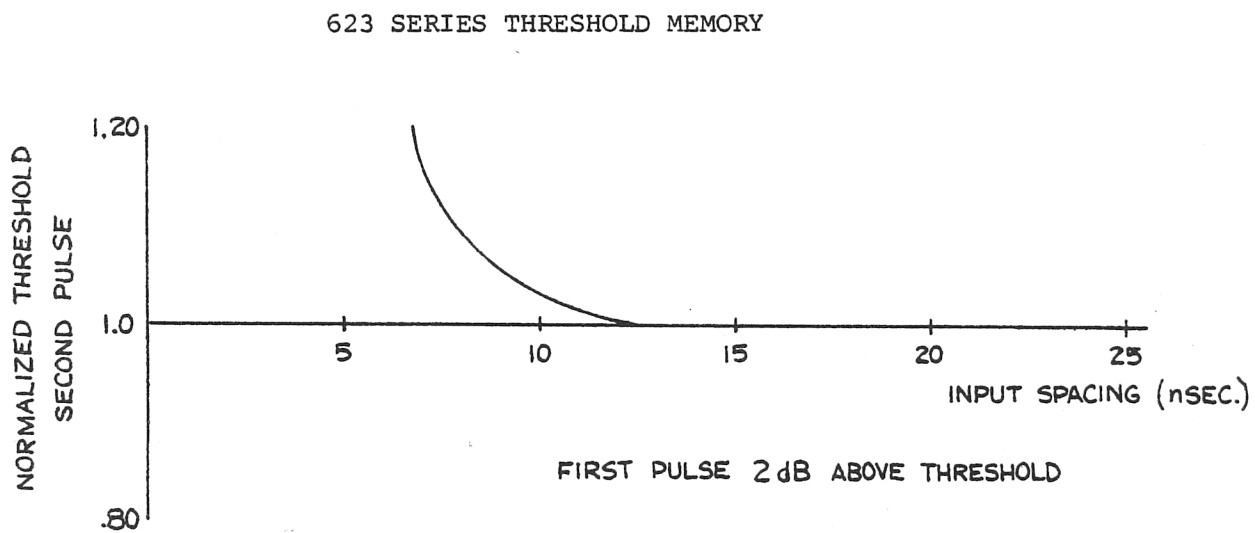
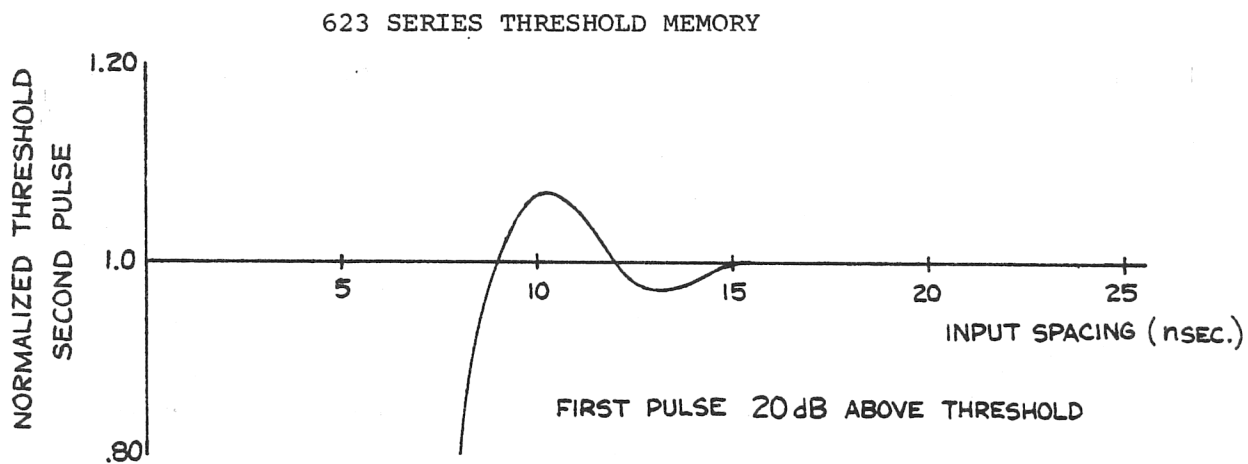


Figure 1.2

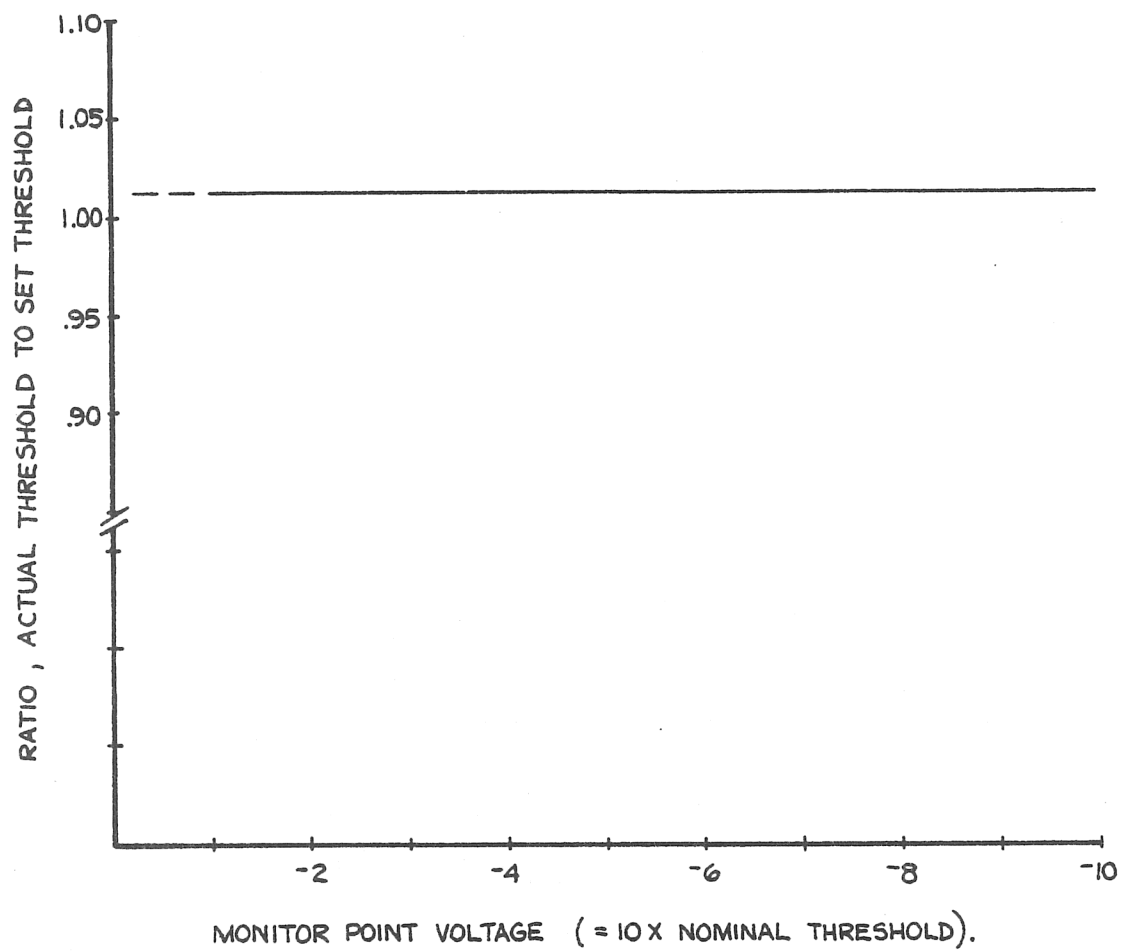


Figure 1.3

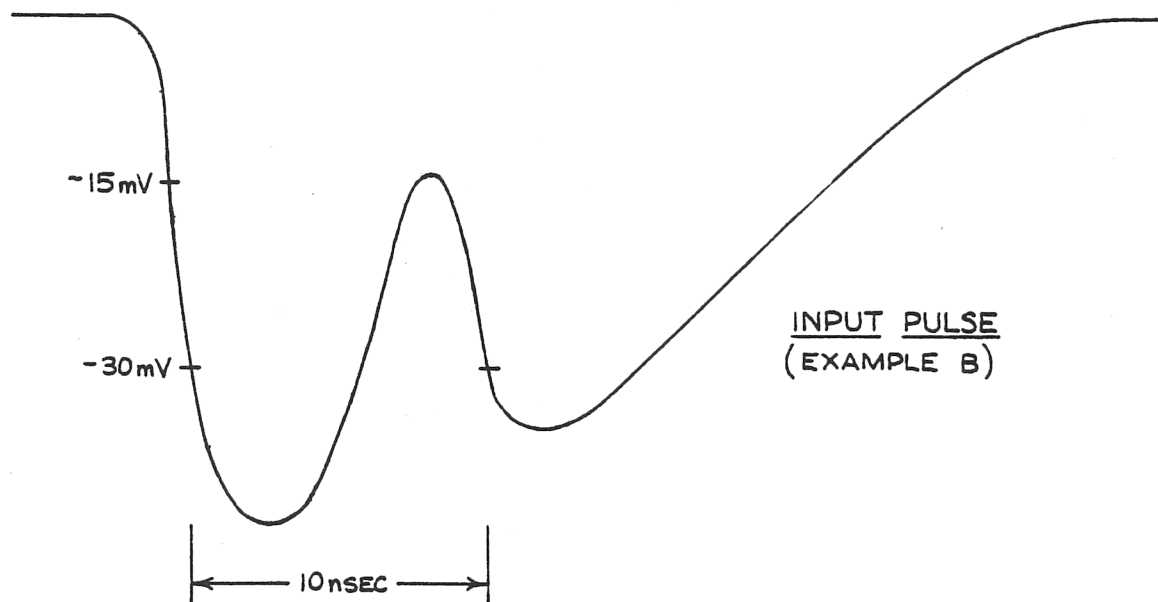
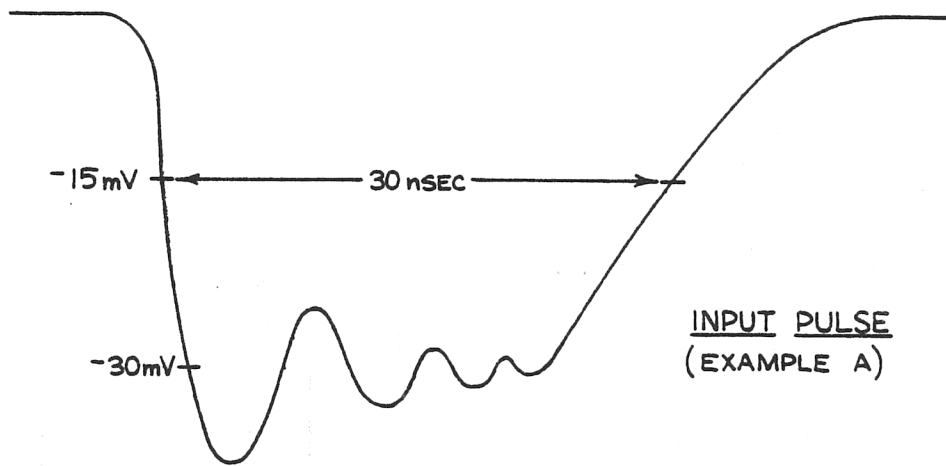


Figure 1.4

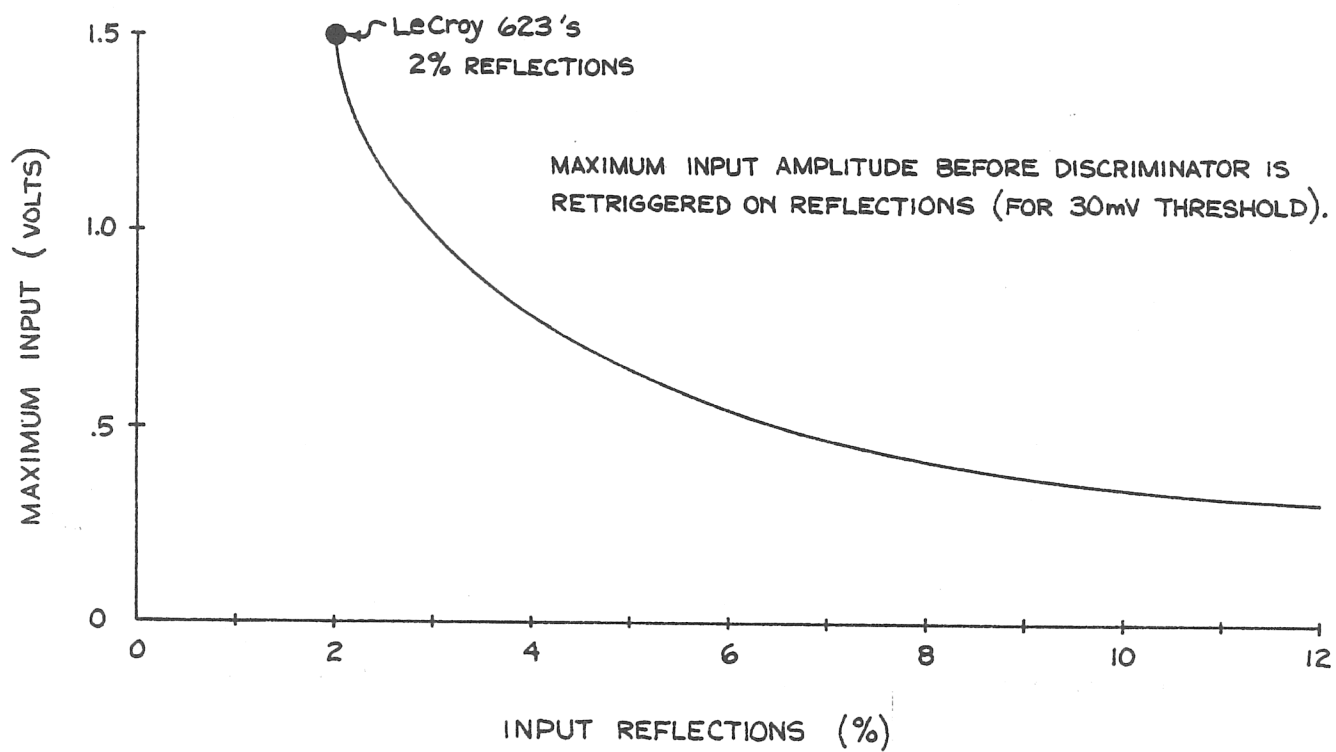
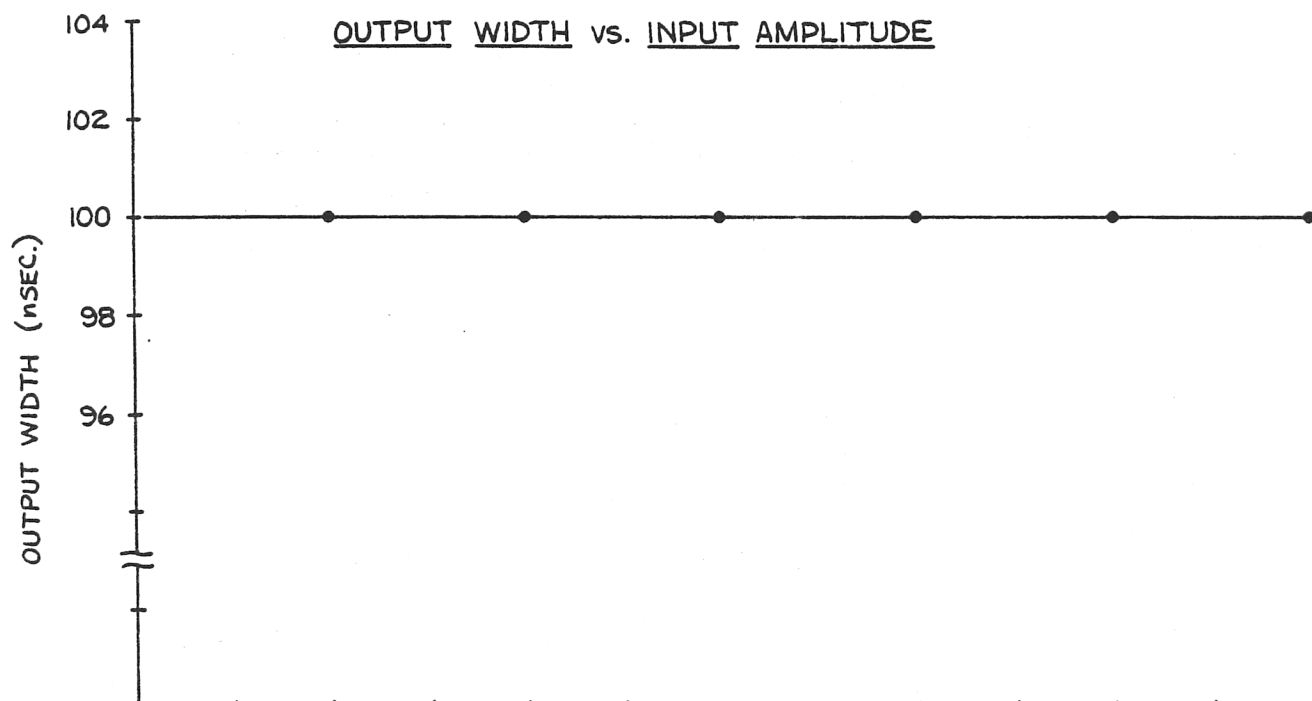


Figure 1.5



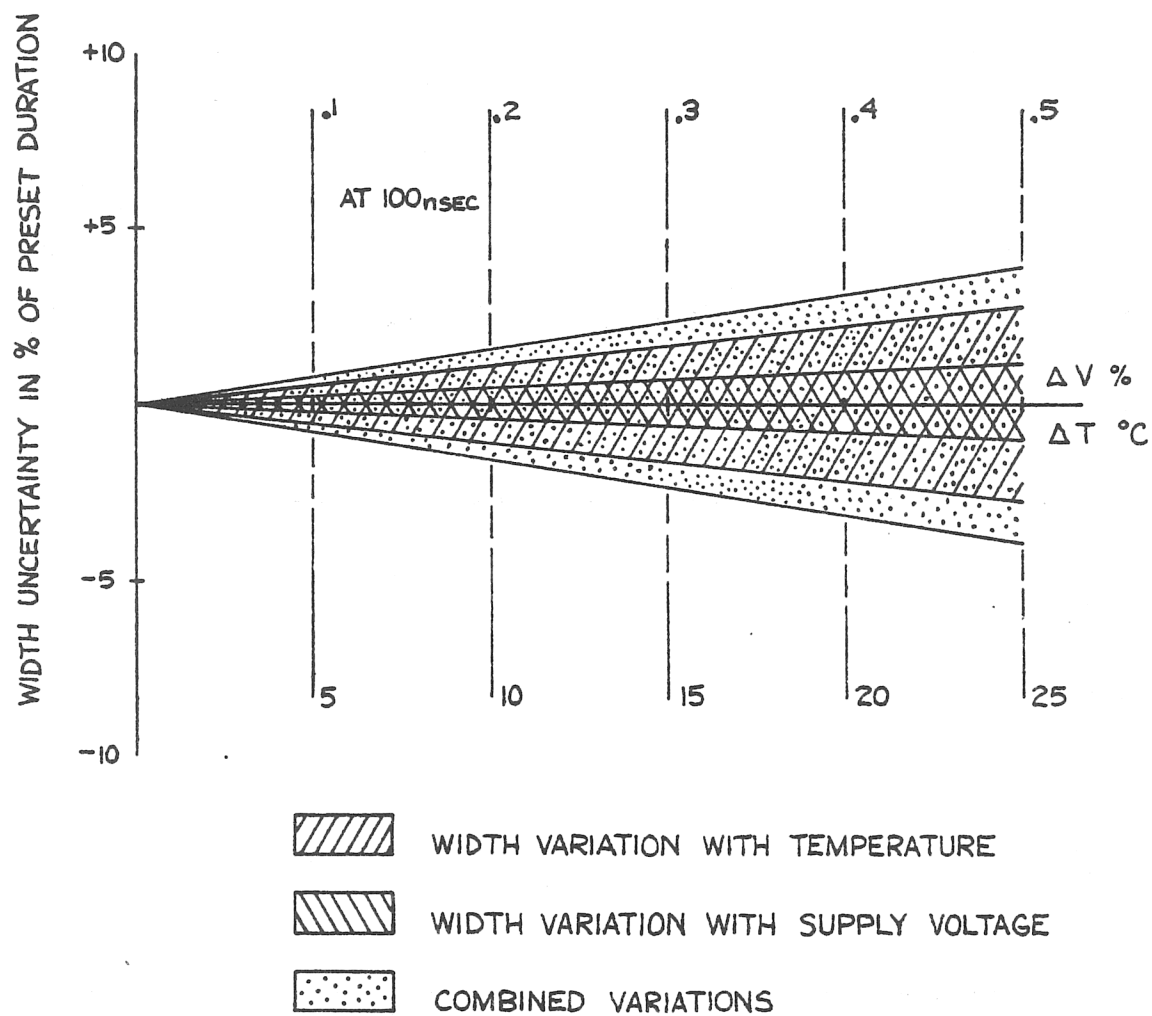


Figure 1.7

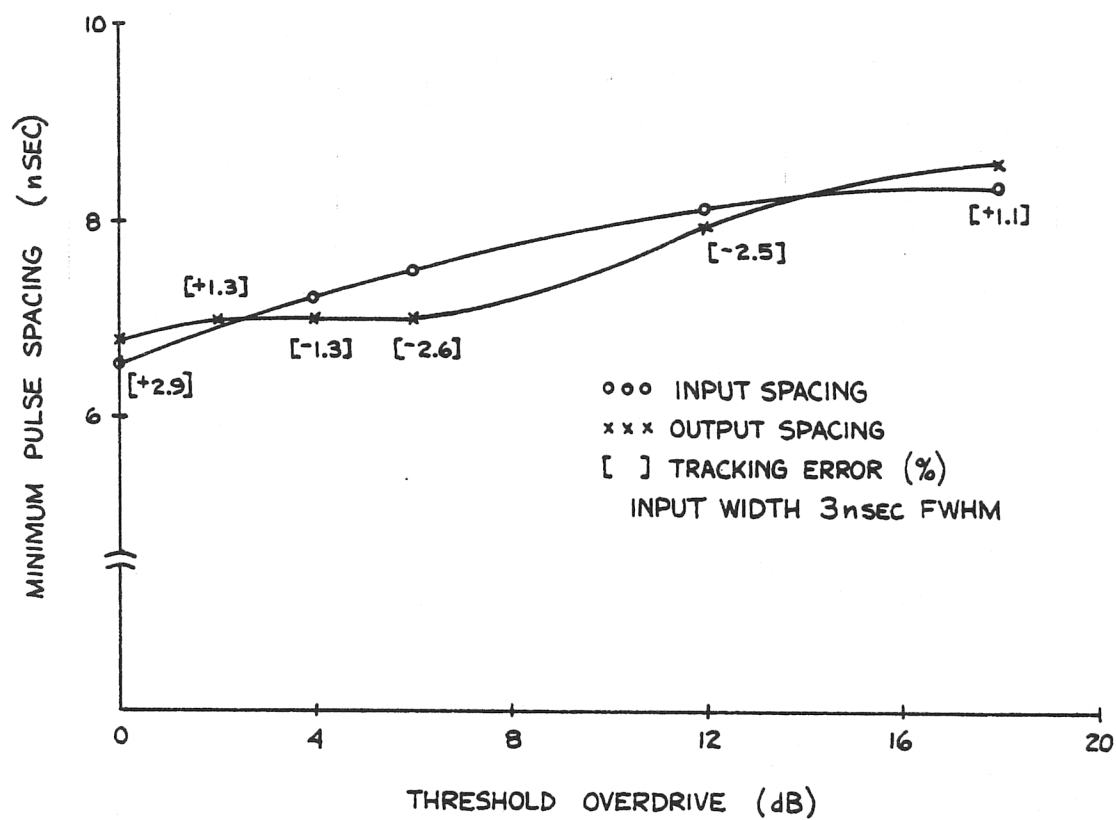


Figure 1.8

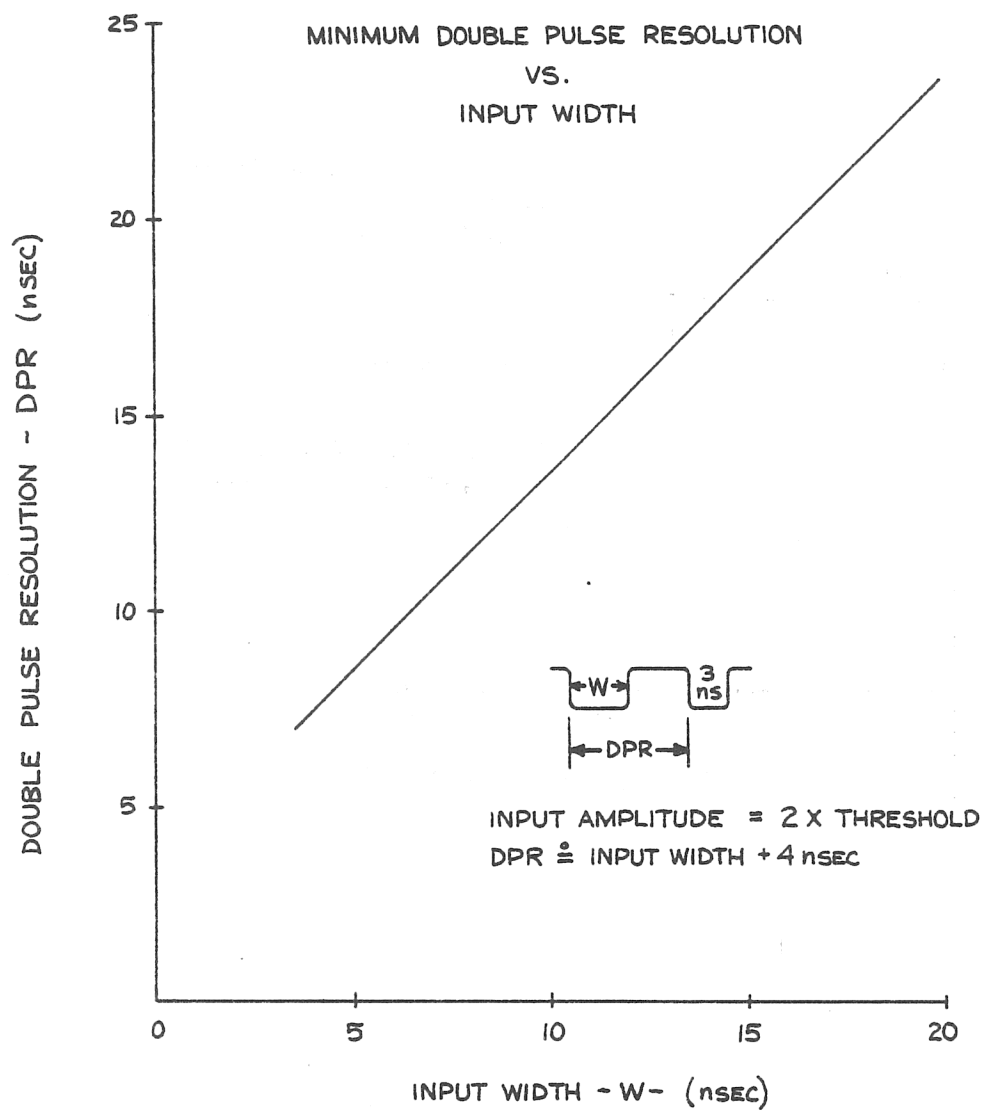


Figure 1.9

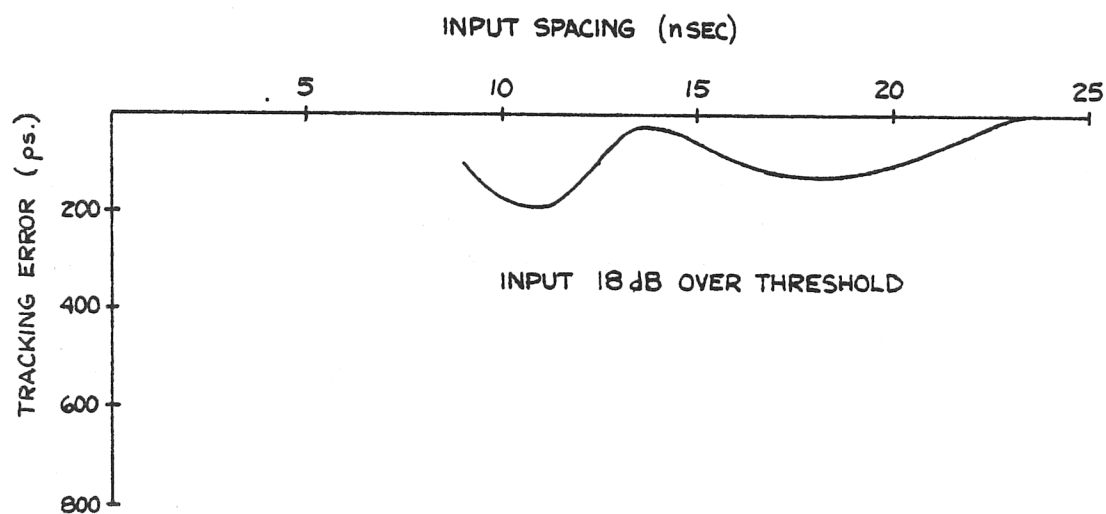
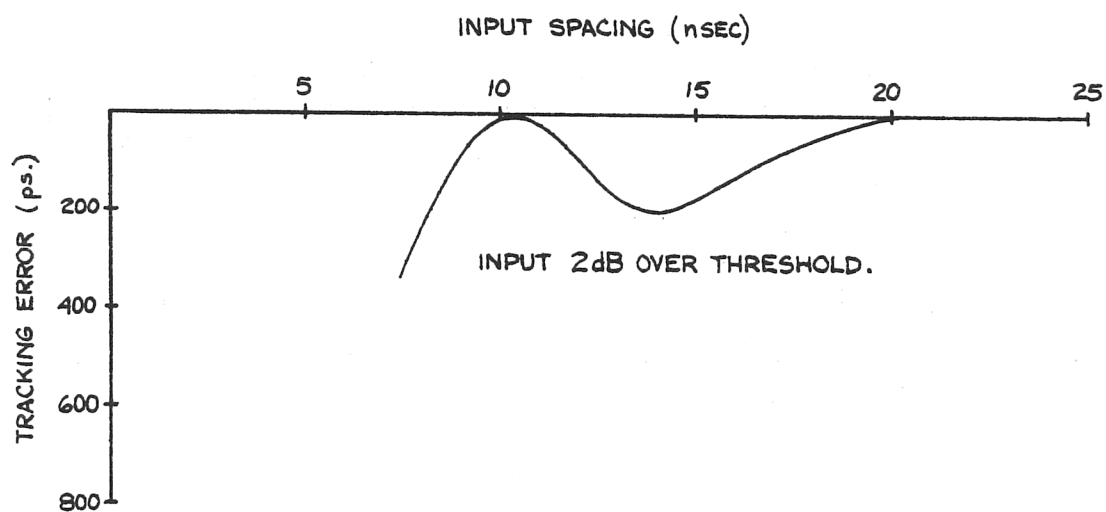
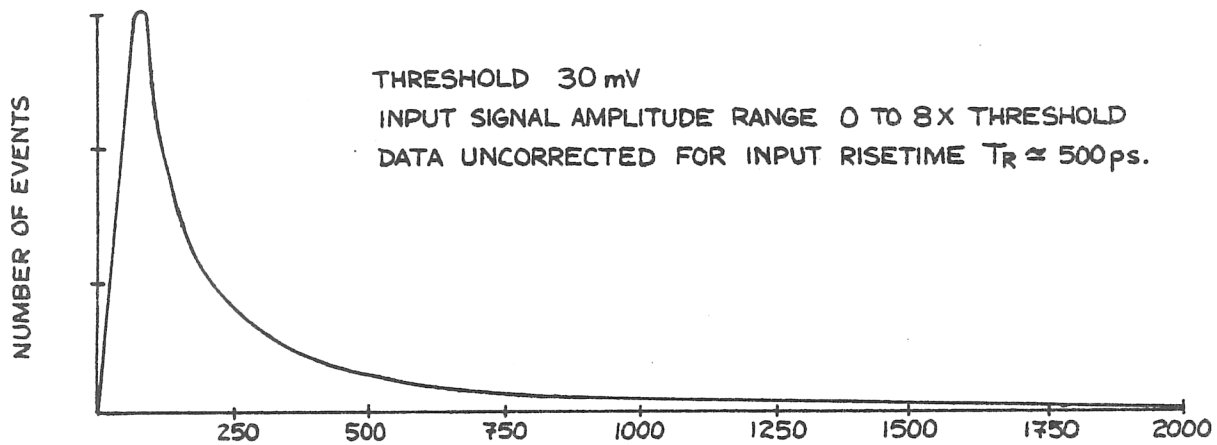


Figure 1.10



From this curve, an integral curve such as shown below may be plotted indicating the percentage of the linearly distributed input events with time shift $\leq t$.

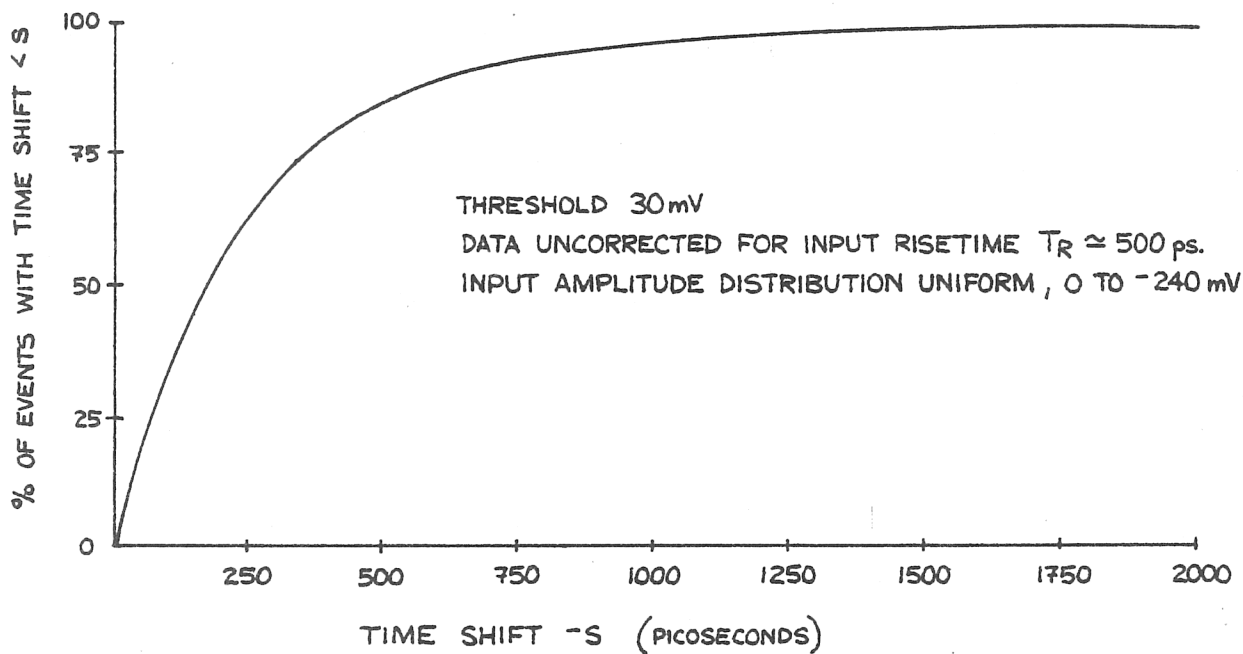


Figure 1.11

SECTION 2

TECHNICAL DESCRIPTION

2.1 General

Each of the eight channels of the 623 series models is composed of three basic sections:

1. Input and discriminator stage
2. Timing or pulse-former stage
3. Output stage.

A block diagram of the 623 series models can be seen in Figure 2.1, and a complete schematic of a specific model can be found in the rear pocket of this manual.

2.2 Input and Discriminator

The input and discriminator stage is based on the LeCroy Model LD601 hybrid. This unit contains all of the circuitry of the discriminator with the exception of the input termination and high voltage protection. The LD601 is functionally presented in Figure 2.2. The threshold level is set by changing the voltage bias on a fast differential amplifier which has a small amount of positive feedback to provide regeneration at threshold. In actual operation the V_T input is grounded, and the threshold level is determined by the 10:1 voltage divider (composed of the external 999 Ω and internal 100 Ω resistors) operating from a voltage which is set by a front panel potentiometer and monitored at the front panel test point.

The measured voltage will be 10 times the actual threshold voltage. When an input signal applied to -IN is equal to the threshold voltage

independent of the input width. Internally, the latch output is fed back to reset the latch after a short time delay, thus generating a short output pulse whose actual width can be set by the proper external selection of RC time constant and voltage levels at Pins 3 and/or 4. It is set at approximately 3 nsec in the 623 series models.

Two trim resistors, T1 and T2, are associated with this stage (see enclosed schematic). T1 sets the minimum threshold. T2 calibrates the LD601 threshold to the test point voltage at its respective channel. If the LD601 is changed, T2 will probably require trimming.

2.3 Timing Stage

The output of the LD601 drives a fast NPN switching transistor. Normally this transistor is found in its cut off region, its collector is clamped to approximately 400 mV by a Schotkey diode. This 400 mV level biases the PNP output stage driver transistor, Q2, to its cut off state. In this state the voltage across the 7.5 pF timing cap is approximately 3.2 V. When the LD601 provides an input pulse to the timing stage the NPN device turns on (it is prevented from saturating by the anti-saturation diodes), the voltage at the collector is negative such that the PNP driver turns on and supplies a pulse to the output stage. The duration of this pulse is determined by the time constant consisting of the equivalent resistance of the front panel potentiometer and trim resistors and the 7.5 pF cap. Since the final voltage to which the cap can charge is much greater than the point where it is clamped, a fairly linear ramp is produced on the collector of the NPN. When the capacitor voltage crosses the base threshold voltage of the PNP, the drive turns off and allows the output stage to return to its quiescent level.

2.4 Output Stage

The output stage is a simple NPN inverter stage with the emitter returned to the negative 3.8 volt supply. The stage is normally biased in the cut off region. During an output pulse, sufficient base current is supplied from the LD601 to turn the output driver on. In the on condition, the collector voltage is approximately -2.7 V. The 110 Ω series resistor and the 50 impedance of the load form a divider to provide a -840 mV output to the output connector. In order to reduce the turn off delay time of the output stage, the output driver is prevented from entering the saturation region by an anti-saturation technique, consisting of a conventional diode and a hot carrier diode.

2.5 Internal Power Supplies

Four internal power supplies are used to generate the -0.8, -3.8, +6 V and -6 V.

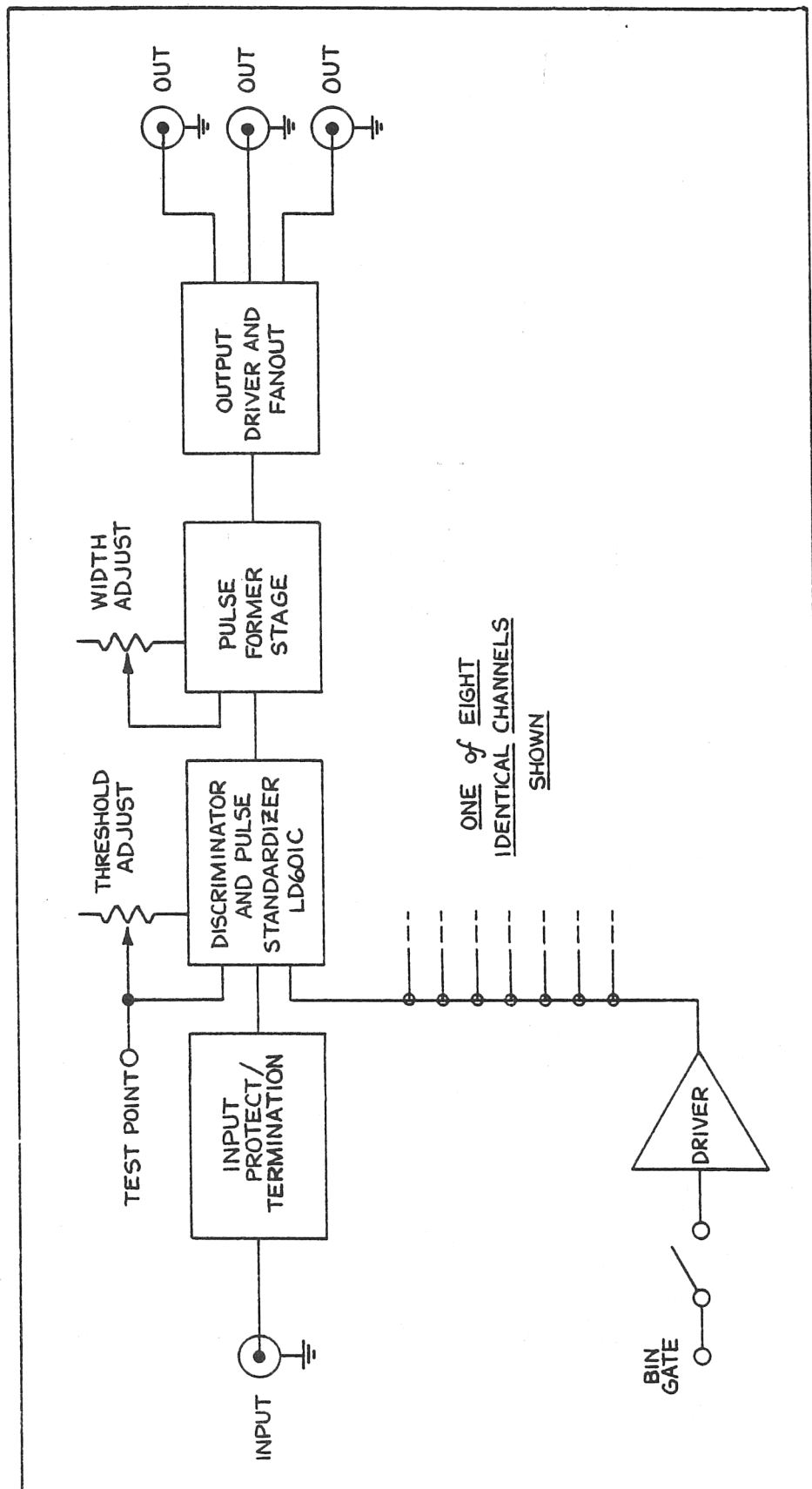


Figure 2.1

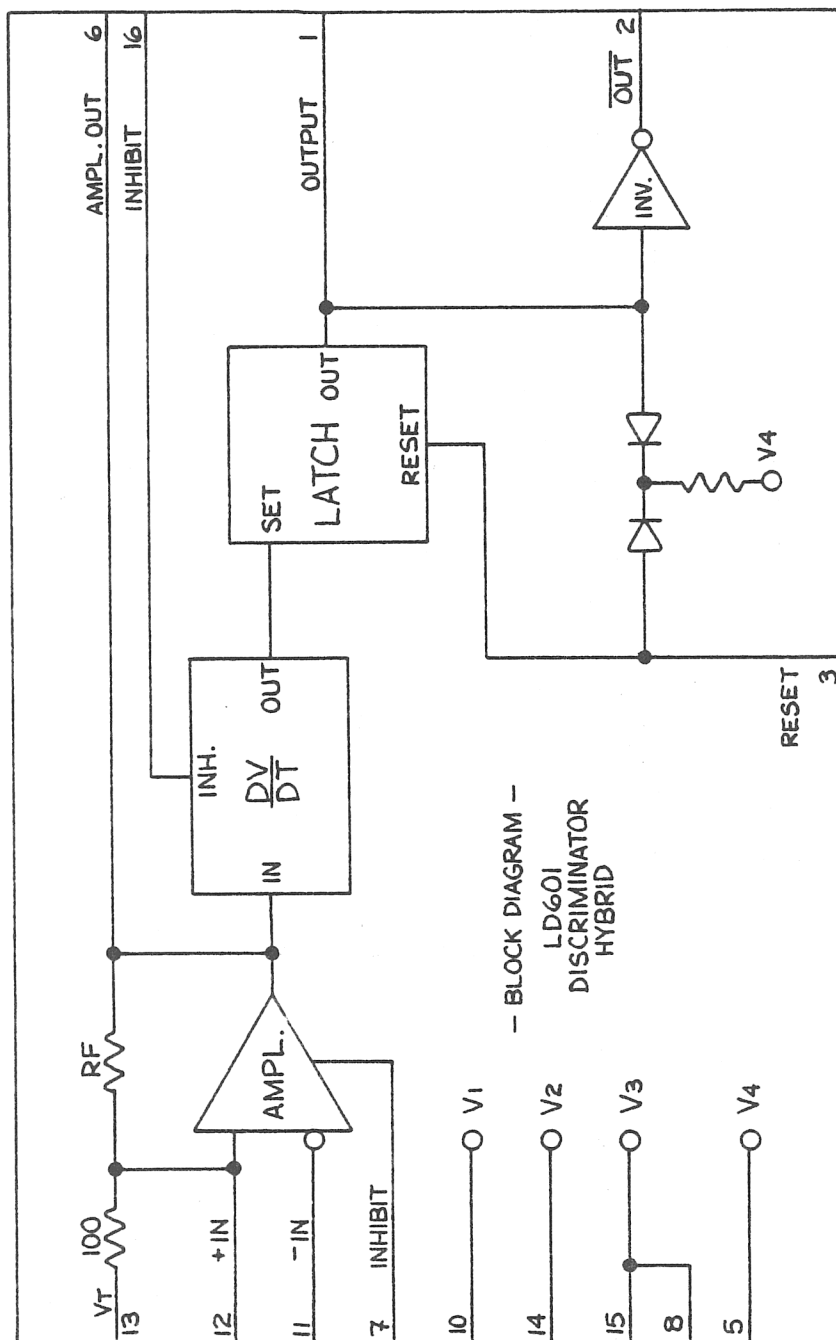


Figure 2.2

SECTION 3

TEST AND CALIBRATION

This Test and Calibration Section has been included to familiarize the service technician with the areas that should be checked when searching for sources of failures and after replacing components, especially front end hybrids (LD601's). The trouble-shooting section is by no means exhaustive, but it does provide insight into some of the problems that have occurred at LeCroy during the initial testing of the 623's. The technician should follow the "Trouble-Shooting Guide" for ease in determining the defective component. Replacement of critical components will require some recalibration.

3.1 Trouble Shooting

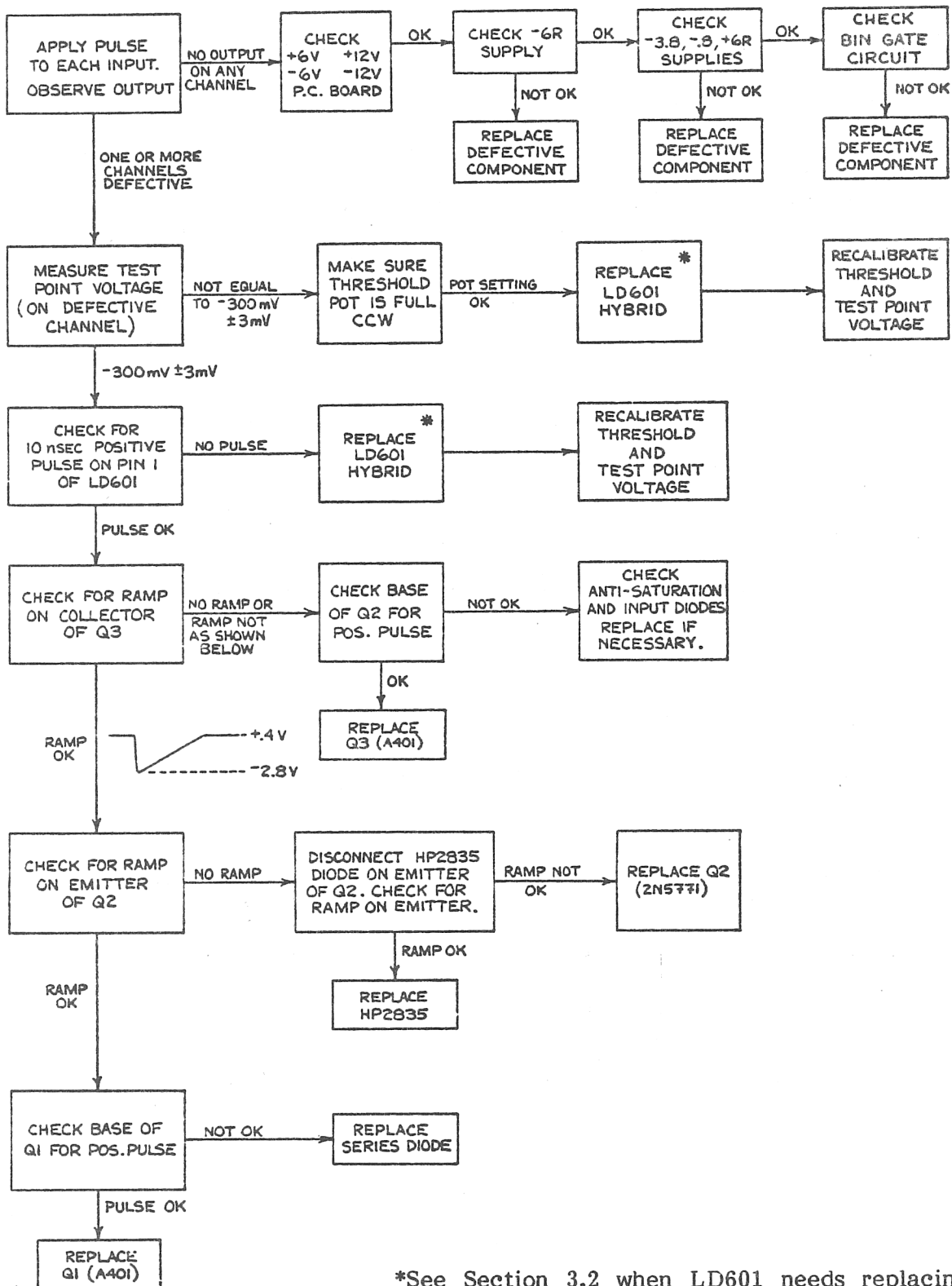
Equipment Required:

1. Digital Voltmeter.
2. Sampling scope; 50 Ω input impedance.
3. High impedance real time scope with bandwidth of 150 MHz or greater (Tektronix 454, 475, or equivalent).
4. Pulse generator or signal source capable of producing 10 nsec - 50 mV pulse into 50 Ω .

Initial Set-Up:

1. Use NIM power extender cable to power the 623 under test.
2. Set all threshold and width pots to their full counter-clockwise position (threshold equal to -30 mV and width equal to less than 5 nsec).

TROUBLE-SHOOTING GUIDE



3.2 Required Recalibration if LD601's are Replaced:

If any LD601 was found to be defective and required replacement, the Threshold and Test Point voltage should be recalibrated.

Procedure:

1. Set front panel Threshold pot to minimum (counterclockwise).
2. Measure Test Point voltage. If not equal to -300 ± 5 mV, replacing existing trim resistor T_1 , (across 5 K Ω pot) with proper resistance to bring Test Point voltage into required range (50 K to 150 K Ω).
3. Check Threshold level with a 5 nsec wide pulse; if it is not -30 mV, replace existing trim resistor T_2 (across 12.4 K Ω resistor) with proper resistance (50 K to 150 K Ω).
4. Check minimum output width, set front panel width control pot fully counterclockwise, check pulse width - if it is not 6 nsec (or less) for model 623 or 7 nsec or less for model 623A, retrim by replacing trim resistor (across the 430 Ω) with the proper value.
5. Check maximum output width, set front panel width control pot fully clockwise, check pulse width - if it is not 150 nsec (or greater) for model 623 or 50 nsec (or greater) for model 623A, retrim by replacing the trim resistors (across the width pot) with the proper value.

Replacement of Q3 and Q4:

Observe output width of less than 1 μ sec with front panel width pot set to its full clockwise position. Retrimming will be required. (See Calibration (9) Maximum Width).

Calibration

The following is a detailed step-by-step calibration procedure for the 623 Discriminator. The sequence should be followed to avoid extraneous labor.

Important

- a. When actual trim and calibration adjustments are performed, be sure the unit had at least 5 minutes of warm-up time. (Calibration may be off if warm-up time is too short).
- b. If for any reason, long periods of time between trimming occur, be sure to double check periodically the bin voltages (Step 3). (Power supply voltage may change and calibration may be off when performed to the new changed voltage).
- c. If at any check or calibration step problems occur, refer to the

Trouble-Shooting Guide.

Procedure

1. Check (on board) the presence and verify the following correct voltages: ± 6 V, ± 12 V, -24 V. These voltage points are clearly marked on the rear of the P. C. board.
2. -0.8 Volt Regulator - Measure the voltage on the -0.8 V bus.
Readjust pot if voltage is not -0.8 V ± 8 mV.
3. -3.8 Volt Regulator - Measure the voltage on the -3.8 V bus.
Readjust pot if voltage is not -3.8 V ± 38 mV.
4. +6 Volt Regulator - Measure the voltage on the +6 VR bus.
Readjust pot if voltage is not $+6$ V ± 60 mV.
5. -6 Volt Regulator - Measure the voltage on the -6 VR bus.
Readjust pot if voltage is not -6 V ± 60 mV.
6. Test Point - Set front panel threshold pot to minimum (counterclockwise). Measure test point voltage. If not equal to -300 ± 5 mV replace existing trim resistor T1 (across 5 K Ω pot) with proper resistance (50 K Ω to 150 K Ω) to bring test point voltage into required range.
7. Threshold - With front panel threshold pot to minimum (counterclockwise), check threshold level with a 5 nsec wide pulse applied to input. If it is not -30 mV, replace existing trim resistor, T2, (across 12.4 K Ω resistor) with proper resistance (50 K Ω to 150 K Ω).
8. Minimum Output Width - With front panel width control pot fully counterclockwise, check output width. If it is not between 5.75 and 6 nsec for 623 and 7 nsec for 623A, retrim by replacing the trim resistor (across the 430 Ω) with the proper value.
9. Maximum Output Width - With front panel width control pot fully clockwise, check output width. If it is not between 150 and 160 nsec for the 623 and 50 nsec for the 623A, retrim by replacing the trim resistor (across the width pot) with the proper value.

TECHNICAL INFORMATION
(SCHEMATICS, PARTS LISTS)

FIS/NCA V4.3A
ZZBPSS.NCA;
ZZIPMS.NCA;

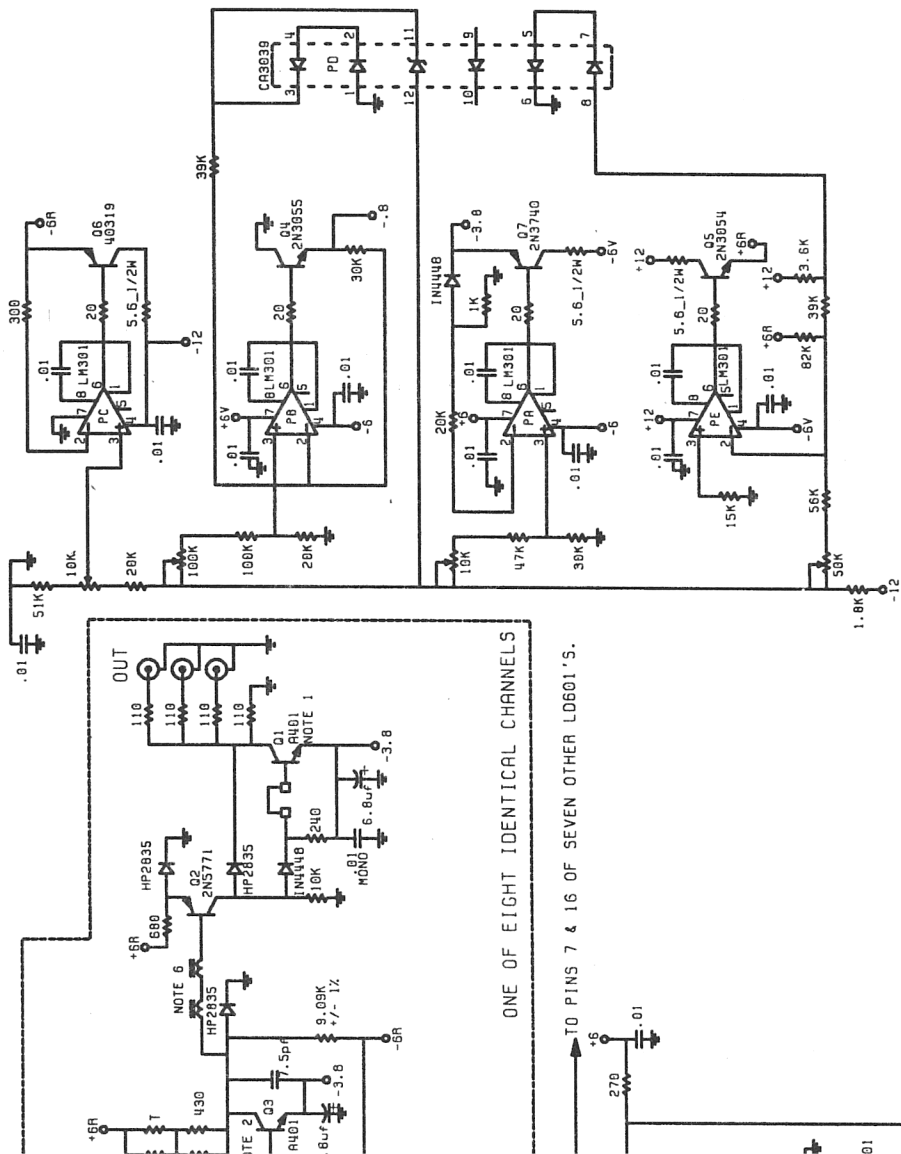
LECROY CORPORATION
623B PARTS LIST

PART NUMBER	DESCRIPTION	QUANTITY PER
102245103	CAP CERA DISC 25V .01 UF	53
102444220	CAP CERA DISC 100V 22 PF	8
102444560	CAP CERA DISC 100V 56 PF	8
102944075	CAP CERA DISC 1KV 7.5 PF	8
103327103	CAP CERA MONO 50V .01 UF	18
105217102	CAP MUCON RIBB LD .001 UF	8
116305180	CAP DIP MICA DM 5 18 PF	8
142824685	CAP TANT DIP CASE 6.8 UF	17
147447050	CAP ALUM METAL CAN 50 UF	2
161335101	RES CARBON FILM 100 OHMS	3
161335102	RES CARBON FILM 1 K	25
161335103	RES CARBON FILM 10 K	8
161335104	RES CARBON FILM 100 K	1
161335111	RES CARBON FILM 110 OHMS	35
161335153	RES CARBON FILM 15 K	1
161335161	RES CARBON FILM 160 OHMS	8
161335181	RES CARBON FILM 180 OHMS	1
161335182	RES COMP 1/4W 5% 1.8 K	2
161335200	RES CARBON FILM 20 OHMS	4
161335202	RES CARBON FILM 2 K	1
161335203	RES CARBON FILM 20 K	3
161335241	RES CARBON FILM 240 OHMS	8
161335242	RES CARBON FILM 2.4 K	1
161335271	RES CARBON FILM 270 OHMS	1
161335301	RES CARBON FILM 300 OHMS	1
161335303	RES CARBON FILM 30 K	2
161335362	RES CARBON FILM 3.6 K	1
161335393	RES CARBON FILM 39 K	2
161335431	RES CARBON FILM 430 OHMS	8
161335473	RES CARBON FILM 47 K	1
161335510	RES CARBON FILM 51 OHMS	8
161335513	RES CARBON FILM 51 K	1
161335560	RES CARBON FILM 56 OHMS	1
161335561	RES CARBON FILM 560 OHMS	1
161335563	RES CARBON FILM 56 K	2
161335681	RES CARBON FILM 680 OHMS	8
161335752	RES CARBON FILM 7.5 K	1
161335823	RES CARBON FILM 82 K	1
161445056	RES CARBON FILM 5.6 OHMS	3
161665241	RES COMP 2W 5% 240 OHMS	1
161665390	RES COMP 2W 5% 39 OHMS	1
168531269	RES PREC RN55D 51.1 OHMS	8
168531326	RES PREC RN55D 200 OHMS	8
168531389	RES PREC RN55D 909 OHMS	8
168531485	RES PREC RN55D 9.09 K	8
168531498	RES PREC RN55D 12.4 K	8
181457103	RES VARI CERMET 10 K	2
181457104	RES VARI CERMET 100 K	1
181457503	RES VARI CERMET 50 K	1
182537103	RES VARI CERMET 10 K	8
182537502	RES VARI CERMET 5 K	8
208011003	IC SINGLE OP AMP LM301AN	4
208074003	IC DIODE ARRAY CA3039	1
230110005	DIODE SWITCHING 1N4448	42

FIS/NCA V4.3A
ZZBPSS.NCA;
ZZIPMS.NCA;

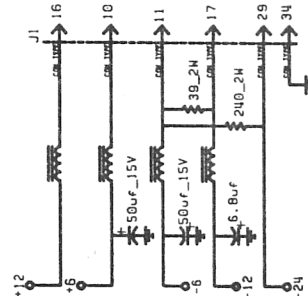
LECROY CORPORATION
623B PARTS LIST

PART NUMBER	DESCRIPTION	QUANTITY PER
253010835	DIODE HOT CARRIER HP2835	32
270130401	TRANSISTOR NPN A401	16
270180002	TRANSISTOR NPN PWR 2N3055	1
270190001	TRANSISTOR NPN PWR 2N3054	1
275150003	TRANSISTOR PNP 40319	1
275170002	TRANSISTOR PNP 2N5771	12
275190001	TRANSISTOR PNP PWR 2N3740	1
300010001	BEAD SHIELDING FERRITE	24
300050001	CHOKE FERRITE SINGLE LEAD	4
400010008	SOCKET IC ST DIP-8	4
400030016	SOCKET IC ST DIP-16	8
402030000	CONNECTOR CO-AXIAL LEMO	33
402030001	HOOD FOR BULKHD LEMO CONN	9
402030002	SPANNER NUT SMALL OD LEMO	33
402030003	GROUND LUG NONLOCK LEMO	8
405112001	CONNECTOR BLOCK (PIN)	1
405212002	GUIDE PIN (MALE)	1
405213001	GUIDE PIN (MALE)	1
405312001	GUIDE PIN (FEMALE)	2
405410016	CONNECTOR PIN (MALE)	0
405613001	CONNECTOR HOOD	1
420212001	SWITCH SLIDE DPDT	1
468911001	TEST POINT (JACK) WHT	8
500120002	TRANSIPAD "LARGE"	1
523400022	ROLL PIN SIZE #4 11/16 LG	16
540103102	SIDE COVER NIM LEFT	1
540103103	SIDE COVER NIM RIGHT	1
540105001	BRACKET NIM WRAP SIZE #1	2
555611001	CAPTIVE SCREW 6-32	2
555621002	CAPTIVE SCREW RETAINER	2
560440005	SCREW PHILIPS 4-40X5/16	12
567256004	SCREW FLAT PHIL 2-56X1/4	4
568440003	SCREW FLAT PHIL 4-40X3/16	10
577400001	WASHER SHAKEPROOF SIZE 4	12
580440001	NUT HEX STANDARD 4-40	6



ONE OF EIGHT IDENTICAL CHANNELS

TO PINS 7 & 16 OF SEVEN OTHER LD601'S.



OR 1N4148, EXCEPT AS NOTED.

NOTICE: THIS DESIGN IS THE PROPERTY OF LUCAS CORP. IT IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS DESIGNED. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

DESIGN	SCHEMATIC DIAGRAM
DATE	11/1/88
CHKD	623B
ENG	OCTAL DISCRIMINATOR
APP'D	DWG NO: 623B-S1
REV	1
SH 1 OF 1	REV NO 2222

