



HIGH ENERGY PHYSICS

Operating and Service Manual

T122/NL
Quad Updating
Discriminator

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STANDARD WARRANTY FOR EG&G/ORTEC INSTRUMENTS

EG&G/ORTEC instruments are warranted to be free from defects in material and workmanship for **one year** from date of shipment or for the specified period for certain components listed in the operating manual. EG&G/ORTEC will repair or replace, at its option, any product that proves to be defective during the warranty period, provided it has been used in a proper manner. No other warranty is expressed or implied.

EG&G/ORTEC must be informed in writing of the nature of the fault of the instrument being returned and of the model and serial numbers. Failure to do so may cause unnecessary delays in getting the unit repaired. Instruments that are returned should be packed so that they will withstand normal handling and must be shipped **PREPAID** via Air Parcel Post or United Parcel Service to the Customer Service Department, 100 Midland Road, Oak Ridge, Tennessee.

QUALITY CONTROL

Before being approved for shipment, each EG&G/ORTEC instrument must pass a stringent set of quality control tests designed to expose any flaws in materials or workmanship. Permanent records of these tests are maintained for use in warranty repair and as a source of statistical information for design improvements.

Our standard procedure requires that instruments returned for repair pass the same quality control tests that are used for new-production instruments.

DAMAGE IN TRANSIT

Shipments should be examined immediately upon receipt for evidence of external or concealed damage. The carrier making delivery should be notified immediately of any such damage, since the carrier is normally liable for damage in shipment. Packing materials, waybills, and other such documentation should be preserved in order to establish claims. After such notification to the carrier, please notify EG&G/ORTEC of the circumstances so that we may assist in damage claims and in providing replacement equipment if necessary.

T122/NL QUAD UPDATING DISCRIMINATOR

1. CHARACTERISTICS

The T122/NL Quad Updating Discriminator is a direct-coupled lower-level discriminator module containing four identical independent sections with common gating. The T122/NL is packaged as a NIM-standard single-width module per USAEC document TID-20893 (Rev); the resulting high packing density makes it extremely useful in applications requiring many discriminator channels or where NIMBIN[®] space is limited. In line with the design objective of compacting the circuitry as much as possible, the T122/NL has been designed with LEMO type RA-00-250 front panel connectors, which are considerably smaller than BNC connectors.

A tunnel-diode discriminator with a controlled reset function prevents multiple-firing on wide input signals. The T122/NL produces only one output pulse each time an input pulse exceeds the threshold, no matter how long the input signal remains above the threshold. The tunnel-diode discriminator also provides low time-slewing with excellent threshold stability.

The T122/NL has an updating timer which guarantees that an output signal persists for a preselected time duration after the most recent input threshold crossing, independent of previous operating history.

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The T122/NL is equipped with a common gate amplifier for the four discriminators. The gating function is controlled by a locking toggle switch located on the rear panel of the module and is initiated by an external NIM-standard slow logic signal. However, for this feature to be utilized, the T122/NL must be installed in a bin that is equipped with logic lines or buses, as well as with power distribution lines or buses. Many bins are equipped with power distribution lines or buses only.

The input threshold level and the output pulse width are continuously variable throughout their respective design ranges by means of recessed front panel potentiometers, and a front panel monitor jack is provided for measuring the threshold level setting.

A normal dual output and a single back-terminated complementary output are provided, giving a fanout of three NIM fast logic signals per section.

Since the T122/NL has the common gating feature and since it makes extensive use of ± 6 -V power lines, we recommend that it be installed in an EG&G/ORTEC M400 NIMBIN, which in addition to the normal NIM requirements provides ± 6 V at 8 A and, among others, the logic line required for the common gating feature.

2. SPECIFICATIONS

2.1. PERFORMANCE

Temperature Range 0 to 50°C.

Continuous Wave Rate >100 MHz.

Pulse Pair Response Counting, 7 nsec for 2 discrete pulses (typically 50% duty cycle at minimum width); timing, 10 nsec for 0.5-nsec change in timing; updating, for pulse widths >10 nsec, output is present for a time equal to the pulse width setting after the last threshold crossing.

Threshold Range, -50 to >-200 mV; monitor calibration, 10 mV = 1 mV threshold; temperature coefficient,

$< \pm 150 \mu\text{V}/^\circ\text{C}$; second pulse sensitivity <1-dB change for pulse spacing >9 nsec.

Output Width Range, 5 to 800 nsec (typical); other ranges optional; temperature coefficient $< \pm 0.2\%/^\circ\text{C}$.

Slewing 1.0 nsec (typical) from threshold (50% triggering probability) to X10 threshold.

2.2. CONTROLS

Note: There is only one Bin Gate switch; the other controls exist in each of the four discriminator circuits.

Width Recessed, screwdriver-adjusted, 22-turn, front panel potentiometer adjusts the width of the output pulse throughout the range 5 to 800 nsec.

Thresh Recessed, screwdriver-adjusted, 22-turn, front panel potentiometer adjusts the response threshold for input pulses throughout the range -50 to greater than -200 mV.

Width Cal Internal screwdriver-adjusted potentiometer calibrates the range of the Width control.

Thresh Norm Internal screwdriver-adjusted potentiometer, together with the Thresh Cal control, calibrates the range of the Thresh control.

Thresh Cal Internal screwdriver-adjusted potentiometer, together with the Thresh Norm control, calibrates the range of the Thresh control.

Reset Internal screwdriver-adjusted potentiometer calibrates the level to which an input signal must decrease for the tunnel-diode discriminator to be reset to its low-voltage state.

Bin Gate Rear panel, two-position, SPST, locking toggle switch provides selection of the acceptance or rejection of the bin system gating (inhibit) signal. In the closed (Gated) position the bin system gating signal can get through to the internal circuitry of the module and therefore will prevent all four discriminator circuits from passing any pulses until it is removed or until the switch is opened. In the open (Ungated) position the bin system gating signal cannot get past the switch and therefore cannot affect the internal circuitry of the module in any way. For this switch to be of any use, the module must be installed in a bin that has the necessary logic line or bus to convey the bin system gating signal to every station in the bin from an outside source. Such a bin is the EG&G/ORTEC M350 NIMBIN.

2.3. INPUTS

Input 1—Input 4 LEMO connectors, type RA-00-250, front panel.

Impedance 50Ω .

Reflections $\leq 10\%$ (dc or transient).

Offset 0 ± 10 mV.

Temperature Coefficient -0.1 mV/ $^{\circ}$ C.

Protection ± 300 V for 1 μ sec/sec.

Bin Gate All sections controlled by a single rear panel toggle switch, which is connected to the bin gating line.

2.4. OUTPUTS

A/B, \bar{A} LEMO connectors, type RA-00-250, front panel; pulse width 5 to 800 nsec (typical); other ranges optional.

Fanout One dual and one back-terminated complement NIM-standard fast logic signals* per section.

Times for T_{01} and T_{10} 2.0 nsec (typical).

Delay 13 nsec (typical) from threshold crossing to half-amplitude point of output pulse.

2.5. ELECTRICAL AND MECHANICAL

Power Required

+24 V, 73 mA; -24 V, 0 mA;

+12 V, 154 mA; -12 V, 150 mA;

+ 6 V, 44 mA; $- 6$ V, 300 mA.

Dimensions NIM-standard single-width module (1.35 by 8.714 in.) per TID-20893 (Rev).

Panel Color Black.

*Zero = 0 ± 50 mV; one = -800 ± 100 mV; T_{01} denotes zero-to-one transition; T_{10} denotes one-to-zero transition.

3. APPLICATIONS

3.1. GENERAL

The T122/NL Quad Updating Discriminator is a direct-coupled lower-level discriminator module containing four identical independent sections with common gating. Packaged as a NIM-standard single-width module, per USAEC document TID-20893 (Rev), the T122/NL is designed for low-cost-per-channel applications in which many discriminators are required or where NIMBIN space is severely limited or restricted. It is designed to process fast negative-going linear signals such as those produced at a photo-multiplier anode, and can also be used to regenerate logic

signals that have been attenuated by transmission over long cable runs.

Each section has a tunnel-diode discriminator with a controlled reset function to prevent multiple-firing on wide input signals. The T122/NL produces only one output pulse each time an input pulse exceeds the threshold, no matter how long the input signal remains above the threshold. The T122/NL also has an updating feature: if a second input threshold crossing occurs during the time interval of a previous output pulse, the output pulse gets updated, or

extended, for the preselected output pulse width or time beyond the most recent threshold crossing.

With four discriminators in each module, as many as 48 discriminators can be contained in a single bin. The result is an optimum combination of cost, performance, and logic flexibility.

3.2. INPUTS

Each of the four discriminator circuits in the T122/NL has a single signal input. When the input signal to any of the four discriminator circuits becomes more negative than its adjusted discrimination threshold, that circuit produces a NIM-standard fast logic signal through each of its three outputs.

A common gating or inhibiting signal can be fed into the T122/NL through the rear panel bin-to-module connector. The use of this signal is discussed in greater detail in Section 3.3.

3.3. CONTROLS

Each of the four discriminator circuits in the T122/NL has two front panel operation controls and four internal calibration controls. The two front panel controls, Width and Thresh, are recessed, screwdriver-adjusted potentiometers. They are provided to allow variations within design value limits of the output pulse width and the input threshold level respectively. The output signal width is continuously adjustable by means of the Width control throughout the range 5 to 800 nsec. The input threshold level is continuously adjustable by means of the Thresh control throughout the range -50 mV to greater than -200 mV, and a front panel monitoring jack provides a convenient means of checking the level at which the threshold has been set. Internal calibration controls Width Cal, Thresh Cal, and Thresh Norm, calibrate the range of the Width control and of the Thresh control. The fourth internal control, Reset, calibrates the level to which an input signal must decrease for the tunnel-diode discriminator to be reset to its low-voltage state.

The T122/NL is also equipped with a common gate amplifier for the four discriminators. The gating function is controlled by a locking toggle Bin Gate switch, located on the rear panel of the module, and is initiated by an external NIM-standard slow logic signal. However, for this feature to be utilized, the T122/NL must be installed in a bin that is equipped with logic lines or buses, as well as with power distribution lines or buses.

Because of the logic line required for the common gating feature and because the T122/NL uses ± 6 -V dc power, as well as power at the more common NIM module voltages, it is recommended that the T122/NL be installed in an EG&G/ORTEC M400 NIMBIN, which is equipped with, among others, the necessary logic line for the common gating feature and which delivers up to 8 A at ± 6 V dc, as well as power at the more common NIM module voltages.

3.4. OUTPUTS

Each of the four discriminator circuits produces a dual output signal (A and B) and a single back-terminated complementary output signal (\bar{A}). Each dual output pair is driven by a 32-mA (twice NIM-standard logic level) current source.

3.5. APPLICATION EXAMPLES

The primary application of each section of the T122/NL is as a lower-level discriminator for fast logic signals of various amplitudes. The controlled output pulse width makes it useful in applications with slower-acting detectors, such as those made from sodium iodide. The updating feature makes it a particularly useful instrument in coincidence vetoing applications. The instrument can also be used to regenerate logic signals following transmission over cables long enough to cause significant losses in signal strength or waveform.

With four discriminators in each module, as many as 48 discriminators can be contained in a single NIM bin. The result is an optimum combination of cost, performance, and logic flexibility.

4. CIRCUIT DESCRIPTION

Refer to Fig. 4.1 and to the schematic and component layout drawings (Dwgs. 307022 and 307040) at the back of this manual.

4.1. GENERAL FUNCTION

The four direct-coupled discriminator circuits comprising the T122/NL Quad Updating Discriminator module are

identical in configuration, performance, and electrical characteristics; therefore the following block diagram description of a single circuit applies to all four.

The block diagram shown in Fig. 4.1 illustrates the functional relationships among the 10 circuit elements forming a single discriminator.

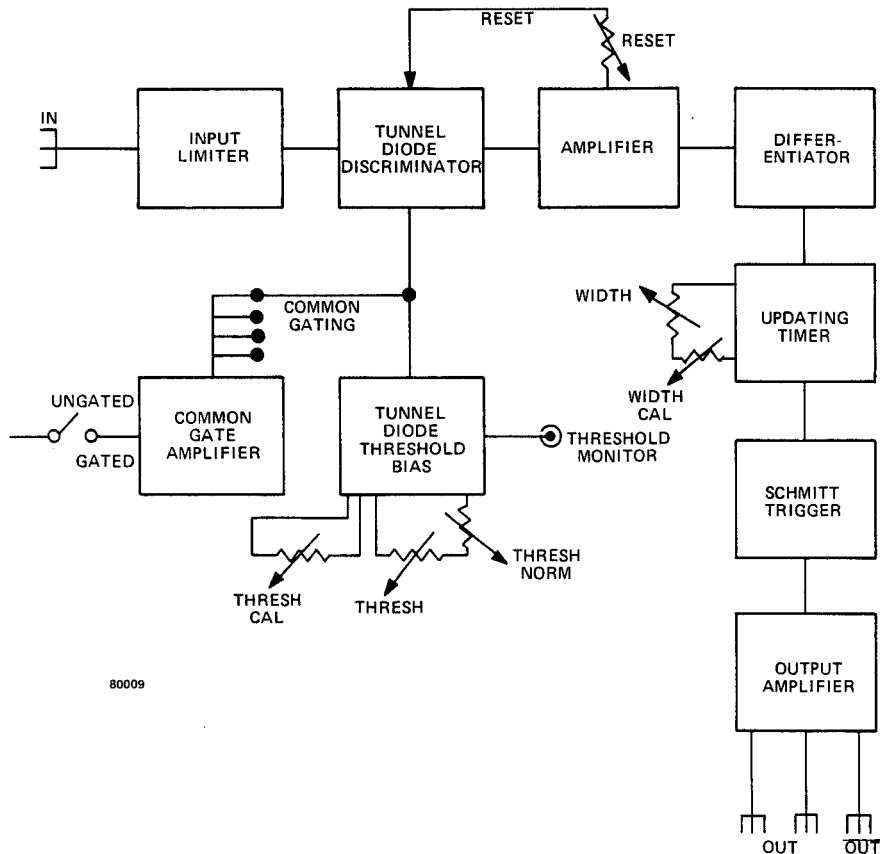


Fig. 4.1. Block Diagram of T122/NL Quad Updating Discriminator (Only One of the Four Shown).

In general, the T122/NL yields a NIM-standard fast logic output signal of adjusted width each time an input signal exceeds the adjusted threshold.

4.2. BLOCK DIAGRAM DISCUSSION

The Input Limiter accepts a negative-going linear or digital signal as its input. When this input signal exceeds the preset threshold level, the Tunnel-Diode Discriminator switches to its high-voltage state. As the input signal current decreases, a second internally adjustable threshold is crossed, which causes the Tunnel-Diode Discriminator to revert to its low-voltage, or quiescent, state to await the next input signal. The discriminator switching action is first amplified, then differentiated, to produce a derivative of the threshold crossing. The derivative is a sharp, 1.5-nsec, negative-going pulse, which triggers the Updating Timer. Output pulse width is determined by the adjustable current source, which sets the discharge ramp for the updating capacitor in the Updating Timer. The design of the Updating Timer is such that each input signal occurring during the width of a given output pulse extends that output pulse one full output signal width from each point of input threshold crossing. The Updating Timer output is shaped at the leading and

trailing edges by a Schmitt Trigger, which in turn drives the Output Amplifier. The Output Amplifier further shapes the output to provide a stable NIM-standard output pulse.

When the T122/NL is used in conjunction with bin gating, the Common Gate Amplifier, when gated, drives the respective gate clamps to inhibit each of the four discriminator circuits in the module.

4.3. CIRCUIT DISCUSSION

Transistors Q1 through Q3 and diodes D1 through D3 form the Input Limiter. With no signal at the input, the common base transistor Q1 is on and conducts 8 mA, which is determined by the current through R2. The base voltage of Q1 is maintained by the reference transistor Q2 so that the input open-circuit voltage never exceeds ± 10 mV. In the quiescent state, the emitter of Q1 is maintained slightly negative to forward-bias limiting diode D1. The forward bias on D1 is set at 360 mV so that, when an input signal exceeds -8 mA and Q1 is turned off, limiting diode D1 is turned on to maintain the 50Ω terminating impedance, thereby minimizing signal reflection. In addition, diode D2

serves to protect the Input Limiter against large positive-going signals at the input.

Transistor Q3 is normally on and in the quiescent state conducts approximately 7 mA, which is the difference between the current at the collector of Q1 and the constant current through R7. Potentiometer R17 provides small adjustments of this current to allow for slight variations in tunnel-diode characteristics. When the current conducted by Q1 increases because of a positive input signal, diode D3 is turned on to limit the base bias on Q3, thereby preventing possible emitter breakdown.

The adjustable current source formed by transistor Q5 and potentiometers R15 and R10, together with the Q3 collector current, serves to bias the Tunnel-Diode Discriminator so that an additional 1 mA through the Q3 collector switches the device to its high-voltage state.

With the Bin Gate switch (S1) in the closed (Gated) position the presence of a Bin Gating signal activates the Common Gate Amplifier (Q19 and Q20), which in turn places transistor Q4 in saturation. The result is a current sink through the emitter of Q5 to ground, and this prevents tunnel diode D5 from switching to its high-voltage state, irrespective of input signal presence.

In the absence of an input signal, Tunnel-Diode Discriminator D5 is in its low-voltage state, so that transistor Q8 of the differential pair Q8-Q9 is on and Q9 is off. With a signal in excess of -50 mV (-1 mA in 50Ω) present at the input the current conducted by Q1 will be reduced by 1 mA, and this causes a corresponding increase in the current conducted by Q3 to keep the current in R7 constant. The 1-mA increase at the collector of Q3 is sufficient to switch Tunnel-Diode Discriminator D5 to its high-voltage state. This action turns off Q8 and turns on transistors Q9 and Q6. The current conducted by Q6 is determined by potentiometer R16, which when correctly calibrated provides sufficient current at the collector of Q6 to reset Tunnel-Diode Discriminator D5 when the input signal drops below -25 mV. Thus Tunnel-Diode Discriminator D5 in conjunction with transistors Q6 through Q9 in effect comprises a Schmitt Trigger that has an extremely sharp threshold with adjustable hysteresis.

When Tunnel-Diode Discriminator D5 is switched to its high-voltage state, the resulting change in collector current

between Q7 and Q9 is summed at differentiating inductor L4. The result is a 1.5-nsec pulse, which is the derivative of the input signal threshold crossing. The length of this pulse is determined by the differential time constant of L4 and R29. This sharp negative-going pulse turns on transistor Q10 of the current-switching pair Q10-Q11 and thereby causes Q11 to turn off sharply, providing a well-defined negative-going pulse to the base of updating emitter-follower Q13, turning it on. The base of Q13 is temperature-compensated by diodes D7 and D8.

Updating-emitter follower Q13 is normally on and conducts current at a level established by active current source Q12, which is adjusted by Width potentiometer R68 and the current supplied through R37. Zener diode D10 serves to vary the current exponentially through Q12, allowing the Width potentiometers to provide smoother control over output signal width.

The leading edge of the 1.5-nsec threshold derivative pulse turns off Q11, causing Q13 to discharge updating capacitor C16 rapidly. At the end of the threshold derivative pulse, updating emitter-follower Q13 is turned off by the Q10-Q11 pair switching back to the quiescent state. At that point updating capacitor C16 begins charging to its quiescent-state voltage at a rate determined by the current flowing out of active current source Q12. Transistor Q14 isolates the Schmitt Trigger Q15-Q16, from the updating capacitor. The use of a Schmitt Trigger at this point in the T122/NL circuit sharpens the relatively slow discharge time of updating capacitor C16 to effectively decrease the rise and fall times of the output pulse. Buffer transistor Q14 turns on normally off Q15 and turns off Q16. This action turns off normally on transistor Q17 in the Output Amplifier and turns on Q18, switching the 32-mA output current from Connector J2 and its back-terminator resistor, R58, to Connectors J3 and J4.

The Common Gate Amplifier is made up of the two normally off transistors, Q19 and Q20. With the Bin Gate toggle switch on the rear panel of the module in the Gated position, less than $+2$ V will turn on transistor Q19. Turning on Q19 saturates Q20 and causes transistors Q4, Q104, Q204, and Q304 to be turned on, blocking the Tunnel-Diode Discriminator in each of the four discriminator circuits.

5. MAINTENANCE

5.1. PREVENTIVE MAINTENANCE

The only preventive maintenance required involves giving reasonable attention to mechanical details. Keep the signal connectors clean, and periodically remove the cover plates to inspect the interior of the module for excessive dust accumulation. Clean as often as required by local conditions (normally about once every 12 months).

5.2. CORRECTIVE MAINTENANCE

Corrective maintenance will generally be restricted to replacing defective components, such as resistors, capacitors, diodes, transistors, and IC's, to replacing missing hardware, and to tightening loose hardware. In tightening screws, nuts, etc., *do not* use excessive force.

When replacing components on a printed-circuit board, be sure that the board is not damaged by excessive heating. When unsoldering leads, grip the lead to be unsoldered with a tool that also acts as a heat sink. Heat the solder joint as little as possible while maintaining a steady pull on the

component lead to assure prompt removal of the lead. Use a solder puller to remove excess solder from the board. *Do not* redrill holes in the printed-circuit board. When the integrity of a plated-through hole is in doubt, solder the component lead on both sides of the board.

5.3. TEST POINTS AND VOLTAGES

Table 5.1 lists some test points within the circuitry of the module, together with the value of voltage to be found at each. Unless otherwise specified, all values in Table 5.1 are stated in volts dc. These voltages are not to be regarded as absolute values, but rather are typical of those found in a properly adjusted unit, operating with the nominal values of input voltages, with all outputs (yellow connectors) terminated in 50Ω impedances, with the proper input signals, with the Bin Gate switch in the open (Ungated) position, and with both the Width and Thresh controls set to the minimum or fully counterclockwise position. All measurements were made with a high-impedance digital voltmeter.

Table 5.1. T122/NL Test Points and Voltages.

Transistor	Pin	V dc	Transistor	Pin	V dc
Q1, Q101, Q201, Q301	e	-0.328	Q7, Q107, Q207, Q307	e	+6.55
	b	-1.075		b	+5.84
	c	-6.11		c	+0.156
Q2, Q102, Q202, Q302	e	-1.08	Q8, Q108, Q208, Q308	e	-0.771
	b	-0.336		b	-0.057
	c	-0.336		c	+5.49
Q3, Q103, Q203, Q303	e	-6.29	Q9, Q109, Q209, Q309	e	-0.771
	b	-5.59		b	-0.158
	c	-0.283		c	+5.68
Q4, Q104, Q204, Q304	e	-0.285	Q10, Q110, Q210, Q310	e	+6.73
	b	+0.295		b	+6.22
	c	0		c	0
Q5, Q105, Q205, Q305	e	-6.69	Q11, Q111, Q211, Q311	e	+ 6.73
	b	-6.03		b	+ 6.00
	c	-0.828		c	+ 1.90
Q6, Q106, Q206, Q306	e	+ 6.55	Q12, Q112, Q212, Q312	e	+12.73
	b	+6.01		b	+11.97
	c	-0.056		c	+12.76

Table 5.1 (continued)

Transistor	Pin	V dc	Transistor	Pin	V dc
Q13, Q113, Q213, Q313	e	+ 2.45	Q17, Q117, Q217, Q317	e	- 3.36
	b	+ 1.75		b	- 2.79
	c	- 5.41		c	0
Q14, Q114, Q214, Q314	e	+ 1.71	Q18, Q118, Q218, Q318	e	- 3.36
	b	+ 2.45		b	- 2.57
	c	+ 5.49		c	- 0.947
Q15, Q115, Q215, Q315	e	+ 0.453	Q19, Q119, Q219, Q319	e	0
	b	+ 0.078		b	+ 0.234
	c	- 3.09		c	-11.96
Q16, Q116, Q216, Q316	e	+ 0.453	Q20, Q120, Q220, Q320	e	-11.96
	b	- 0.305		b	-11.96
	c	- 2.32		c	- 0.290

6. CALIBRATION

The module must be removed from the bin for calibration. The most convenient method of performing the calibration involves the use of an extender cable or extender module (such as the EG&G/ORTEC EX100/N) to electrically connect the module to the bin buses while the module is outside the bin. Calibration of the T122/NL requires the adjustment of four potentiometers in each of the four discriminator circuits. Drawing 307040 shows a left-side elevation view of the printed-circuit board as assembled in the module. The front of the board is toward the right side of the drawing, and the top of the board is toward the top of the drawing. The threshold calibration potentiometers (R17, R117, R217, and R317, labeled "THRESH CAL" on Dwg. 307022) are located slightly to the rear from the center and near the bottom of that portion of the board that is allocated to each discriminator circuit. The threshold normalizing potentiometers (R10, R110, R210, and R310, labeled "THRESH NORM" on Dwg. 307022) are located at the bottom of that portion of the board that is allocated to each discriminator circuit and closer to the rear of the board than each corresponding threshold calibration potentiometer. The reset potentiometers (R16, R116, R216, and R316, labeled "RESET" on Dwg. 307022) are located in almost the center of that portion of the board that is allocated to each discriminator circuit. The width calibration potentiometers (R69, R169, R269, and R369, labeled "WIDTH CAL" on Dwg. 307022) are located at the top of that portion of the board that is allocated to each discriminator circuit and closer to the front of the board than each corresponding reset potentiometer. The calibration procedures listed below are for one discriminator

circuit only and must be repeated for each of the other three discriminator circuits.

6.1. REQUIRED EQUIPMENT

The following equipment is required for the performance of the T122/NL calibration procedure:

1. Sampling oscilloscope, Tektronix 661 or equivalent.
2. Fast-rise-time negative-going pulse generator, Hewlett-Packard 215A or equivalent.
3. High-impedance digital-readout voltmeter, Hewlett-Packard 3439A with Hewlett-Packard 3442A automatic ranging plug-in module or equivalent.
4. Bin-to-module extender cable or extender module, EG&G/ORTEC EX100/N or equivalent.

6.2. CALIBRATION PROCEDURE

Perform the following steps in the sequence listed:

1. With bin power turned off, remove the module from the bin and electrically reconnect it to the bin buses with the extender cable or extender module.
2. Place the rear panel Bin Gate Switch in the open (Ungated) position.

3. Turn on bin power, oscilloscope power, pulse generator power, and digital voltmeter power and allow the equipment to warm up for at least 5 min before proceeding beyond step 6.
4. Connect the digital voltmeter to the front panel threshold monitor jack for Section 1.
5. Turn the Section 1 front panel Thresh control fully counterclockwise (CCW).
6. Turn the Section 1 Thresh Cal control fully clockwise (CW).
7. Adjust the Section 1 Thresh Norm control for a reading of -500 mV on the digital voltmeter.
8. Turn the Section 1 Reset control fully CW.
9. Terminate all unused LEMO connectors in 50Ω impedances.
10. Set up the oscilloscope for external sweep triggering from the pulse generator.
11. Connect the output of the pulse generator to the Section 1 Input connector of the module.
12. Connect the Section 1 A connector on the module to the vertical input connector on the oscilloscope.
13. Set up the oscilloscope for a horizontal sweep time of 20 nsec per scale division and a vertical deflection of 200 mV per scale division.
14. Turn the Section 1 Thresh Cal control CCW until the output just begins to oscillate within the duration of the input signal.
15. With the output oscillating, turn the Section 1 Reset control CCW until the output oscillation just ceases. At this point no output pulse should be produced, the threshold should be approximately 10 mV, and the hysteresis should be >10 mV.
16. Increase the pulse generator output to -50 mV and turn the Section 1 Thresh Cal control CW. The circuit should produce an output pulse with only a slight turn of the control.
17. Continue turning the Section 1 Thresh Cal control CW until the output is half-triggered.
18. Turn the Section 1 front panel Width control fully CW.
19. Increase the pulse generator output amplitude to -100 mV.
20. Set up the oscilloscope for a horizontal sweep time of 100 nsec per scale division.
21. Adjust the Section 1 Width Cal control until the output pulse is 800 nsec wide.
22. Adjust the Section 1 front panel Width control until the output pulse is 10 nsec wide.
23. Repeat steps 4 through 22 for each of the other three discriminator circuits in the module.

Set pulse to 10 mV at 100 nsec
width

APPENDIX

REPLACEABLE PARTS

ORDERING INFORMATION

The Replaceable Parts List shown below contains information needed for ordering spare and/or replacement parts. Each listing indicates the reference designator number, the part number, a description of the component, and the part manufacturer and manufacturer's part number.

All inquiries concerning spare and/or replacement parts and all orders for same should include the model and serial numbers of the instruments involved and should be addressed to the Customer Service Department at 100 Midland Road, Oak Ridge, Tennessee 37830. The Manager of Customer Services can be reached by telephone at

(615) 482-4411. The minimum order for spare and/or replacement parts is \$25.00.

ORDERING INFORMATION
FOR PARTS NOT LISTED

In order to facilitate the ordering of a part not listed below, the following information should be submitted to the Customer Service Department:

1. the instrument model number,
2. the instrument serial number,
3. a description of the part,
4. information as to the function and location of the part.

Replaceable Parts List

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0100	5004 64430			
28	9094 49271	Switch, Toggle, SPDT	95146	AEP #MSTL-106D
30	9097 60815	Connector, Lemo	ORTEC	RA00.250
R15	9047 43581	2 K 20-Turn TPT	02111	SPT #43Y-R2K
R68	9047 43578	10 K 20-Turn TPT	02111	SPT #43Y-R10K
R115	9047 43581	2 K 20-Turn TPT	02111	SPT #43Y-R2K
R168	9047 43578	10 K 20-Turn TPT	02111	SPT #43Y-R10K
R215	9047 43581	2 K 20-Turn TPT	02111	SPT #43Y-R2K
R268	9047 43578	10 K 20-Turn TPT	02111	SPT #43Y-R10K
R315	9047 43581	2 K 20-Turn TPT	02111	SPT #43Y-R2K
R368	9047 43578	10 K 20-Turn TPT	02111	SPT #43Y-R10K

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
C1	9055 43616	10 pf 10% 1KV Disc.	71590	CRL #DD-100
C2	9055 43614	5 pf 10% 1KV Disc.	71590	CRL #DD-050
C3	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C4	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C5	9055 43621	50 pf 1KV Disc.	71590	CRL #DD-500
C6	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C7	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C8	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C10	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C11	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C12	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C13	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C14	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C15	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C16	9059 47158	24 pf 5% 500V D.M.	84171	ARC #DM15-240J
C17	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C18	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C19	9065 49546	1 uf 10% 35V Tan.	31433	KMT #K1C35K
C20	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C21	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C22	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C23	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C25	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C26	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C27	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C28	9055 43618	20 pf 10% 1KV Disc.	71590	CRL #DD-200
C29	9065 49546	1 uf 10% 35V Tan.	31433	KMT #K1C35K
C30	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C31	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C32	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C33	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C34	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C35	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C36	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C37	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C38	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C39	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C40	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C41	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C101	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C102	9055 43614	5 pf 10% 1KV Disc.	71590	CRL #DD-050
C103	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C104	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C105	9055 43621	50 pf 1KV Disc.	71590	CRL #DD-500
C106	9055 43611	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C107	9071 48997	270 pf 50V	72982	ERC #1034-00-271P

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
cont'd.				
C108	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C111	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C112	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C113	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C114	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C115	9055 43611	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C116	9059 47158	24 pf 5% 500V D.M.	84171	ARC #DM15-240J
C117	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C118	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C119	9065 49546	1 uf 10% 35V Tan.	31433	KMT #K1C35K
C120	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C121	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C122	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C123	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C125	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C126	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C127	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C128	9055 43618	20 pf 10% 1KV Disc.	71590	CRL #DA-200
C139	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C140	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C141	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C201	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C202	9055 43614	5 pf 10% 1kv Disc.	71590	CRL #DD-050
C203	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C204	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C205	9055 43621	50 pf 1KV Disc.	71590	CRL #DD-500
C206	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C207	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C208	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C211	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C212	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C213	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C214	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C215	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C216	9059 47158	24 pf 5% 500V D.M.	84171	SRC #DM15-240J
C217	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C218	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C219	9065 49546	1 uf 10% 35V Tan.	31433	KMT #K1C35K
C220	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C221	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C222	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C223	9055 43611	0.02 uf 20% 100V Disc.	80183	SPR #TG-20

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200 cont'd.	5007 64431			
C225	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C226	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C227	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C228	9055 43618	20 pf 10% 1KV Disc.	80183	SPR #TG-20
C239	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C240	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C241	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C301	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C302	9055 43614	5 pf 10% 1KV Disc.	71590	CRL #DD-050
C303	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C304	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C305	9055 43621	50 pf 1KV Disc.	71590	CRL #DD-500
C306	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C307	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C308	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C311	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C312	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C313	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C314	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C315	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C316	9059 47158	24 pf 5% 500V D.M.	84171	ARC #DM15-240J
C317	9059 47176	1000 pf 10% 100V S.M.	84171	ARC #SCDM15-102K
C318	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C319	9065 49546	1 uf 10% 35V Tan.	31433	KMT #K1C35K
C320	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C321	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C322	9055 43616	10 pf 1KV Disc.	71590	CRL #DD-100
C323	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C325	9071 48997	270 pf 50V	72982	ERC #1034-00-271P
C326	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C327	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C328	9055 43618			
C339	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C340	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
C341	9055 43593	0.02 uf 20% 100V Disc.	80183	SPR #TG-20
D1	9080 44192	Diode - 1003/5082-8844	04404	HPA
D2	9080 44192	Diode - 1003/5082-8844	04404	HPA
D3	9080 60202	Diode - FD777	13715	FSC
D4	9080 41106	Diode - 1N752A	80211	MOT

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
Cont'd.				
D5	9080 60236	Diode - Fast 10 mA, Blue	KSC	KSC
D6	9080 60229	Diode - 1N4372	80211	MOT
D7	9080 41098	Diode - 1N270	24446	GEC
D8	9080 41098	Diode - 1N270	24446	GEC
D9	9080 60229	Diode - 1N4372	80211	MOT
D10	9080 41106	Diode - 1N752A	80211	MOT
D15	9080 41098	Diode - 1N270	24446	GEC
D16	9080 41098	Diode - 1N270	24446	GEC
D17	9080 41106	Diode - 1N752A	80211	MOT
D101	9080 44192	Diode - 1003/5082-8844	04404	HPA
D102	9080 44192	Diode - 1003/5082-8844	04404	HPA
D103	9080 60202	Diode - FD777	13715	FSC
D104	9080 41106	Diode - 1N752A	80211	MOT
D105	9080 60236	Diode - Fast 10 mA, Blue	KSC	KSC
D106	9080 60229	Diode - 1N4372	80211	MOT
D107	9080 41098	Diode - 1N270	24446	GEC
D108	9080 41098	Diode - 1N270	24446	GEC
D109	9080 60229	Diode - 1N4372	80211	MOT
D110	9080 41106	Diode - 1N752A	80211	MOT
D116	9080 41098	Diode - 1N270	24446	GEC
D117	9080 41106	Diode - 1N752A	80211	MOT
D201	9080 44192	Diode - 1003/5082-8844	04404	HPA
D202	9080 44192	Diode - 1003/5082-8844	04404	HPA
D203	9080 60202	Diode - FD777	13715	FSC
D204	9080 41106	Diode - 1N752A	80211	MOT
D205	9080 60236	Diode - Fast 10 mA, Blue	KSC	KSC
D206	9080 60229	Diode - 1N4372	80211	MOT
D207	9080 41098	Diode - 1N270	24446	GEC
D208	9080 41098	Diode - 1N270	24446	GEC
D209	9080 60229	Diode - 1N4372	80211	MOT
D210	9080 41106	Diode - 1N752A	80211	MOT
D216	9080 41098	Diode - 1N270	24446	GEC
D217	9080 41106	Diode - 1N752A	80211	MOT
D301	9080 44192	Diode - 1003/5082-8844	04404	HPA
D302	9080 44192	Diode - 1003/5082-8844	04404	HPA
D303	9080 60202	Diode - FD777	13715	FSC
D304	9080 41106	Diode - 1N752A	80211	MOT
D305	9080 60236	Diode - Fast 10 mA, Blue	KSC	KSC

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
Cont'd.				
D306	9080 60229	Diode - 1N4372	80211	MOT
D307	9080 41098	Diode - 1N270	24446	GEC
D308	9080 41098	Diode - 1N270	24446	GEC
D309	9080 60229	Diode - 1N4372	80211	MOT
D310	9080 41106	Diode - 1N752A	80211	MOT
D316	9080 41098	Diode - 1N270	24446	GEC
D317	9080 41106	Diode - 1N752A	80211	MOT
L3	9090 61141	Bead	02114	FEX #56-590-65/486
L4	9092 47052	Choke - 0.1 μ h	WLE	WLE #50600010V1
L5	9090 61141	Bead	02114	FEX #56-590-65/486
L6	9090 61141	Bead	02114	FEX #56-590-65/486
L9	9090 61141	Bead	02114	FEX #56-590-65/486
L10	9090 61141	Bead	02114	FEX #56-590-65-486
L13	9092 47061	Choke - 22 μ h	99800	DLV #1537-44
L14	9092 41235	Choke - 0.56 μ h	72259	NTC
L15	9092 41235	Choke - 0.56 μ h	72259	NTC
L16	9092 41235	Choke - 0.56 μ h	72259	NTC
L17	9092 41235	Choke - 0.56 μ h	72259	NTC
L18	9092 41235	Choke - 0.56 μ h	72259	NTC
L19	9092 41235	Choke - 0.56 μ h	72259	NTC
L20	9092 41235	Choke - 0.56 μ h	72259	NTC
L21	9092 41235	Choke - 0.56 μ h	72259	NTC
L22	9092 41235	Choke - 0.56 μ h	72259	NTC
L23	9092 41235	Choke - 0.56 μ h	72259	NTC
L24	9092 41235	Choke - 0.56 μ h	72259	NTC
L25	9092 41235	Choke - 0.56 μ h	72259	NTC
L26	9092 41235	Choke - 0.56 μ h	72259	NTC
L27	9092 41235	Choke - 0.56 μ h	72259	NTC
L28	9092 41235	Choke - 0.56 μ h	72259	NTC
L29	9092 41235	Choke - 0.56 μ h	72259	NTC
L30	9092 47058	Choke - 0.22 μ h	99800	DLV #1537-02
L31	9092 47058	Choke - 0.22 μ h	99800	DLV #1537-02
L32	9092 47058	Choke - 0.22 μ h	99800	DLV #1537-02
L33	9092 47058	Choke - 0.22 μ h	99800	DLV #1537-02
L34	9092 41235	Choke - 0.56 μ h	72259	NTC
L35	9092 41235	Choke - 0.56 μ h	72259	NTC
L36	9092 41235	Choke - 0.56 μ h	72259	NTC
L37	9092 41235	Choke - 0.56 μ h	72259	NTC
L38	9092 47058	Choke - 0.22 μ h	99800	DLV #1537-02

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
Cont'd.				
L103	9090 61141	Bead	02114	FEX #56-590-65/486
L104	9092 47052	Choke - 0.1 μ h	WLE	WLE #506000010V1
L105	9090 61141	Bead	02114	FEX #56-590-65/486
L106	9090 61141	Bead	02114	FEX #56-590-65/486
L109	9090 61141	Bead	02114	FEX #56-590-65/486
L110	9090 61141	Bead	02114	FEX #56-590-65/486
L203	9090 61141	Bead	02114	FEX #56-590-65/486
L204	9092 47052	Choke - 0.1 μ h	WLE	WLE #506000010V1
L205	9090 61141	Bead	02114	FEX #56-590-65/486
L206	9090 61141	Bead	02114	FEX #56-590-65/486
L209	9090 61141	Bead	02114	FEX #56-590-65/486
L210	9090 61141	Bead	02114	FEX #56-590-65/486
L303	9090 61141	Bead	02114	FEX #56-590-65/486
L304	9092 47052	Choke - 0.1 μ h	WLE	WLE #506000010V1
L305	9090 61141	Bead	02114	FEX #56-590-65/486
L306	9090 61141	Bead	02114	FEX #56-590-65/486
L309	9090 61141	Bead	02114	FEX #56-590-65/486
L310	9090 61141	Bead	02114	FEX #56-590-65/486
Q1	9078 47855	Transistor - MPS3640	80211	MOT (Selected - Tan)
Q2	9078 47855	" - MPS3640	82011	MOT (Selected - Tan)
Q3	9078 47844	" - MPS2369	80211	MOT
Q4	9078 43652	" - MPS3640	80211	MOT
Q5	9078 47860	" - 2N3904	80211	MOT
Q6	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q7	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q8	9078 47873	" - 2N5179	80211	MOT (Selected - Red)
Q9	9078 47873	Transistor - 2N5178	80211	MOT
Q10	9078 47855	" - MPS3640	80211	MOT (Selected - Green)
Q11	9078 47855	" - MPS3640	80211	MOT (Selected - Green)
Q12	9078 41089	" - 2N3906	80211	MOT
Q13	9078 43652	" - MPS3640	80211	MOT
Q14	9078 47877	" - 2N5179	80211	MOT (Selected - Orange)
Q15	9078 47855	" - MPS3640	80211	MOT (Selected - Green)
Q16	9078 47855	" - MPS3640	80211	MOT (Selected - Green)
Q17	9078 48004	" - SS04031	80211	MOT (A303419)
Q18	9078 48004	" - SS04031	80211	MOT (A303419)

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
Cont'd.				
Q19	9078 43652	" - MPS3640	80211	MOT (Selected - Green)
Q20	9078 47844	" - MPS2369	80211	MOT
Q101	9078 47855	Transistor - MPS3640	80211	MOT (Selected - Tan)
Q102	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q103	9078 47844	" - MPS2369	80211	MOT
Q104	9078 43652	" - MPS3640	80211	MOT
Q105	9078 47860	" - 2N3904	80211	MOT
Q106	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q107	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q108	9078 47873	" - 2N5179	80211	MOT (Selected - Red)
Q109	9078 47873	" - 2N5179	80211	MOT (Selected - Red)
Q110	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q111	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q112	9078 41089	" - 2N3906	80211	MOT
Q113	9078 43652	" - MPS3640	80211	MOT
Q114	9078 47877	" - 2N5179	80211	MOT (Selected - Orange)
Q115	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q116	9078 47855	Transistor - MPS3640	80211	MOT (Selected - Tan)
Q117	9078 48004	" - SS04031	80211	MOT (A303419)
Q118	9078 48004	" - SS04031	80211	MOT (A303419)
Q201	9078 47855	Transistor - MPS3640	80211	MOT (Selected - Tan)
Q202	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q203	9078 47844	" - MPS2369	80211	MOT
Q204	9078 43652	" - MPS3640	80211	MOT
Q205	9078 47860	" - 2N3904	80211	MOT
Q206	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q207	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q208	9078 47873	" - 2N5179	80211	MOT
Q209	9078 47873	" - 2N5179	80211	MOT (Selected - Red)
Q210	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q211	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q212	9078 41089	" - 2N3906	80211	MOT
Q213	9078 43652	" - MPS3640	80211	MOT
Q214	9078 47877	" - 2N5179	80211	MOT (Selected - Orange)
Q215	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q216	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q217	9078 48004	" - SS04031	80211	MOT (A303419)
Q218	9078 48004	" - SS04031	80211	MOT (A303419)

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
cont'd.				
Q301	9078 47855	Transistor - MPS3640	80211	MOT (Selected - Tan)
Q302	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q303	9078 47844	" - MPS2369	80211	MOT
Q304	9078 43652	" - MPS3640	80211	MOT
Q305	9078 47860	" - 2N3904	80211	MOT
Q306	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q307	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q308	9078 47873	" - 2N5179	80211	MOT (Selected - Red)
Q309	9078 47873	" - 2N5179	80211	MOT (Selected - Red)
Q310	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q311	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q312	9078 41089	" - 2N3906	80211	MOT
Q313	9078 43652	" - MPS3640	80211	MOT
Q314	9078 47877	" - 2N5179	80211	MOT (Selected - Orange)
Q315	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q316	9078 47855	" - MPS3640	80211	MOT (Selected - Tan)
Q317	9078 48004	" - SS04031	80211	MOT (A303419)
Q318	9078 48004	" - SS04031	80211	MOT (A303419)
R1	9015 40209	100 Ω 1/4W 5% C	01121	ABC CB
R2	9029 44790	1.5 K 1/4W 1% MF	24546	CGW C-5
R3	9030 62292	42.2 Ω 1/2W 1% MF	24546	CGW C-5
R4	9015 40204	22 Ω 1/4W 5% C	01121	ABC CB
R5	9029 44745	6.04 K 1/4W 1% MF	24546	CGW C-5
R6	9029 44764	205 Ω 1/4W 1% MF	24546	CGW C-5
R7	9027 40506	402 Ω 1/8W 1% MF	24546	CGW C-4
R8	9015 40237	3.9 K 1/4W 5% C	01121	ABC CB
R9	9015 40231	2 K 1/4W 5% C	01121	ABC CB
R10	9047 43559	1 K 1-T TPT	05721	HEL 62P-R1K
R11	9015 40204	22 Ω 1/4W 5% C	01121	ABC CB
R12	9015 40228	1.2 K 1/4W 5% C	01121	ABC CB
R13	9015 40209	100 Ω 1/4W 5% C	01121	ABC CB
R14	9029 44781	825 Ω 1/4W 1% MF	24546	CGW C-5
R16	9047 43559	1 K 1-T TPT	05721	HEL 62P-R1K
R17	9051 40821	100 Ω 1-T Pot	73138	BEK 62P-R100
R18	9015 40232	2.2 K 1/4W 5% C	01121	ABC CB
R19	9015 40230	1.8 K 1/4W 5% C	01121	ABC CB
R20	9015 40271	51 Ω 1/4W 5% C	01121	ABC CB
R21	9015 40294	75 Ω 1/4W 5% C	01121	ABC CB
R22	9015 40204	22 Ω 1/4W 5% C	01121	ABC CB
R23	9015 40271	51 Ω 1/4W 5% C	01121	ABC CB
R24	9015 40221	620 Ω 1/4W 5% C	01121	ABC CB
R25	9015 40211	150 Ω 1/4W 5% C	01121	ABC CB
R26	9015 40223	750 Ω 1/4W 5% C	01121	ABC CB
R27	9015 40240	5.6 K 1/4W 5% C	01121	ABC CB
R28	9015 40233	2.4 K 1/4W 5% C	01121	ABC CB
R29	9015 43981	82 Ω 1/4W 5% C	01121	ABC CB

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION						MFR.	MFR. PART NO.	
T122/NL-0200	5007 64431									
Cont'd.										
R30	9015 40223	750 Ω	1/4W	5%	C	01121	ABC	CB		
R31	9015 40205	33 Ω	1/4W	5%	C	01121	ABC	CB		
R32	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R33	9015 40211	150 Ω	1/4W	5%	C	01121	ABC	CB		
R34	9015 40241	6.8 K	1/4W	5%	C	01121	ABC	CB		
R35	9027 43691	24.9 K	1/8W	1%	MF	24546	CGW	C-4		
R36	9015 40219	470 Ω	1/4W	5%	C	01121	ABC	CB		
R37	9015 40258	120 K	1/4W	5%	C	01121	ABC	CB		
R38	9015 40226	1 K	1/4W	5%	C	01121	ABC	CB		
R39	9015 40271	51 Ω	1/4W	5%	C	01121	ABC	CB		
R40	9015 40203	18 Ω	1/4W	5%	C	01121	ABC	CB		
R41	9015 40228	1.2 K	1/4W	5%	C	01121	ABC	CB		
R42	9015 40209	100 Ω	1/4W	5%	C	01121	ABC	CB		
R43	9015 40216	330 Ω	1/4W	5%	C	01121	ABC	CB		
R44	9015 40233	2.4 K	1/4W	5%	C	01121	ABC	CB		
R45	9015 40220	510 Ω	1/4W	5%	C	01121	ABC	CB		
R46	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R47	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R48	9015 40205	33 Ω	1/4W	5%	C	01121	ABC	CB		
R49	9015 40215	300 Ω	1/4W	5%	C	01121	ABC	CB		
R50	9027 43691	24.9 K	1/8W	1%	MF	24546	CGW	C-4		
R51	9027 40486	82.5 Ω	1/8W	1%	MF	24546	CGW	C-4		
R52	9015 43949	2.7 Ω	1/4W	5%	C	01121	ABC	CB		
R53	9015 40219	470 Ω	1/4W	5%	C	01121	ABC	CB		
R54	9015 40207	68 Ω	1/4W	5%	C	01121	ABC	CB		
R55	9015 43979	30 Ω	1/4W	5%	C	01121	ABC	CB		
R56	9027 40495	75 Ω	1/8W	1%	MF	24546	CGW	C-4		
R57	9015 40214	270 Ω	1/4W	5%	C	01121	ABC	CB		
R58	9015 40271	51 Ω	1/4W	5%	C	01121	ABC	CB		
R59	9027 40536	6.19 K	1/8W	1%	MF	24546	CGW	C-4		
R63	9015 40245	10 K	1/4	5%	C	01121	ABC	CB		
R64	9015 40233	2.4 K	1/4W	5%	C	01121	ABC	CB		
R65	9015 40245	10 K	1/4W	5%	C	01121	ABC	CB		
R66	9015 40226	1 K	1/4W	5%	C	01121	ABC	CB		
R67	9015 40212	200 Ω	1/4W	5%	C	01121	ABC	CB		
R69	9047 43566	10 K	1-T		TPT.	05721	HEL	#62P-R10K		
R70	9015 40230	1.8 K	1/4W	5%	C	01121	ABC	CB		
R71	9015 40226	1 K	1/4W	5%	C	01121	ABC	CB		
R101	9015 40209	100 Ω	1/4W	5%	C	01121	ABC	CB		
R102	9029 44790	1.5 K	1/4W	5%	MF	24546	CGW	C-5		
R103	9030 62292	42.2 Ω	1/2W	1%	MF	24546	CGW	C-6		
R104	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R105	9029 44745	6.04 K	1/4W	1%	MF	24546	CGW	C-5		
R106	9029 44764	205 Ω	1/4W	1%	MF	24546	CGW	C-5		
R107	9027 40506	402 Ω	1/8W	1%	MF	24546	CGW	C-4		

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION			MFR.	MFR. PART NO.
T122/NL-0200 cont'd.	5007 64431					
R108	9015 40237	3.9 K	1/4W 5% C	01121	ABC CB	
R109	9015 40231	2 K	1/4W 5% C	01121	ABC CB	
R110	9047 43559	1 K	1-Turn Pot.	05721	HEL #62P-R1K	
R111	9015 40204	22 Ω	1/4W 5% C	01121	ABC CB	
R112	9015 40228	1.2 K	1/4W 5% C	01121	ABC CB	
R113	9015 40209	100 Ω	1/4W 5% C	01121	ABC CB	
R114	9029 44781	825 Ω	1/4W 1% MF	24546	CGW C-5	
R116	9047 43559	1 K	1-Turn Pot.	05721	HEL #62P-R1K	
R117	9051 40821	100 Ω	1-Turn Pot.	73138	BEK #62P-R100	
R118	9015 40232	2.2 K	1/4W 5% C	01121	ABC CB	
R119	9015 40230	1.8 K	1/4W 5% C	01121	ABC CB	
R120	9015 40271	51 Ω	1/4W 5% C	01121	ABC CB	
R121	9015 40294	75 Ω	1/4W 5% C	01121	ABC CB	
R122	9015 40204	22 Ω	1/4W 5% C	01121	ABC CB	
R123	9015 40271	51 Ω	1/4W 5% C	01121	ABC CB	
R124	9015 40221	620 Ω	1/4W 5% C	01121	ABC CB	
R125	9015 40211	150 Ω	1/4W 5% C	01121	ABC CB	
R126	9015 40223	750 Ω	1/4W 5% C	01121	ABC CB	
R127	9015 40240	5.6 K	1/4W 5% C	01121	ABC CB	
R128	9015 40233	2.4 K	1/4W 5% C	01121	ABC CB	
R129	9015 43981	82 Ω	1/4W 5% C	01121	ABC CB	
R130	9015 40223	750 Ω	1/4W 5% C	01121	ABC CB	
R131	9015 40205	33 Ω	1/4W 5% C	01121	ABC CB	
R132	9015 40204	22 Ω	1/4W 5% C	01121	ABC CB	
R133	9015 40211	150 Ω	1/4W 5% C	01121	ABC CB	
R134	9015 40241	6.8 K	1/4W 5% C	01121	ABC CB	
R135	9027 43691	24.9 K	1/8W 1% MF	24546	CGW C-4	
R136	9015 40219	470 Ω	1/4W 5% C	01121	ABC CB	
R137	9015 40258	120 K	1/4W 5% C	01121	ABC CB	
R138	9015 40226	1 K	1/4W 5% C	01121	ABC CB	
R139	9015 40271	51 Ω	1/4W 5% C	01121	ABC CB	
R140	9015 40203	18 Ω	1/4W 5% C	01121	ABC CB	
R141	9015 40228	1.2 K	1/4W 5% C	01121	ABC CB	
R142	9015 40209	100 Ω	1/4W 5% C	01121	ABC CB	
R143	9015 40216	330 Ω	1/4W 5% C	01121	ABC CB	
R144	9015 40233	2.4 K	1/4W 5% C	01121	ABC CB	
R145	9015 40220	510 Ω	1/4W 5% C	01121	ABC CB	
R146	9015 40204	22 Ω	1/4W 5% C	01121	ABC CB	
R147	9015 40204	22 Ω	1/4W 5% C	01121	ABC CB	
R148	9015 40205	33 Ω	1/4W 5% C	01121	ABC CB	
R149	9015 40215	300 Ω	1/4W 5% C	01121	ABC CB	
R150	9027 43691	24.9 K	1/8W 1% MF	24546	CGW C-4	
R151	9027 40486	82.5 Ω	1/8W 1% MF	24546	CGW C-4	
R152	9015 43949	2.7 Ω	1/4W 5% C	01121	ABC CB	
R153	9015 40219	470 Ω	1/4W 5% C	01121	ABC CB	
R154	9015 40207	68 Ω	1/4W 5% C	01121	ABC CB	
R155	9015 43979	30 Ω	1/4W 5% C	01121	ABC CB	
R156	9027 40495	75 Ω	1/8W 1% MF	24546	CGW C-4	

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION				MFR.	MFR. PART NO.
T122/NL-0200 cont'd.	5007 64431						
R157	9015 40214	270 Ω	1/4W	5% C	01121	ABC CB	
R158	9015 40271	51 Ω	1/4W	5% C	01121	ABC CB	
R159	9027 40536	6.19 K	1/8W	1% MF	24546	CGW C-4	
R169	9047 43566	10 K	1-Turn	Pot	05721	HEL #62P-R10K	
R170	9015 40230	1.8 K	1/4W	5% C	01121	ABC CB	
R201	9015 40209	100 Ω	1/4W	5% C	01121	ABC CB	
R202	9029 44790	1.5 K	1/4W	1% MF	24546	CGW C-5	
R203	9030 62292	42.2 Ω	1/2W	1% MF	24546	CGW C-6	
R204	9015 40204	22 Ω	1/4W	5% C	01121	ABC CB	
R205	9029 44745	6.04 K	1/4W	1% MF	24546	CGW C-5	
R206	9029 44764	205 Ω	1/4W	1% MF	24546	CGW C-5	
R207	9027 40506	402 Ω	1/8W	1% MF	24546	CGW C-4	
R208	9015 40237	3.9 K	1/4W	5% C	01121	ABC CB	
R209	9015 40231	2 K	1/4W	5% C	01121	ABC CB	
R210	9047 43559	1 K	1-T	Pot	05721	HEL #62P-R1K	
R211	9015 40204	22 Ω	1/4W	5% C	01121	ABC CB	
R212	9015 40228	1.2 K	1/4W	5% C	01121	ABC CB	
R213	9015 40209	100 Ω	1/4W	5% C	01121	ABC CB	
R214	9029 44781	825 Ω	1/4W	1% MF	24546	CGW C-5	
R216	9047 43559	1 K	1-T	Pot	05721	HEL #62P-R1K	
R217	9051 40821	100 Ω	1-T	Pot	73138	BEK #62P-R100	
R218	9015 40232	2.2 K	1/4W	5% C	01121	ABC CB	
R219	9015 40230	1.8 K	1/4W	5% C	01121	ABC CB	
R220	9015 40271	51 Ω	1/4W	5% C	01121	ABC CB	
R221	9015 40294	75 Ω	1/4W	5% C	01121	ABC CB	
R222	9015 40204	22 Ω	1/4W	5% C	01121	ABC CB	
R223	9015 40271	51 Ω	1/4W	5% C	01121	ABC CB	
R224	9015 40221	620 Ω	1/4W	5% C	01121	ABC CB	
R225	9015 40211	150 Ω	1/4W	5% C	01121	ABC CB	
R226	9015 40223	750 Ω	1/4W	5% C	01121	ABC CB	
R227	9015 40240	5.6 K	1/4W	5% C	01121	ABC CB	
R228	9015 40233	2.4 K	1/4W	5% C	01121	ABC CB	
R229	9015 43981	82 Ω	1/4W	5% C	01121	ABC CB	
R230	9015 40223	750 Ω	1/4W	5% C	01121	ABC CB	
R231	9015 40205	33 Ω	1/4W	5% C	01121	ABC CB	
R232	9015 40204	22 Ω	1/4W	5% C	01121	ABC CB	
R233	9015 40211	150 Ω	1/4W	5% C	01121	ABC CB	
R234	9015 40241	6.8 K	1/4W	5% C	01121	ABC CB	
R235	9027 43691	24.9 K	1/8W	1% MF	24546	CGW C-4	
R236	9015 40219	470 Ω	1/4W	5% C	01121	ABC CB	
R237	9015 40258	120 K	1/4W	5% C	01121	ABC CB	
R238	9015 40226	1 K	1/4W	5% C	01121	ABC CB	
R239	9015 40271	51 Ω	1/4W	5% C	01121	ABC CB	
R240	9015 40203	18 Ω	1/4W	5% C	01121	ABC CB	
R241	9015 40228	1.2 K	1/4W	5% C	01121	ABC CB	

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION						MFR.	MFR. PART NO.	
T122/NL-0200	5007 64431									
cont 'd.										
R242	9015 40209	100 Ω	1/4W	5%	C	01121	ABC	CB		
R243	9015 40216	330 Ω	1/4W	5%	C	01121	ABC	CB		
R244	9015 40233	2.4 K	1/4	5%	C	01121	ABC	CB		
R245	9015 40220	510 Ω	1/4W	5%	C	01121	ABC	CB		
R246	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R247	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R248	9015 40205	33 Ω	1/4W	5%	C	01121	ABC	CB		
R249	9015 40215	300 Ω	1/4W	5%	C	01121	ABC	CB		
R250	9027 43691	24.9 K	1/8W	1%	MF	24546	CGW	C-4		
R251	9027 40486	82.5 Ω	1/8W	1%	MF	24546	CGW	C-4		
R252	9015 43949	2.7 Ω	1/4W	5%	C	01121	ABC	CB		
R253	9015 40219	470 Ω	1/4W	5%	C	01121	ABC	CB		
R254	9015 40207	68 Ω	1/4W	5%	C	01121	ABC	CB		
R255	9015 43979	30 Ω	1/4W	5%	C	01121	ABC	CB		
R256	9027 40495	75 Ω	1/8W	1%	MF	24546	CGW	C-4		
R257	9015 40214	270 Ω	1/4W	5%	C	01121	ABC	CB		
R258	9015 40271	51 Ω	1/4W	5%	C	01121	ABC	CB		
R259	9027 40536	6.19 K	1/8W	1%	MF	24546	CGW	C-4		
R269	9047 43566	10 K	1-T		Pot	73138	BEK	#62P-R10K		
R270	9015 40230	1.8 K	1/4W	5%	C	01121	ABC	CB		
R301	9015 40209	100 Ω	1/4W	5%	C	01121	ABC	CB		
R302	9029 44790	1.5 K	1/4W	1%	MF	24546	CGW	C-5		
R303	9030 62292	42.2 Ω	1/2W	1%	MF	24546	CGW	C-6		
R304	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R305	9029 44745	6.04 K	1/4W	1%	MF	24546	CGW	C-5		
R306	9029 44764	205 Ω	1/4W	1%	MF	24546	CGW	C-5		
R307	9027 40506	402 Ω	1/8W	1%	MF	24546	CGW	C-4		
R308	9015 40237	3.9 K	1/4W	5%	C	01121	ABC	CB		
R309	9015 40226	1 K	1/4W	5%	C	01121	ABC	CB		
R310	9047 43559	1 K	1-T		Pot	73138	BEK	#62P-R1K		
R311	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R312	9015 40228	1.2 K	1/4W	5%	C	01121	ABC	CB		
R313	9015 40209	100 Ω	1/4W	5%	C	01121	ABC	CB		
R314	9029 44781	825 Ω	1/4W	1%	MF	24546	CGW	C-5		
R316	9047 43559	1 K	1-T		Pot	73138	BEK	#62P-R1K		
R317	9051 40821	100 Ω	1-T		Pot	73138	BEK	#62P-R1K		
R318	9015 40232	2.2 K	1/4W	5%	C	01121	ABC	CB		
R319	9015 40230	1.8 K	1/4W	5%	C	01121	ABC	CB		
R320	9015 40271	51 Ω	1/4W	5%	C	01121	ABC	CB		
R321	9015 40294	75 Ω	1/4W	5%	C	01121	ABC	CB		
R322	9015 40204	22 Ω	1/4W	5%	C	01121	ABC	CB		
R323	9015 40271	51 Ω	1/4W	5%	C	01121	ABC	CB		
R324	9015 40221	620 Ω	1/4W	5%	C	01121	ABC	CB		
R325	9015 40211	150 Ω	1/4W	5%	C	01121	ABC	CB		
R326	9015 40223	750 Ω	1/4W	5%	C	01121	ABC	CB		

Replaceable Parts List (continued)

REFERENCE DESIGNATOR	ORTEC PART NO.	DESCRIPTION	MFR.	MFR. PART NO.
T122/NL-0200	5007 64431			
cont'd.				
R327	9015 40240	5.6 K 1/4W 5% C	01121	ABC CB
R328	9015 40233	2.4 K 1/4W 5% C	01121	ABC CB
R329	9015 43981	82 Ω 1/4W 5% C	01121	ABC CB
R330	9015 40223	750 Ω 1/4W 5% C	01121	ABC CB
R331	9015 40205	33 Ω 1/4W 5% C	01121	ABC CB
R332	9015 40204	22 Ω 1/4W 5% C	01121	ABC CB
R333	9015 40211	150 Ω 1/4W 5% C	01121	ABC CB
R334	9015 40241	6.8 K 1/4W 5% C	01121	ABC CB
R335	9027 43691	24.9 K 1/8W 1% MF	24546	CGW C-4
R336	9015 40219	470 Ω 1/4W 5% C	01121	ABC CB
R337	9015 40258	120 K 1/4W 5% C	01121	ABC CB
R338	9015 40226	1 K 1/4W 5% C	01121	ABC CB
R339	9015 40271	51 Ω 1/4W 5% C	01121	ABC CB
R340	9015 40203	18 Ω 1/4W 5% C	01121	ABC CB
R341	9015 40228	1.2 K 1/4W 5% C	01121	ABC CB
R342	9015 40209	100 Ω 1/4W 5% C	01121	ABC CB
R343	9015 40216	330 Ω 1/4W 5% C	01121	ABC CB
R344	9015 40233	2.4 K 1/4W 5% C	01121	ABC CB
R345	9015 40220	510 Ω 1/4W 5% C	01121	ABC CB
R346	9015 40204	22 Ω 1/4W 5% C	01121	ABC CB
R347	9015 40204	22 Ω 1/4W 5% C	01121	ABC CB
R348	9015 40205	33 Ω 1/4W 5% C	01121	ABC CB
R349	9015 40215	300 Ω 1/4W 5% C	01121	ABC CB
R350	9027 43691	24.9 K 1/8W 1% MF	24546	CGW C-4
R351	9027 40486	82.5 Ω 1/8W 1% MF	24546	CGW C-4
R352	9015 43949	2.7 Ω 1/4W 5% C	01121	ABC CB
R353	9015 40219	470 Ω 1/4W 5% C	01121	ABC CB
R354	9015 40207	68 Ω 1/4W 5% C	01121	ABC CB
R355	9015 43979	30 Ω 1/4W 5% C	01121	ABC CB
R356	9027 40495	75 Ω 1/8W 1% MF	24546	CGW C-4
R357	9015 40214	270 Ω 1/4W 5% C	01121	ABC CB
R358	9015 40271	51 Ω 1/4W 5% C	01121	ABC CB
R359	9027 40536	6.19 K 1/8W 1% MF	24546	CGW C-4
R369	9047 43566	10 K 1-Turn Pot.	73138	BEK #62P-R10K
R370	9015 40230	1.8 K 1/4W 5% C	01121	ABC CB

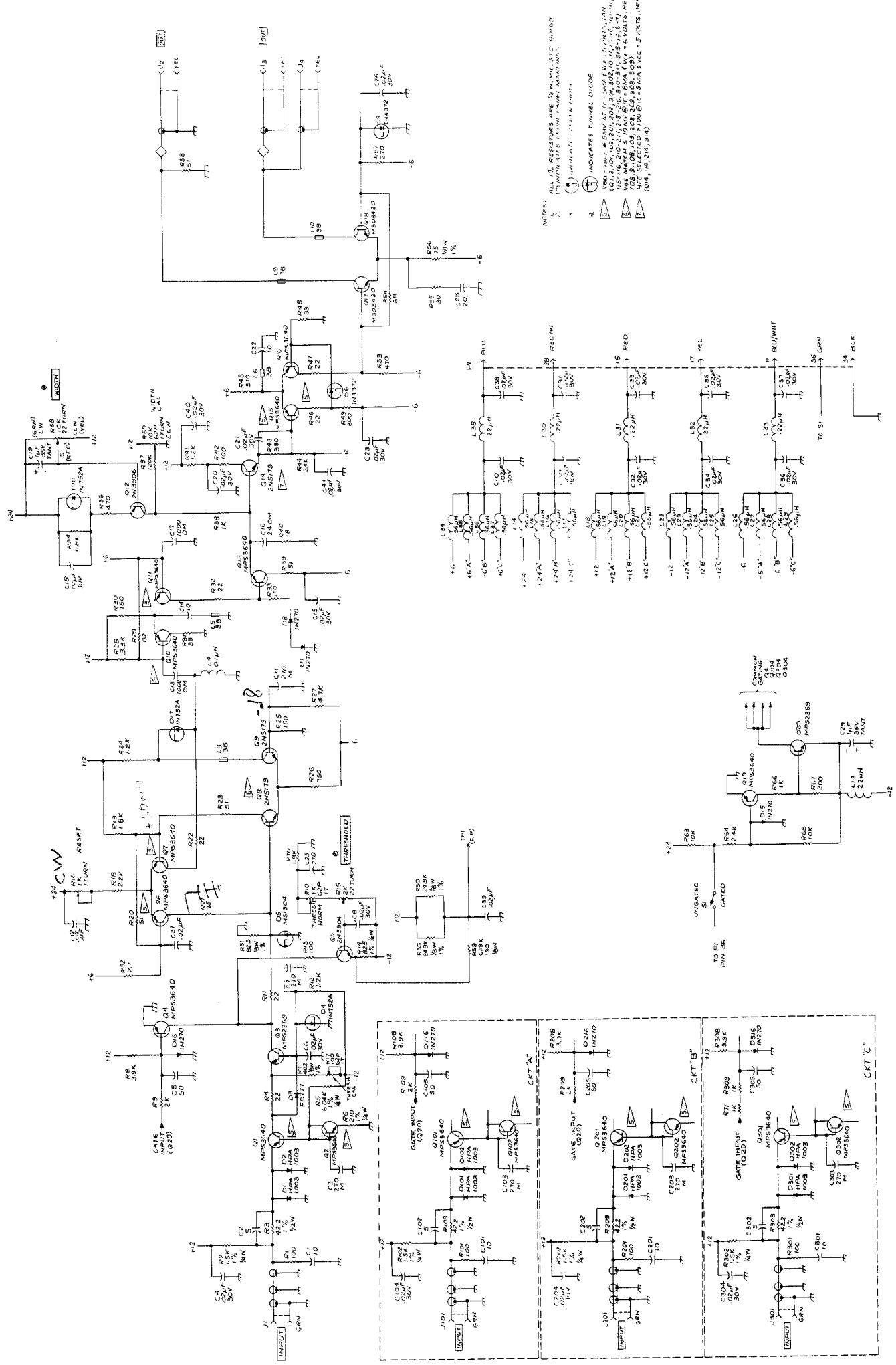
**BIN/MODULE CONNECTOR PIN ASSIGNMENTS
FOR AEC STANDARD NUCLEAR INSTRUMENT MODULES
PER TID-20893**

Pin	Function	Pin	Function
1	+3 volts	23	Reserved
2	-3 volts	24	Reserved
3	Spare Bus	25	Reserved
4	Reserved Bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	*28	+24 volts
7	Coaxial	*29	-24 volts
8	200 volts dc	30	Spare Bus
9	Spare	31	Spare
*10	+6 volts	32	Spare
*11	-6 volts	*33	115 volts ac (Hot)
12	Reserved Bus	*34	Power Return Ground
13	Spare	**35	Reset (Scaler)
14	Spare	**36	Gate
15	Reserved	**37	Reset (Auxiliary)
*16	+12 volts	38	Coaxial
*17	-12 volts	39	Coaxial
18	Spare Bus	40	Coaxial
19	Reserved Bus	*41	115 volts ac (Neut.)
20	Spare	*42	High Quality Ground
21	Spare	G	Ground Guide Pin
22	Reserved		

Pins marked (*) are installed and wired in ORTEC 401A and 401B Modular System Bins.

Pins marked (*) and (**) are installed and wired in EG&G/ORTEC-HEP M250/N and M350/N NIMBINS.

The transistor types installed in your instrument may differ from those shown in the schematic diagram. In such cases, necessary replacements can be made with either the type shown in the diagram or the type actually used in the instrument.



- NOTES:
1. ALL 1% RESISTORS ARE 1/4W UNLESS OTHERWISE SPECIFIED.
 2. CAPACITORS ARE 50V UNLESS OTHERWISE SPECIFIED.
 3. INDICATES TUNNEL DIODE.
 4. VALUES IN PARENTHESES ARE 10% TOLERANCE UNLESS OTHERWISE SPECIFIED.

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