

**Model 418A
Universal Coincidence
Operating and Service Manual**

Advanced Measurement Technology, Inc.

a/k/a/ ORTEC[®], a subsidiary of AMETEK[®], Inc.

WARRANTY

ORTEC* warrants that the items will be delivered free from defects in material or workmanship. ORTEC makes no other warranties, express or implied, and specifically NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

ORTEC's exclusive liability is limited to repairing or replacing at ORTEC's option, items found by ORTEC to be defective in workmanship or materials within one year from the date of delivery. ORTEC's liability on any claim of any kind, including negligence, loss, or damages arising out of, connected with, or from the performance or breach thereof, or from the manufacture, sale, delivery, resale, repair, or use of any item or services covered by this agreement or purchase order, shall in no case exceed the price allocable to the item or service furnished or any part thereof that gives rise to the claim. In the event ORTEC fails to manufacture or deliver items called for in this agreement or purchase order, ORTEC's exclusive liability and buyer's exclusive remedy shall be release of the buyer from the obligation to pay the purchase price. In no event shall ORTEC be liable for special or consequential damages.

Quality Control

Before being approved for shipment, each 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.

Repair Service

If it becomes necessary to return this instrument for repair, it is essential that Customer Services be contacted in advance of its return so that a Return Authorization Number can be assigned to the unit. Also, ORTEC must be informed, either in writing, by telephone [(865) 482-4411] or by facsimile transmission [(865) 483-2133], of the nature of the fault of the instrument being returned and of the model, serial, and revision ("Rev" on rear panel) numbers. Failure to do so may cause unnecessary delays in getting the unit repaired. The ORTEC standard procedure requires that instruments returned for repair pass the same quality control tests that are used for new-production instruments. Instruments that are returned should be packed so that they will withstand normal transit handling and must be shipped PREPAID via Air Parcel Post or United Parcel Service to the designated ORTEC repair center. The address label and the package should include the Return Authorization Number assigned. Instruments being returned that are damaged in transit due to inadequate packing will be repaired at the sender's expense, and it will be the sender's responsibility to make claim with the shipper. Instruments not in warranty should follow the same procedure and ORTEC will provide a quotation.

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 ORTEC of the circumstances so that assistance can be provided in making damage claims and in providing replacement equipment, if necessary.

Copyright © 2002, Advanced Measurement Technology, Inc. All rights reserved.

*ORTEC[®] is a registered trademark of Advanced Measurement Technology, Inc. All other trademarks used herein are the property of their respective owners.

CONTENTS

WARRANTY	ii
SAFETY INSTRUCTIONS AND SYMBOLS	v
SAFETY WARNINGS AND CLEANING INSTRUCTIONS	vi
1. DESCRIPTION	1
1.1. GENERAL	1
1.2. BASIC FUNCTION	1
2. SPECIFICATIONS	1
3. INSTALLATION	2
3.1. GENERAL	2
3.2. CONNECTION TO POWER	2
3.3. LOGIC INPUTS TO THE COINCIDENCE UNIT	2
4. OPERATING INSTRUCTIONS	3
4.1. FRONT PANEL CONTROLS	3
4.2. CONNECTOR DATA	3
4.3. INITIAL TESTING AND OBSERVATION OF PULSE WAVEFORMS	3
4.4. TYPICAL OPERATING CONSIDERATIONS	3
5. CIRCUIT DESCRIPTION	4
5.1. INPUT A	5
5.2. INPUTS B,C,D, and E	5
6. CALIBRATION AND MAINTENANCE	6
6.1. TESTING PERFORMANCE OF SLOW COINCIDENCE	6
6.2. SUGGESTIONS FOR TROUBLESHOOTING	8
6.3. TABULATED TEST POINT VOLTAGES ON ETCHED BOARD	8



SAFETY INSTRUCTIONS AND SYMBOLS

This manual contains up to three levels of safety instructions that must be observed in order to avoid personal injury and/or damage to equipment or other property. These are:

- DANGER** Indicates a hazard that could result in death or serious bodily harm if the safety instruction is not observed.
- WARNING** Indicates a hazard that could result in bodily harm if the safety instruction is not observed.
- CAUTION** Indicates a hazard that could result in property damage if the safety instruction is not observed.

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

In addition, the following symbol may appear on the product:



ATTENTION—Refer to Manual



DANGER—High Voltage

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

SAFETY WARNINGS AND CLEANING INSTRUCTIONS

DANGER Opening the cover of this instrument is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.

WARNING Using this instrument in a manner not specified by the manufacturer may impair the protection provided by the instrument.

Cleaning Instructions

To clean the instrument exterior:

- Unplug the instrument from the ac power supply.
- Remove loose dust on the outside of the instrument with a lint-free cloth.
- Remove remaining dirt with a lint-free cloth dampened in a general-purpose detergent and water solution. Do not use abrasive cleaners.

CAUTION To prevent moisture inside of the instrument during external cleaning, use only enough liquid to dampen the cloth or applicator.

- Allow the instrument to dry completely before reconnecting it to the power source.

ORTEC MODEL 418A UNIVERSAL COINCIDENCE

1. DESCRIPTION

1.1. GENERAL

The ORTEC 418A is a coincidence unit with five inputs. Each input has a three-position switch associated with it to select the COINCIDENCE, ANTICOINCIDENCE, or OFF mode. The resolving time of Input A is controlled by a front-panel potentiometer and is continuously variable from 100 ns to 2 μ s. The remaining four inputs are dc-coupled and their resolving times are determined by their input pulse widths. By means of a front-panel switch 1,2,3,4, or 5 coincident pulses may be required for an output and all five inputs are used in the coincident mode, an output pulse will be obtained when a coincident occurs between any two inputs. Input A is particularly useful for anticoincidence and coincidence strobe operations because of its variable resolving time; e.g., this input can be used in the anticoincidence mode to block two 500-ns-wide input pulses without additional external pulse-shaping equipment. Two positive output pulses are provided on BNC connectors, one front panel and one rear panel. These pulses are normally 500 ns wide but their width can be altered as desired by changing a capacitor.

1.2. BASIC FUNCTION

The 418A employs an "overlap" type of coincidence circuit. Each input pulse is regenerated into a current pulse which has a fast rise and fall time.

These current pulses are fed into an AND circuit which produces an output when an overlap occurs.

The width of the current pulse from Input A is controlled by a front-panel potentiometer and can be varied from 100 ns to 2 μ s. The current pulses from the remaining inputs are the same width as their associated input pulses at the 1.8-V level. Since these inputs are dc-coupled, their current pulses can be made infinitely long by the application of a dc voltage to the input.

The routing of the individual current is controlled by front-panel toggle switches. They can be routed to the COINCIDENCE or AND circuit, ground (OFF position), or the ANTICOINCIDENCE circuit. The front-panel COINCIDENCE REQUIREMENTS switch alters the AND circuits so that 1,2,3,4, or 5 coincident current pulses are required to produce an output; therefore the number of INPUT CONTROL toggle switches in the COINCIDENCE position must be equal to or greater than the number selected by the COINCIDENCE REQUIREMENTS switch in order for the unit to produce an output. A current pulse routed to the anticoincidence circuit blocks all pulses routed to the coincidence circuit for the duration of the anticoincidence pulse.

When the coincidence requirements are met, a 500-ns-wide output pulse is generated. The width of this pulse can be changed as desired by changing the value of capacitor C9.

2. SPECIFICATIONS

The 418A is housed in a Nuclear Standard Module. It is one module wide and weighs 1.5 lb. It contains no internal power supply and must therefore obtain the necessary operating power from the Nuclear Standard Bin and Power Supply, ORTEC 4001A/4002A. All signals in and out of the module are on front-panel BNC connectors, and an additional output BNC is on the rear panel.

PERFORMANCE

RESOLVING TIME (τ).

INPUT A 100 ns to 2 μ s controlled by 20-turn potentiometer.

INPUTS B,C,D,E, Controlled by input pulse width.

COINCIDENCE REQUIREMENTS Selectable by front-panel switch; i.e., 1, 2, 3, 4, or 5 coincident pulses may be required to yield an output. For example, if the COINCIDENCE REQUIREMENTS switch is set to 3 and all five INPUT CONTROL switches are set to COINCIDENCE, an output will be obtained when a coincidence occurs between any three inputs.

TEMPERATURE STABILITY Change in INPUT A resolving time (τ) is less than 0.1%/°C; change in INPUTS B, C, D, and E resolving time (τ) is less than 0.5%/°C; $\tau = 500$ ns.

OPERATING TEMPERATURE 0 to 50°C.

CONTROLS (INPUTS)

Each input has a three-position locking toggle switch associated with it which permits any input to be used in the COINCIDENCE, ANTICOINCIDENCE, or OFF mode. When the OFF mode is selected, the respective input is disabled.

INPUTS

POLARITY Positive 2 V minimum, 30 V maximum.

PULSE WIDTH 50 ns to dc.

IMPEDANCE >1.5k Ω , dc-coupled

OUTPUTS

Two each, dc-coupled, positive 5 V, 500 ns wide; impedance <10 Ω .

MECHANICAL AND ELECTRICAL

MECHANICAL One module wide and designed to meet the recommended interchangeability standards set forth in DOE Report TID-20893 (Rev.); 1.35 in. Wide, 8.714 in. High, and 9.75 in. Long.

POWER REQUIREMENTS +24 V, 105 mA; +12 V, 50 mA; -24 V, 90 mA; -12 V, 30 mA.

3. INSTALLATION

3.1. GENERAL

The 418A, used in conjunction with a 4001A/4002A Bin and Power Supply, is intended for rack mounting; therefore any vacuum tube equipment operating in the same rack must be sufficiently cooled with circulating air to prevent any localized heating of the all-transistor circuitry used throughout the 418A. The temperature of the equipment mounted in racks can easily exceed the recommended maximum of 120°F (50°C) unless precautions are taken.

3.2. CONNECTION TO POWER

Because the 418A contains no internal power supply, it must obtain operating power from the Nuclear Standard Bin and Power Supply such as ORTEC 4001A/4002A. It is recommended that the bin power supply be turned off when modules are inserted or removed. The ORTEC NIM modules are designed so that it is not possible to overload the NIM power supply with a full complement of

modules in the bin. Since, however, this may not be true when the bin contains modules other than those of ORTEC design, power supply voltages should be checked after the modules are inserted. ORTEC 4001A/4002A has test points on the power supply control panel to monitor the dc voltages.

3.3. LOGIC INPUTS TO THE COINCIDENCE UNIT

The input pulses to the 418A may come from any source of logic pulses. The input impedance is approximately 2000 Ω , and some care must be given to ensure that reflections do not occur in the driving transmission cable. Reflections can probably best be avoided by terminating the driving cable at the inputs with the characteristic impedance of the driving cable. The amplitude and width of the input signals are specified in Section 2.2.

4. OPERATING INSTRUCTIONS

4.1. FRONT PANEL CONTROLS

INPUT A RESOLVING TIME CONTROL

Each input pulse is regenerated into a current pulse with fast rise and fall times. The width of the current pulse from INPUT A is continuously variable from 100 ns to 2 μ . The current pulses from the remaining inputs are the same width of these current pulses at the 1.8-V level. The width of these current pulses determines the resolving time of the unit. INPUT A RESOLVING TIME control is especially useful when INPUT A is used in the anticoincidence mode; e.g., this input can be used to block two 500-ns-wide pulses without additional external pulse shaping equipment.

COINCIDENCE REQUIREMENTS

The position of this switch determines the number of coincidence pulses required to produce an output pulse; e.g., if this switch is in the 2 position and all input control switches are in the COINCIDENCE position, an output pulse will be produced when any two input pulses are in coincidence. In order to obtain an output pulse, the number of input control switches in the COINCIDENCE position must always be equal to or greater than the number of selected by the COINCIDENCE REQUIREMENTS switch.

INPUT CONTROLS

Each of the five three-position locking toggle switches determines the routing of the signal applied to its associated input connector. The three positions of each switch and their function are:

1. COINCIDENCE – Input signal is routed to the coincidence portion of the circuit.
2. OUT – Input signal is routed to ground; therefore it does not affect the coincidence or anticoincidence portion of the circuit and is completely out of the system.
3. ANTICOINCIDENCE – Input signal is routed to the anticoincidence portion of the circuit and will block all coincidence signals for the duration of the anticoincidence signal, except for INPUT A, for which the blocking time is a function of the front-panel RESOLVING TIME control.

Any combination of switch positions may be used; however, an output pulse can be obtained only when the number of input controls in the COINCIDENCE positions is equal to or exceeds the number selected by the COINCIDENCE REQUIREMENTS switch.

4.2. CONNECTOR DATA

INPUT A is a front-panel BNC connector dc-coupled to the internal circuitry and has an impedance to ground greater than 1.5 k Ω . To minimize reflections when driving from a low-impedance source into this connector, a terminator equal to the characteristics impedance of the driving cable should be shunted to ground. A positive 2-V signal with a minimum width of 50 ns is required to trigger the input circuit. The resolving time of INPUT A can be varied from 100 ns to 2 μ by the INPUT A RESOLVING TIME control.

INPUTS B,C,D,E - Same as INPUT A, except that the resolving time is set by the input pulse width.

OUTPUTS Two separate, buffered, dc-coupled coincidence outputs are provided on BNC connectors. The output pulses are 5 V in amplitude and 500 ns wide. The output pulse width can be altered as desired by changing capacitor C9. The amplitude can be increased by increasing the value of R75.

TEST POINT An oscilloscope test point is provided for monitoring the output signals. The test point has a 470 Ω resistor connecting it to the associated BNC output connector on the front panel.

4.3. INITIAL TESTING AND OBSERVATION OF PULSE WAVEFORMS

Refer to Section 6 for information on testing performance and observing waveforms.

4.4. TYPICAL OPERATING CONSIDERATIONS

The coincidence circuit is an overlap type or it can be described as an AND circuit. The 2T resolving time of INPUT A is determined by the INPUT A RESOLVING TIME control. See timing diagrams in Figs. 4.1 through 4.5.

If the coincidence requirements are met by the input pulses, two standard output pulses 500 ns wide and 5 V in amplitude are produced regardless of the overlap time of the coincident pulses. The width of the output pulses may be changed by changing the value of C9.

Careful attention should be given the 418A front-panel controls when using it. The input control toggle switches determine the routing of each input pulse. The COINCIDENCE REQUIREMENTS switch determines the number of coincident pulses required to yield an output pulse. This means that the number of input control switches in the COINCIDENCE position must be equal to or greater than the number selected by the COINCIDENCE REQUIREMENTS switch (see Fig. 4.5).

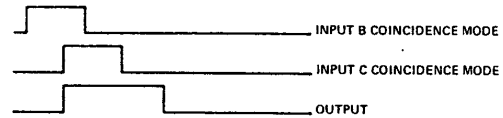


Fig. 4.1. Coincidence Requirements When Switch Setting Is 2.

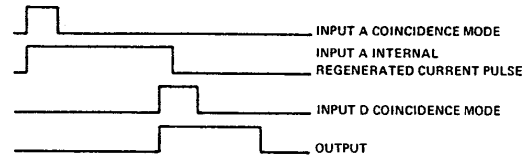


Fig. 4.2. Coincidence Requirements When Switch Setting Is 2.

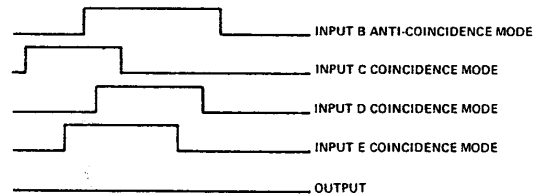


Fig. 4.3. Coincidence Requirements When Switch Setting Is 3.

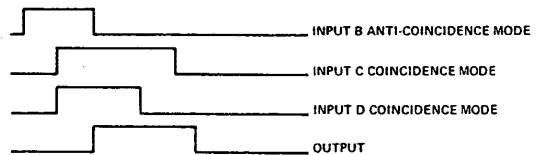


Fig. 4.4. Coincidence Requirements When Switch Setting Is 2.

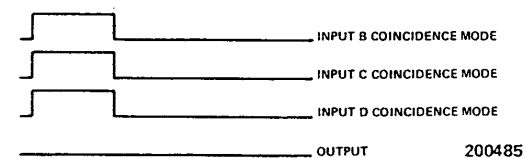


Fig. 4.5. Coincidence Requirements When Switch Setting Is 4.

5. CIRCUIT DESCRIPTION

The 418A has five dc-coupled inputs which may be used in the coincidence or anticoincidence mode. Each input is protected by a diode limiter. INPUT A has a variable resolving time, while INPUTS B through E have a resolving time determined by their

input pulse widths. The input controls route the signals from these inputs to the coincidence (CR29) or anticoincidence (Q25) stage. The number of coincident pulses required to trigger the coincidence stage (tunnel diode CR29) is determined by the amount of reverse current flowing in CR29. The

quiescent current flowing in CR29 is controlled by the COINCIDENCE REQUIREMENTS switch and Q26. If CR29 is triggered to its high state, a one shot (Q27-Q29) is triggered which produces a 5-V 500-ns-wide pulse. This pulse is passed through two emitter followers to the output connectors.

5.1. INPUT A

INPUT A is fed to a current switch (Q1 and Q3) through a diode limiter consisting of CR1, CR2, R1, R2, R3, and R4. The limiting action is accomplished when a positive voltage, large enough to switch the constant current that normally flows through CR1 and R1 to the limiter load, R3 and R4, is applied to the input. This causes the Q1 base voltage to exceed ground potential and turn Q1 on. Emitter follower Q2 drives the base of Q6 negative through the timing capacitor, C2, with the pulse from the collector of Q1. The resolving time of INPUT A, τ_a , is determined by the length of time that Q6 is off. The constant current generator, Q4, controls the off time of Q6, τ_a by discharging capacitor C2 back from its negative value toward ground. When the voltage at the base of Q6 exceeds ground potential, Q6 is turned on again. Q8 converts the voltage pulse at Q6 collector to a current pulse to drive the coincidence stage. Q5 is used as a feedback element to ensure that the pulse from the input current switch, Q1 collector, has a minimum duration of τ_a regardless of the input pulse width.

5.2. INPUTS B,C,D, and E

These four inputs are identical, so only INPUT B will be explained. A diode limiter similar to that of INPUT A is provided. This limiter is followed by a dc Schmitt trigger circuit, Q9, Q10, Q11. In the quiescent state the base of Q9 is at ground potential and the base of Q10 is 1.8 V. The Q10 base potential is maintained by the current from Q11 and R25. When a pulse is applied to the input and raises the base of Q9 above the potential at the base of Q10, Q9 turns on and Q10 and Q11 turn off. Due to the loss of the current supplied by Q11, the base of Q10 is now set at 0.9 V. The circuit will be reset to its quiescent state when the input voltage drops below 0.9 V. The hysteresis and

threshold of the circuit can be altered by changing the value of R22 and R25. Q12 converts the voltage pulse at the collector of Q10 to a current pulse.

The current pulse from each input circuit is connected to a three-position toggle switch (input controls) which routes the pulse to the coincidence stage, ground (OUT position), or the anticoincidence stage.

The anticoincidence stage is composed of Q25, which is biased off in the quiescent condition. An anticoincidence pulse saturates Q25 for the duration of the pulse. When Q25 saturates, it short circuits the coincidence line to ground, thereby preventing coincidence signals from reaching the coincidence stage for the duration of the anticoincidence pulse.

The coincidence stage is composed of CR29 and Q26. When tunnel diode CR29 is set to its high state by the coincidence current pulses, the 418A produces an output pulse. The number of coincident current pulses required to set CR29 to its high state is determined by its quiescent current. The bias current in CR29 is equal to the collector current of Q26. This current is controlled by the Q26 emitter resistor which is selected by the COINCIDENCE REQUIREMENTS switch. The voltage pulse produced when CR29 is set to its high state turns Q27 and Q29 off. The period of time that Q29 stays off is equal to the output pulse width and is controlled by C9 and R74. If a different output pulse width is desired, the value of C9 should be changed. The pulse at the collector of Q29 is dc-coupled to the output connectors through two emitter followers (Q30 and Q31). In the quiescent condition, the bases of these transistors are at zero volts, and they do not conduct. The amplitude of the output pulses is determined by the ratio of R72 and R75. R75 should be increased in value to increase the output pulse amplitude. An output pulse amplitude of approximately 10 V can be obtained by removing R75 from the circuit.

6. CALIBRATION AND MAINTENANCE

6.1. TESTING PERFORMANCE OF SLOW COINCIDENCE

INTRODUCTION

The following paragraphs are intended as aids in the installation and checkout of the 418A. These instructions present information on front-panel controls and waveforms at test points and output connectors.

TEST EQUIPMENT

The following or equivalent test equipment is needed:

ORTEC 419 or 480 Pulse Generator
 ORTEC 410, 435A, 440A, 450, or 451 Amplifier
 Two ORTEC 416 Gate and Delay Generators
 Tektronix Model 580 Oscilloscope
 100Ω BNC terminators

PRELIMINARY PROCEDURES

1. Visually check module for possible damage due to shipment.
2. Connect ac power to nuclear standard bin, ORTEC 4001A/4002A.
3. Plug module into bin and check for proper mechanical alignment.
4. Switch on ac power and check the dc power supply voltage at the test points on the 4001A Power Supply control panel.

COINCIDENCE TESTING

1. Connect the above test equipment as shown in Fig. 6.1. The ORTEC 416's will be referred to as 416A and 416B for clarity.
2. Adjust the 419 and 410 for a 6-V output pulse from the 410.

3. Set the 416A and 416B controls as follows:

DELAY RANGE switch	1.0-11
DELAY control	500
WIDTH control	Minimum
AMPLITUDE control	4 V

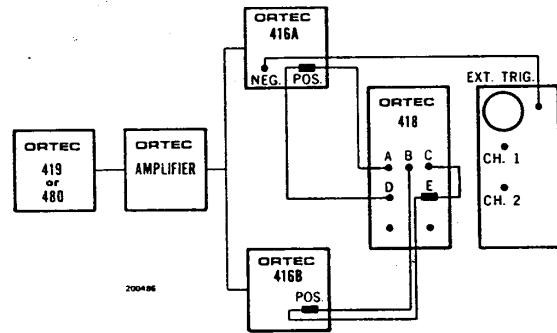


Fig. 6.1. ORTEC 418A Test Circuit

4. Set the 418A controls as follows:

INPUT A RESOLVING TIME Control	Maximum
COINCIDENCE REQUIREMENTS Control	2
INPUT Controls	
A	COIN
B	COIN
C	OFF
D	OFF
E	OFF

5. Monitor the 416A and 416B outputs with the oscilloscope. Adjust the 416B DELAY control until the leading edges of the two pulses are in coincidence.
6. Monitor the 416B and 418A outputs with the oscilloscope. An output pulse should be present at the 418A test point. Increase the 416B DELAY control until the 418A output pulse disappears.
7. Check the 416A and 416B outputs with the oscilloscope again. The leading edges of these two pulses should be 2 μs apart.

8. Repeat steps 4 through 7 except for the following changes:

Set INPUT A RESOLVING TIME Control to Minimum. Step 7 The leading edges of the two pulses from the 416A and 416B should be less than 100 ns apart.

9. Place 418A input control switches to OFF, INPUT A RESOLVING TIME to 0.1 μ s, and COINCIDENCE REQUIREMENTS to 1.

10. Sequentially place each INPUT-CONTROL switch to COINCIDENCE and then to OFF. An output pulse should appear on the oscilloscope each time a switch is placed to the COINCIDENCE position and should disappear when the switch is returned to OFF position.

11. Place the COINCIDENCE REQUIREMENTS switch to 2. Place switch A to the COINCIDENCE position and all others to the OFF position. An output pulse should not be present. Place switch B to the COINCIDENCE position and an output pulse should appear.

12. Place the COINCIDENCE REQUIREMENTS switch to 3 and the output pulse should disappear. Place switch C to the COINCIDENCE position and an output pulse should appear.

13. Place the COINCIDENCE REQUIREMENTS switch to 4 and the output pulse should disappear. Place switch D to the COINCIDENCE position and an output pulse should appear.

14. Place the COINCIDENCE REQUIREMENTS switch to 5 and the output pulse should disappear. Place switch E to the COINCIDENCE position and an output pulse should appear.

15. Reduce the 416A and 416B output pulses to 2.0 V and ensure that a pulse still appears at the 418A output. Reset the 416A and 416B output pulses to 5 V.

16. Load both 418A outputs with 100 Ω . The 418A output pulses should be a minimum of 5 V in amplitude and 500 ns wide.

17. Set instrument controls as follows:

416A

DELAY RANGE	1.0-11
DELAY	400
WIDTH	4 μ s
AMPLITUDE	5 V

416B

DELAY RANGE	1.0-11
DELAY	500
WIDTH	0.4 μ s
AMPLITUDE	5 V

418A

INPUT A RESOLVING TIME CONTROL	2 μ s
COINCIDENCE REQUIREMENTS	1

INPUT CONTROLS

A and D	OFF
B, C, and E	COINCIDENCE

18. Monitor the 418A output with the oscilloscope. An output pulse should be present. Sequentially place switches A and D to the ANTICOINCIDENCE mode and ensure that the output pulse disappears.

19. Change the instrument controls as follows:

416A

DELAY	500
WIDTH	0.4, μ s

416B

DELAY	400
WIDTH	4 μ s

418A

INPUT A RESOLVING TIME Control 0.1 μ s

INPUT CONTROLS

A and D	COINCIDENCE
B, C, and E	OFF

20. Monitor the 418A Output with the oscilloscope. Ensure that the 418A output pulse disappears as switches B, C, and E are sequentially switched to the ANTICOINCIDENCE position.

6.2. SUGGESTIONS FOR TROUBLESHOOTING

Recheck front-panel control settings. Ensure that the number of INPUT CONTROL switches in the COINCIDENCE position is equal to or exceeds the number selected by the COINCIDENCE REQUIREMENTS switch. If the 418A is still suspected of malfunctioning, it is essential to verify such malfunctioning in terms of simple pulse generator impulse at the input and output. In consideration of this, the 418A must be disconnected from its position in the system, and routine diagnostic analysis performed with a test pulse generator and oscilloscope. It is imperative that testing not be performed with a source and detector until the logic inputs to the coincidence unit perform satisfactorily with the test pulse generator.

The testing instructions in Section 6.1 Of this manual and the circuit description in Section 5 should provide assistance in locating the region of trouble and remedying the malfunctioning. The guide plate and shield cover can be completely removed from the module to enable oscilloscope and voltmeter observations with a minimal chance of accidentally short-circuiting portions of etched board.

The 418A may be returned to ORTEC for repair service at nominal cost. Our standardized procedure requires that each repaired instrument

receive the same extensive quality control tests that a new instrument receives.

6.3. TABULATED TEST POINT VOLTAGES ON ETCHED BOARD

The following dc voltages are intended to indicate the typical voltages measured on the etched circuit board. The voltages given here should not be considered as absolute values, but should be used as an aid in troubleshooting. All voltages were measured from ground with a DVM having an input impedance of 10 M Ω or greater. Voltages are dc values with no input pulses. Set INPUT A RESOLVING TIME Control to 0.1 μ s (min). Set COINCIDENCE REQUIREMENTS switch to 1.

<u>Test Point</u>	<u>Voltage</u>	<u>Test Point</u>	<u>Voltage</u>
Q1c	11.5	Q18b	1.8
Q4b	14.5	Q18c	10.8
Q6b	0.7	Q21b	0
Q6c	10.0	Q22b	1.8
Q7c	11.9	Q22c	10.8
Q9b	0	Q25b	- 0.6
Q10b	1.8	Q26b	- 2.9
Q10c	10.8	Q26c	0
Q13b	0	Q27b	- 12.0
Q14b	1.8	Q29b	- 11.7
Q14c	10.8	Q29c	- 0.3
Q17b	0		

**BIN/MODULE CONNECTOR PIN ASSIGNMENTS
FOR STANDARD NUCLEAR INSTRUMENT
MODULES PER DOE/ER-0457T**

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	117 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	117 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 4001A and 4001C
Modular System Bins.

