SECTION 1
NTRODUCTION

1. GENERAL

The Canberra Model 840 Coincidence Analyzer accepts up to four input signals generated by energy analysis or time discrimination modules. In turn, it produces a logic pulse output when all of the inputs enabled by front-panel switches occur within the resolving time set by front-panel controls; that is, when the leading edges of all selected input logic pulses occur within a time period equal to the "resolving time" selected.

Two resolving time ranges are provided: 0.1 - 1.0 microsecond and 10 - 100 nanoseconds. The 0.1 - 1.0 microsecond range is typically used for energy coincidence analysis; the 10 - 100 nanosecond range is used for timing, or simultaneous energy and timing coincidence experiments.

The Model 840 will accept the outputs of the following Canberra modules:

Model 820 and Model 1421 Zero Discriminators

Model 830 and Model 1430 Single Channel Analyzers

Model 832 and Model 1432 Integral Discriminators

Model 835 and Model 1435 Timing Single Channel Analyzers

Model 1455 Logic Shaper and Delay

.2 SPECIFICATIONS

.2. INPUT SIGNAL

Number: up to 4; 3 coincidence and 1 anti-coincidence.

Polarity: positive.

Amplitude: 4 to 10 volts.

Rise Time: 50 nanoseconds, maximum

Duration: 100 nanoseconds, minimum

Impedance: 2.2K ohms shunted by 120pf.

Connectors: BNC UG/1094-U.

.2.2 OUTPUT SIGNAL

Polarity: positive.

Amplitude: 10 volts, nominal

Rise Time: 50 nanoseconds, maximum.

Duration: 1 microsecond, nominal

Impedance: 50 ohms, DC coupled.

Connector: BNC UG/1094-U.

.2.3 PERFORMANCE

Resolving Time: 10 - 100 nanoseconds, and 0.1 - 1.0 microsecond, range-switch and rotary-control selectable.

Resolving Time Stability: better than 5% of setting or 3 nanoseconds, whichever is larger.

Linearity: see Figure 3-1.

.2.4 CONTROLS

RESOLVING TIME: front-panel potentiometer providing a 10:1 range (within the range set at the RANGE switch).

RANGE: front-panel switch for selecting resolving time ranges of 10 - 100 nanoseconds or 0.1 - 1 microsecond.

IN A, B, C Connectors: accept input signals for coincidence operation; enabled by corresponding front-panel switches.

ANTI Connector: accepts input signal for anti-coincidence operation; enabled by corresponding front-panel switch.

.2.5 POWER REQUIREMENTS

+24V - 35mA +12V - 70mA
-24V - 80mA -12V - 12mA

.2.6 PHYSICAL

Size: standard single-width module (1.35 inches wide) per TID-20893.

Weight: 2.8 lbs

SECTION 2
CONTROLS AND CONNECTORS

2. GENERAL

The functions of the controls and connectors located on the module are described in this section. It is recommended that this section be read before proceeding with the operation of the module.

2.2 CONTROLS

2.2.1 RANGE Switch

This switch determines the resolving time range within which the Model 840 will operate. There are two positions: 10 - 100 nanoseconds and 0.1 - 1.0 microsecond.

2.2.2 RESOLVING TIME Control

This potentiometer selects resolving times within the range set by the RANGE switch.

2.2.3 Toggle Switches (IN)

These switches are used to select those inputs which will be considered for the coincidence (or anti-coincidence) experiment; all inputs not selected by these switches are ignored; the absence of any input pulse at an input enabled by the toggle switch will inhibit any output from the Model 840 Coincidence Analyzer.

2.3 CONNECTORS

2.3. INPUT Connectors

Connectors A through C are used for coincidence events. If all signals at these connectors (enabled by the corresponding input toggle switches) occur within the resolving time set by the RESOLVING TIME controls, an output signal will occur at the OUTPUT connector. The anti-coincidence input (ANTI) is used to inhibit an output, imposing a NAND condition.

2.3.2 OUTPUT Connector

A positive 10 volt pulse with a rise time less than 50 nanoseconds and a duration of one microsecond is produced when a coincidence (or anti-coincidence, depending upon the connections made) occurs among the enabled inputs to the Model 840.

SECTION 3
OPERATING INSTRUCTIONS

3. GENERAL

Since it is impossible to determine exactly how the user will operate his module in a specific experiment, explicit instructions can not be given. However, if the following general procedures are performed, the user will become as familiar with the operation of the module as is possible.

3.2 SET UP

1. Insert the Model 840 Coincidence Analyzer module in an AEC compatible bin such as the Canberra Model 800.

2. For coincidence operation, connect input signals, which meet the conditions detailed in Section 1.2.1, to BNC connectors A and B.

3. Set toggle switches A and B to the IN position.

4. Set the toggle switches associated with input C and ANTI at their out positions (down).

5. Connect the OUTPUT connector to an oscilloscope or to the input of a scaler such as the Canberra Model 870. Set the sensitivities of the oscilloscope to 5V/cm and 1 microsecond/cm, vertical and horizontal, respectively.

6. Set the RANGE switch to 0.1 - microsecond; set the RESOLVING TIME control to 10.

3.3 COINCIDENCE CHECKOUT

1. Activate the input signals and observe the OUTPUT signal on the oscilloscope (or observe the scaler beginning to count). If an output can not be seen, using the oscilloscope check that the inputs are as specified in Section 1.2.1. An output signal will be generated when the input signals occur within one microsecond of each other.

2. Repeat step with the following input signal combinations:

   Input A and Input C

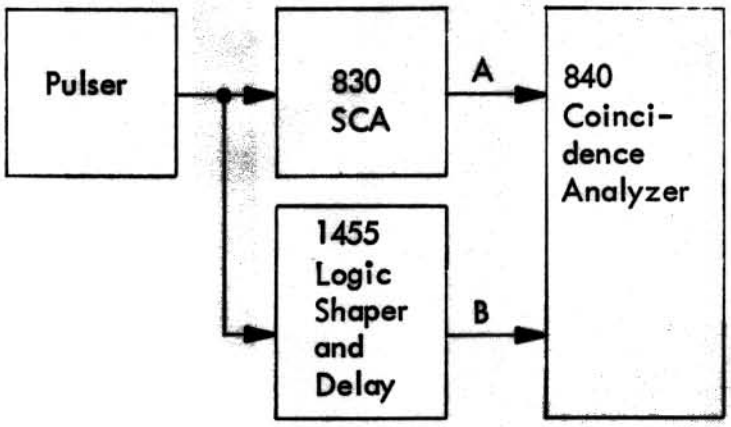
   Input B and Input C

   Inputs A, B, and C

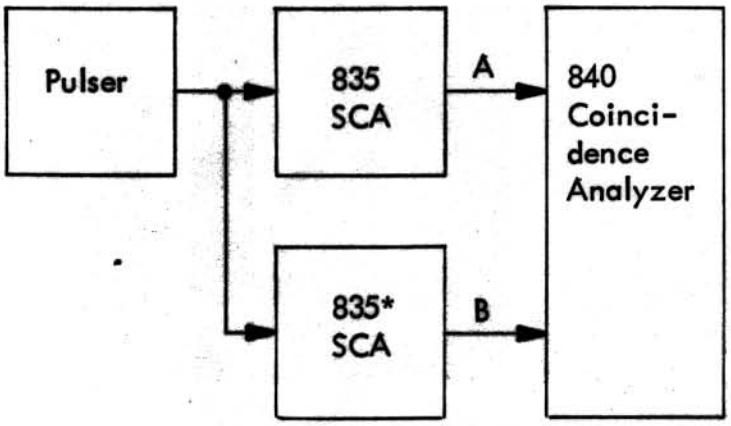
Be sure that the IN switch is set for those inputs which are to be enabled (and that they are off for those not enabled).

3. Keeping the set up as in step 2, reduce the RESOLVING TIME control setting and note that the OUTPUT signal finally disappears.

4. Using two coincidence inputs (A and B, for example) delay one with respect to the other. The following diagrams show how Canberra modules can be used for this test:



OR



*(Use variable delay on one Model 835 SCA)

5. Check that an output is generated when the input signals occur within the RESOLVING TIME set on the RESOLVING TIME control. Vary the delay and RESOLVING TIME controls and check them at different settings. Refer to Figure 3-1 for a typical linearity/accuracy curve of actual resolving time vs. indicated time.

6. Set all IN switches at their off position (down). Note that the OUTPUT signal disappears.

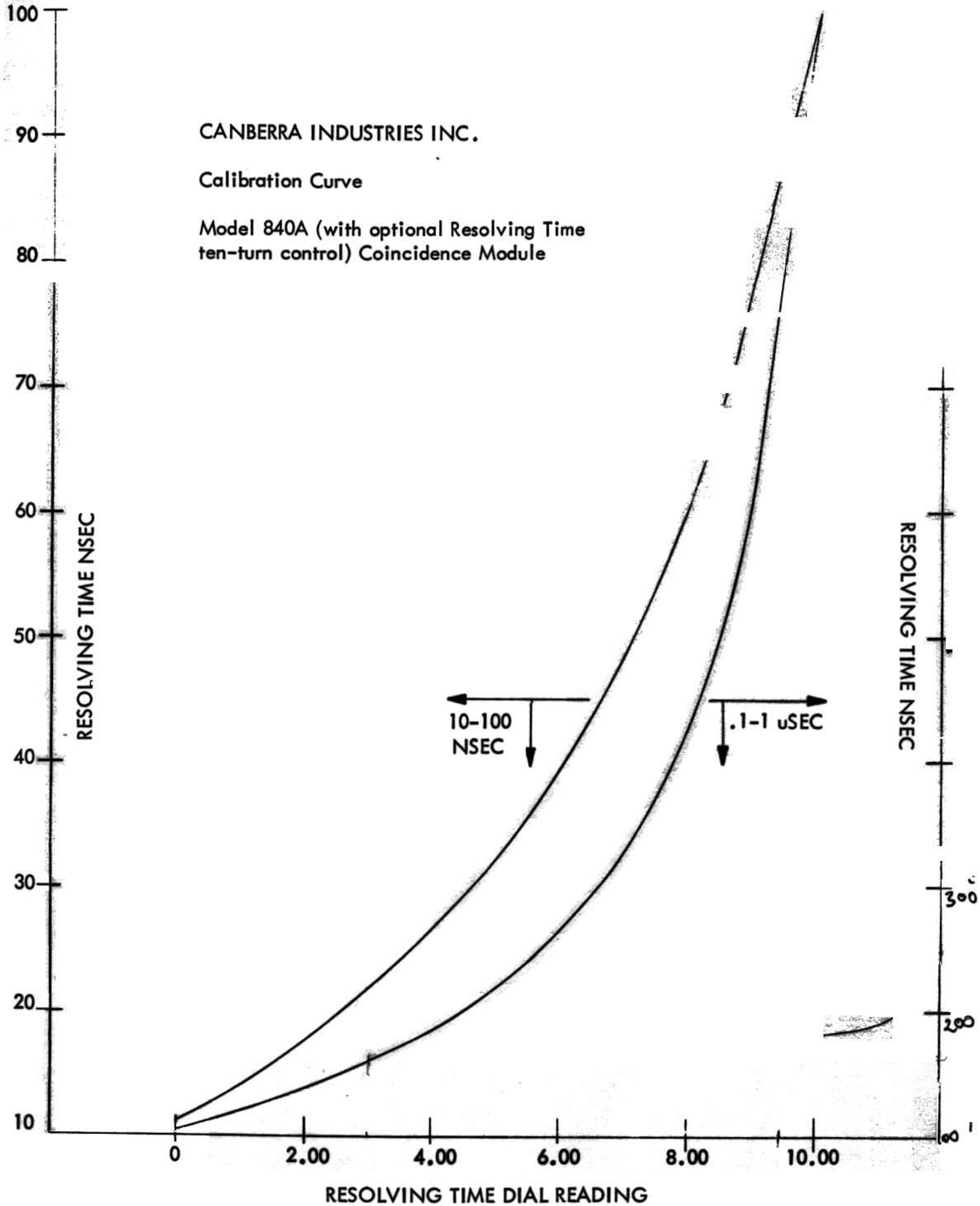


FIGURE 3-1 DIAL RESOLVING TIME VS. ACTUAL RESOLVING TIME

3.4 ANTI-COINCIDENCE

Supply a signal to the ANTI connector and one to the INPUT A connector.

2. Set the RESOLVING TIME control at 10.

3. Set the RANGE switch at 0. - microsecond

4. Set the A IN switch at IN.

5. Set the ANTI IN switch at IN.

6. Set all other switches at their off position (down).

7. Observe the OUTPUT. No output pulse will be generated if any input signals on connectors A, B, or C occur in coincidence with the signal at the ANTI connector.

8. Repeat step 7 utilizing other coincidence inputs. The following truth table will be obtained when operating the Model 840 Coincidence Analyzer:

INPUT SIGNAL		
A B C	ANTI	OUTPUT
0 0 0	1	0
0 0 1	1	0
0 1 0	1	0
0 1 1	1	0
1 0 0	1	0
1 0 1	1	0
1 1 0	1	0
1 1 1	1	0
0 0 0	0	0
0 0 1	0	1
0 1 0	0	1
0 1 1	0	1
1 0 0	0	1
1 0 1	0	1
1 1 0	0	1
1 1 1	0	1

Note: It is assumed that a "0" input refers to the corresponding channel that is switched "OUT".