Model 552
Pulse-Shape Analyzer
and
Timing Single-Channel Analyzer
Operating and Service Manual

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Advanced Measurement Technology, Inc.

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

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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.

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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
552
PSA/T-SCA
UPPER LEVEL
LOWER LEVEL
MODE
NORM
INT
WIN
B-FRACTION
.5
.6
.4
.7
.3
.8
.2
.9
.1
BI
ATTN
DELAY
×1
×10
.0
INPUT
A
B
WALK
ADJ
OUTPUTS


LL
REF
STROBE
INT
EXT
IN
IN
SCA
OUT
LL
OUT
UL
OUT

ORTEC MODEL 552
PULSE-SHAPE ANALYZER AND TIMING SINGLE-CHANNEL ANALYZER

1. DESCRIPTION

1.1. PURPOSE

The ORTEC 552 PSA/T-SCA provides a versatile group of signal derivation functions. It can be used as either a single-channel analyzer or as an integral discriminator; by comparing the time relationships between its two sets of outputs, information can be interpreted for pulse-shape analysis. Each input signal that is accepted by the adjusted amplitude criteria generates two separate outputs, each precisely time-related to the input signal. For reference in the instrument, one output signal is generated through channel A and the other through channel B.

The input logic circuits can be used in any of three modes, selected by a front panel switch. The Integral mode uses the adjusted lower-level discriminator as the only logic reference and generates an output if the input signal amplitude exceeds the lower level. The Normal mode uses both lower-level and upper-level discriminators and generates an output if the input amplitude exceeds the lower-level bias but does not exceed the upper level; the front panel Upper-Level control is adjusted within a range of 0 to 10 V with ground as the zero reference point. The Window mode operates the same as the Normal mode except that the zero reference point for the Upper-Level control is equal to the adjusted lower level and the range of the Upper-Level control is 0 to 1 V. The lower level for any mode can be furnished from the front panel control or by a dc input signal through a rear panel connector.

An output signal through channel A is generated by the constant-fraction method on the trailing edge of the input signal, after the logic for acceptance has been completed. The fraction is selectable at 10%, 20%, or 50% measured down from the peak pulse height, using a jumper on the printed circuit board to select the fraction. The output occurs promptly at the constant-fraction point on the trailing edge and is a NIM-standard fast negative output pulse with excellent timing characteristics.

An output signal through channel B is also generated by the constant-fraction method on the trailing edge of the input signal. The fraction for channel B is selected by a front panel switch that can be set for any level from 10% through 100% (bipolar crossover) in 10% increments of the peak pulse height. The unit must be strobed, either internally or externally, for an output pulse to be provided. When the rear panel switch selects internal strobe, the channel B outputs are generated after an adjusted delay following the constant-fraction trigger point; the delay is adjusted on the front panel within the range of 0.1 to 1.1 µs, permitting normalization for specific applications. When the rear panel switch selects external strobe, the channel B outputs are generated promptly when a NIM-standard positive strobe is furnished through the rear panel connector; the strobe signal must be furnished within 10 µs after the channel B constant-fraction trigger point. There are two channel B outputs; one is a NIM-standard fast negative pulse and the other is a NIM-standard slow positive pulse.

By using an internally-strobed channel B output, the timing differentials between channels A and B can be used to measure the decay characteristics of an input pulse as the constant-fraction points of the two channels are changed. For example, using a 50% fraction for channel A and 10% for channel B, the time difference on the decaying waveform can be measured by subtracting the channel B delay. In many applications, the decay time of the pulse is significant for the type of particle that is detected so the pulse shape can be used to identify the nature of the source.

The 552 accepts either unipolar or bipolar input pulses having either RC or delay-line pulse-shaped waveforms. It includes an input attenuator so that an input amplitude can be reduced by a factor of 1, 10, or 100, selected by a front panel toggle switch. The walk of the attenuator is typically less than 1 ns. This feature can be used to optimize the timing accuracy of both output channels. The walk characteristics can be optimized individually in each channel, using a front panel screwdriver adjustment for each channel. When these controls are adjusted

properly, the walk characteristics for a bipolar delay-line shaped input are less than 2.5 ns over a 200:1 dynamic range of input amplitudes (see Fig. 1.1).

The instrument is designed to meet the interchangeability standards recommended by USDOE Report DOE/ER-0457T. An ORTEC 4001/4002 Series Bin and Power Supply provides all the necessary power through the rear panel module connector. All signal levels and impedances are compatible with other ORTEC NIM modules.

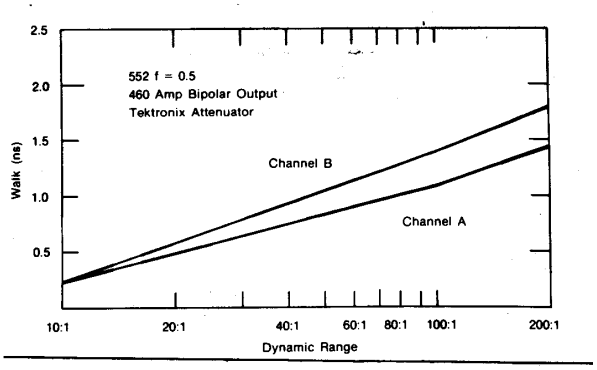

Fig. 1.1. Typical Walk vs Dynamic Range.

1.2. LOWER-LEVEL REFERENCE

A rear panel toggle switch selects either the front panel Lower-Level control or the voltage signal furnished through the rear panel LL Ref connector as the reference for the lower-level discriminator. This permits flexibility in operation, where an external reference source can furnish the lower-level threshold from a stepped- or sliding-voltage source to automatically sweep the SCA response through a spectral range. The selected source for the lower-level reference is effective for all three operating modes.

1.3. OUTPUT STROBE

A rear panel toggle switch selects either an internal strobe, based on a delayed trigger derived from the input signal, or a strobe pulse that is furnished through the rear panel Strobe In connector to determine when the channel B outputs are to be generated. This has no effect on the channel A output, which is generated promptly at the constant-fraction trigger. When external strobe is used, the input signal must be received within 10 µs after the trigger time or the channel B outputs will not be generated. When the internal strobe is used, the Delay control on the front panel can be adjusted to set the delay time from the trigger point to the channel B output in the range of 0.1 through 1.1 µs.

1.4. CONSTANT-FRACTION TECHNIQUE

Both output channels derive information that uses the constant-fraction technique, which is an ORTEC development. It consists of comparing the amplitude along the decay of a pulse to a selected fraction of the peak amplitude of the same pulse. Thus, through a wide range of input pulse peak amplitudes, the timing information is obtained with precision.

The reference fractions that are available in both output channels indicate the percentage of amplitude decay from the peak toward the ground reference level. Thus a setting of 10% in either channel selects a trigger point at 90% of the peak amplitude for that channel, or a setting of 20% selects a trigger point at 80% of the peak amplitude.

2. SPECIFICATIONS

2.1. PERFORMANCE

INPUT DYNAMIC RANGE 200:1.

PULSE-PAIR RESOLVING TIME Output pulse width plus Delay (selected by front panel Delay control or by external strobe input) plus 200 ns for NIM-standard fast negative output or plus 740 ns for NIM-standard slow positive output. Minimum resolving time for negative output, 260 ns; for positive output, 800 ns.

THRESHOLD TEMPERATURE INSTABILITY ≤0.005%/°C of full scale, 0 to 50°C.

DISCRIMINATOR NONLINEARITY ≤±0.25% of full scale (integral) for each discriminator.

DELAY TEMPERATURE INSTABILITY ≤±0.01%/°C of full scale, 0 to 50°C, measured at full scale.

DELAY NONLINEARITY ≤±2% of delay range.

WINDOW WIDTH INCONSISTENCY ≤±0.1% variation of full-scale window width over the 0-to l0-V linear range.

MINIMUM INPUT THRESHOLD 40 mV.

TIME SHIFT vs PULSE HEIGHT (Walk) (Specified for Channels A and B at 50% fraction.)

	Walk (ps)	
Input Dynamic Range	**System I***	**System II****
10:1	± 500	±2000
50:1	±1500	±2500
100:1	±2000	±3000
200:1	±2500	±8000

*Using the bipolar output of an ORTEC 460 Amplifier, single delay-line mode, integrate ≤0.1 µs with delay line 1 µs.
**Using an ORTEC 472A Amplifier, unipolar output, 0.5 µs shaping.

2.2. CONTROLS

UPPER LEVEL Front panel 10-turn potentiometer determines the window width (0 to +1V) in the Window mode or the Upper Level (0 to +10 V) in the Normal and Integral modes (not used to determine SCA outputs during Integral mode operation).

LOWER LEVEL Front panel 10-turn potentiometer adjustable from 40 mV to 10 V; when the rear panel LL Ref switch is set for Int, determines the threshold setting for the Lower-Level discriminator; when the LL Ref switch is set at Ext, this control is ineffective.

MODE Front panel 3-position locking toggle switch selects one of three operating modes:
INT (Integral) LL sets a single discriminator threshold (40 mV to 10V) and UL is not used to determine an SCA response.
NORM (Normal) UL and LL are independently adjustable levels; UL range 0 to +10 V; LL range 40 mV to 10V.
WIN (Window) LL sets the baseline level (40 mV to 10V) and UL sets the window width (LL to LL+l V).
ATTN Front panel 3-position locking toggle switch selects an attenuation factor for the input signals:

X1 Input signals not attenuated.
X10 Input signals are attenuated by a factor of 1/10.
X100 Input signals are attenuated by a factor of 1/100.

DELAY Front panel 10-turn potentiometer for continuously adjustable delay for channel B output, using internal strobe; range 0.1 to 1.1 µs.

WALK ADJ (A and B) Independent front panel screwdriver adjustments on front panel for precise setting of walk compensation in each output channel. The Walk Adj B control is ineffective when the B Fraction switch is set at its BI position.

LL REF MODE Rear panel 2-position locking toggle switch selects either the front panel LL control or the voltage signal applied to the rear panel LL Ref Ext connector for the lower-level discriminator reference threshold.

STROBE MODE Rear panel 2-position locking toggle switch selects either an internal strobe, derived from the input signal, or an external strobe, furnished through the adjacent connector, to generate a channel B output. The automatic reset time is ≈10 µs.

B-FRACTION Front panel switch selects the constant fraction that will be used for the channel B response point; marked .1 through .9 and BI for 10% through 90% and bipolar crossover (100%), referring to the decay after the peak of the input waveform.

A-FRACTION An internal jumper selects the constant fraction that will be used for the channel A response point; jumper positions are 10%, 20%, and 50%, referring to the decay from the peak of the input waveform.

2.3. INPUTS

INPUT Front panel dc-coupled BNC connector accepts positive unipolar or bipolar signals, 0 to +10 V linear range, ±12 V maximum; width, ≥100 ns; 1000Ω input impedance.

LL REF IN Rear panel BNC accepts lower-level bias when the LL Ref mode switch selects Ext. An input of 0 to -10 V on this connector corresponds to a range of 0 to +10 V for the front panel Lower-Level control. Input protected to ±24 V.

EXT STROBE IN Rear panel BNC accepts a NIM-standard slow positive pulse, nominally +5 V, 500 ns wide, to cause an output to occur from the channel B circuits when the Strobe switch is set at Ext. The external strobe must be provided within 10 µs after the linear input. At the end of this period, the 552 resets its internal logic without producing a channel B output.

2.4. OUTPUTS

SCA NEG OUT A Front panel BNC connector provides NIM-standard fast negative output pulses from channel A only; nominally -16 mA (-800 mV on 50Ω load), ≤20 ns wide, ≤5 ns rise time. Output occurs promptly at the channel A constant fraction trigger point.

SCA NEG OUT B Front panel BNC connector provides NIM-standard fast negative output pulses from channel B only; nominally -16 mA (-800 mV on 50Ω load), ≤20 ns wide, ≤5 ns rise time. Output occurs promptly at strobe time.

SCA POS OUT B Front and rear panel BNC connectors provide NIM-standard slow positive output pulses from channel B only; nominally +5 V, 500 ns wide. Output occurs promptly at strobe time. $Z_o \leq 10\Omega$.

LL OUT Rear panel BNC connector provides positive NIM-standard output, nominally +5 V, 500 ns wide. Output occurs as leading edge of the linear input crosses the LL threshold, $Z_o \leq 10\Omega$.

UL OUT Rear panel BNC connector provides positive NIM-standard output, nominally +5 V, 500 ns wide. Output occurs as leading edge of the linear input crosses the UL threshold. $Z_o \leq 10\Omega$.

2.5. RELATED EQUIPMENT

The 552 is compatible with all ORTEC amplifiers and other amplifiers having a 0- to +10-V linear output range.

2.6. ELECTRICAL AND MECHANICAL

POWER REQUIRED +24 V, 90 mA; -24 V, 90 mA; +12 V, 190 mA; -12 V, 190 mA.

DIMENSIONS NIM-standard single-width module (1.35 by 8.714 inches) per DOE/ER-0457T.

3. INSTALLATION

3.1. GENERAL

The 552 must be used in conjunction with an ORTEC 4001/4002 Series Bin and Power Supply, or equivalent, which is intended for rack mounting. If any source of heat is operating in the same rack, there must be sufficient cooling air circulating to prevent any localized heating of the transistorized and integrated circuits used throughout the 552. The temperature of equipment mounted in racks can easily exceed the maximum unless precautions are taken; the 552 should not be subjected to temperatures in excess of 120° F (50°C).

3.2. CONNECTION TO POWER

Turn off the Bin Power Supply when inserting or removing modules. The ORTEC NIM modules are designed so that it is not possible to overload a properly operating 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 have been inserted. The 4001/4002 has test points on the power supply control panel to monitor the dc voltage levels.

When using the 552 outside the 4001/4002 Bin and Power Supply, be sure that the power extension cord or cable that is used properly accounts for the power supply grounding circuits that are provided according to the recommended DOE standards outlined in DOE/ER-0457T. Both high-quality and power-return ground connections are provided to ensure proper reference voltage feedback into the power supply, and these must be preserved in remote cable installations. Be careful also to avoid ground loops when the module is operated outside the bin.

3.3. CONNECTION FROM LINEAR AMPLIFIER

The Input BNC connector on the front panel accepts positive unipolar or bipolar signals through a dc-coupled input path. For bipolar input pulses, the positive lobe will be analyzed. The amplifier output should be adjusted so that there is no dc offset, and the pole-zero networks are adjusted properly.

The input impedance of the 552 is 1000Ω. When long cables are used to connect the amplifier output to the 552 Input, cable termination may be necessary in order to prevent reflections; match the cable impedance with a terminator at the 552 Input in such cases.

Normally, the ATTN switch on the 552 front panel will be left at its X1 setting for operation in a system. The main purpose for the X10 and X100 attenuator settings are to aid in precise walk adjustments.

3.4. OUTPUT CONNECTIONS

Outputs are furnished through both channel A and channel B connectors. Each channel is considered separately because of the differences in timing characteristics of the two channels. The channel A output on the front panel is dependent only on satisfaction of the input logic of the single-channel analyzer and it occurs at the selected trigger level on the trailing edge of the linear input. The channel B outputs are dependent on satisfaction of input logic and of a strobe, which can be either internally generated or furnished from an external source.

The channel A output is available as a NIM-standard fast negative pulse from a front panel BNC connector. It is intended for transmission to the driven unit through 50Ω cable with 50Ω termination. When the 552 is set for either the Normal or Window mode, a channel A output means that an input pulse amplitude is sufficient to trigger the lower-level discriminator without also triggering the upper-level discriminator. When the 552 is set for the Integral mode of operation, the channel A output means that the input pulse amplitude is sufficient to trigger the lower-level discriminator; triggering of the upper-level discriminator does not affect the output for this mode.

The time when a channel A output is made available is promptly at a trigger point on the decay of the input waveform. The decay level is selected by an internal jumper on the printed circuit board, which can be set for 10%, 20%, or 50%, referring to the decay from the peak amplitude of the pulse.

Three channel B outputs are available. A NIM-standard fast negative pulse is furnished through a front panel connector and a NIM-standard slow positive pulse is furnished through both front and rear panel connectors. The negative output is intended for transmission to the driven unit through 50Ω cable with 50Ω termination. The positive outputs can be furnished through 50Ω or 93Ω cable to the driven unit. A channel B output means that the logic for the channel A output has been satisfied and that an output strobe is furnished. The output strobe can be generated internally or furnished from an external source, depending on the setting of the rear panel switch.

The time when the channel B outputs are generated, using the internal strobe, is at a fixed delay after the trigger point on the decay of the input waveform. The decay level is selected by a front panel switch that can be set at any multiple of 10% from 10% through 100% (baseline crossover of a bipolar input), referring to the decay from the peak amplitude of the pulse. The range of the front panel Delay control is about 0.1 through 1.1 µs. The channel B output time, using an external strobe, is promptly at the strobe pulse; this strobe pulse must be furnished within 10 µs after the trigger point or the internal logic is reset without generating a channel B output.

Separate logic outputs are available through the rear panel to indicate when, on the leading edge of an input pulse, each of the two discriminators is triggered. These responses can be used to monitor the discriminator levels during adjustment, to be counted in external scalers, to provide subgroup routing to a multichannel analyzer, or for any other applications desired. Each logic output for LL Out and UL Out is a NIM-standard slow positive pulse that is compatible with ORTEC counters, ratemeters, and other instruments. The output impedance through each output path is sufficiently low to drive as many as ten paralleled l000Ω inputs.

3.5. LOWER-LEVEL REFERENCE INPUT

If the LL Ref toggle switch on the rear panel of the 552 is set at Ext, the reference level for the lower-level discriminator must be furnished through the adjacent In BNC connector; the 10-turn Lower-Level control on the front panel is disconnected. An input of 0 to -10 V through this connector corresponds directly to a range of 0 to +10 V for the lower-level discriminator threshold.

The signal through the LL Ref In connector is not used unless the toggle switch is set at Ext.

4. OPERATING INSTRUCTIONS

After the 552 has been connected into a system according to the installation information in Section 3, the operating and strobe modes can be selected and the discriminator thresholds can be adjusted as required for each application.

Figure 4.1 illustrates the timing relationships that will be effective in the 552, operating with an internal strobe, for each of three possible input pulse amplitudes. The first two pulses exceed the lower-level threshold without also exceeding the upper level, and the third pulse exceeds both threshold levels. Superimposed on each of these input pulses in Fig. 4.1 are two internally stretched constant-fraction reference levels; the upper stretched level is at the 50% point on the input pulse decay, which can be set in channel A; the lower stretched level is at the 70% point on the input pulse decay, which can be set in channel B. When the input pulse decays through the 50% level, the channel A CF discriminator is fired and triggers a prompt channel A output. When the input pulse decays through the 70% level, the channel B CF discriminator is fired and triggers an internal delay, which then generates both negative and positive channel B outputs at the end of the delay. The delay is front panel adjusted in the range of 0.1 through 1.1 µs. If the 552 is set for Normal or Window mode, time-significant pulses would be generated for each of the first two input pulses but none would be generated for the third pulse because it is too large to satisfy the single-channel criteria. If the 552 is set for Integral mode, the responses would be generated for the third input pulse, as shown by the broken line output pulses. For any mode of operation, the LL Out and UL Out pulses are generated when the input pulse amplitude exceeds the related discriminator level.

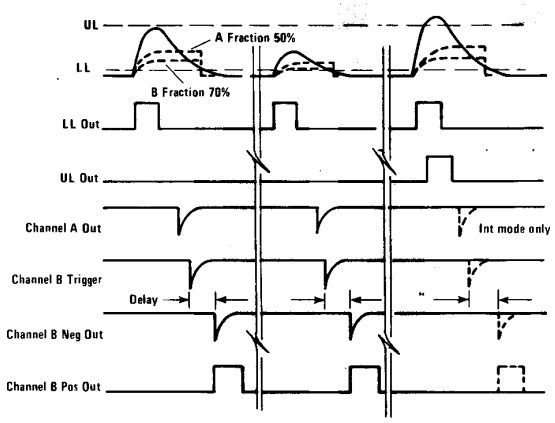

Fig. 4.1. Timing Relationships for Input and Output Pulses for Operation with Internal Strobe.

The adjusted lower-level threshold is furnished from either the front panel Lower-Level control or an external source that is furnished through the rear panel LL Ref connector; selection of the source is made with the rear panel LL Ref toggle switch. In either case, the range (for an unattenuated input signal) is from 0 to +10V, measured from chassis ground.

The adjusted upper-level threshold is determined by the setting of the front panel Upper-Level control and by the mode selector toggle switch. When the switch is set at either Int or Norm, the range of the variable control is from 0 to +10 V, measured from chassis ground. When the switch is set at Win, the range of the variable control is 0 to +1 V, measured above the adjusted, lower-level threshold.

When the rear panel Strobe switch selects Ext, operation of the 552 is the same as it is for Int except for the time at which a channel B output is made available. For this mode of operation, an external strobe pulse must be furnished after the channel B CF trigger time and before an automatic reset, and the channel B outputs are furnished promptly at the strobe time. The time window, during which the strobe can be effective, is from the trigger time to 10µs after the trigger. If no strobe is furnished within the time window, the internal logic is reset without generating an output through channel B.

For optimum time-significant outputs, each front panel Walk Adj control must be trimmed for the combined effects of the input shaping and its time constants, and of the expected dynamic range of operation. Using a duplicate of the minimum and maximum amplitudes for shaped input pulses, set each control to provide the minimum walk for its respective channel; walk is the variation of time of occurrence vs input pulse amplitude.

Using internal strobe, the decay shape of an input pulse can be reconstructed. Use the following steps.

1. Select the same fraction for both channels of outputs, and adjust the Delay control as desired.

2. Connect the channel A output to the Start input of a time-to-pulse-height converter (TPHC).

3. Connect the channel B Neg output to the Stop input of the TPHC.

4. Furnish the shaped input pulses to the 552 and measure the time difference between the channel A and channel B outputs. This is an accurate measurement of the Delay time adjustment.

5. Switch the B-Fraction selector to each of its active settings, 10% through 90%, and measure the time differences at each level; use the adjusted Delay time to correct each measurement.

Note: Do not use the BI setting of the B-Fraction selector unless the input pulse is bipolar, since a zero crossover is necessary to obtain a channel B output when this selection has been made.

6. Plot the decay curve for the input pulses, using the set of data obtained in step 5.

5. MAINTENANCE AND CALIBRATION

5.1. GENERAL

The basic performance of the 552 Pulse-Shape Analyzer and Timing SCA can be inferred from its operating responses.

5.2. STRETCHER CALIBRATION

There is a provision for calibration of the stretcher circuit. Potentiometers R18 and R29, mounted on the printed circuit, provide this calibration. Use the following procedure:

1. Remove jumper at location J1 from A to B and insert in B to C.

2. Set potentiometer R18 fully counterclockwise, as viewed from the top.

3. With no input signals into the 552, adjust R27 to obtain 0 V ± 1 mV at TP1.

4. Remove jumper at location Jl from B to C and insert in A to B.

5. With no input signals into the 552, adjust R18 to obtain 0 V ± 1 mV at TP1.

Leave jumper in position A to B for normal operation.

5.3. WALK CALIBRATION

A Walk Adj control is furnished separately for each of the two output channels. R86 serves channel A and R100 serves channel B. Use the following procedure after the stretcher has been calibrated as described in Section 6.2.

1. With the 552 turned on and with no input signal, adjust R86 to a point where the dc levels at pins 3 and 4 of IC7 have a difference of 0 V. Adjust R100 so the dc levels at pins 3 and 4 of IC9 have a difference of 0 V.

2. Set the front panel ATTN switch at X1, the Mode switch at Int, and use Internal Strobe. Adjust the Lower-Level control to its minimum setting.

3. Furnish a 10-V shaped pulse into the 552 Input connector. Use whatever shaping will be used for subsequent operation.

4. Examine the response time for each channel.

5. Switch the ATTN to X10, and check the response time for walk. If any is noted, adjust R86 carefully for channel A or R100 for channel B.

6. Switch the ATTN to X100 and check for walk. If necessary, adjust R86 for channel A and R100 for channel B.

7. Use all three settings of the ATTN switch and compare the timing responses. The final adjustment of R86 and R100 should provide minimum walk. The input attenuator is a high-quality circuit for this application and contributes nominally less than 1 ns to the walk.

8. Return the ATTN switch to X1 for normal operation.

5.4. LOWER-LEVEL CALIBRATION

The minimum level to which the Lower-Level front panel control can be set is 40 mV. This can be calibrated by adjusting R54 on the printed circuit board as follows:

1. Set the Lower-Level control at 004/1000 dial divisions.

2. Set the ATTN switch at X1.

3. Furnish a 40 mV input pulse into the 552.

4. Adjust R54 as required to half-trigger under these conditions.

5.5. FACTORY REPAIR

This instrument can be returned to the ORTEC factory for service and repair at a nominal cost. Our standard procedure for repair ensures the same quality control and checkout that are used for a new instrument. Always contact Customer Services at ORTEC, (865) 482-4411, before sending in an instrument for repair to obtain shipping instructions and so that the required Return Authorization Number can be assigned to the unit. Write this number on the address label and on the package to ensure prompt attention when the shipment reaches the ORTEC factory.

Bin/Module Connector Pin Assignments For Standard Nuclear Instrument Modules per DOE/ER-0457T.

Pin	Function	Pin	Function
1	+3 V	23	Reserved
2	- 3 V	24	Reserved
3	Spare bus	25	Reserved
4	Reserved bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	*28	+24 V
7	Coaxial	*29	- 24 V
8	200 V dc	30	Spare bus
9	Spare	31	Spare
*10	+6 V	32	Spare
*11	- 6 V	*33	117 V 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 V	38	Coaxial
*17	- 12 V	39	Coaxial
18	Spare bus	40	Coaxial
19	Reserved bus	*41	117 V ac (neutral)
20	Spare	*42	High-quality ground
21	Spare	G	Ground guide pin
22	Reserved		

Pins marked (*) are installed and wired in ORTEC's 4001A and 4001C Modular System Bins.