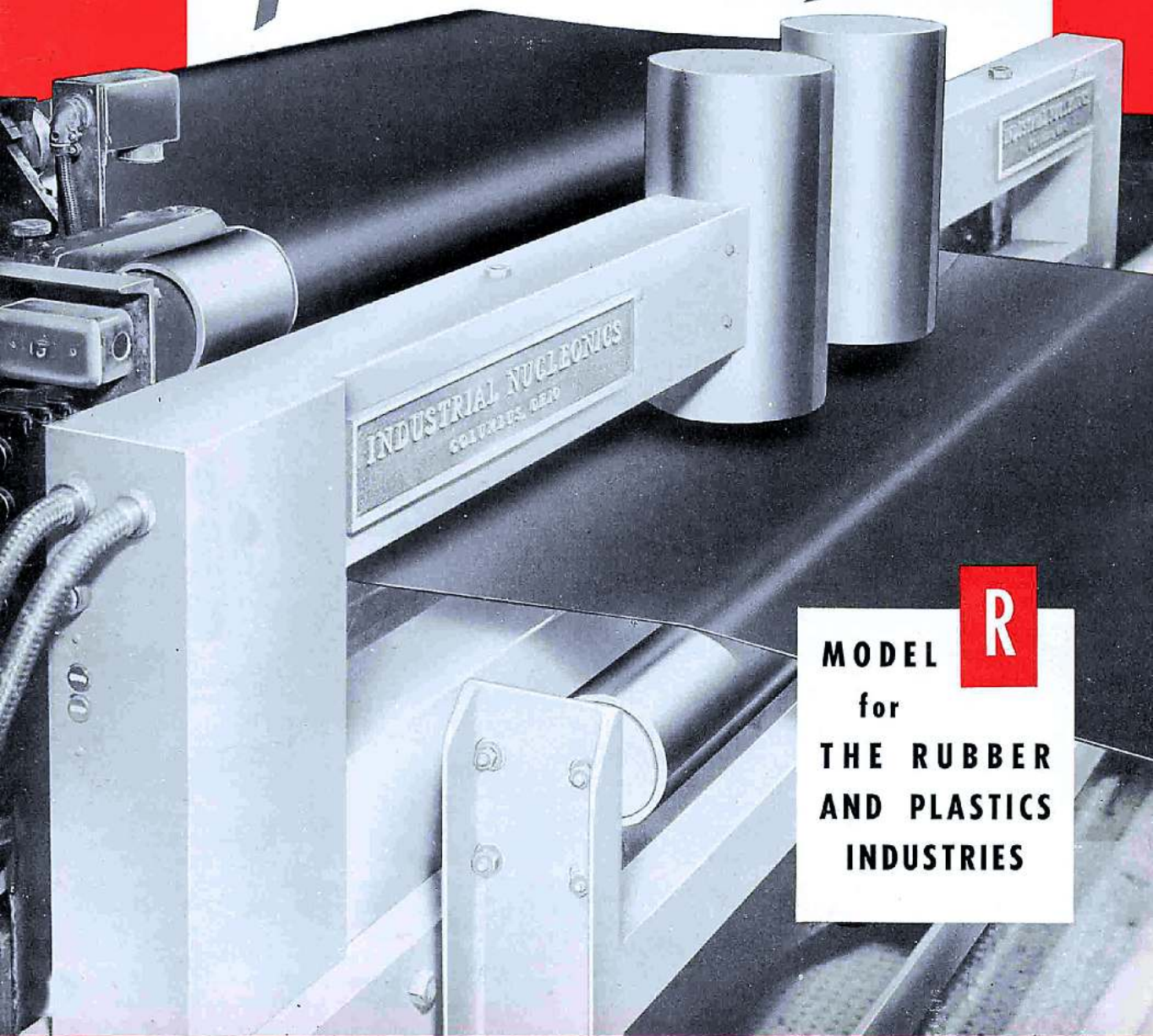


AccuRay

BETA GAUGE



MODEL

R

for

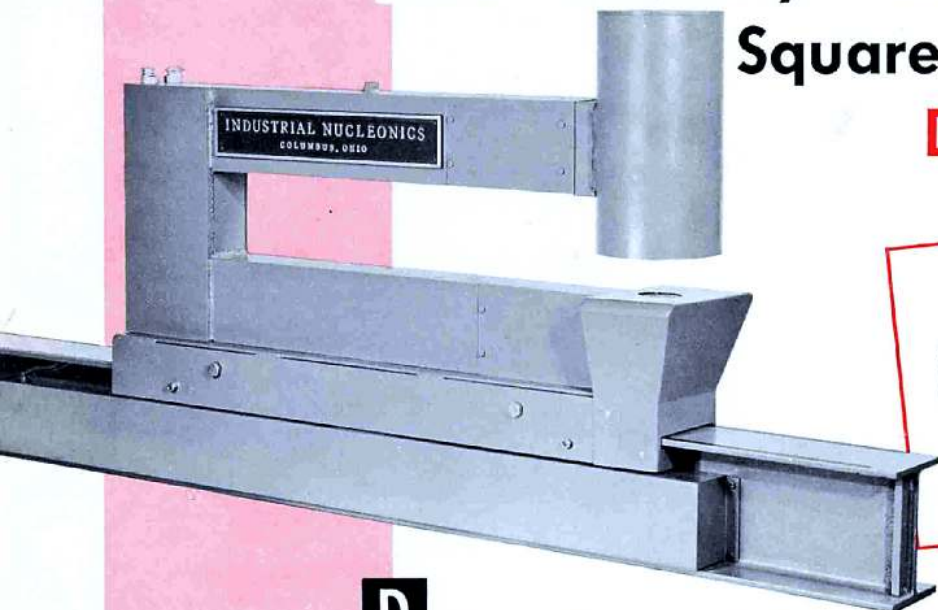
**THE RUBBER
AND PLASTICS
INDUSTRIES**

NUCLEAR CONTROLS AND MEASUREMENTS FOR INDUSTRY

by

INDUSTRIAL NUCLEONICS CORPORATION • COLUMBUS, OHIO

New Beta Ray Gauge Measures Square Yard Weight Directly



With Better Than
ONE PERCENT
ACCURACY

Designed to withstand rough industrial usage, the AccuRay mounting is fabricated of heavy, welded steel beams and plates. The hermetically sealed source capsule, containing radioactive Strontium-90, is located in a metal housing on the lower right end of the mounting, directly below the cylindrical detector unit. As used in the AccuRay, beta radiation is harmless to plant personnel. The Model R is available with throat depths permitting measurements up to 24, 36, 48, and 60 inches from the edge of the sheet.

NON-CONTACTING GAUGE SAVES MATERIAL, IMPROVES QUALITY AND PROVIDES BETTER UTILIZATION OF MACHINES AND LABOR

Because it provides amazingly accurate readings *directly* in square yard weight—heretofore impossible without the availability of radioisotopes—the Industrial Nucleonics AccuRay Gauge has revolutionized quality control measurements in the rubber and plastics industries. With the Model R, the Beta Gauge designed specifically for the rubber and plastics industries, it is possible for the first time to measure accurately rubberized and coated fabrics and other sheet materials as they flow from calenders on production lines. In addition to presenting its recordings directly in square yard weight, the AccuRay with its automatic standardization entirely eliminates human error in production measurements.

This automatic standardization feature of the Model R makes obsolete the need for recalibration or periodic adjustment, comparisons with standards, and tricky settings associated with old style equipment in obtaining readings. The 100% reliability of the AccuRay has enabled companies to achieve an entirely new measurement standard based on actual fabric weights rather than on an average of rolled-up weights.

Using readings obtained from the AccuRay to control calender operations, rubber company production officials have been able to improve their quality control to the extent of eliminating the necessity of heavy runs "to be on the safe side" of tolerance, thereby saving thousands of dollars in material annually. Improvement in quality control also has resulted in fewer material rejects and in assurance of constant quality.

Not to be overlooked in examining the benefits of the AccuRay are the savings resulting from better utilization of machines and labor. The instantaneous, accurate picture of the sheet provided by the gauge reduces the time necessary to make calender adjustments. In addition to the elimination of stock rejects caused by manual sampling, the man hours spent in cutting, measuring, and weighing samples can be diverted to more productive channels. Also, the time and labor needed to weigh rolls on "load scales" is no longer required. As demonstrated by users of the gauge, the dollar savings directly attributable to the AccuRay in better machine and labor utilization alone are enough to amortize the gauge in a very short period of time.

ONLY



AccuRay Gauges Give You All Of These

FEATURES

1. Direct, continuous readings. 2. Measurement accuracy of 1%. 3. Completely automatic standardization. 4. Original calibration handles all weight ranges. 5. Gauge does not contact material. 6. Automatic traversing across sheet. 7. Rugged industrial design. 8. Simple, non-technical operation. 9. Instantaneous response. 10. Adaptable accessories for your own needs.

• THE ACCURAY WILL SHUT ITSELF OFF IF DAMAGED—PREVENTING INCORRECT READINGS! •

What These AccuRay Features Mean To YOUR Operation...

1. Gauge measures continually, giving you readings directly in square yard weight and providing 100% sampling of the sheet. Gauge accuracy unaffected by the rate of sheet flow.

2. Measurement accuracy of 1% makes AccuRay finest instrument of its kind on the market. Sheet variations in composition, moisture, color do not affect accuracy of reading.

3. Only the AccuRay standardizes automatically and completely, compensating for any temperature changes, dirt accumulation, source decay, and other influencing factors.

4. After gauge is once calibrated at our factory, recalibration or checking against standard samples is never required. This eliminates "cranking" in a new setting and removes any chance for human error.

5. Since gauge does not contact sheet at any time, all types of sticky, sensitive, or delicate materials can be measured with complete safety.

6. Gauge is equipped with automatic traversing unit, permitting measurement across the sheet at preset positions and providing a regular check on the transverse profile of the sheet.

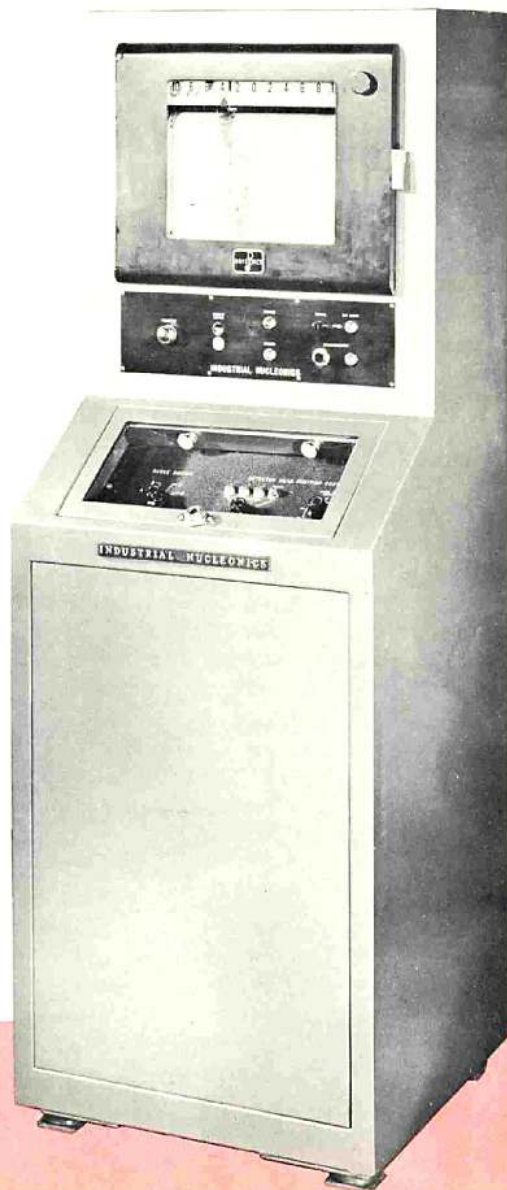
7. Made to withstand the shocks and vibrations of production operations, the AccuRay Gauge is an industrial instrument sturdily constructed of heavy, welded steel beams and plates. It is insensitive to changes in ambient temperature, variations in line voltage, welding arcs.

8. The gauge is simple to operate and foolproof. Only one simple control is required for changing specifications—it takes but a flick of a switch to change from one weight scale to another. In case of damage, gauge shuts itself off and lights warning signal.

9. Instantaneous response provided by gauge permits calender operator to make immediate adjustments to specification, eliminating long runs of out of tolerance material, cutting down rejects.

10. Gauge has wide range of throat depths to fit your sheet requirements. Remote stations with calibrated dial and gauge positioning controls are available. A selection of one to five weight ranges is provided—weight ranges up to twelve pounds per square yard can be furnished.

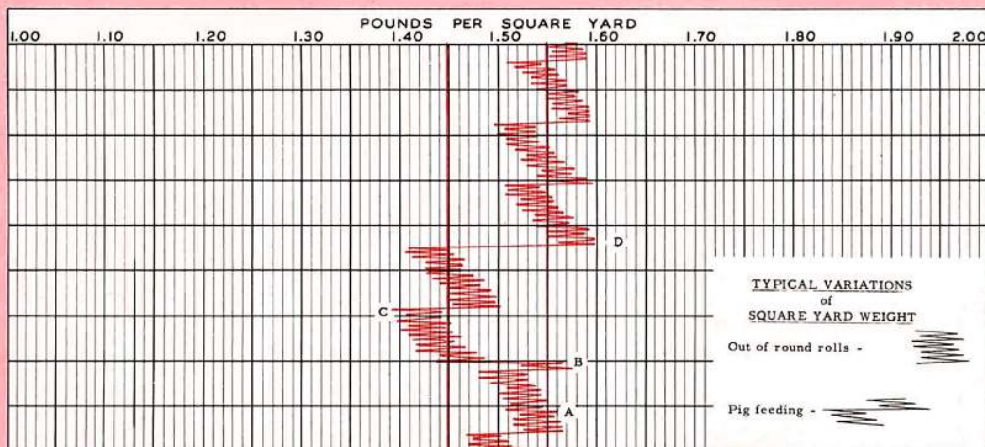
The strongly constructed console of the Model R is fabricated of 14 gauge steel and furnished in smooth, grey baked enamel. It houses and protects a recorder, automatic standardizing equipment, indicator and operating panels, plus other circuitry. The recorder is a Bristol Dynamaster strip chart electronic recorder with full scale pen speed of 3 seconds and standard chart speeds. Other models of Bristol recorders and various chart speeds are available if required. The Gauge is calibrated in accordance with the weight ranges specified by the customer and these ranges are indicated on the recorder scale.



How **IN** AccuRay Performance P

Both charts on this page are condensed versions of actual production line readings taken in rubber plants under ordinary operating conditions.

CALENDER OPERATION WITHOUT BENEFIT OF AccuRay

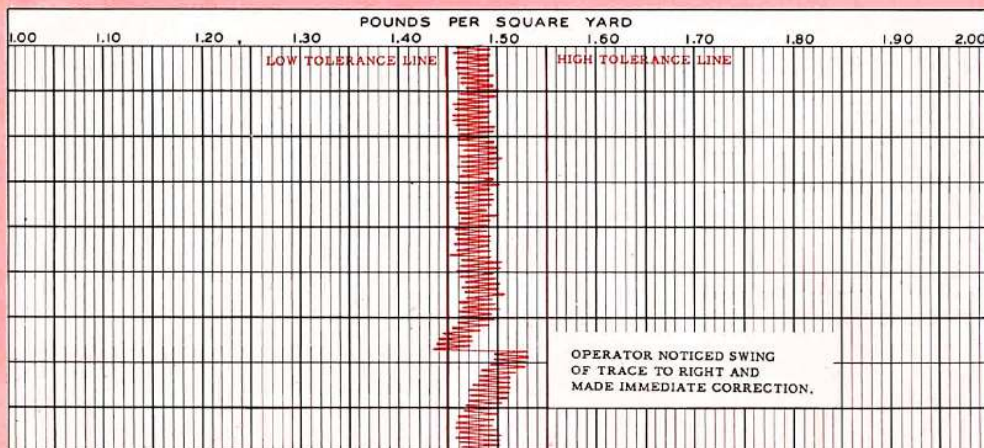


The above view shows a typical trace obtained in calendering tire fabric. Specified sheet weight is $1\frac{1}{2}$ pounds per square yard. Reading chart from bottom upwards, notice that the trace first swings to the heavy side (right), indicating that a pig of rubber has been fed into the calender. The placing of the rubber pig in the calender forces the rolls upward, resulting in a heavier application of rubber on the fabric. This swing to the heavy side is repeated on the average of once every minute as a new pig is added. The cyclical variations present are caused by the "out of roundness" of the calender rolls.

At Point A, on the heavier side of specified weight, the operator cut a sample and mistakenly assumed that his run was on the heavy side. The trace at Point B jogs sharply to the low side (left) as the operator compensated for what he thought was a heavy application. After running on the light side for a period of time, the operator cut another sample, at Point C, and found that he was on the low side of tolerance. In readjusting the rolls, he "overcontrolled" the heavy side, causing the trace to jog right at Point D.

By using AccuRay as a guide for adjusting calender controls under the same conditions as shown above, the same operator was able to calender within the tolerance lines shown on the chart below. The ability of the gauge to provide a 100% sampling of the sheet and present immediate and continuous information to the operator, makes it possible for him to see the effects of various calender adjustments and make necessary corrections at once. This is why the operator can produce smooth results even when pig rubber is fed to the calender. With such accurate control now possible, companies using the AccuRay actually have been able to make their former lower tolerance zone their present operating norm and secure large material savings.

With its traversing mechanism, the AccuRay also makes possible a regular check on the transverse profile of the sheet, providing valuable engineering information. Low and high spots in the rolls are pinpointed and the need for re-grinding established.



CALENDER OPERATION USING AccuRay

ys Off For You...

Serving Industry NOW!

Like every other revolutionary advancement in industrial equipment, the AccuRay Gauge has had to prove itself under the rigors of hard industrial usage. In addition, because it is the first purely industrial application of atomic research to the nation's production lines, the AccuRay has had to prove conclusively that the gap between laboratory experiments and practical industrial utilization could be bridged successfully. Proof of the AccuRay's effectiveness in industry is shown by the following comments of individuals who have had firsthand opportunity to evaluate the gauge as a production tool.

F. C. Rankin, Factory Superintendent, McCreary Tire & Rubber Company, Indiana, Pennsylvania: "Our calender operator likes to use our new AccuRay Gauge because of its well designed panel and convenient controls that enable him to determine at a glance how much the material varies from the specification. We are saving rubber and improving quality every day since we installed our gauge."

Engineering Staff, Mohawk Rubber Company, Akron, Ohio: "By utilizing the information provided by our AccuRay Gauge for quality control purposes, we believe it will be possible for us to make large savings in materials and increase the uniformity of our product."

Glenn H. Orr, Plant Manager, General Tire & Rubber Company, Akron, Ohio: "By installing an Industrial Nucleonics AccuRay Gauge we have solved the problem of securing an accurate and continuous recording instrument for measuring calendered rubber fabric being processed. We are extremely satisfied with the job the gauge is doing for us."

Frank S. Bosley, Vice-President, Gates Rubber Company, Denver, Colorado: "We are greatly impressed with the performance of our AccuRay Gauges and the excellent installation services rendered by Industrial Nucleonics. The twin gauges enable us to control both sides of our sheet at the same time, resulting in improved quality and material savings."

Here are actual figures showing typical savings that you can expect your company to realize with the installation of Accu-Ray Gauges on your calendering operations.

CASE STUDY A

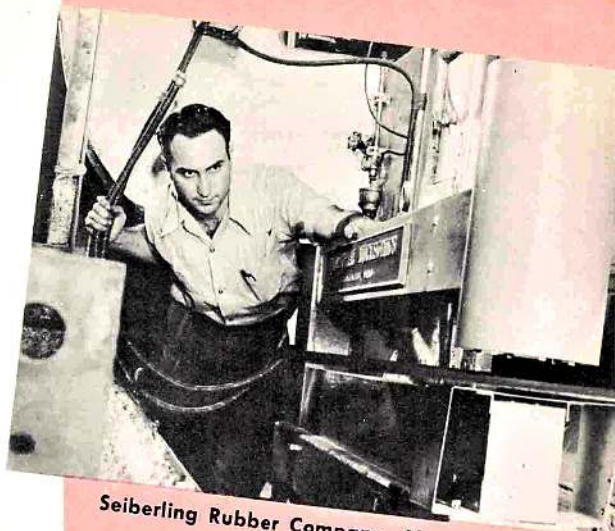
A company previously using other types of instruments for production of material weighing 1.6 pounds per square yard and being calendered at the rate of 45 yards per minute, obtained an average material saving of .025 pounds per square yard after the installation of our Model R Gauge. The cost of raw materials averaged 40 cents per pound. The average material savings in one six-hour shift was in excess of \$160.

CASE STUDY B

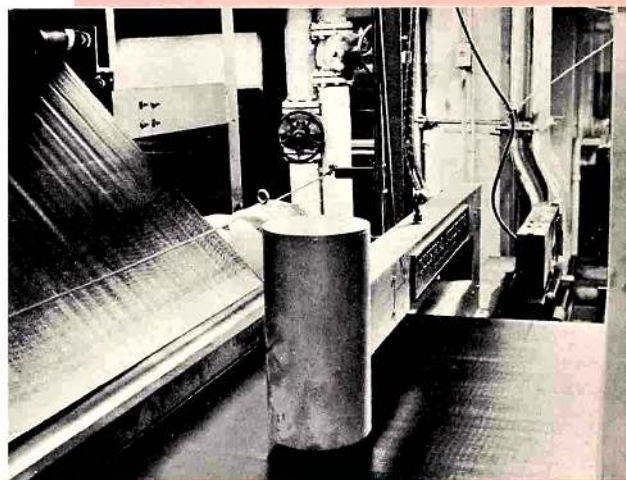
Another case study showed that a company, making six specification changes per day, installed an AccuRay and reduced the time needed to attain the required weight from 9 minutes to one minute. By decreasing this production of reject material that was valued at 20 cents per pound, the AccuRay Gauge secured daily material savings in excess of \$690.

Companies such as those described above have paid Industrial Nucleonics Corporation the best possible compliment after receiving their gauges — they have placed REORDERS.

Typical Installations



Seiberling Rubber Company, Akron, Ohio



Goodyear Tire & Rubber Company, Akron, Ohio

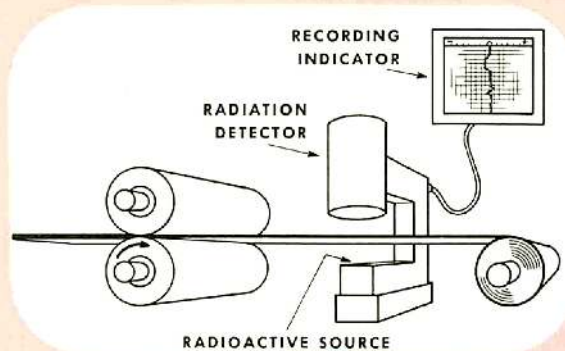


General Tire & Rubber Company, Akron, Ohio

How The AccuRay Gauge Works

Operation of the gauge is basically simple. The main components of the gauge are a source of beta radiation, a detector of radiation, and an indicating or recording device. As the material being measured is run through a gap between the source and detector, the amount of radiation passing through the material to the detector varies according to the weight of the material. These variations in the amount of radiation passing through the material are measured by the detector unit and expressed on the recording device directly in terms of pounds per square yard.

Such material variations as color, moisture content, and composition will in no way affect the accuracy of the AccuRay readings because beta ray absorption is primarily a function of the weight per unit area of the material through which the rays pass, rather than being dependent upon the chemical composition of material. Variations in composition or added moisture will affect the reading of the gauge only in proportion to the unit weight which they contribute to the material being measured. Also, the beta rays themselves will in no way affect the material being measured.



Simplified Diagram of AccuRay Principle

SOURCE-DETECTOR UNIT

The source-detector unit is U-shaped with the source and detector mounted on the open ends of the U, directly opposite each other. A radioactive substance, Strontium-90, produced under the direction of the U. S. Atomic Energy Commission at Oak Ridge, is contained in a hermetically sealed capsule and mounted inside a cast metal box on the lower arm of the U. The source capsule, developed for Industrial Nucleonics Corporation by Battelle Memorial Institute, is fabricated in such a way that, for all practical purposes, it is impossible to break open. An electrically-actuated shutter is provided to cover the source when the gauge is not measuring or when it is desired to clean the source-detector unit. A pilot light on the U-mount indicates when the source shutter is in open position. The radioactive Strontium-90 has a rated active life of 30 years in the gauge.

Welded to the upper arm of the mount is the detector unit which is housed in a cylinder made of one quarter inch steel plate. The cylinder is 14 inches high and eight inches in diameter. Consisting of a special chamber-type detector and an amplifying circuit, the detector unit is insensitive to ambient temperature changes.

Of extremely rugged construction, the U-mount is fabricated of welded, heavy steel beams and plates. This sturdy mounting is furnished to assure accurate readings even when much vibration is present or in the event that the upper arm of the mount is temporarily loaded. The source-detector unit is available in lengths permitting measurements up to 24 inches, 36 inches, 48 inches, and 60 inches from the edge of the sheet. The bottom member of the support frame rests on a motor-driven carriage which runs along the length of the support rail, permitting the unit to move off and on sheet during automatic standardization cycle and to take measurements at any point across the sheet within throat depth limits.

ELECTRONIC SYSTEM

Industrial Nucleonics AccuRay Gauges offer outstanding mechanical features and electronic circuit advantages not available previously. To fulfill industrial requirements including stability under severe conditions of moisture, corrosive atmospheres, vibration, and rough handling, both the source-detector unit and console are designed with liberal safety margins to provide the necessary strength. Electronic components in the circuitry are sufficiently rugged to absorb severe shocks without damage or short term changes in characteristics even when the detector head is struck a sharp blow. Delicate, easily damaged sub-miniature electrometer tubes are not used in the instrument, and replacement of amplifier or power tubes normally will not be required for a number of years. The circuit is unaffected by fluctuations of line voltage, use of heavy electrical equipment, and electric arc welders near the gauge, or sudden pulses caused by quick removal or breaking of the sheet being measured.

COMPLETELY AUTOMATIC STANDARDIZATION

The AccuRay is completely automatic in operation and requires no attention on the part of the machine operator or foreman for calibration or standardization. Compensation for variables such as source decay, change in characteristics of electronic components, changes in weight of air column between the source and detector because of variations in temperature, pressure, or humidity, and changes resulting from the accumulation of dirt on the source and detector housings — compensation for all these variables is automatically carried out by the gauge. During the automatic standardization cycle, the source-detector unit withdraws from the sheet for approximately 30 seconds while compensation is made.

Operating Data and Accessories

ONE CONTROL SELECTS ALL WEIGHT RANGES

The easy-to-operate AccuRay features a single control for the changing of weight ranges. Each gauge is equipped with one or more weight ranges capable of handling all changes in customer specifications. To change from one weight range to another is but a simple matter of pointing the Range Switch at the desired range.

For gauges designed to measure at more than one position, a Position Switch is furnished to select any one of three preset positions across sheet. Should the operator desire readings at additional points across the sheet, he merely moves the Position Switch to MANUAL and uses the Manual Position knob to select his measuring points.

On gauges having a Remote Station, the control panel is equipped with an extra control to shift control of the measuring unit from the panel to Remote.

TYPICAL CONTROL PANEL



INDICATOR PANEL

This light is on only when the detector head is out over the sheet and measuring.

Pushing the START button puts the gauge in operation.

If this light is on, it indicates that the gauge requires servicing. Recorder shuts itself off when this occurs to prevent erroneous readings.

Throwing this switch to OFF SHEET causes the detector head to withdraw off the sheet and remain there.

The cleanly designed indicator panel shown right is standard on all Model R Beta Gauges. Functions of the lights and switches are explained.



This light is on when the detector head is off sheet.

The STOP button is pushed for routine shutdown. This stops the chart motor and shuts off the recorder amplifier. A shield cuts off the source of radiation. The STAND BY light will come on.

Light is on when power is present in the console but the gauge is not operating. It will light when the STOP button is pushed.

Pushing this button will cause standardization to take place. The gauge standardizes automatically in normal operation.

This light is on while automatic standardization is taking place.

TYPICAL REMOTE STATION

REMOTE STATION WITH REPEAT METER

For those installations where the console recorder is not conveniently located for the calender operator, Industrial Nucleonics offers a remote station which repeats the recorder reading and has a control for positioning the gauge across the sheet. The remote station can be provided with either the sheet positioning control or repeat meter alone.

RANGE CHART MARKERS

A range chart marker can be installed to record the range being used at time of measurement.

TARGET MARKING POINTER AND PEN

To aid the operator in working to the specified weight range, an index set pointer, adjustable from the outside of the recorder, is provided. A target pen to record the specified weight on the chart is available also.

Meter repeats readings on recorder.

1, 2, 3 indicate fixed measuring positions. Switching to MANUAL transfers positioning function to MANUAL POSITION control knob.

The large green measuring light is on when the gauge is measuring.



The MANUAL POSITION control knob permits the selection of any measuring position across the sheet.

These lights indicate which range is in use.

Throwing this switch to the right causes the detector head to withdraw off sheet and remain there.

This light is on while the detector head is off sheet.

POSITION CHART MARKERS

A position chart marker for recording the position of the source-detector unit across the sheet is also available.

HIGH AND LOW LIMIT SWITCHES

To provide a warning when tolerance limits are exceeded, high and low limit switches are furnished with external cabling for alarm light or signals.

HIGH AND LOW TOLERANCE PENS

To present and record the complete measurement picture, high and low tolerance chart marking pens can be furnished.

INSTALLATION



Industrial Nucleonics AccuRay Gauges are designed to conserve space and the source-detector unit can be placed at any height in the calender train. The console, only two feet wide, usually can be fitted alongside the operator's control equipment without difficulty. Remote control stations are small and can be installed wherever needed. Only one power hook-up is necessary—AccuRay Gauges can be plugged into the regular plant lighting circuit of 110 volts AC.

SPECIAL MOUNTINGS

Wherever special mountings are required, our engineers will submit an engineering estimate based on time required and cost of materials.

MAINTENANCE

Electrical components with much higher ratings than those required have been built into the design of these gauges to assure trouble-free operation over a long period. The various standardizing circuits, amplifier, and power supplies are mounted separately in metal boxes and connected together with detachable connectors. Each major circuit unit is easily removable from the console for servicing. All Industrial Nucleonics AccuRay Gauges are installed and serviced by our own engineering maintenance staff.

SERVICING

In compliance with Atomic Energy Commission requirements, the customer is provided with a minimum service contract. This service consists of semi-annual routine service calls to check on operation of the gauge and source, verify calibration, and replace parts when necessary. During the first year, two routine service calls will be made with no charge for labor.

WARRANTY

AccuRay Beta Gauges are warranted to be free from defects in materials and workmanship. Our liability under this warranty covers only servicing, adjustments, and replacement of any defective parts in the instrument for a period of 90 days after the gauge is installed on the premises of the original purchaser. If the fault has been caused by misuse, alteration, or abnormal operating conditions, repairs will be billed at our standard service rates.

It will pay you to investigate the many benefits provided by the AccuRay. Write now for a quotation on an installation designed to solve your own particular measuring problems. Please include information on type of material to be gauged, average weights, width of sheet, sheet speed, and any other pertinent data.

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