December 1971

OCD Item No. CD V-794 Model 2

Radiological Instrument Calibrator

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Instructions for the repair of a binding attenuator disc assembly.

Introduction

The CD V-794 Model 2 Calibrator provides four intensity levels for calibrating portable radiation survey instruments. These four levels of radiation intensity and the OFF position are selected by the rotation of an attenuator disc that interposes various thicknesses of uranium in the radiation beam. There have been instances where the rotation of this attenuator becomes difficult. The cause is due to binding of the attenuator disc shaft in its bearings. To remedy this condition, it is necessary to disassemble the primary shield assembly. Disassembly cannot be accomplished until the source is removed from the calibrator. Removal of the source requires specialized source handling equipment and training in its use. In addition, personnel must be experienced in the handling of high intensity sources. All operations must be conducted in a manner that meets the radiation protection requirements of 10CFR, Part 20, or equivalent state regulations.

Equipment and Tools Required

Operation and Maintenance Manual Instrument Calibrator
OCD Item No. CD V-794 Model 2

Radiological CD V-794 Model No. 2 Source Loading Device

Gamma Radiation Survey Meter range at least 2 to 1000 mR/hr

Personnel monitoring dosimeters (minimum of one per person involved)

Personnel monitoring film badges or thermoluminescent dosimeter (minimum of one per person involved)

Screwdrivers one set including one Phillips

Allen Keys one set

Socket wrenches

Open end wrenches

Hoist capacity 1500 lbs.

Sling-fabric webbing 1000 lb. rating 2" wide

Line reamers 0.6265" diameter and 0.6270" diameter

No. 600 wet or dry abrasive paper

Lubricating oil SAE 10 w/o additives

Procedures

I. Removal of source from calibrator

Note: Assemble equipment in an area adequate to protect all personnel from exposure.

1. Close chamber door - turn selector wheel to safe position. Remove cabinet access cover (see manual Figure 1-3, item 6 lower illustration) by cutting safety wire and unscrewing four bolts.

2. Remove sealing bolt securing shielding cap. Remove shielding cap. See Figure 1-5 of manual. When removing shielding cap, be sure source plug shield is held in place. Do Not Permit Source Plug Shield To Be Withdrawn.

3. Position source loading device with its snout aligned with and inserted in the socket from which the shielding cap was removed.

CAUTION NOTE

Use care not to damage socket.

Move and pin swinging shield of source loading device to align with snout. Insert handling rod through source loading device and engage the threaded end in the threaded hole of the source plug shield. The source in its source plug shield is now ready to be withdrawn. During withdrawal the source is NOT shielded; therefore, all personnel other than the person who withdraws the

Procedures (continued)

source should withdraw to a shielded or remote position. The person withdrawing the source should stand at the handling rod facing the axis of the source. This position is partially shielded by the shield of the source loading device. Withdraw the rod carefully until the source plug shield is flush with the back of the swinging portion of the source loading device. If any undue resistance is felt, do not force. Return the source to the calibrator and recheck alignment. When the source plug shield is flush with the back of the swinging portion, tighten clamp screw with knob. Remove handling rod. Next withdraw pin securing the swinging portion and move the swinging portion to the closed position and secure with pin. The source loading device may now be wheeled away from the calibrator. Placard the source loading device with a radioactive material sign and instructions to insure that personnel must not loiter near or tamper with the device.

II. Removal of Primary Shield from the Calibrator

Position the calibrator as shown on sketch No. 1

With calibrator door in extreme right-hand position, remove the rubber bumper and bar from the left-hand edge of the door. Remove rail end bar, item 12, as shown on Figure 1-7, page 1-9. Remove door and place on two strips of soft wood on a level surface. Door is heavy so care must be taken to avoid damage to lead glass. This is best done by two persons.

Removal of Primary Shield from the Calibrator (continued)

Next remove range select control, item 5, in Figure 1-6, page 1-8. This is held in place by a slotted head screw in center of knob.

Next remove right-hand portion of control panel by unfastening four screws, two of which are located along extreme bottom of panel and two along extreme top. disconnect lamp leads - Note Order of Connection. See Figure 5-3, page 5-6.

Next refer to Figure 1-9, page 1-12, right-hand illustration. Remove item 1 remote control stations from chamber wall. Left-hand portion of the control panel assembly is now removed by removing four screws, two of which are found on the extreme bottom and two on extreme top. See Figure 1-6, page 1-8.

Remove contact assembly C79415 - use care not to damage contact pins.

Before selector wheel is removed, measure and record the distance from the wheel rim to the left end of the cabinet. This dimension will be needed when the selector wheel is replaced.

Remove wiper disc from hub of selector wheel. Item 12, Figure 1-2 lower illustration, page 1-3. Next release taper lock hub of selector wheel by loosening three clamp screws - insert releasing screws 1/4-20 into two tapped holes in flanged hub and withdraw taper lock hub to remove wheel.

Next place a wooden block under the door interlock pin to hold it in the fully raised position.

Removal of Primary Shield from the Calibrator (continued)

The primary shield assembly is now ready for removal. See Figure 1-2 upper illustration, page 1-3. Mark rim of item 6, Figure 1-5 upper illustration, to show registration in respect to partition. Place sling around primary shield at mid point. Slign must pass between tie rods and primary shield. Attach sling to hoist and remove slack.

Remove tie rod nuts. Remove support bracket (two bolts through bottom of cabinet) remove upper tie rod.

Hoist just enough to lift primary shield slightly. Move primary shield away from partition. Be sure primary shield balances in sling and will lift out in a level position. See Figure 1-5 upper illustration. Item 6, collimator piece, must be held against item 1 during lifting.

Place primary shield assembly on a bench. Block to hold upright. Remove item 6 from assembly. Remove split collar from attenuator disc shaft. Withdraw attenuator disc and shaft. Do Not Hammer on Shaft. Shaft must be withdrawn by pulling on attenuator while rotating back and forth. Use a light lubricating oil on the shaft to assist.

When attenuator and shaft are withdrawn, clean the shaft with No. 600 polishing paper and oil to remove any oxidation or gummed lubricant.

Line ream the attenuator shaft bearings starting the reamer from the selector wheel end. Finished diameter of the bearings should be .0015 to .0020 larger than the attenuator disc shaft.

Clean bearing bore thoroughly. Apply light lubricating oil to both bearings.

III. Reassembly

Place decay compensator, with numbers facing selector wheel end, on the shoulder of the bearing. Insert attenuator shaft and test for free rotation. Place split collar on attenuator shaft with a .002 shim to set end play. Tighten collar and remove shim. End play should not be less than .002 or more than .004.

Lubricate pin bearing and install collimator (item 6, Figure 1-5, page 1-7, upper illustration). Check attenuator disc for free rotation. Sling and lower primary shield assembly into calibrator cabinet. Place rear support bracket on primary shield. Rotate primary shield assembly to align registration marks.

Install upper tie rod. Fasten rear support bracket loosely. Put nuts on tie rods loosely. Check registration with alignment marks.

Tighten tie rod nuts alternately to maintain even tension and insure that collimator is drawn flush to partition. Lower tie rod nuts maybe tightened snugly. Tighten upper tie rod nut without bending rear support bracket.

Test attenuator disc for free rotation. Test decay compensator for free rotation. Set decay compensator disc to proper step. Release door interlock pin from blocked position. Rotate attenuator and check for proper operation of door interlock pin.

Install radiation level selector wheel. Orient safe indication on rim of selector wheel when attenuator is in safe position. Tighten screws of flanged taper lock hub. Reset axial position of selector wheel rim to dimension recorded prior to removal.

Reassembly (continued)

Next fasten wiper disc to selector wheel hub.

Install contact assembly C79415.

Test for proper operation of indicating lamps by connecting lamp leads and applying internal power to calibrator. Do not install panel at this time.

Install left-hand panel with screwdriver shafts fed through partition.

Replace remote control station block in radiation chamber over potentiometer adjusting screwdrivers and bolt in place. Test screwdrivers for proper operation. Install right-hand portion of control panel and screw in place. Replace door and replace rail end bar (item 12, Figure 1-7, page 1-9).

Replace rubber bumpers and bar on left-hand edge of door.

Replace range changing control knob.

Test calibrator for function and satisfactory mechanical and electrical operation.

Calibrator is now ready for re-installation of source.

IV. Installation of Source

The source is re-installed in the calibrator by reversing the operations describing removal of the source. The same precautions must be ob-

Installation of Source (continued)

served. The source loading device is first aligned and centered carefully with its snout in the shield cap cup.

The swinging portion of the source loading device is now released from the stored position and pinned in the open or receive source position.

The handling rod is screwed into the source plug shield. The source clamping screw is next released.

The handling rod is now pushed in to move the source into the calibrator.

During the transfer of the source, it is momentarily unshielded. Keep all personnel away from the operation. The person performing the source transfer should stand behind the protruding handling rod. DO NOT RAM THE SOURCE INTO THE CALIBRATOR. Use steady even pressure. If resistance is encountered, it indicates improper alignment. Do not attempt to correct alignment until the source is shielded. Return the source to the source loading device, secure it with the source clamping screw, remove the handling rod and move the swinging shield to the shielded position. The alignment can now be corrected.

NOTE

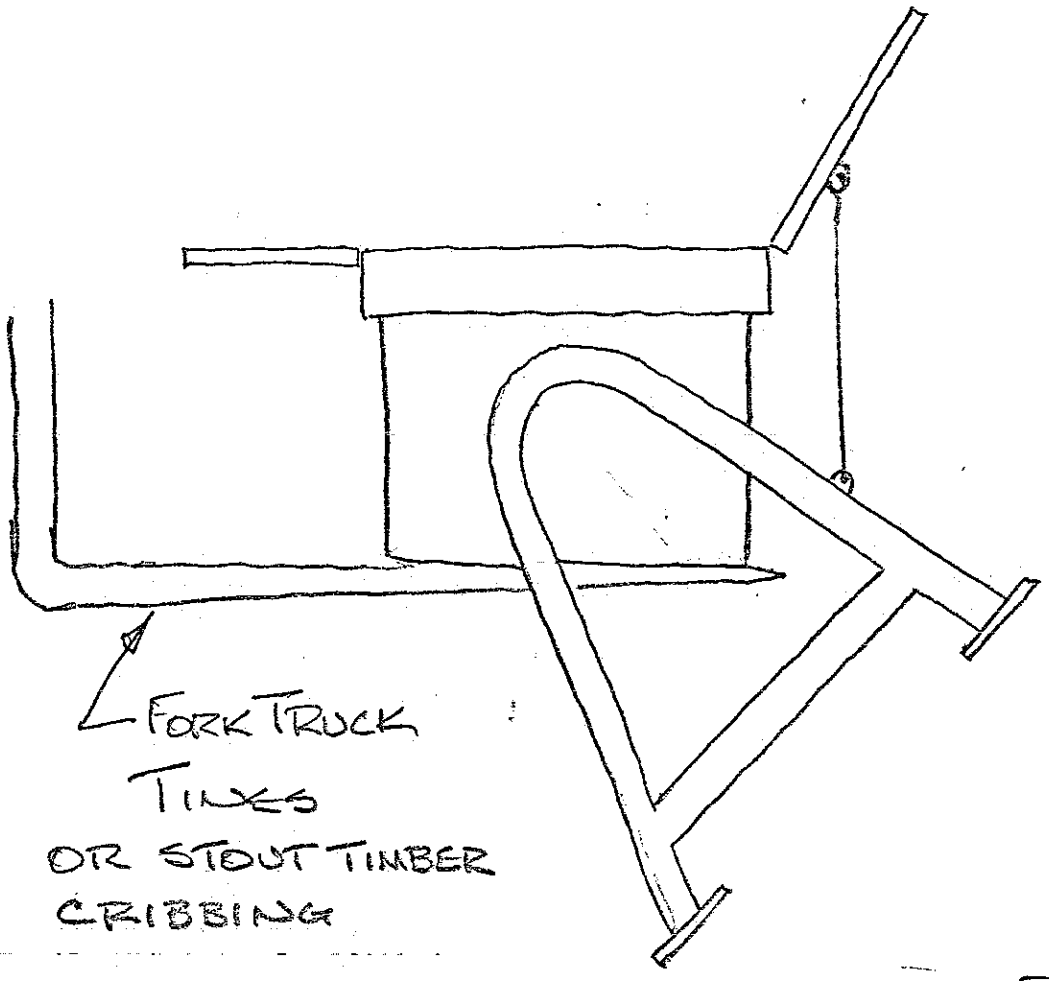
Proper operation of the source loading device is critically dependent upon correct alignment. The bore of the snout and the bore of the source cavity in the shield must be coaxial.

TECHNICAL OPERATIONS, INC. • SOUTH AVENUE, BURLINGTON, MASS.

BY DP DATE 11/30/71 SUBJECT CDV Calibrator SHEET NO. 1 OF 1

CHKD. BY ____ DATE ____ CD V-794 Mod No 2 JOB NO. ____

CALIBRATOR SUPPORT FOR DISASSEMBLY SKETCH #1



NOTE: STAND MAY BE REMOVED TO FACILITATE FURTHER DISASSEMBLY, AND WRITING SURFACE COVER