REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

NO: NR-182-D-101-S DATE: NOV 10 1982 PAGE 1 OF 5

DEVICE TYPE: Gamma Gauging Device

MODEL: BEC-104

MANUFACTURER/DISTRIBUTOR: Bedford Engineering Corporation (BEC)
124 South Road
Bedford, MA 01730

MANUFACTURER/DISTRIBUTOR:

SEALED SOURCE MODEL DESIGNATION: Amersham Corporation Model AMC.24 (ANSI 77C54344)
or
New England Nuclear Model NER-478C (ANSI 77C64444)

ISOTOPE: Americium-241 MAXIMUM ACTIVITY: 14 millicuries

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (D) Gamma Gauging

CUSTOM DEVICE: X YES _____ NO

CUSTOM USER: Wyman-Gordon Company
Eastern Division
Worcester Street
North Grafton, MA 01536

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NO: NR-182-D-101-S DATE: NOV 1 0 1982

DEVICE TYPE: Gamma Gauging Device

DESCRIPTION:

The BEC Model 104 gauging device utilizes an Americium-241 sealed source of up to 45 millicuries and manufactured by either Amersham Corporation or New England Nuclear Corporation.

The key features of the device are shown in the assembly sketch (B032, Enclosure 1). The radioactive source capsule (Item 7) is retained in the source holder (Item 6) by the brass screw (Item 8). The loaded holder as an assembly is threaded into the main brass housing (Item 10). A wire and lead crimp seal is installed thru item (6, 8, and 9) to prevent removal of the source capsule once installed in the main housing.

A spring loaded shutter (Item 4) is installed in the main housing as shown. The shutter is constructed of 3/8" thick brass and is held captive in the main housing by the cover plate (Item 1) and the base plate (Item 11). When the shutter is fully depressed (open condition) the radiation beam emerges from the aperture (Item 4a). This aperture may be circular or rectangular and will have an open area not to exceed 0.035 square inches. A second hole (Item 4b) is bored thru the upper tab in the shutter for purposes of locking the shutter closed. This tab extends through the slot in the cover plate when the shutter is closed.

An electrical contact (Item 3) is installed in the cover plate as shown. When the shutter is fully closed, the circuit for the shutter indicator lights is completed.

Loctite is used on the threads of all of the assembly screws used to attach the cover and the base plates.

LABELING:

The BEC Model 104 shall be labeled in accordance with the requirements of Section 20. (Note: The manufacturer erroneously labeled this device with a label indicator that it is authorized for distribution to persons generally licensed. This is not the case. According to Wyman-Gordon letter dated October 21, 1982, this has been corrected.

DIAGRAM:

See Enclosure 1, Figures 1 and 2.

CONDITIONS OF NORMAL USE:

The BEC Model 104 device is intended for use as a fill level gauge in an industrial "clean room" environment. Typical conditions are:

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DEVICE TYPE: Gamma Gauging Device

CONDITIONS OF NORMAL USE (Cont'd):

- Temperature: 68-72°F (normal room temperature)
- Vibration: Low level/short duration
- Corrosion: None expected
- Impact: Unlikely/drop unlikely
- Fire: Low probability
- Explosion: Low probability

PROTOTYPE TESTING:

Both sources to be used in the proposed device have been tested and registered with the NRC. They both meet higher specifications then required by the ANSI classification for gamma gauging devices. Other than radiation surveys on the proposed source holder no formal testing has been performed. Since all of the parts are made of brass with the exception of the electrical teflon insulated feed-thru for the shutter contact, the basic device should meet considerably higher temperature limits than indicated in its ANSI designation (64-565-985-R1, ANSI N538-1979). The 200 degree C upper limit is due to the teflon insulation.

A minimum of 3/8" of brass shields the source when the shutter is closed. Surface radiation levels are barely detectable over background with the shutter closed and are well below 0.5 mrem/hr.

EXTERNAL RADIATION LEVELS:

When loaded with a 10 millicurie Americium-241 source, the device manufacturers survey shows dose rates as follows:

- Surface radiation levels with shutter closed < 0.5 mr/hr
- At 5 cms - maximum reading in beam 15 mr/hr
- At 30 cms - maximum reading in beam 1 mr/hr
- At 100 cms - maximum reading in beam 0.1 mr/hr

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SAFETY EVALUATION OF DEVICE

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DEVICE TYPE: Gamma Gauging Device

QUALITY ASSURANCE AND CONTROL:

Each source holder will be fabricated to the tolerances indicated on drawing no. B012, B014, B015, B016, and B017 submitted with letter dated May 28, 1982. Shutter operation and proper functioning of the shutter switch contact will be checked before and after the source is installed in the holder.

Copies of the certificate of assay and the leak check supplied by the source manufacturer (New England Nuclear or Amersham) will be supplied with each assembly. In addition, a leak check will be performed by BEC prior to transfer if more than six months have elapsed since the manufactures leak test.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

A. This device shall not be used under conditions in which the temperature exceeds 200°C.

B. This device shall be labeled in accordance with the requirements of Section 20.203, 10 CFR Part 20.

C. This device shall be distributed only to:

Wyman-Gordon Company
Eastern Division
Worcester Street
North Grafton, MA 01536

D. Sealed sources contained in these devices shall be installed, serviced, removed from service or disposed of only by the sealed source manufacturer or other persons specifically licensed by NRC or Agreement States.

E. The sealed source contained in the BEC Model 104 device shall be leak tested at six-month intervals using techniques approved by the licensing authority and capable of detecting the presence of 0.005 microcuries of Americium-241 contamination.

F. At time of installation and thereafter at six-month intervals, the devices' "on-off" mechanism shall be checked for proper operation by persons approved by the licensing authority.

SAFETY ANALYSIS SUMMARY:

The Bedford Engineering Corporation Model 104 is designed to use an Americium-241 sealed source with an activity of 14 millicuries which is manufactured by either Amersham Corporation or New England Nuclear Corporation. These sources have ANSI

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

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DEVICE TYPE: Gamma Gauging Device

SAFETY ANALYSIS SUMMARY (Cont'd):

Classification of 77C54344 and C64444, respectively. Both of these classifications exceed the minimum classification of 77C33222 recommended by ANSI for low energy gamma sources used in gauging devices.

The applicant reports that the Model 104 has an ANSI performance Classification of 64-565-985-R1. Thus, the device should withstand a temperature range of -65° to 200°C.

Based on the above considerations and our review of the information and test data contained in the references cited below, we conclude that the BEC Model 104 level device is acceptable for custom licensing to Wyman-Gordon Company. Furthermore, we conclude that this device is likely to maintain containment integrity for normal industrial uses proposed by Wyman-Gordon.

REFERENCES:

The following supporting documents for the BEC Model 104 level measuring device are hereby incorporated by reference and are made a part of this registry document:

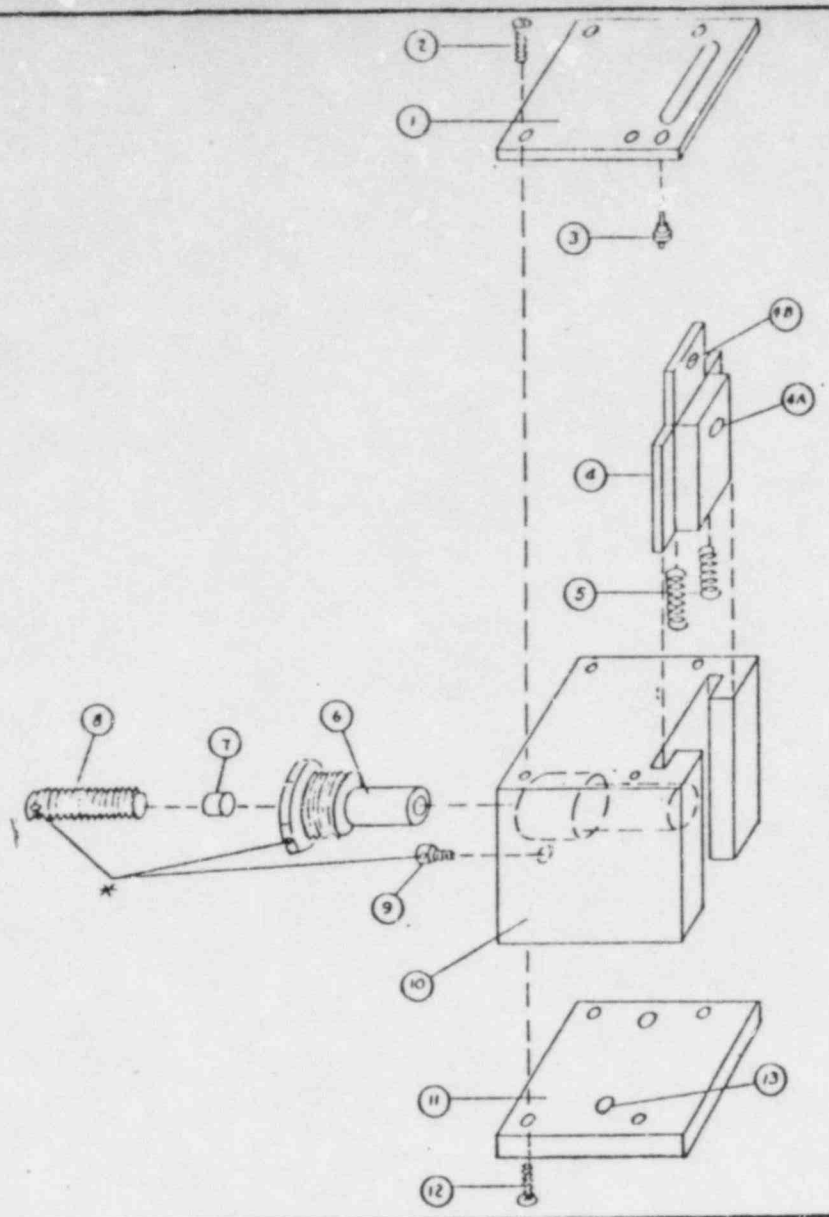
- Wyman-Gordon application dated May 28, 1982 and letters dated July 15, 1982 and October 21, 1982, and enclosures thereto.

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: NOV 1 0 1982 Reviewer: Earl G Wright

Date: NOV 1 0 1982 Concurrence: Richard Singh



REVISION RECORD			

LEGEND :

(1) COVER
(2) (4) 6-32 SCREWS (APPLY LOCTITE)
(3) ELECTRICAL CONTACT FOR SHUTTER
(4) SHUTTER
(4A) BEAM APERTURE
(4B) HOLE TO LOCK SHUTTER CLOSED
(5) SHUTTER RETURN SPRINGS
(6) SOURCE HOLDER TO SCREW INTO MAIN HOUSING 10
(7) SEALED SOURCE CAPSULES
(8) RETAINING SCREW
(9) TIE SCREW FOR LEAD CRIMP SEAL
(10) MAIN HOUSING
(11) BASE
(12) (9) 6-32 SCREWS (APPLY LOCTITE)
(13) 2 HOLES FOR ASSEMBLY MOUNTING

NOTES :

* AFTER SOURCE IS INSTALLED IN MAIN HOUSING, LOOP STEEL WIRE THRU 13 HOLES AND JOIN WITH LEAD CRIMP SEAL.

BEDFORD ENGINEERING CORP
124 SOUTH ROAD
BEDFORD, MA. 01730

TOLERANCES (EXCEPT AS NOTED)	MODEL 104 GAMMA GAUGE		
DECIMAL ±	S.O. # 2310	SCALE	DRAWN BY APPROVED BY
FRACTIONAL ±	TITLE SOURCE HOLDER ASS'Y -- MODEL 104		
ANGULAR ±	DATE 9-19-80	DRAWING NUMBER B032	

ENCL 1

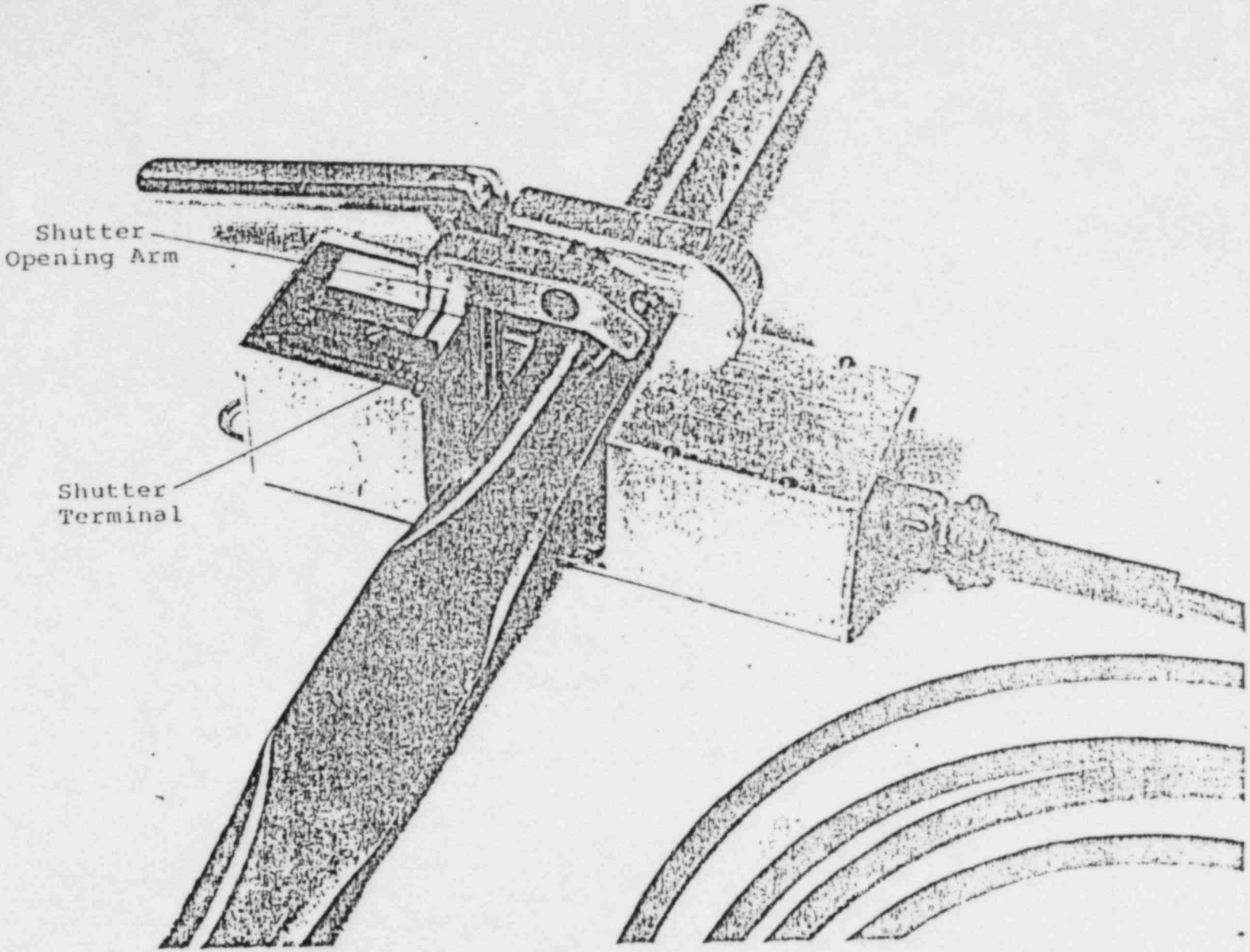


Figure -1

Typical Prototype Gauge Using Model 104 Source Holder

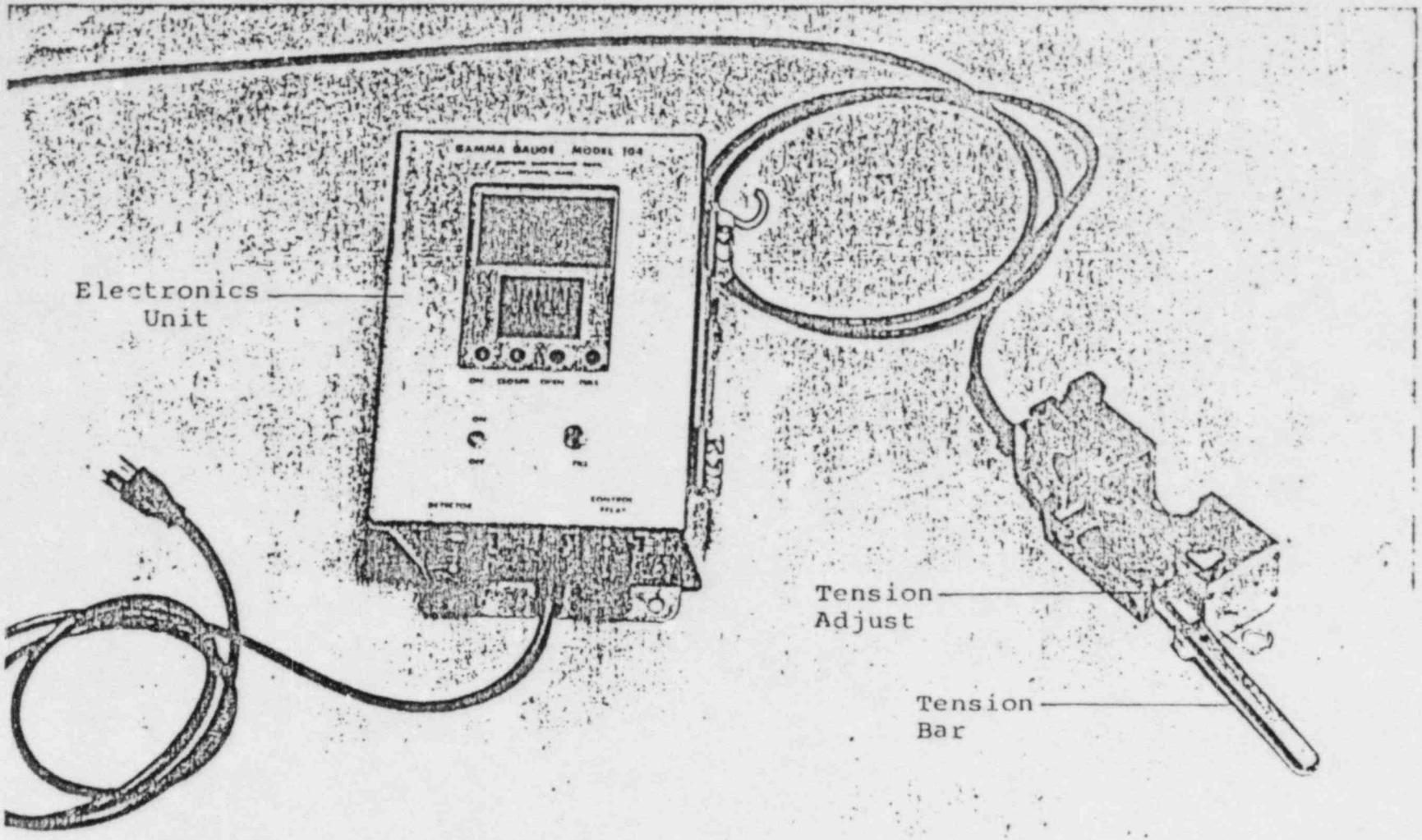


Figure 2
System Components