



Model 777

Ultra Low-Background Shield



Nuclear



Healthcare



Homeland
Security
& Defense



Labs and
Education



Industrial and
Manufacturing

KEY FEATURES

- 15 cm (6 in.) lead thickness
- Ultra low-background materials
- Versions for vertical or U-style cryostats
- Purge port for radon expulsion
- Graded tin-copper liner

DESCRIPTION

The CANBERRA 777 is an ultra low-background lead shield for germanium gamma-ray detectors. It features 50% greater lead thickness than that of typical lead shields and is constructed from materials carefully selected for low background. The 777 is available in three versions which complement CANBERRA ultra low-background cryostats. The 777 (pictured above) can accommodate either a vertical dipstick slimline cryostat or a U-style cryostat. The 777A accommodates vertical dipstick cryostats only such as the 7500SL with a remote detector chamber (Model RDC-6). The 777B accommodates only U-style cryostats. All versions of the 777 are equipped with a swing-top door for sample chamber access and a door lift mechanism which allows the door to fit tightly against the shield body.

Background radiation from lead is dominated by ^{210}Pb because other elements are chemically separated fairly effectively in the refining process. ^{210}Pb decays with the emission of a 46.5 keV gamma ray. This gamma ray is generally absorbed by the tin-copper liner and may be below the energy range of the detector so it is of little concern. The ^{210}Bi daughter of ^{210}Pb , however, is of concern. It is an energetic beta emitter and bremsstrahlung from this beta gives rise to a continuum of background counts ranging up to 500 keV. For this reason, the

777 is constructed with layered bulk lead. The outer five inches is ordinary low-background lead while the innermost one inch is selected for ^{210}Pb content of about 20 Bq/kg. This thickness of lead will stop the bremsstrahlung from the outer lead volume.

The 777 has a graded liner to stop the lead K-shell x rays in the energy range of 75-85 keV. Liner materials are low background tin with a thickness of 1 mm (0.040 in.) and high purity copper with a thickness of 1.5 mm (0.060 in.).

The 777 is equipped with a gas port for the introduction of gas (bottled air or nitrogen) to flush the shield interior and reduce background from radon and radon daughters. Boil-off nitrogen from the LN_2 cryostat is a free source of gas but care must be taken to prevent liquid nitrogen from entering the shield and freezing the cryostat seals. An N_2 purge kit is available from CANBERRA for most cryostat types.

The 777A (see illustration) is supplied with a table which supports the shield above the LN_2 Dewar. This shield has an opening in the floor and a split annular back shield which surrounds the cryostat RDC neck. The 777B (see illustration) is attached to a steel plate which normally sits on the floor. The 777B has a side port which accommodates the horizontal arm of a U-style cryostat and a rectangular plug which is withdrawn vertically to provide access to the port. An optional cryostat stand (Model 777-5) is available to support the cryostat.

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SPECIFICATIONS

MATERIALS

- OUTER JACKET – 9.5 mm (0.375 in.) thick low carbon steel.
- BULK SHIELD – 15 cm (6 in.) thick low background lead with the innermost 2.5 cm (1 in.) having ^{210}Pb content of less than 25 Bq/kg.
- GRADED LINER – 1 mm (0.040 in.) low background tin and 1.6 mm (0.062 in.) high purity, low-background copper.

WEIGHT

- 1633 kg (3600 lb) installed; 1769 kg (3900 lb) shipping.

MECHANICAL

- Door hinge – oiled bronze bushings
- Door lift – lever actuated cam.

FINISH

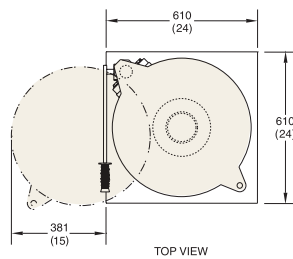
- Light gray textured finish outside; clear polyurethane inside.

OPTIONS

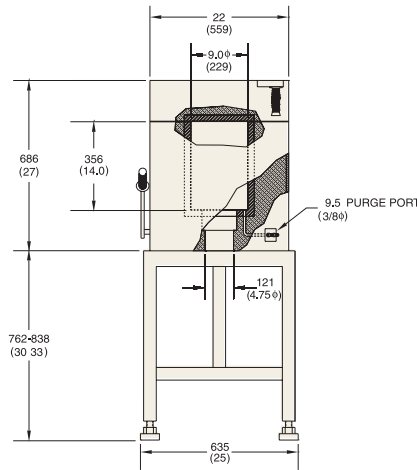
- 777-1 – Solid floor plug for 777 (use with U-style cryostat).
- 777-2 – Side plug for 777 (use with vertical cryostat).
- 777-3 – Split backshield for 777 or 777A.
- 777-4 – Cryostat stand for 777.
- 777-5 – Cryostat stand for 777B.
- 777-6 – N_2 gas purge kit for vertical cryostat.
- 777-7 – N_2 gas purge kit for U-style cryostat.

MODELS

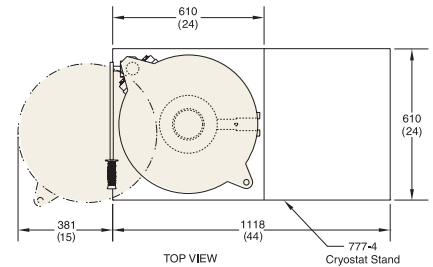
- 777 – For vertical or U-style cryostat.
- 777A – For vertical cryostat only.
- 777B – For U-style cryostat only.



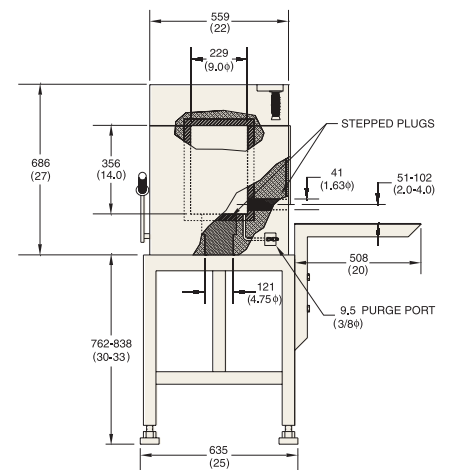
TOP VIEW



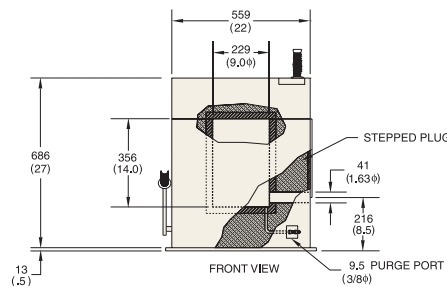
MODEL 777A



TOP VIEW

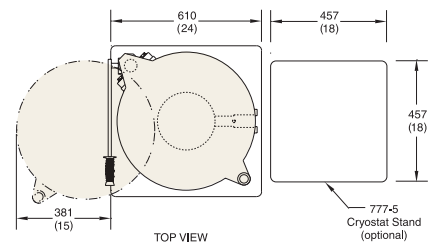


MODEL 777



FRONT VIEW

MODEL 777B



TOP VIEW



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