

Rutherford Laboratory

Technical Leaflet

A 5.2

NIMROD RIPPLE FILTER SYSTEMS

The 24-phase rectifiers used to power the NIMROD magnet have an inherent ripple component superimposed on their output voltage. This ripple would modulate the proton beam giving rise to undesirable effects when the beam spills onto a target. One method of reducing this effect is to interpose a suitable filter between the rectifiers and the magnet.

The primary system employed on NIMROD consists of two amplifiers which produce a voltage in phase opposition to the ripple voltages. This voltage is developed across chokes in the magnet power supply lines. The residual ripple appearing at the magnet terminals is, thus, the difference between the amplifier output and the original ripple voltages. The amplifier input is taken from the magnet terminals, hence the complete system forms a negative feed-back loop.

A secondary system is also in use. This consists of coils mounted on the magnet pole-pieces and connected through a blocking capacitor to a driving coil placed around the pole-pieces. The current flowing in these coils due to the coupling between them and the main magnet winding produces a magnetic flux which opposes, and consequently reduces, the ripple flux in the magnet gap. It is intended at a later date to replace the driving winding by an amplifier to enable a greater reduction in ripple flux to be achieved.

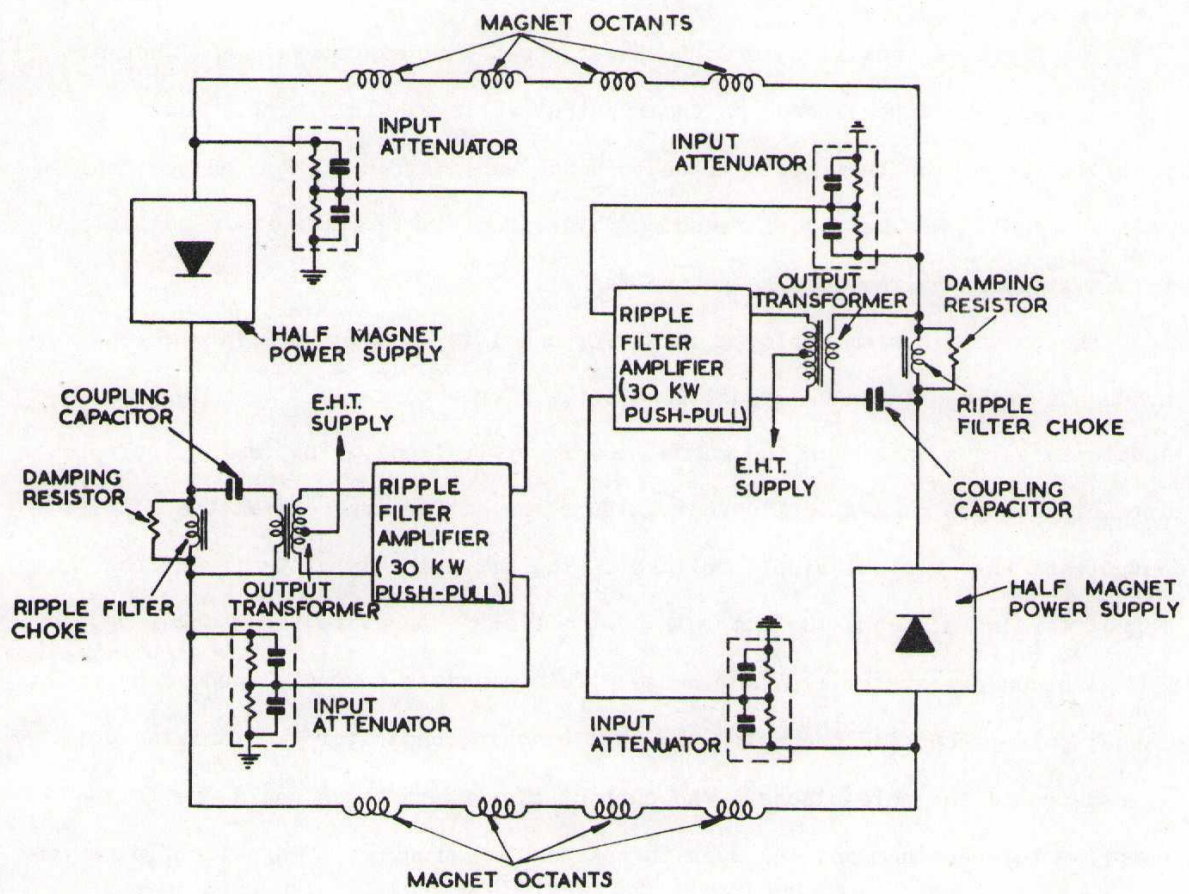


FIGURE 1 NIMROD PRIMARY RIPPLE FILTER SYSTEM

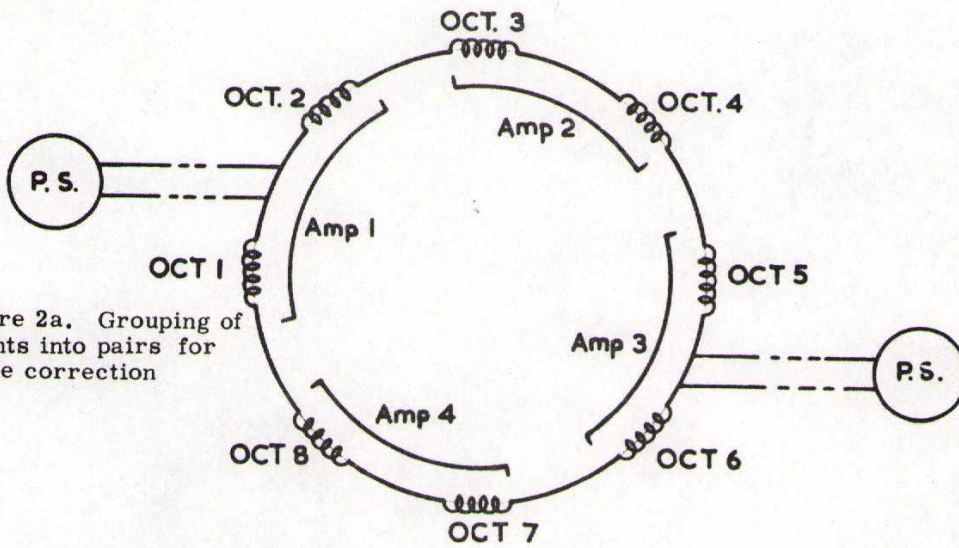


Figure 2a. Grouping of octants into pairs for ripple correction

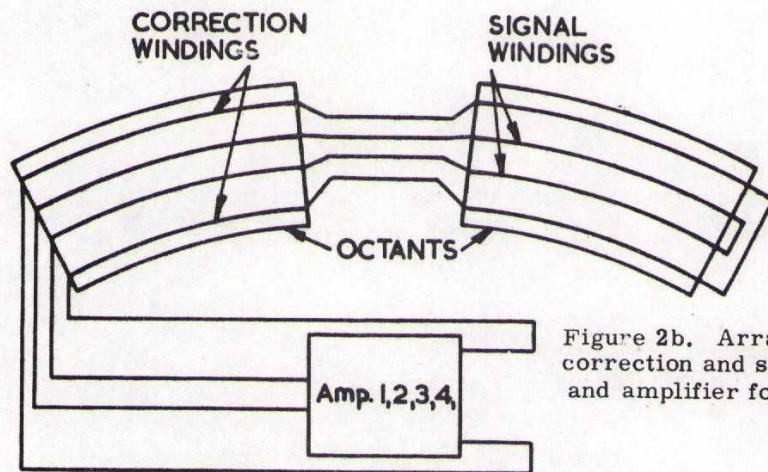


Figure 2b. Arrangement of correction and signal windings and amplifier for each octant pair

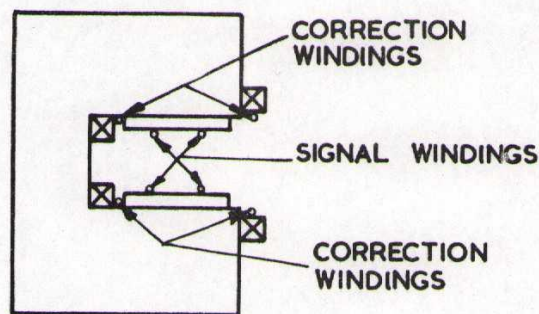


Figure 2c. Positions of windings in magnet gap

FIGURE 2 NIMROD SECONDARY RIPPLE FILTER SYSTEM