

type 2713

Power Amplifier

USES:

- Driving B & K Hydrophones Types 8103, 8104 and 8105 as projectors
- Driving electrostatic actuators at high voltage levels
- As general purpose power amplifier for capacitive piezoelectric transducers

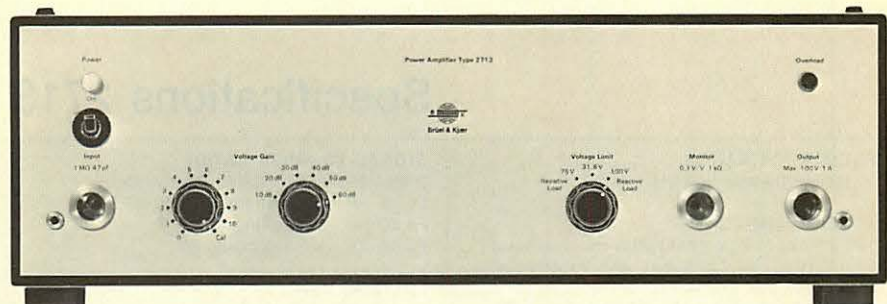
FEATURES:

- 100 V RMS, 1 A into capacitive load
- Frequency range 10 Hz to 200 kHz
- 0 to 60 dB voltage gain in six 10 dB ranges
- Switchable maximum output voltage limits
- Circuit protection against overload

The Power Amplifier Type 2713 has been designed to drive highly capacitive transducers to high voltage levels, such as when the B & K Hydrophones Types 8103, 8104 or 8105 are employed as projectors in underwater calibration arrangements.

When a piezoelectric transducer like the Standard Hydrophone is used as a transmitter, the driving voltage should be high so that the best possible signal-to-noise ratio can be obtained at low frequencies where the transmitting sensitivity is low. This in turn leads to a heavy current at high frequencies where the transmitting sensitivity of the Hydrophone is higher. Furthermore, the driving amplifier must deliver this constant voltage without being influenced by the highly capacitive loading presented by the Hydrophone and cable.

These special requirements place severe demands on the output section of the power amplifier because the voltage and current are out of phase with each other with capacitive loading, so that transistors will not be satisfactory, due to secondary breakdown limitations. Therefore, the unusual step was taken of employing electron tubes in the output section of the 2713. This arrangement can handle capacitive loads up to 30 nF, while maintaining a good signal-to-noise ratio.



The Power Amplifier has a frequency range from 10 Hz to 200 kHz with a maximum gain of 60 dB in 10 dB steps with continuously variable gain in each range. Switchable voltage limits of 100 V RMS (141 V peak) for reactive loads, 75 V RMS (105 V peak) for resistive loads, or 31,6 V RMS (44,7 V peak) for both reactive and resistive loads can be selected to protect the particular transducer being employed. The maximum output current is 1,41 A peak. The maximum RMS current available (I) can be found from the following relationship:

$$I = \frac{100 + W}{200} (\text{A RMS})$$

where the Output Power (W) depends upon the loading and the duty cycle of the amplifier. In any case the maximum continuous output power available is 100 W.

With the "pure" capacitive loading obtained from the Hydrophone, the output power will be 0 W, so the maximum continuous current = 0,5 A RMS

When the Amplifier is operating with a gated signal, for example a sine wave gated by the Type 4440 Gating System, the maximum available RMS current limits the duty cycle to 50% when a current level of 1,41 A peak is required.

The output voltage can be monitored at the "Monitor" socket on the front panel which gives a calibrated level of 0,1 V for each 1,0 V at the "Output". The "Monitor" socket, like the other front panel sockets is paralleled by a BNC socket on the rear panel.

Extensive precautions have been taken to prevent damage to either the

Transducer, or to the Amplifier due to overload or overheating. The "Overload" lamp on the front panel lights, and the signal is prevented from reaching the output section (and sockets) if the output voltage exceeds the preset "Voltage Limit", or if the output current exceeds the peak value of 1,41 A. The lamp also lights and the output is removed during the "warm-up" period of the instrument (about 40 s). To ensure adequate cooling of the tubes, an extractor fan is built in. Nevertheless, should the output section temperature rise above 120°C (250°F), the "Overload" lamp will light and the output be inhibited.

Fig. 1 shows a typical arrangement that can be used for calibrating the frequency response and sensitivity of Hydrophones and Projectors. This particular arrangement is suitable for use in small water tanks because the use of the Gating System allows accurate calibration even where reflections are present. Calibration is achieved by

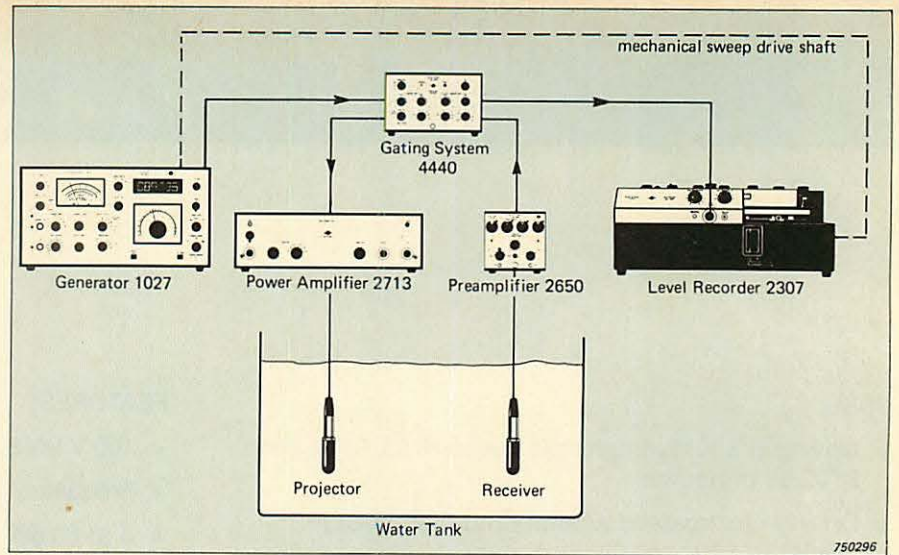


Fig. 1. Arrangement for calibrating hydrophones or projectors in small water tanks

emitting an impulse from the Gating System, and then measuring the received signal for only a short period during the time when the direct signal

is being received. This blocks out the reflections completely and gives measurements corresponding to those obtained under free field conditions.

Specifications 2713

FREQUENCY RANGE:
10 Hz to 200 kHz \pm 3 dB

VOLTAGE LIMITS:
100 V RMS (141 V peak) with reactive load
31,6 V RMS (44,7 V peak) with reactive and resistive loads
75 V RMS (105 V peak) with resistive load

INPUT:
AC coupled

INPUT IMPEDANCE:
1 M Ω in parallel with 47 pF

OUTPUT IMPEDANCE:
< 1 Ω up to 5 kHz
< 30 Ω up to 200 kHz

MAXIMUM OUTPUT CURRENT:
1,41 A peak

DC STABILITY:
Less than 100 mV offset for \pm 10% variation of mains supply from nominal, and for 5 to 40°C (41 to 104°F) variation in ambient temperature

SIGNAL-TO-NOISE RATIO:
(measured with 300 kHz bandwidth)
80 dB for gain settings 0 to 40 dB
70 dB for gain setting 50 dB
60 dB for gain setting 60 dB

VOLTAGE GAIN:
0 to 60 dB in 10 dB ranges, continuously variable within each range

PROTECTION:
Overload lamp lights and output is blocked under any of the following conditions:

1. Output voltage exceeds the preset limit
2. Output current exceeds 1,41 A peak
3. During instrument warm-up time, approximately 40 s
4. Temperature in the output section exceeds 120°C (250°F)

Forced air cooling of the output section is also supplied by an extractor fan

OPERATING TEMPERATURE RANGE:
5 to 40°C (41 to 104°F) ambient temperatures

POWER REQUIREMENTS:
100 to 240 V, 50 to 60 Hz, approximately 200 VA
Complies with Class 1 of IEC 348

ACCESSORIES SUPPLIED:
Power Cable.....AN 0010
Screened Cable.....AO 0013
One BNC plug.....JP 0035
Fuses: 1,6 A (220-240 V), 3,15 A (100-150 V)

DIMENSIONS:
Height: 132,6 mm (5,2 in)
Width: 430 mm (16,9 in)
Depth: 200 mm (7,9 in)

WEIGHT:
12 kg (26,5 lb)

ACCESSORIES AVAILABLE:
Rack mounting flanges.....KS 0038
Mahogany Case.....KA 0059
B & K to B & K coax. cables: 3 m.....AO 0019
10 m.....AO 0020
BNC to BNC coax. cable.....AO 0087