The Plessey Type 112 Power Supply

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A few issues ago I made reference to the fact that a mains to 28 volt power supply, Plessey type 112 (NATO Stock Number 5821-99-943-7136), was available from J. Birkett of Lincoln. Since then a number of members have contacted me to ask for information on this equipment.

Fig. 1 Front view of the Type 112 Power unit

The PSU is housed in an aluminium case approximately 7 inches by 7 inches by 16 inches deep. Chromed carrying handles are provided on the front panel but it would not be advisable to make use of these if you are in a situation covered by the Health and Safety at Work Act as the weight of the unit is in excess of 50lb!
To say that the construction of the innards is substantial would not be an understatement – the mains transformer and smoothing choke are held between massive alloy castings which are bolted together, and the (minimal) electronics is assembled on a tag board fitted to the top of the transformer.

The front panel (fig. 1) carries the on-off switch, primary fuses, indicator lamp, which has a rotatable shutter to adjust the amount of light visible from it, voltmeter, power input and output sockets, and, under a hinged cover two switches for setting the transformer primary tappings to suit the supply voltage. Opening the front cover operates a microswitch which disconnects the supply.
Removing four 4BA screws from the rear of the unit allows the assembly to be slid forwards out of the case, and it can be seen (fig. 2) that the front panel is attached to the transformer by a cast alloy framework, to which is also attached a block carrying two large silicon rectifiers. Between the panel and the transformer is a large empty space, I wondered if this might have been for "metal rectifiers" at some time, though there was no indication that the silicon rectifiers had ever been replaced. Perhaps instead it was built to a standard sized case. The front panel is easily removable for access to the wiring behind it.

Voltage Stabilisation

Regulation is by the "saturable reactor" principle. This is the large black potted component on the left hand side of the unit in fig. 2. This works by passing the rectified but as yet unsmoothed output of the transformer through an inductance. This would result in a voltage drop due to the impedance of the inductor; this impedance can be controlled by passing a direct current through another winding on the same core. Compare this with the fact that the inductance of a normal HT smoothing choke or audio output transformer is reduced by the DC component passing through it. The control winding is very simply connected in series with a variable resistor across the output of the PSU to provide regulation, There are also two other windings which are connected in series with the mains supply, presumably to provide some compensation for mains voltage variations. Final smoothing is by four 1000µF electrolytic capacitors in parallel across the output. The negative output is earthed.

Soft Start

All this inductance could produce some very nasty voltage spikes and current surges if precautions are not taken to control them, and several measures are taken here. The "on – off" switch in fact consists of a three position toggle switch, biased to the "centre off" position. Holding the switch to the 'on' position applies the mains to the primary via two 33Ω 5 watt resistors which act to limit the inrush current. When the output voltage comes up (which happens slowly over a period of one second or so) this energises a 12 volt relay via a 180Ω 5 watt resistor. The relay contacts short out both the 33Ω resistors and the switch, keeping the unit energised once the switch is released to the centre position.

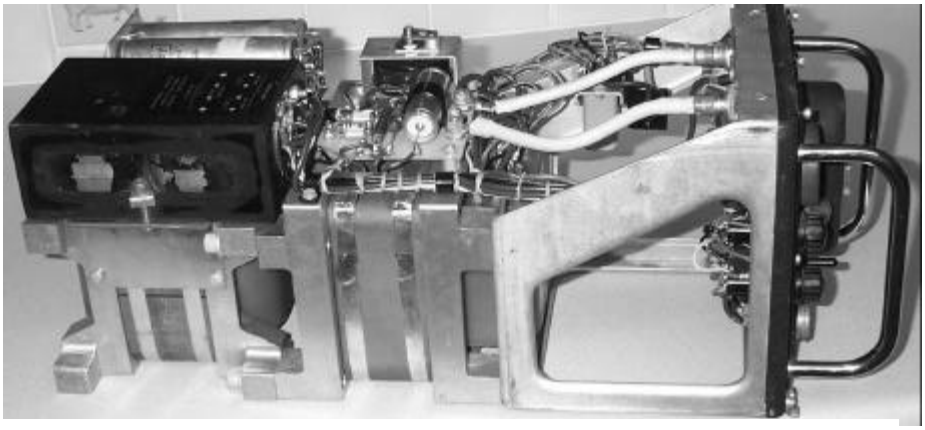

Fig. 2 Shows the substantial construction of the Type 112 PSU

When the switch is pushed over to the 'off' position, its other pole simply shorts out the relay coil causing it to de-energise and disconnect the supply. A dead short across the output would have a similar effect so this arrangement provides a degree of short-circuit protection.
Additionally a pair of small neon regulator type components are connected across the transformer secondary: these glow a faint orange when the unit is running, and give out a very bright blue flash when the unit is switched off, indicating that there is a voltage spike here, and so serve to protect the rectifiers from this. A large 0.1µF 1000 volt capacitor across the primary completes the protection measures.

Testing

The unit I collected was wrapped in a sealed plastic bag, and upon opening the package, appeared to be new and unused, however, opening the case revealed that it had been 'worked on' so before applying power I decided to check it over thoroughly.

The front panel voltmeter is dated 1961, and the electrolytics are dated 1962, with a "reformed in 1975" label attached to them, so I guess it must have been refurbished around this time, sealed and put into storage.

Some of the wiring had been replaced, suggesting that there had been a burn-up, and some of the soldering was not too good: as this is on the mains side of the transformer I re-worked this, and checked around for shorts or leakage from primary to secondary, and primary to earth with a portable appliance tester. These checks being OK I applied the mains via temporary connections to the back of the socket as I haven't got a plug to fit the input connector. Pushing the switch to the 'on' position produced a loud hum and an indication of around 35 volts on the meter. Adjusting the variable resistor produced a very slight change in the voltage but didn't reduce it to 28 (or as I'd hoped 24) volts. I connected two 12 volt 21 watt car bulbs in series across the output: with these connected the voltage could be adjusted between 22 and 35 volts so it seems that the regulation works only if there is some loading on the PSU. To really give it a test I connected it to the power unit of an SCR522, the manual for which states that it draws 22 amps. It coughed a bit as the dynamotor started, but didn't trip off, and once running the voltage came back up to the preset value and remained there during a prolonged test.

Fig. 3 Supply socket, four male pins, outside diameter 30mm

Connectors

Birketts haven't got any of the power connectors and I haven't been able to locate any elsewhere as yet, but as they are of the same pattern as those on Larkspur equipment they should be about somewhere out there. If anyone has any, or knows a source of them I'd be pleased to hear about it. To aid identification photographs of each, seen as looking at the front panel are shown below.

Conclusion

These are a very useful unit for running "mechanical (ie dynamotor or vibrator supplied)" vintage24/28 volt equipment which draws a fairly high current, but I would not recommend that they are used as they are for modern solid state equipment, due to the voltage rise on light load. Some sort of voltage limiter would be required for this application, these are not complex and I will describe one in a future issue.

Incidentally, with the unit open, a lovely smell, reminicent of much vintage gear, fills the shack; I think it is a chemical used to "tropicalise" equipment. Probably carcinogenic, but much nicer than any pot-pourri!

Fig. 4 Output Socket, two female pins, outside diameter 25mm