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Solar Powering IRS micro blocks

The purpose of this document is to give a brief explanation of the means by which the use of solar power can aid the installation of IRS into the smallest apartment blocks. These so-called micro blocks can best be identified as being those blocks that fall into the following categories.

- Blocks of circa 12 homes or less
- Blocks where there is no landlords power
- Blocks where a landlords power supply is cost prohibitive.
- Terraces of houses (strictly speaking not micro blocks)
- Areas of special study or demonstration (green or grid connected areas)

Solar powered IRS is a comparatively new concept made possible now due to several recent developments, most notably the decreasing cost of solar panels, the increased availability of so-called high efficiency encapsulated designs and purpose designed ultra low draw transistor stages now useable in antenna amplifiers (courtesy of the mobile phone industry)

The layout of a Solar Powered IRS is as follows.

The **solar panel** should be orientated due south and at an angle from the vertical (latitude dependant). Incoming power is regulated by a **charge controller,** which feeds a **battery.** The **battery** will now power the **multiband terrestrial amplifier**, which has the dual purpose of combining together the various off-air signals and amplifying them. The signal is then presented to the terrestrial input of a satellite **multiswitch** or **multiswitches** where it will be combined together with the satellite dish signals. At this point the signal strength must be such that it overcomes the passive combination and sub feed cable losses, allowing acceptable signal strength at the user's receiver.
Of particular note is the fact that the active (amplified) satellite stage in the **multiswitch** and the **LNB** (low noise block down converter) fitted to the dish is powered at all times by the individual resident owned satellite receivers.
Our solar powering proposal is based on the need only to power the terrestrial services.

There are two reasons for this, firstly the additional power required to feed the multiswitch satellite amplifiers and the LNB equate to something like 10 times the power needed to supply the terrestrial amplifier alone and secondly, the satellite receivers by design have to control the multiswich and power the LNB and are equipped to do so.

Unfortunately we are unable to 'harness' the satellite receivers power to run our terrestrial amplifier because there may be no satellite users on our micro block and those that are should neither be made responsible for this task nor be able to withhold the power and prevent others from viewing the terrestrial services.

The powering and provision of the 'free to all' terrestrial service as opposed to all other services is an obligation of the landlord.

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Explanation of terms

The **Solar Panel** is an encapsulated silicon material printed across a network of wired cells. As the material is sensitive to a wide frequency of radiated light, both visible and invisible a current is induced into the material when exposed to light. The amount of separate cells and the way in which they are arranged dictates the voltage and capacity of the panel. The type of design dictates the panels' efficiency, which is expressed as a percentage. Care needs to be taken when choosing a panel as a law of diminishing returns apply to the cost. Ultimately the size of the panel will be affected by two crucial factors, firstly the sunshine energy on the ground at the location. This is a measurement of Kilowatt Hours per square metre and will vary across the UK. One can imagine the incoming sunshine strength in Aberdeen will be quite different from that of Penzance. Secondly the incidence of cloud cover likely to afflict your location will differ from say the Lake District to the East Anglian flatlands.

The **Regulator** or **Charge Controller** serves several important functions. Initially it exists to 'chop' the continually varying incoming voltage from the panel to a level where it will not damage the battery. During the hours of darkness we must be sure that the capacity of the battery will not backfeed into the panel and discharge itself and finally it is a desirable function if the device is intelligent enough to detect temperature and vary the charge rate accordingly. Strong consideration needs to be given to the differing ways in which the regulation of the voltage will affect the way in which the battery is recovered from stages of discharge. It is important to match the regulation method to the batteries' preferred recovery pattern. A poorly chosen regulator will impose limitations on the batteries' performance.

The **Battery** exists to support the amplifier at all times, not just during the hours of darkness. It is recharged very quickly on a summers' day. During the summer seasons the battery is float charged.
More importantly the battery exists to support the amplifier during the short low light days of winter. It is under these conditions that the choice of battery is most important. During the winter there will be many days when the solar panel produces little or no energy. The battery will now begin to discharge. We can calculate to what extent this will occur to some extent but the fact remains that ultimately it is the incoming daylight that will dictate the extent the battery will discharge. The depth of discharge (DOD) will dictate the batteries lifetime.
There is a second significant factor at play here and that is temperature. As temperature drops battery capacity is challenged and the batteries efficiency is compromised.
Conflicting circumstances now affect our system. A cloudy mild winter will yield little useable energy from the panel so our battery will discharge more although remains efficient. A clear cold winter will yield more light energy but our battery could be subjected to daily sub zero temperatures especially on a north-facing wall.
Conversely very high summertime temperatures will shorten the batteries life even more. The choice and performance of the battery is probably the most critical aspect of the whole solar proposal. It is the one item that will need to be replaced on a regular basis. The cost of battery replacement and its lifetime estimate are the most difficult to define. Needless to say if one cuts a corner here the consequences are easy to imagine! The service to the residents will stop abruptly, may not restart for hours or days, if at all. Battery specifications may look similar but performance characteristics can vary considerably. Whilst it may be difficult to warrant a battery for 2, 3, 4 or possibly 5 years one could be sure a lower grade unit would only last 50 or 75% of that period.

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Periodic Maintenance and Support

Once installed the solar powered IRS will need occasional maintenance set across a time frame agreeable between the installer and system manager.

- Keep the solar panel clean and clear of bird droppings
- Ensure growing trees are not shading the arc of the sun
- Check battery capacity using instrumentation (not discussed here)
- Check and clean battery terminals
- Always carry a spare battery

In Conclusion

A solar powered IRS micro system is designed to last many years. Because the component parts are solid state their lifetime can be compared to the other items in the IRS. Typically solar panel encapsulations are rated at around 15-20 years at approx 90% of rated output. Mounting frames would last in much the same way as satellite dishes say 10 years +. Charge controllers have a similar failure rate as LNB's say 1 failure per 100 pieces per annum. Batteries will require constant monitoring and a schedule of replacement should be calculated. In areas of concentrated installs, for example a Metropolitan Borough we could decide to install a data logger or similar device at a chosen single installation, using this as our point of reference from which all the systems can be compared. Where a landlord owns blocks throughout parts of or the whole of the UK less overall control and monitoring is possible.
The so-called 'Carbon footprint' of the individually manufactured items or the system design as a whole is not discussed here.

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May 2009

Also see attached schematic.

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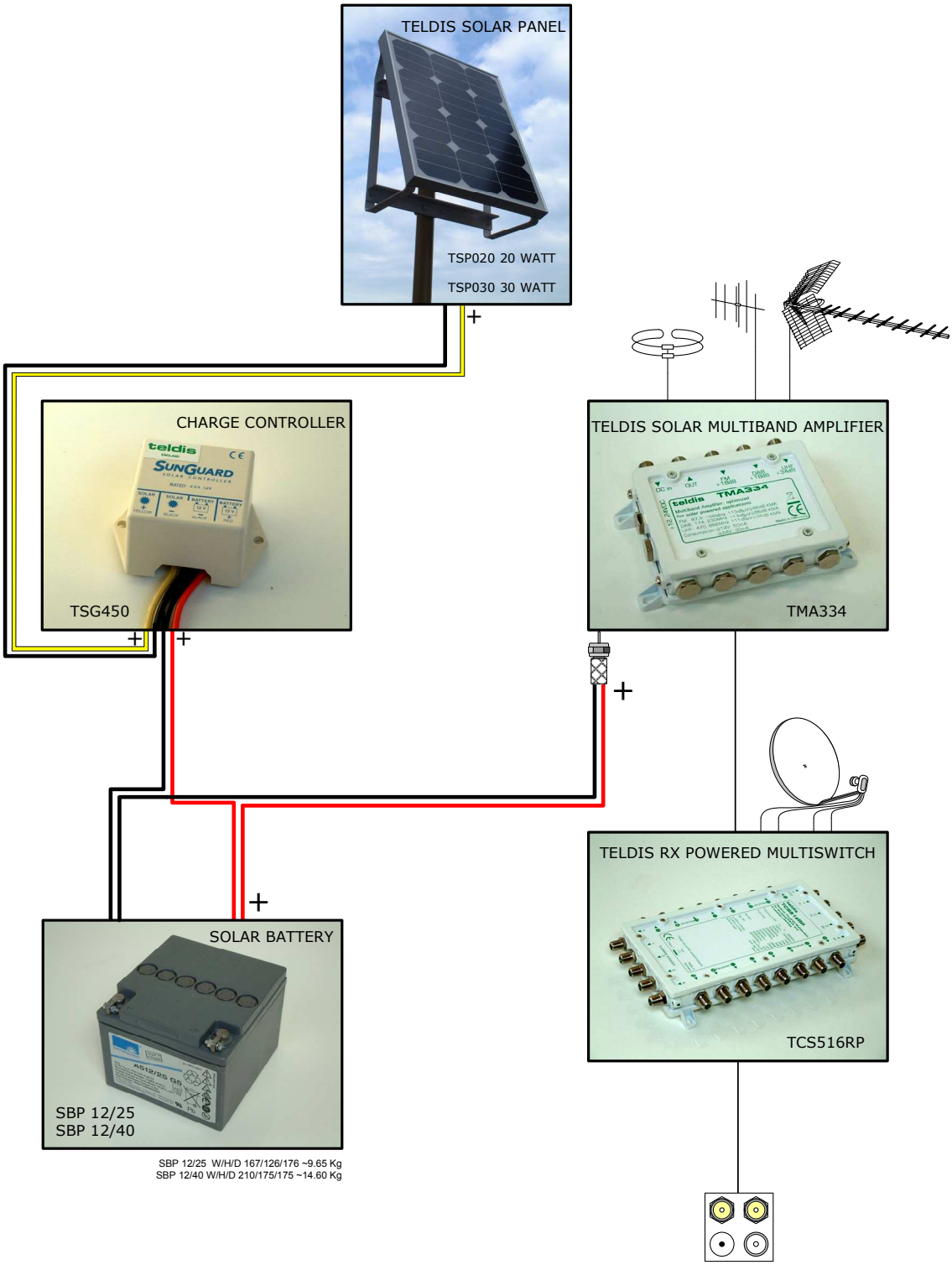

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