Redeveloping A Show Cave

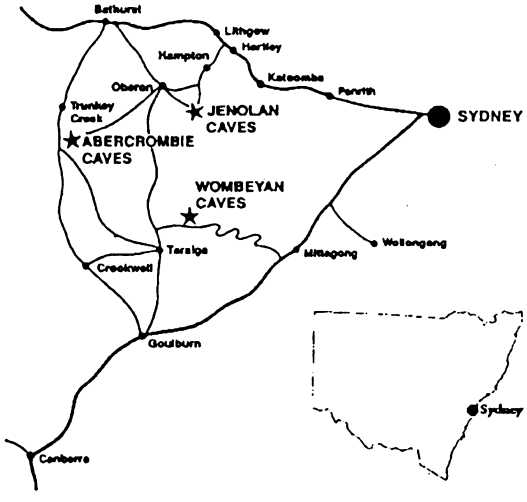
RimPoolArea - Junction Cave

JUNCTION CAVE

by Terry Matts, Junction Cave, Wombeyan Caves , NSW
Administered by the Jenolan Caves Reserve Trust

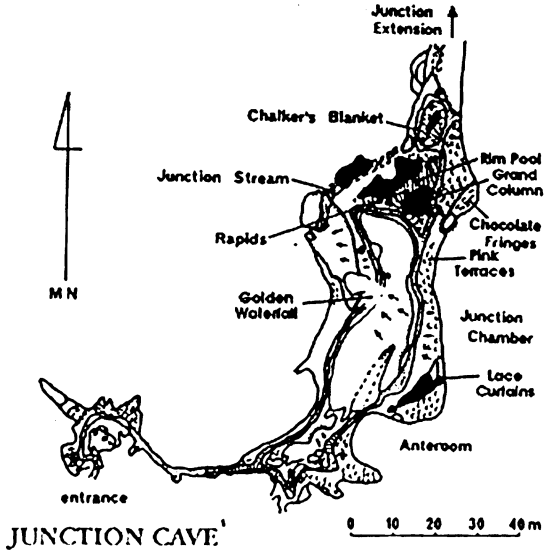
Introduction

Junction Cave is found within the Wombeyan Caves Reserve, north of Goulburn in the Southern Highlands of NSW.



The cave was discovered in 1897 and opened to the public nine years later. The early opening to visitors meant a lack of knowledge about the cave - with no formally made paths. Visitors could walk, stand or climb on any parts of the cave, dirtying much of the formations either by hand or foot.

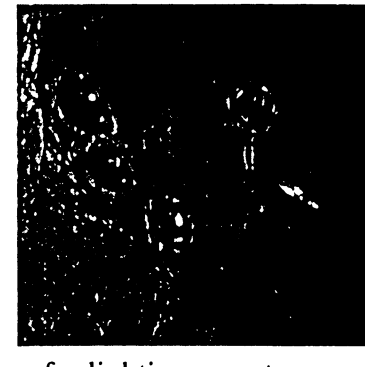
A stream in the cave drains the Wombeyan Valley, a surface area of about thirty-six square kilometres, and also picks up seepage. The cave is the final path of that stream before the water finds its way out to Mares Forest Creek.



JUNCTION CAVE'

The water course, moving through a restriction at the bottom of Junction Chamber, 1m by 400 mm, creates an impedimence causing the system to fill with water, flooding sections of the developed cave. This slow moving and slow draining water, standing for many hours, allows silt and sediment to settle from the water on to the formations. Any flowstone, with water flowing over it as the water recedes, is self-cleaning.

The cave was first lit in 1928, by two diesel power plants in the valley, which produced 415 volts reduced to 110 volts, 55 volts each side. All electrical work complied with the Department of Mining regulations. There was only sufficient power produced to light the pathways. Features still had to be lit with magnesium. Lead sheathed cables were used with knife blade switches. In 1958 power was brought in from the state grid supplying more power and allowing more lights. Cables were replaced with building wire, which has a plastic outer sheath (known as T. P. S. by electricians). Cables were spliced together, soldered, then coated with pitch and covered with PVC tape to seal out the moisture. Features were lit using copper bowls, chrome plated and polished, with 100w globes mounted in them . Wiring was fixed to the walls by drilling a small hole and cementing in a short length of copper wire, which supported the cables. Lights were mounted on steel posts and fixed to the cave wall in the same manner. These installations were clearly visible to the visitor.



The aim of relighting was to conceal as much of the infrastructure as possible, hiding lights, circuit breakers and wiring.

Power

The power enters the cave via a main, going through earth leakage circuit breakers at three points, powering the lights through the C Bus system which controls the lights for five interpreted areas.

All circuit breakers are in moisture resistant boxes, and the use of glands on the wiring, keeps out any condensation or seepage.

To aid with cave aesthetics, cables were placed in as many side passages or under the pathway where possible .

Three differenct voltages were used.

The move from 110 volts to 240 volts provides access to a greater range of electrical accessories such as earth leakage circuit breakers to protect people in the cave, a lightning arrestor to protect the cave electrics. Dicroic globes are available to illuminate the cave with a white light. These items are available over the counter, at any electrical wholesaler.

Transformers are utilised to reduce the voltage to 12 and 24 volts.

One of the advantages of this, is the ability of caves staff to connect or repair defective lights safely without the need for a electrician.

In addition, smaller fittings and globes can be used, which are easier to conceal in fluted shawls and other difficult areas. Reduced diameter wire can also be utilised, which may be colour matched , by using white, grey and black wire, to the cave environment.

A small 12 volt light, with a narrow beam was required to light Chalkers Blanket. The light was mounted on a ledge to the side, some distance away and directed between the Blanket and a shawl-stalactite behind Chalker's Blanket.

As the cave is at the end of the overhead cables, emergency lights have been fitted for safety in the event of a power outage.

The C Bus by Clipsal

(I hear you say, "What is C Bus?")

Clipsal Data Bus Line

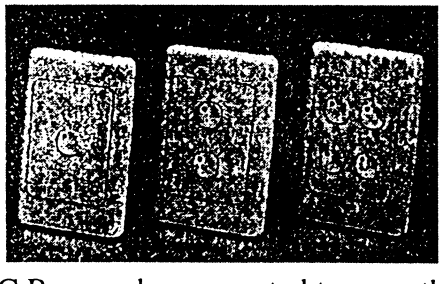
It 's a micro processor, controlled wiring system that uses unshielded telephone cable as its communication medium, which can control lighting, air conditioning, fire detector systems, access control systems, security and other applications in buildings, as well as, in our case, caves.

Each device communicates on the Bus and has its own in-built-micro-processor.

Information comes from Input Units, such as touch pads, remote control units, light level and passive infra-red sensors. Messages are sent via the Bus to the appropriate Output Units such as relays and dimmers. Messages control the loads connected to the Output Units.

We Chose the C Bus system as it has more potential and less control cabling than others. It enhances the visitors' experience as they are less distracted by obvious wiring. One can be face to face answering questions, then use the remote control, switching lights on as desired.

Each guide carries a remote control. This enables staff to control lights without moving to touch pads (key input modules). Touch pads are not needed in the cave, but in the event a remote is lost or becomes inoperable, a guide can continue the tour by using these touch pads.



The C Bus can be connected to any other C Bus items, being easily programmed with a laptop, to dim or switch the lighting system. A main switch at the entrance kills all lights that may have been left on, once a tour is completed.

See abstract 1 & 2.

Lighting

We decided on a new light from Sylvania. Halogen lights are reputed to last longer and fit a standard 120w Outdoor Liteflood from Phillips. Globes that were used, come in 25^{o} flood, 10^{o} spot, 50w, 10^{o} spot and 25^{o} flood 75w. Having a Dicroic reflector gives very good white light without the low voltage problems. Other lights used were 300w and 500w flood lights.

The halogen gives good light for features, while the flood lights are best suited to larger areas.

Thorn's Multibeam Dynaspot transformer light combination12v 50w is only used once in the cave. This lights Chalkers Blanket but suffers problems with moisture.

The 24 volt lights were put to use in confined areas - small fittings, globes and a reduced circumference wire, are ideal for places where the installation is right in the visitors line of sight and needs to be hidden behind small shawls and other delicate places.

Flood light fittings, also known as Flexifloods have been used, mounted on different junction boxes, fitted with glands to give a water resistant seal. Fitting heat resistant tube to the front of the lights stopped any cross glare when looking over or at the lights. To do this agricultural drainage pipe was used, as we were unable to locate any suitable fittings. We had to reduce the diameter ; hold it with cable ties and then force it over the globe. Lights have been positioned so the light will bounce off the walls and features to light the paths.

Repairs and New Pathways

Very little pathway had to be repaired as most of the floors are formed in naturally occurring sediments.

Some new paths and steps were added for safety and some risers were reformed due to wear. Much of the path work was done to stop dirt on the paths finding its way on to any formations. Work in the Rim Pool area included removal of the path in the main Rim Pool and replacing it with a bridge. Aluminium products were used for ease of construction. It was prefabricated in Taralga, manhandled into the cave and assembled on site.

Cleaning

From 1910 little attention was paid to visitor traffic, consequently, there were areas that were covered in mud. The cleaning task here, was a little different to that at Jenolan Caves. The formations at Jenolan become covered with lint from clothing, dust, and mud splashed from visitors shoes.

As this was Junction's first clean, the main problem was the cleaning of areas that had suffered from visitors walking randomly over the cave.

After the electrical work had been completed, cleaning of the Pink Terraces side of the Grand Column was tried first. This area would have been a high traffic area in the candle-lit days, as this was the route to the Wishing Pool area.

Water was pumped up six metres from the stream to a Gernie High Pressure Water Cleaner using a turbo head, then the nozzle, after the turbo head failed.

Starting high and washing down, we were surprised how easily the hand marks and

most of the foot marks were cleaned. The dirt on the flowstone and in the rimpools was found to be sediment from flood waters that had been compacted into the rimpools by the traffic of many feet. This was removed fairly easily with the high pressure cleaner.

Moving into the Rim Pool area (formally known as the Wishing Pool), it was necessary to commence a little higher. The Rim Pool is six metres above the stream, lending this area to being syphoned. The sediment and gravel from the small gaps in the crystal came out with the dirty water. Some upper areas are covered with bat guano , natural to the cave, which we didn't want to disturb. An area of flowstone around this side of the Grand Column was guano stained and broke away in very small pieces when it was cleaned, so cleaning was stopped.

The pathway through the Rim Pool, once removed, left dirt and small stones. Once this was removed and a general clean done, it was apparent that the Rim Pools had been lined with cement. Possibly, it filled with mud in a flood and it was easier to cover it than clean out the mud? Maybe it was to get the coins out easily? Or so it held water longer after rain? No one on the staff at this time has any idea why.

This was the biggest job. A decision had to be made whether to remove the cement or leave it. After a little chiselling (I see you cringe) and much standing and looking, it had to go. By chiselling carefully the cement would come off the pool floor with little or no damage, as a thin layer of mud was under the cement. This helped to protect the pool crystal. The half metre or so that I did, proved it would take a long time. I encouraged (conned) two good friends into having a week off work and spending four "fun-filled" days in the main pool, chiselling small areas, rinsing and syphoning the mud and fine sediment. A 15mm diameter hose with a fitting in the pickup end to stop the hose getting blocked with gravel was utilised. All the cement has not yet been removed. It may be continued later but at this stage it is used as part of the interpretation of the area.

When all the cleaning around the Rim Pool area was completed, the Pool was filled with water, and then siphoned out three times to rinse it. After the rinsing a skull and many bones were found in the crystal under the removed pathway. Completely undamaged it may have been protected by the old path.

While this was taking place, cleaning continued on the main wall of the pool and the area under Chalkers Blanket. This was heavily used by early visitors, to gain a view of the Blanket. Where this flow meets the floor there was an additional area of path, which was found to cover two rim pools; one of these was cracked. Once emptied of rock and dirt, one of the pool walls broke away and is now in need of repair. Bones of a small animal were found under this cleaned area of path. Some other rim pools nearby had been levelled to make the path, which were also cleaned. The path was topped with cement and suspended over the cleaned pools.

Towards the Junction Extension, the area to the left was mainly covered with sediment from floods. This was difficult to clean as the area above it is moon milk. When hit with pressurised water it cleans off the mud splashing the moonmilk and leaving spots. We found that standing well back and letting the mist off the pressure water clean the moonmilk, would remove the spots . Strict attention to the procedure and much patience was required to ensure the moonmilk was not damaged.

Under some of the mud was coral . On some of this, in the crystal were found bat bones, including a skull. The path was dirt. This and a small area under Chalkers Blanket were cemented with a slope to

keep the water on the path, and pipes were placed under the pathway to allow water to continue over the flowstone. Raised edges were added to the original steps, to help keep this area clean.

The Pink Terraces were next. They are located beside the Grand Column steps, extending to the Junction Chamber. About ten metres long and six metres high, only the lower metre or two were cleaned; again, hand and foot marks were removed.

The flowstone and rimpools at the Junction Chamber end, had been well trogged and in fact, had the appearance of a dirt floor. After cleaning, the results were extremely rewarding, with formations returned to near original condition. Additional handrail had to be added to protect this new piece. The edges of the pools are broken and much of this washed away when cleaned. Unfortunately, these pieces were too small to repair.

Putting a thin cement floor from Junction Chamber to the Grand Column steps along the base of the Pink Terraces will stop mud splashing on the wall and flowstone, keeping the path clean into and around the Rim Pool area.

Cleaning the lower Lace Curtains was mainly completed to remove the foot marks and debris left by people fitting lights to the shawls of the curtains in 1960. Lower down, handmarks were removed. The floor below the Lace Curtains is covered in small rimpools. These were full of compressed mud and formed the pathway.

A pathway was added to stop dirt walked in on visitors shoes, from getting into the rimpools. The path was formed over rubble so the water can run under it. If the rubble clogs with crystal, the water can run though polypipe also placed under the path in many places. These rimpools have had three trial spots cleaned. This area will clean very well when time allows. Drainage on the ladder to keep the water on the path will keep this whole area clean.

In the Ante Room, the pump wouldn't lift enough water to the pressure cleaner, which at this point, was sixteen metres above the stream. A trickle of water from the pump hose filled twenty-litre drums which were carried up fifteen steps to the platform, the highest chamber in the cave .

The Ante Room was well walked. After removing rock fragments larger than 20mm in size, the rest had to be washed off. Vacuuming couldn't remove the dirt, as it was well compacted. Pressured water was the only way to remove it and some two hundred drums of water were moved around, supplying the pressure cleaner.

Cleaning started, where dirt and rubble stopped and flowstone began. A path went up into the rubble leading to another section, which is now closed. Cleaning of the Ante Room took some time. So much dirt came out of the flowstone, cleaning was stopped every metre to remove it.

This chamber now has visible flowstone over all the floor area. The paths in and out of the Ante Room as well as walls on either side, were cleaned. An area of stalactites after the ladder out of the Ante Room was washed. Most of these stalactites had been broken and could contain mud. No matter how many times they were washed brown water would run off.

Fences

There was very little fencing, other than at steps and high areas, which were for the protection of visitors. Most of these were either too high or too low. No protection for flowstone on the floor, next to paths was provided. Consequently these areas would still be walked on, if not by visitors then by staff.

The addition of fences around much of the paths, was to stop visitors walking on formations. Replacement of almost all the old fencing was mainly due to rust. The majority of the netting was in good repair but the fittings had rusted. The bottom of the netting wasn't secured well with the netting left touching the pathway, causing it to rust.

Strainers were replaced or added and the netting re-tied. This tidied up the fencing and saved replacement of the wire netting.

Problems We Have Encountered

Possible Environmental Impacts.

The new cable is coated with agents, possibly to assist in manufacture. This coating seems to form a mould when in the cave, making the wire go black. This stands in contrast to the environment, a possible solution may involve washing the cable before use in the cave.

Carrying all the material in, may import life from the outside. Around some of the lights can be found dark spiders in webs usually found outside.

Low voltage lights are not sealed. Corrosion on the pins of the globes may be from the damp air, causing electrolysis.

What are the effects of aluminium on the cave? This should be monitored to prevent any permanent damage to the cave.

Interestingly, the water in the stream has a very high calcite content. This is detrimental to water cleaners, wearing out the turbo nozzle in ten minutes and also lowering the pressure produced by the cleaner. The intake hose quickly became encrusted with calcite, this resulted in the turbo head twice being replaced by Gernie at no cost .

Stopping the cross glare. We used agricultural drainage pipe for a temporary fix. We are still looking for something to do the job.

Some Redevelopment at the Jenolan Caves Reserve

The Diamond Cave, part of the Imperial Cave at Jenolan Caves, is also being redeveloped. This branch has fences at differing heights, enclosing the path. It was also originally lit with 110 volt lights. Both lights and wire were clearly visible.

This section was totally stripped. Only the original path remained. This allowed the frame enclosing the path to be replaced at a standard height, removing a Health and Safety problem. 240 volt globes and fittings, as used in Junction Cave at Wombeyan, switched again with C Bus and infrared remote controls were installed. Wires were run and lights fitted to the frame which was replaced to hold the netting. Plastic fish netting is being trialled, in an attempt to decrease the amount of galvanised wire netting.

If successful, this will reduce the quantity of galvanised products in the caves, which is "*claimed*" to create environmental problems.

The dirt areas beside the pathways have been cemented to assist with future water cleaning programmes.

When all this work was completed, the Diamond Cave was cleaned, prior to being reopened to the public.

Acknowledgements

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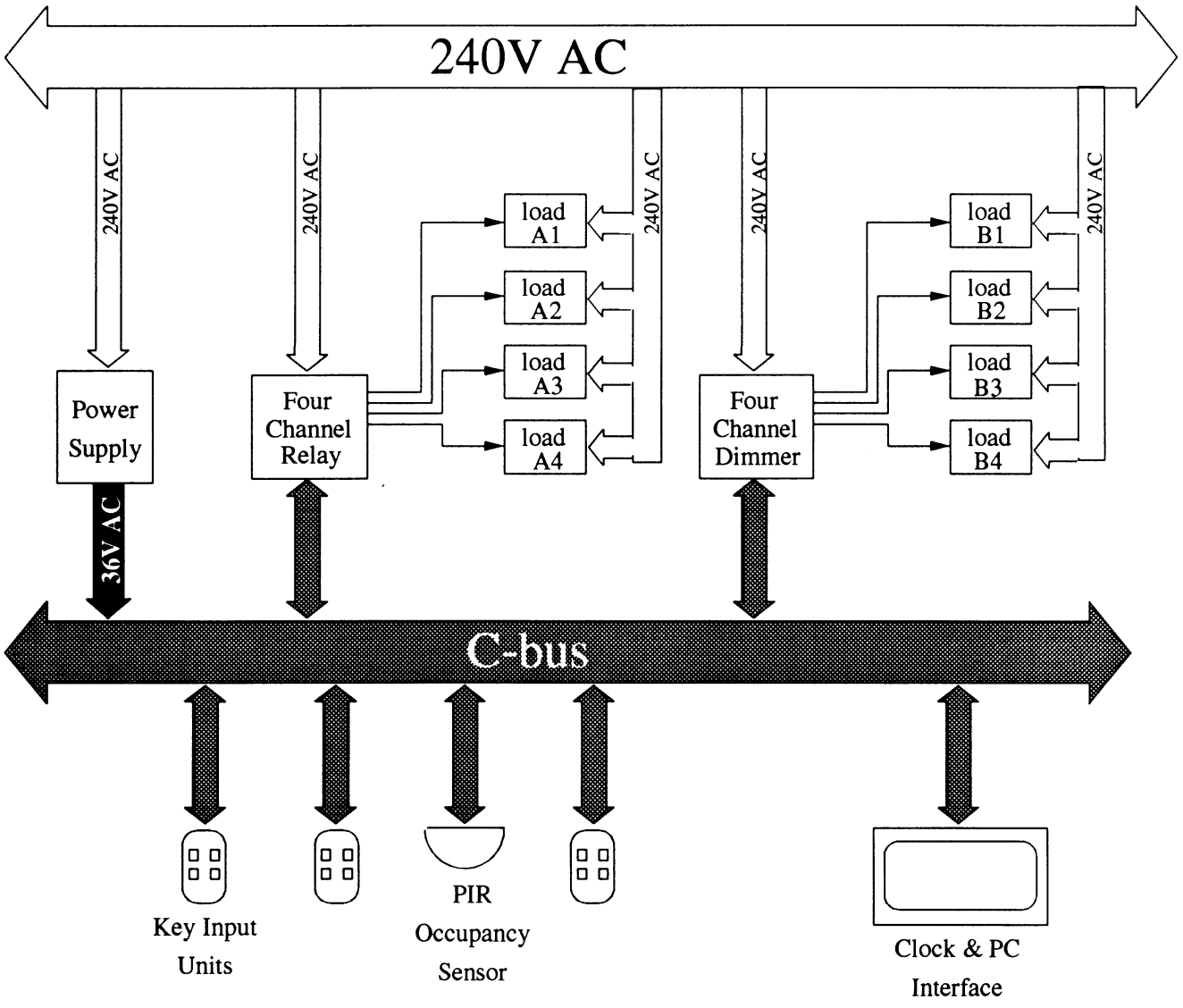
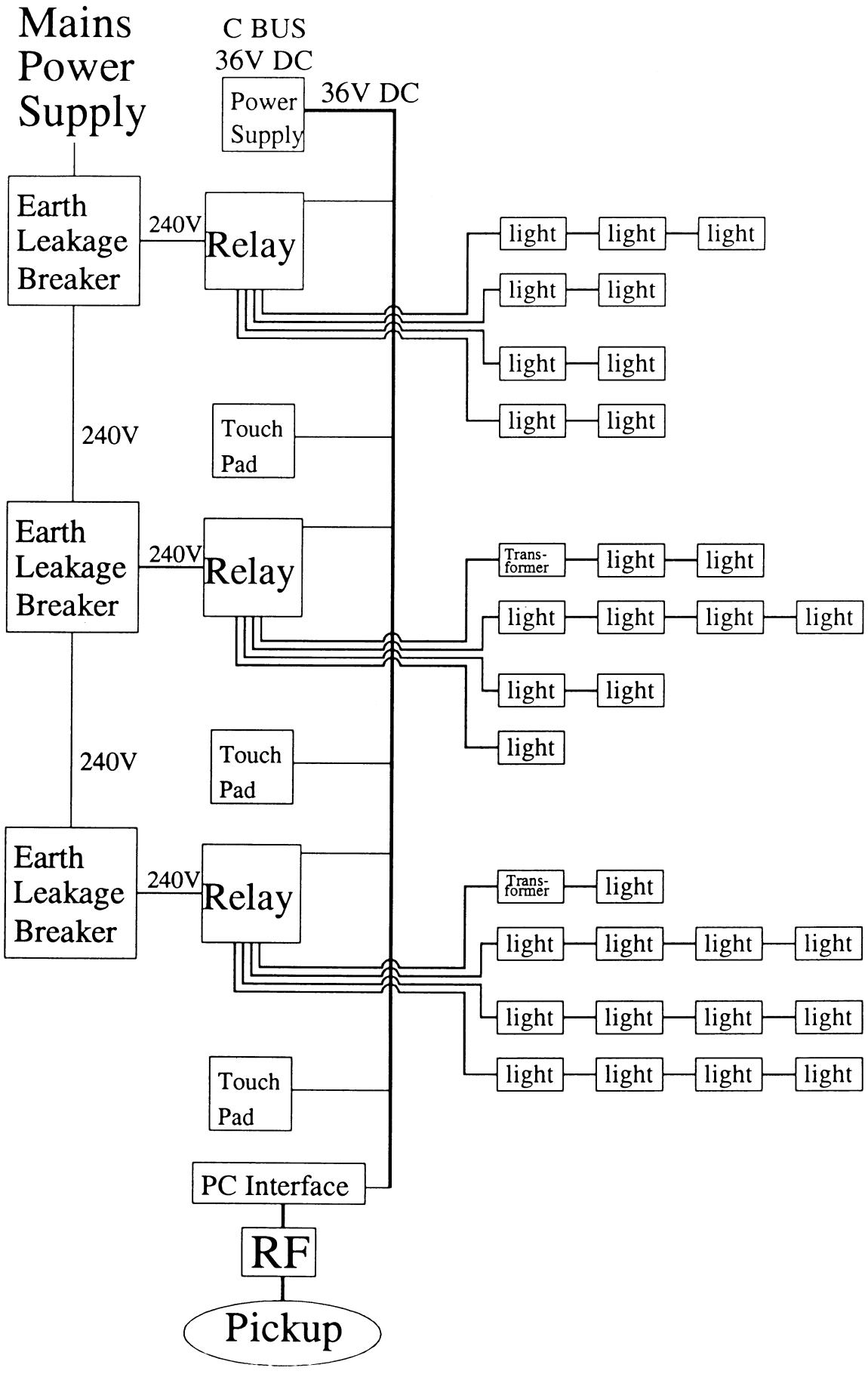
Abstract 1



Schematic Representation of the Components of the C-Bus System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