Oakley Sound Systems

Parts Guide

A guide to buying parts for Oakley Sound projects

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Introduction

This is my generalised parts guide for all of the Oakley Sound projects. It is intended to be a one stop information pack for all UK builders of Oakley equipment, as well as being, I hope, a great help to those customers in other parts of the world. Some of the information presented here is already found in our older 'User Guides'. Those older style 'User Guides' will eventually be phased out and replaced by a project bundle which contains a Builders Guide, the User Manual, a generic Construction Guide and this parts guide. It is hoped that by splitting things up this way we will be able to keep everything far more up to date. I should mention at this point that you should always ensure that you have the most up to date documentation before starting to build your project. We do make small changes to the parts lists from time to time to incorporate improvements and reflect any changes in sourcing components.

The first part of this document will give details about the sort of parts we use in Oakley projects. It is a generalised round up so don't be too alarmed to find that there will be a few things in here that will have nothing to do with the project you are building right now.

The second part contains Rapid and Farnell part numbers for some of our most common parts. However, it is not a complete list of part numbers, nor is it always up to date, although I try to to keep it as current as possible. All suppliers have a habit of changing their part numbers from time to time as they source from one manufacturer to another. Also, some parts simply become obsolete and are no longer available any more. I try and make sure all current circuit boards use easily available parts, and if not, Paul Darlow will normally make them available via the website.

If you do find a problem in getting hold of a part, why not ask for help on either the “Oakley-Synths” Yahoo Group or our new online “Oakley Sound Systems” forum at muffwiggler.com. It is also worthwhile to have a quick search on those sites to see if someone else has asked the very same question before. Please do not contact myself or Paul Darlow directly for help with supplier's part numbers. Honestly, we would love to help but we most often haven't got the time to answer these sorts of questions.

For general information on how to build our modules, including circuit board population, mounting front panel components and making up board interconnects please see our new Construction Guide at www.oakleysound.com/construct.pdf.

Please note that although I have tried to make sure that no errors have occurred in the preparation of this document, I do not accept any liability for any inconvenience or losses of any kind caused by the information presented in this document. If you do find any errors or obsolete information in this or any other of our documentation please do let me know either directly or via the forum or the Yahoo group.

The source file for this document can be found at www.oakleysound.com/parts.odt. This is an OpenOffice format and can be freely edited for your own personal use. If you would like to have your additions put into the official version please feel free to send your annotated version to me. All input will be credited. However, I do reserve the right to edit any new material before putting any new version online.

A Guide to the Parts Used in Oakley Sound Projects

Most of the parts for our projects are easily available from your local parts stockist. I use Rapid Electronics, RS Components, Maplin and Farnell, here in the UK. Rapid are probably the best source of individual parts for UK builders, they are cheap, fast and very rarely make mistakes. Maplin had that honour once but alas have fallen from grace somewhat over the years. They still prove to be useful from time to time though. Farnell are massive and not completely geared up to dealing with the little fellow who only wants to buy the odd component. However, they do have a good online service and are sometimes cheaper than Rapid, especially if you need something in large quantities.

Some complete parts kits are available from the following sources:

Bridechamber (USA) : http://www.bridechamber.com/bridechamber.com/Oakley_Kits.html

Elby Designs (Australia) : http://www.elby-designs.com/oakley/oakley-modular.htm

Resistors

The resistors can be 5% carbon 0.25W types except where stated in the parts lists. However, I recommend that you use 1% 0.25W metal film resistors throughout since these are very cheap nowadays and offer exceptional stability and noise. It also means that the colour codes match up on all your resistors; 5% types have often only four bands while metal film have five band codes, which can cause confusion.

If you do want to use 5% types, to save money perhaps or because you have a bunch of them stashed away, then please note that sometimes a project will specify that some of the resistors **have to** be 1% or better types. Failure to use good quality parts in these locations will affect the performance of your project. These critical parts are indicated in the project's parts list.

Sometimes a specialised resistor is required, for example, the positive temperature coefficient (PTC) resistor we use for temperature scaling on the VCOs and VCFs. Meggitt make a +3000ppm/K type that is a very good part. It is available from Farnell and the part number is found in the lists later in this document. We typically use this with less critical projects like VCFs or the LFO.

For the VCO module and the TM3030 projects I recommend the 1K 1W wirewound resistors with a nominal TC of +3500ppm/K. You can buy these from us, KRL-Bantry in the US, or from Senso's Vintage Planet (www.senso.dds.nl/index.html). These are sold as equivalents to the old Tel Labs Q81 series.

Capacitors

All the electrolytic capacitors (sometimes abbreviated to ‘elect’ in my older parts lists) normally have a maximum working voltage of 35V or 63V. This will be stated in the parts list along with the capacitance which is measured in uF (microfarads). They are standard

electrolytic devices – there is usually no need to get low ESR (impedance) types or extra stable ones unless it is mentioned in the parts list. However, I would say that the more you pay for a capacitor the longer it is likely to last. Capacitors do have a limited lifespan compared to other electronic components but even the cheaper ones should last twenty years.

All the electrolytic capacitors are radially mounted unless it specifically says so. Radially mounted means that they are supplied as little plastic covered cylinders with the leads sticking out of one end. The boards are laid out to accommodate a pitch or lead spacing of 0.2" (5mm), but 0.1" (2.5mm) is the most common type of radial electrolytic capacitor and I use these types all the time. The benefit of using these smaller pitched capacitors is that the device sits just above the board surface allowing the water wash to work very well. Some of the bigger capacitors used in the power supply projects use larger lead spacings. The Compact PSU, for example, uses a 7.5mm lead spacing which gives better physical stability to the larger devices used.

Don't chose too high a working voltage for your capacitors. As stated I typically use 35V and 63V devices, but this is the maximum voltage the capacitor is designed to withstand. It is unlikely that any capacitor in a Oakley module will see greater than 30V across it. The higher the working voltage, for a given value of capacitance, the larger in size the capacitor. So something like a 10uF, 220V capacitor will be too big to fit on the board.

The ceramic capacitors should be 'low-K' ceramic plates. These are sometimes called C0G or NP0 types. The lead spacing is always 0.2" or 5mm on my boards. Some suppliers will only sell 0.1" types but it is near impossible to make a 0.1" device fit into a 0.2" hole without breaking it, so do try to get the right size. Do not use cheap and nasty ceramic disk types, usually labelled as 'high-K', obtainable from some suppliers and surplus places. These can lead to a noisy audio output.

There are such things as dipped multilayer ceramics that could be used in place of the low-K ceramic plates. I have little experience with these at the moment, but they look good on paper.

Most PCBs require 50V or 63V 100nF axial ceramics for the power supply decoupling. These are good components with an excellent performance. The PCB legend for these devices features a lead spacing of 0.3" (7.5mm). Various types of axial ceramics exist, each one having a different dielectric. There are the more expensive C0G types from Farnell, but the other cheaper types with Y5V and X7R dielectrics are perfectly good enough for this application.

I also use metallised polyester film capacitors in my designs. These come in little plastic, usually yellow but sometimes red or blue, boxes with short legs that stick out of the bottom. The ones we need have a pitch spacing of 5mm (0.2"). Try to get ones with operating voltages of 50V, 63V or 100V. Anything much higher than that will probably be too physically large. Again, it should be possible to use dipped multilayer ceramics in place of the polyesters but I have little experience with these devices.

Integrated Circuits

All ICs are dual in line (DIL or DIP) packages. These are generally, but not always, suffixed with a CP or a CN in their part numbers. These are the traditionally shaped silicon chips that

most of us, of a certain age, are familiar with. They are typically 0.3” across and have pins, spaced at 0.1”, running down each of the long sides.

Do not use SMD, SM or surface mount packages with our boards. They are a completely different size and they don't have pins that will go through the board. Check very carefully that the chips you are buying are 'through hole' devices. Rapid mark their parts with a SMD if they are surface mount. However, it hasn't always stopped me buying the little blighters by accident.

We use a variety of different ICs in our projects. These are our most common:

The TL072CP dual op-amp is probably the most used of any IC in our whole range of modules. Various manufacturers make it and it is available virtually everywhere.

The DG403 is an analogue switch. A variety of companies make this part, although Vishay-Siliconix is probably the most common version. The part you need is DG403DJ. We use this part on our Discontinuity, VC-LFO and Little-LFO modules.

The 4558 dual bipolar op-amp is chosen for its latch up free behaviour and its increased output current capability. We use it in a few modules and it's a popular audio chip, but I would not recommend its use in all places where you need a dual op-amp. In the UK, Farnell and RS sell the little chap for peanuts. Various manufactures make the device, eg. MC4558CN and RC4558P.

The LM13700N is a dual operational transconductance amplifier. It is sometimes not found in the op-amp section of your parts catalogue but listed as a ‘special’ or under ‘OTA’. The LM13700 can be substituted with the LM13600 (still available from JRC although not commonly in the UK) or the now defunct NE5517 with no loss of performance.

The THAT2180LC is used in our voltage controlled cores in our ADSRs. Their transistor arrays, THAT300P, 320P and 340P, are used in many of our modules. THAT parts are available from ourselves, Farnell or direct from the manufacturer's main distributor www.profusionplc.com.

Transistors

The BC550 and BC560 devices are discrete low noise NPN and PNP transistors respectively. They are 'European' types and are found easily within the UK. Farnell sell them at a good price. Quite often you see an A, B or C suffix used in their full part name, eg. BC550C. This letter depicts the gain or grade of the transistor (actually hfe range of the device). Oakley modules are designed to work with any grade device unless stated specifically in the parts list.

A BC550 can be substituted with a BC549 of any grade, also very common. Like wise the BC560 can be substituted with a BC559. The only real difference between a BC550 and BC549 is the maximum operating voltage, Vce(max). Both devices have a Vce(max) that is greater than anything they will see in any Oakley module.

I use typically use only one JFET and that is the J201. This is available from Farnell. However, in the VCO I use the J112 which is available at both Rapid and Farnell. Apparently it is made with the same FET die as the MiniMoog's E112. But take note, the E112 has a different pin out so shouldn't be used.

Diodes

The standard signal diode is the 1N4148. This is a very common part and is available pretty much everywhere. Alternatively you can use the 1N914 or 1N4448. The 1N4148 is an axial component which means it is like a resistor in that the device is housed in a small cylindrical container with the leads sticking out each end.

The most common power diode I use is the 1N4002. However, you can also use the 1N4003 or 1N4004. In most cases it should also be fine to use the 1N4001, but in the power supplies I would recommend the 1N4002 because of its higher voltage capability. You can get them with different lead diameters too, but it does not matter which one you get for Oakley projects.

Zener diodes are sometimes used in Oakley projects. These are different than ordinary diodes and should not be used in place of them. The ones I use are 500mW types with axial leads. At first glance they look identical to 1N4148 signal diodes but they will have their reverse voltage rating written in small print on their sides.

Light Emitting Diodes

These are a standard part and available in most places. The biggest problem is choosing the right one from the bewildering array of parts on offer from the suppliers. Generally speaking buy the cheapest ones they sell and you'll probably get it right.

Some LEDs can be bought with internal series resistor. These types normally have an operating voltage specified like 5V, 12V or 15V. You do not want these types. Instead get the ones with operating voltages that vary from 1.8V to 2.4V as these have no internal resistor.

Some of my modules use bi-colour LEDs. These have two different coloured LEDs in one clear or diffused package. Do not get tri-colour types as an alternative to bi-colour ones; these have three legs not two, and cannot be made to work in my circuits. For the bi-colour LEDs I prefer to use ‘red-green’ types, although other colours are available.

Only one module, the later issue VC-LFO, uses a tri-colour LED. As stated above these have three legs not two and both LEDs can be lit simultaneously to create varying colours. A bi-colour LED cannot be used in place of a tri-colour LED. Again I prefer to use ‘red-green’ types, although other colours are available.

The 5U modules when they have need for an LED use 5mm round dome types. The Schaeffer panels assume that you will be using these with a mounting lens clip. The LED clips I use I get from Rapid which are described as '5mm standard lenses'. They stick out proud of the front panel and hold the LED very firmly. Red LEDs should use a red clip, green LEDs should use a

green clip and so on. For bi-colour and tri-colour LEDs, it is best to get an uncoloured or clear lens.

Maplin also sell LED clips under the name LED Covers or cliplites. They're not as cheap as Rapid but they do sell green ones which Rapid do not at the moment. Make sure you get the 5mm ones.

The 3U, Filtrex and TM3030 use 3mm LEDs. These are usually mounted direct to the board. They normally require no LED clip to hold them in place.

Pots

The board mounted pots for most of the current range of 5U modules are Spectrol 248 conductive plastic types or the newer BI TT equivalents. Either type is held onto the board with specially made Oakley pot brackets. Only we sell these pot brackets. You also need an extra pot nut for every pot that uses a pot bracket and these are provided with the ‘pot bracket kit’.

Some modules use off-board mounted pots. These are simply bolted onto the front panel and wired to the circuit board with flying wires. You don't need a pot bracket for these pots, although it does help if you have our specially made 'pot chips'. These are little circuit boards that you solder an individual pot to and allows any wiring to be easily attached to the pot. We are able to supply 'pot chip' PCBs.

In the UK, Farnell, CPC and Rapid Electronics sell the Spectrol pots. Rapid sell the TT pots but they seem to be pretty poor at keeping good stock of them.

Paul Darlow sells Vishay and TT pot kits for all the Oakley projects that need them.

The 3U and newer 5U modules use Alpha or ALPS 16mm carbon potentiometers. These are very much an industry standard part and are used in all sorts of gear, including most of the Doepfer and Analogue Systems modulars. These are also attached to the PCB with pot brackets. These are different to the Vishay/TT pot brackets in that they have a larger footprint and smaller mounting hole. The brackets are also considerably cheaper since they are a stock part from Omeg Ltd. They are supplied as part of the pot kits that we sell, but we can sell them individually as well on request.

Now this is where it gets complicated. Even if you buy 16mm Alpha or ALPS pots you still need to make sure you have the correct pot shaft. It is the shaft that the knob will fit onto. They come in three basic types; splined, round, and D-shaft. The knobs you will need to buy should then fit onto the shaft you have chosen. The D-shaft types are probably not going to be easy to find although they are the most common in commercial mass produced applications. The most likely one you will see from the parts suppliers is the 6mm diameter splined shaft which work with low cost push fit knobs. The shaft is split down the middle so that the natural springiness of the metal holds the knob in place. Round types have perfectly smooth cylindrical shafts and tend to be found on the ALPS pots you can buy. However, you need to use the more expensive grub screw or collet knobs on these.

Grub screw knobs can be used with splined shafts. However, you have to be very careful that you don't overtighten the screw other wise the shaft can become distorted. I haven't found this to be a problem on the modular synthesiser projects. On these modules the grub screw tends to line up with the split in the splined shaft and thus makes a good contact with both halves of the shaft. However, on our rack modules this is not the case as the board sits horizontally so the grub screw will push onto one half of the shaft only. It is better to use push on knobs with our standalone rack projects.

Now just to make things really annoying, the shaft length also varies with vendor. In most cases a longer shaft can be simply cut down with a hack saw to the smaller lengths. It is a good idea to then use a file to round off any sharp edges though.

In the UK, Rapid sell the most of the Alpha pots we need at a very good price. However, the Rapid pots have long shafts that need to be cut down if you want to use their excellent 'soft touch' knobs for splined shafts.

Banzai are in Germany, but deliver worldwide, also sell Alpha pots. These come with a nice short shaft, so they don't need cutting down. Banzai also sell stereo (also called dual gang) pots which we use on some modules. However, currently Banzai do not sell 1M log 16mm pots for PCB mount.

In the parts list the you may find that the value of some of the pots are 50K. You may find that your supplier cannot sell this value, but instead offers 47K. This is perfectly fine as either value will do. Indeed, when you measure the track resistance of most commercial grade pots you will normally find it to be out as much as 10% from the stated value.

One last thing to mention about the far eastern pots is that they use a different nomenclature compared to European designs. Like most engineers in the UK I call a linear taper pot A-type and a logarithmic taper pot B-type. The Alpha pots, like the original ALPS pots, are the opposite way around. A is 'audio' or log taper, and B is linear.

Trimmers

When I was a kid the standard term for this device was preset, but I think trimmer is pretty much universal now.

I use three basic types in Oakley projects, the multiturn cermet, the standard horizontal and the 6mm horizontal.

The multiturn trimmers are the ones that have the adjustment on the top of the box. Spectrol and Bourns make these. Some types are 20 turns, while others are 25 turns. Either will do. They should have three pins that are in a line at 0.1” pitch. I generally use the Bourns 3296 series.

The standard horizontal types are traditional sealed carbon units. These are adjusted from the top and, as such, are called horizontally mounted or vertically adjusted. Piher and other companies make suitable types. Lead spacing is 0.2” for the track ends, and the wiper is 0.4” away. Rapid, Farnell and RS sell these parts at reasonable cost. You can use the more

expensive cermet types that fit this footprint if you wish, but stability is not critical for any Oakley application that uses these trimmers.

The 6mm trimmers I specify are sealed, or semi-sealed, carbon units with a smaller footprint than the traditional horizontal types. Like the others they are adjusted from the top and, as such, are called horizontally mounted types. Spectrol, Bourns and other companies make their own versions of this popular size. Lead spacing is 0.2" for the track ends, and the wiper is 0.2" away. Rapid, Farnell and Maplin sell these parts at reasonable cost. You can again use the more expensive cermet types if you wish but stability is not critical those projects using these types of trimmers.

Switches

What type of switch is very much up to you on most of the 5U modules. The switches are not attached to the PCB so can be any sort for the most part. The ones we use are the Series 5000 by APEM in France, and have a flat toggle. Farnell sell them and their part numbers can be found at the rear of this guide.

The 3U modules use a horizontally mounted switch that goes from side to side as you look at board when it's laid flat on your workbench. Both Farnell and Rapid sell versions of this switch. However, I prefer the ones with a metal bush over the red plastic ones because they look nicer.

The Filtrex and TM3030 use the same type of switches as the 3U modules but this time they work so the toggle goes up and down when the board is laid flat. Again, the switches are available with either metal or plastic bushes. I prefer the metal ones simply for aesthetics.

PCB mounted switches as used on the 3U modules and the rack projects are very much preferred over wired types. It keeps the module together when it is not in the front panel and reduces the chances of wiring errors.

Ferrite Beads

Most boards are fitted with leaded ferrite beads, usually labelled L1 and L2 on the circuit diagrams. These are little axial components that look like little blackened resistors. They are available from most of the mail order suppliers including Rapid and Farnell. Find them in the EMC or Inductor section of the catalogues.

Heatsinks

The ones found on the Compact PSU and Orbital project are the dual vaned TV35 from Aavid Thermalloy. These are actually built to take up to two TO-220 devices but we use them for one device each. They are rated at 7.2 deg C/W. Rapid sell them in the UK.

The TO-220 clip on heatsinks for the Filtrex can bought from a variety of places. I rather like the little 21 deg C/W ones by Fischer Electronik. Their part number is FK237 SA220 O. Farnell sell them.

Jumper Interconnects

The multiway jumper interconnects are used on projects that use more than one circuit board. They are used to transport signals from one board in the module to another. They are a one piece assembly bought ready made from several places including Rapid. These come as pre-stripped and often pre-tinned with solder too. Make sure you get the 0.1" (2.54mm) pitch variety and most projects need ones no longer than 80 mm.

Quite often you will need 4 or 6 way interconnects. Sometimes it is easier to buy larger ways, like an 8-way one, and cut them down to width.

0.1" interconnects

For the flexible 0.1" (2.54mm) interconnections between the various boards within a module I use the either the 26 awg MTA parts, or Molex KK or their equivalents.

The MTA parts are made by Amp, now part of the massive Tyco empire. To use these effectively you need a special insertion tool to poke the wires into the special 'housings'. The housing contains specially shaped contacts that cut through the insulation of the wire so you don't need to do any stripping. Just simply push down on the wire with the tool to lock it into place in the housing.

The Molex KK strip and crimp systems are actually cheaper although perhaps not quite as neat or as quick to use. These use simple plastic housings that hold the individual crimps. The crimps are normally bought in reels but some places sell them individually. The crimpers, that attach your wire to the crimp, can be quite expensive if you don't shop around. However, they are not nearly as expensive at the MTA insertion tool.

There is a lot more information about these parts in our Construction Guide.

Sockets

We use the Switchcraft 112A 1/4" sockets in all of our ready made 5U modules. These excellent parts are also used on the Moog and MOTM modulars. The version you need to fit in the socket board is the 112APC. This part is stocked by most suppliers. The PC part of the name means 'printed circuit' mounting. Both Rapid and Farnell sell them at a reasonable price.

Rapid also sell a Far Eastern clone of the 112APC part that is considerably cheaper, but doesn't look as nice. Please note that the standard 112A will not into our socket boards as it has solder tags. However, the 112A is a great socket for hand wired modules.

Tony Allgood at Oakley Sound

Cumbria, UK

Preferred Parts Numbers for UK buyers

Part Name	Rapid Electronics	Farnell
Resistors		
1K +3000ppm/K		1174306
22R	62-0724	
75R	62-0752	
100R	62-0762	
150R	62-0767	
330R	62-0792	
1K	62-0824	
2K2	62-0847	
2K7	62-0852	
4K7	62-0862	
5K1	62-0864	
6K2	62-0872	
6K8	62-0874	
10K	62-0897	
10K 0.1% (singles)	63-1448	
11K	62-0902	
12K	62-0904	
19K6 0.1% (singles)	63-1506	
20K 0.1% (singles)	63-1508	
22K	62-0922	
27K	62-0927	
30K	62-0932	
33K	62-0934	
47K	62-0942	
51K	62-0944	
56K	62-0947	
68K	62-0952	
75K	62-0954	
100K	62-0964	
100K 0.1% (singles)	63-1658	
200K 0.1% (singles)	63-1718	
220K	62-0984	
470K	62-0997	
560K	62-1002	
680K	62-1004	
10M		336-907
100K x 4 sil pack	63-0280	
100K x 8 sil pack	63-0245	

Capacitors

100nF axial ceramic	08-0240	108-993
33pF ceramic 2.5mm	08-0930	
470pF ceramic 2.5mm	08-0955	
4p7 ceramic 5mm		303-379
10pF ceramic 5mm	08-0920	
18pF ceramic 5mm		303-446
22pF ceramic 5mm	08-1218	
33pF ceramic 5mm	08-1222	303-471
47pF ceramic 5mm	08-1224	
150pF ceramic 5mm	08-1236	
100pF ceramic 5mm		1138907
220pF ceramic 5mm	08-1240	
330pF ceramic 5mm	08-1244	
470pF ceramic 5mm	08-1246	303-604
1nF polyester	10-3240	146-072
1n5 polyester	10-3242	
2n2 polyester	10-3244	
3n3 polyester	10-3246	
4n7 polyester	10-3248 or 10-1940	9752935
10nF polyester	10-2204 or 10-1950	577-698
15nF polyester	10-3252	
22nF polyester	10-2208	577-716
33nF polyester	10-3256	
68nF polyester		1669197
100nF polyester	10-3260	
150nF polyester	10-3262	
220nF polyester	10-3264	
330nF polyester	10-3266	
470nF polyester	10-3268	
680nF polyester	10-3270	3018702
1uF polyester	10-3272	
1u5 polyester		3347370
2u2 polyester	10-2200	
1nF polyprop	10-1430	
6n8 polyprop	10-1455	
10nF polyprop	10-1460	
1nF 1% polystyrene		9520236
2.2nF 1% polystyrene		9520244
10nF 1% polystyrene		9520830

1u0 elect	11-1280	
2u2 elect	11-1285	
4u7 elect	11-1290	
10u elect	11-1220	
22u elect	11-1225	
47u elect	11-1230	
1000uF 35V radial elect	11-0760	

3mm LEDs

Green	55-0105	
Red	55-0150	
Yellow	55-0110	
Bi-colour red/green	56-0600	

5mm LEDs

Green	56-0120	
Red	56-0155	
Yellow	56-0125	
Orange	55-0124	1142516
Bicolour	55-0172	
Tr-colour	56-0685	

Discrete Semiconductors

BC182L	81-0034	
BC212L	81-0044	
BC549C	81-0440	
BC550		3163246
BC559C	81-0442	
BC560C		1467886
J201		1017715
J112	47-0366	1017712
BAT-42	47-3102	9801430
1N4148	47-3308	
5V1 zener	47-3014	
5V6 zener	47-3016	
8V2 zener	47-3024	
10V zener	47-3028	
12V zener	47-3032	

Integrated Semiconductors (ICs)

723	47-3336	
1458		9486852 or 1103044
2903	82-0842	404-410
4001	83-0316	
4016	83-0338	
4050	83-0382	
4051	83-0384	
4052	83-0386	
4066	83-0392	
4093	83-0420	
4104		385890
4558		1106010
6N137	58-0640	
6N139	58-0602	
74HC04	83-0042	
78L05	47-3278	9489444
7812		9490280
7815	47-3295	
79L05	47-3284	
7915	47-3301	
AD712	82-0454	9604898
DG403DJ		1077116
LF398		9487140
LF412	82-5048	
LM311	82-0208	
LM358 (replaces AN6562)		1459520
LM13700	82-5038	
LM329DZ		9488510
LM336Z-5		9488502
LT1013CP		1470376
OP275GP		9603760
OPA2277 (see also LT1013)		1459562
REF-02	82-0004	
SSM2210P		9605088
SSM2220		9605096
THAT300P		1354175
THAT2180LC		1354168
TL072	82-0050	
TL074	82-0054	

Pots

10K lin SP248	68-1278	9609547
25K lin SP248	68-1280	9609555
50K lin SP248	68-1282	9609563
100K lin SP248	68-1284	9609571

50K lin SP249		9609369
10K log SP	68-1292	9609580
50K log SP	68-1294	9609598
100K log SP		9609601
10K dual lin SP		8557322
Spectrol/Vishay nuts		1213371
47K lin Alpha 16mm	65-0725	
1M log Alpha 16mm	65-0845	

Trimmers

1K m/t cermet	68-0315	
2K m/t cermet	68-0320	
10K m/t cermet	68-0330	
20K m/t cermet	68-0335	
100K m/t cermet	68-0345	
50K m/t cermet	68-0340	9353305
1M m/t cermet	68-0360	
500R 6mm cermet	67-0432	
1K 6mm cermet	67-0434	
20K 6mm cermet	67-0442	
50K 6mm cermet	67-0444	
100K 6mm cermet	67-0446	
1K horiz	67-0215	
2K2 horiz	67-0220	
10K horiz	67-0230	
22K horiz	67-0235	
47K horiz	67-0240	
100K horiz	67-0245	614-713
470K horiz	67-0255	
1M horiz	67-0260	

IC Sockets

8-pin	22-1720
14-pin	22-1721
16-pin	22-1722
18-pin	22-1723
28-pin skinny (for PIC)	22-1726

Heatsinks

TV35 7.2 degC/W	36-0196	
TO-220 clip on (Filtrex)		4621141

Interconnects

4-way terminal block	21-0116	
8-way jumper wire	22-1655	
12-way jumper wire	22-1665	
2-way jumpers	22-0692	
4 way 0.156” MTA hdr		589068
4 way 0.156” MTA cover		589007
4 way 0.156” MTA hsg		1098723
2 way 0.1” MTA hdr		588570
3-way 0.1” MTA hdr		588581
4-way 0.1” MTA hdr		588593
5-way 0.1” MTA hdr		588600
6-way 0.1” MTA hdr		588611
2-way 0.1” MTA hsg		1098459
3-way 0.1” MTA hsg		1098438
4-way 0.1” MTA hsg		1098455
5-way 0.1” MTA hsg		1098439
6-way 0.1” MTA hsg		1098456
0.1” 2-way MLX hdr	22-0838	
0.1” 3-way MLX hdr	22-0840	
0.1” 4-way MLX hdr	22-0842	
0.1” 5-way MLX hdr	22-0844	
0.1” 6-way MLX hdr	22-0846	
0.1” 8-way MLX hdr	22-0848	
0.1” 2-way MLX hsg	22-0820	
0.1” 3-way MLX hsg	22-0822	
0.1” 4-way MLX hsg	22-0824	
0.1” 5-way MLX hsg	22-0826	
0.1” 6-way MLX hsg	22-0828	
0.1” 8-way MLX hsg	22-0830	
Cable ties (pack of 100)	04-0631	

Sockets & Plugs

1/4” 112APC socket	20-1430	1192839
1/4” Chinese Neutrik plug	20-2183	
5-pin socket (midi)	20-0314	

Miscellaneous

Ferrites	26-4860	9526820
4MHz Xtal	90-1074	1368786

Switches

SPDT toggle (on-on)		1082301
SPDT toggle (on-off-on)		1082308
DPDP toggle (on-on)		1082315
SPDT PCB mount on-on		9473297 (TM3030 & Filtrex)
SPDT PCB mount on-off-on		9473300 (Filtrex)
DPDT PCB mount on-on		9473270 (3U modules)
DIL SW (4-way)	80-0304	9471570

Power

Cable grommet	04-0275