

HeyPhone Parts List – Issued 22nd February 2003

Individual Parts List

Resistors (see note 1)

Component ID	Board	Grid Reference(s)	Value	Comments
R1	Receiver	Rx-A2	15k, Type 16	
R2	Receiver	Rx-A3	15k, Type 16	
R3	Receiver	Rx-B3	270, Type 16	
R4	Receiver	Rx-B2	100, Type 16	
R5	Receiver	Rx-B3	100k, Type 16	
R6	Receiver	Rx-B3	5k6, Type 16	
R7	Receiver	Rx-C3	5k6, Type 16	
R8	Receiver	Rx-D1	1k5, Type 16	
R9	Receiver	Rx-D2	1k5, Type 16	
R10	Receiver	Rx-D4	1k5, Type 16	
R11	Receiver	Rx-D5	1k5, Type 16	
R12	Receiver	Rx-D2	10k, Type 16	
R13	Receiver	Rx-D2	1k, Type 16	
R14	Receiver	Rx-D3	1k, Type 16	
R15	Receiver	Rx-D3	10k, Type 16	
R16	Receiver	Rx-D5	10k, Type 16	
R17	Receiver	Rx-D5	1k, Type 16	
R18	Receiver	Rx-D5	1k, Type 16	
R19	Receiver	Rx-D6	10k, Type 16	
R20	Receiver	Rx-E2	10k, Type 16	
R21	Receiver	Rx-E1	15k, Type 16	
R22	Receiver	Rx-E1	20k, Type 12	
R23	Receiver	Rx-E3	8k2, Type 16	
R24	Receiver	Rx-E4	10k, Type 16	
R25	Receiver	Rx-E4	15k, Type 16	
R26	Receiver	Rx-E4	20k, Type 12	
R27	Receiver	Rx-E5	8k2, Type 16	
R28	Receiver	Rx-F1	430k, Type 12	
R29	Receiver	Rx-F2	56k, Type 16	
R30	Receiver	Rx-F2	1k5, Type 16	
R31	Receiver	Rx-F2	330k, Type 16	
R32	Receiver	Rx-F3	220k, Type 16	
R33	Receiver	Rx-F3	220k, Type 16	
R34	Receiver	Rx-F4	110k, Type 12	
R35	Receiver	Rx-F4	15k, Type 16	
R36	Receiver	Rx-F5	18k, Type 16	
R37	Receiver	Rx-F5	180k, Type 16	
R38	Receiver	Rx-F2	47k, Type 16	
R39	Receiver	Rx-F5	47k, Type 16	
R40	Receiver	Rx-G3	47k, Type 16	
R41	Receiver	Rx-F3	15k, Type 16	
R42	Receiver	Rx-G3	6k8, Type 16	
R43	Receiver	Rx-H3	6k8, Type 16	
R44	Receiver	Rx-H3	6k8, Type 16	
R45	Receiver	Rx-H2	13k, Type 12	
R46	Receiver	Rx-H3	6k8, Type 16	
R47	Receiver	Rx-J3	8k2, Type 16	
R48	Receiver	Rx-J3	8k2, Type 16	
R49	Receiver	Rx-G4	10k, Type 16	
R50	Receiver	Rx-G5	470k, Type 16	
R51	Receiver	Rx-H5	100k, Type 16	
R52	Receiver	Rx-H5	470k, Type 16	
R53	Receiver	Rx-G6	10k, Type 16	

R54	Receiver	Rx-H6	1M, Type 16	
R55	Top Panel	Rx-H4, Gen-G4	5k6, Type 16	Wired to pins of SW1b
R56	Top Panel	Rx-H4, Gen-H3	2k2, Type 16	Wired to pins of SW1b
R57	Top Panel	Rx-H4, Gen-H4	1k, Type 16	Wired to pins of SW1b
R58	Top Panel	Rx-H5, Gen-H4	470, Type 16	Wired to pins of SW1b
R59	Top Panel	Rx-H5, Gen-H5	270, Type 16	Wired to pins of SW1b
R60	Top Panel	Rx-H6, Gen-H6	220, Type 16	Wired to pins of SW1b
R61				ID not used
R62	Transmitter	Tx-B2	100k, Type 16	
R63	Transmitter	Tx-B2	4k7, Type 16	
R64	Transmitter	Tx-B2	39k, Type 16	
R65	Transmitter	Tx-C2	6k8, Type 16	
R66	Transmitter	Tx-C2	6k8, Type 16	
R67	Transmitter	Tx-C2	6k8, Type 16	
R68	Transmitter	Tx-D1	13k, Type 12	
R69	Transmitter	Tx-D2	6k8, Type 16	
R70	Transmitter	Tx-D2	10k, Type 16	
R71	Transmitter	Tx-E1	15k, Type 16	
R72	Transmitter	Tx-E1	20k, Type 12	
R73	Transmitter	Tx-E2	8k2, Type 16	
R74	Transmitter	Tx-B3	4k7, Type 16	
R75	Transmitter	Tx-B4	4k7, Type 16	
R76	Transmitter	Tx-E1	430k, Type 12	
R77	Transmitter	Tx-E2	56k, Type 16	
R78	Transmitter	Tx-E2	1k5, Type 16	
R79	Transmitter	Tx-E3	330k, Type 16	
R80	Transmitter	Tx-E3	220k, Type 16	
R81	Transmitter	Tx-E3	220k, Type 16	
R82	Transmitter	Tx-F2	110k, Type 12	
R83	Transmitter	Tx-F2	15k, Type 16	
R84	Transmitter	Tx-F3	180k, Type 16	
R85	Transmitter	Tx-F3	18k, Type 16	
R86	Transmitter	Tx-G1	47k, Type 16	
R87	Transmitter	Tx-G2	47k, Type 16	
R88	Transmitter	Tx-G3	47k, Type 16	
R89	Transmitter	Tx-G4	47k, Type 16	
R90	Transmitter	Tx-F4	22k, Type 16	
R91	Transmitter	Tx-F4	22k, Type 16	
R92	Transmitter	Tx-H2	47k, Type 16	
R93	Transmitter	Tx-H4	47k, Type 16	
R94	Transmitter	Tx-J4	470, Type 16	
R95	Transmitter	Tx-J5	2k2, Type 16	
R96	Transmitter	Tx-K4	220, 0.5W	
R97	Transmitter	Tx-K5	2R2, 0.5W	
R98	Transmitter	Tx-K4	2R2, 0.5W	
R99	Transmitter	Tx-D4	1M, Type 16	
R100	Transmitter	Tx-D5	2k2, Type 16	
R101	Receiver	Rx-B5	4k7, Type 16	
R102	Receiver	Rx-B5	4k7, Type 16	
R103	Control	Ctrl-A2	22k, Type 16	
R104	Control	Ctrl-D4	1M, Type 16	
R105	Control	Ctrl-D2	47k, Type 16	
R106	Control	Ctrl-D2	1M, Type 16	
R107	Control	Ctrl-F2	10k, Type 16	
R108	Control	Ctrl-B3	2M, Type 12	
R109	Control	Ctrl-B3	1M, Type 16	
R110	Control	Ctrl-F3	1M, Type 16	
R111	Control	Ctrl-F4	1M, Type 16	
R112	Control	Ctrl-F4	1M, Type 16	

R113	Control	Ctrl-H3	1M, Type 16	Only fitted for Morse beacon
R114	Control	Ctrl-K3	10k, Type 16	Only fitted for Morse beacon
R115	Control	Ctrl-K3	10k, Type 16	Only fitted for Morse beacon
R116	Control	Ctrl-J4	56k, Type 16	
R117	Control	Ctrl-J5	220k, Type 16	
R118	Control	Ctrl-E2	10k, Type 16	
R119	Control	Ctrl-J2	1k, Type 16	
R120	Control	Ctrl-E5	160k, Type 12	
R121	Control	Ctrl-E3	220k, Type 16	
R122				ID not used
R123				ID not used
R124	Top Panel	Tx-K4, Gen-H10	820, Type 16	Fitted to LED1
VR1	Transmitter	Tx-F5	20k, 3/8" Multi-turn vertical cermet trimmer	
VR2	Transmitter	Tx-J5	10k Miniature horizontal cermet skeletal trimmer	
VR3	Receiver	Rx-G5	10k Miniature vertical cermet skeletal trimmer	

Capacitors

Component ID	Board	Grid Reference(s)	Value	Comments
C1	Receiver	Rx-A3	10n, polyester, 5mm spacing	
C2	Receiver	Rx-A3	150n, polyester, 5mm spacing	
C3	Receiver	Rx-B3	47n, polyester, 5mm spacing	
C4	Receiver	Rx-B3	470n, multi-layer ceramic	
C5	Receiver	Rx-A2	470n, multi-layer ceramic	
C6	Receiver	Rx-B2	10n, polyester, 5mm spacing	
C7	Receiver	Rx-B3	1n, ceramic disk	
C8	Receiver	Rx-D2	1n, ceramic disk	
C9	Receiver	Rx-D2	1n, ceramic disk	
C10	Receiver	Rx-D4	1n, ceramic disk	
C11	Receiver	Rx-D5	1n, ceramic disk	
C12	Receiver	Rx-F2	680p, 1%, polystyrene, axial	
C13	Receiver	Rx-E3	430p, 1%, polystyrene, axial	
C14	Receiver	Rx-F5	680p, 1%, polystyrene, axial	
C15	Receiver	Rx-E5	430p, 1%, polystyrene, axial	
C16	Receiver	Rx-E4	47 μ , 16V, elec., radial, 3.5mm spacing	
C17	Receiver	Rx-G3	22n, polyester, 5mm spacing	
C18	Receiver	Rx-H3	22n, polyester, 5mm spacing	
C19	Receiver	Rx-J3	2n2, polyester, 5mm spacing	
C20	Receiver	Rx-G5	1 μ , polyester, 5mm spacing	
C21	Receiver	Rx-G5	100n, polyester, 5mm spacing	
C22	Receiver	Rx-H5	100n, polyester, 5mm spacing	
C23	Receiver	Rx-H6	1 μ , polyester, 5mm spacing	
C24	Receiver	Rx-J4	2 μ 2, 16V, elec., axial	
C25	Receiver	Rx-K4	470 μ , 16V, elec., radial, 5.5mm spacing	
C26	Receiver	Rx-J2	100 μ , 16V, elec., radial, 5.5mm spacing	
C27	Transmitter	Tx-A2	15n, polyester, 5mm spacing	
C28	Transmitter	Tx-C2	22n, polyester, 5mm spacing	
C29	Transmitter	Tx-C2	22n, polyester, 5mm spacing	
C30	Transmitter	Tx-D2	2n2, polyester, 5mm spacing	
C31	Transmitter	Tx-E2	680p, 1%, polystyrene, axial	
C32	Transmitter	Tx-E3	430p, 1%, polystyrene, axial	
C33	Transmitter	Tx-F2	680p, 1%, polystyrene, axial	
C34	Transmitter	Tx-F3	430p, 1%, polystyrene, axial	
C35	Transmitter	Tx-J4	10n, polyester, 5mm spacing	
C36	Transmitter	Tx-J4	100n, polyester, 5mm spacing	

C37	Transmitter	Tx-J5	470n, multi-layer ceramic	
C38	Transmitter	Tx-J5	100n, polyester, 5mm spacing	
C39	Transmitter	Tx-J5	1 μ , polyester, 5mm spacing	
C40	Transmitter	Tx-K5	100n, polyester, 5mm spacing	
C41	Transmitter	Tx-J3	2 μ 2, polyester, 5mm spacing	
C42	Transmitter	Tx-J4	470n, multi-layer ceramic	
C43	Transmitter	Tx-J4	100 μ , 16V, elec., axial	
C44	Transmitter	Tx-C5	33p, plate ceramic	
C45	Transmitter	Tx-D5	100p, plate ceramic	
C46	Transmitter	Tx-B4	4 μ 7, 16V, elec., axial	
C47	Receiver	Rx-J3	15n, polyester, 5mm spacing	
C48	Receiver	Rx-K3	3n3, polyester, 5mm spacing	
C49				ID not used
C50	Control	Ctrl-B4	470n, multi-layer ceramic	Wired to pins of U16 and U17 on bottom of board
C51	Control	Ctrl-D3	330n, polyester, 5mm spacing	
C52	Control	Ctrl-D4	220n, polyester, 5mm spacing	
C53	Control	Ctrl-H3	100n, polyester, 5mm spacing	Only fitted for Morse beacon
C54	Control	Ctrl-J2	4 μ 7, 16V tantalum	
C55	Control	Ctrl-H4	10n, polyester, 5mm spacing	
C56	Control	Ctrl-F5	100n, polyester, 5mm spacing	
C57	Control	Ctrl-E5	3n3, polyester, 5mm spacing	
C58	Control	Ctrl-E3	3n3, polyester, 5mm spacing	
C59	Receiver	Rx-G6	2 μ 2, 10V tantalum	Wired to pins of VR3 on bottom of board
C60	Loop Antenna	Ext-G6	10nF, 2,000V high performance polypropylene (FEC 286-850).	Only required for optional loop antenna. Originally this was 10nF, 1,600V, high performance polypropylene, Philips 376 series (FEC 577-832) – now obsolete.
C61	Loop Antenna	Ext-G7	1n2, 400V, polyester	Only required for optional loop antenna. 1n2 is a nominal value. Ideally it should be selected on test for resonance.
C62	Top Panel	Gen-D3	100n ceramic	Wired to tag strip
C63	Top Panel	Gen-E3	100n ceramic	Wired to tag strip

Discrete Semiconductors / Crystal

Component ID	Board	Grid Reference(s)	Value	Comments
D1	Receiver	Rx-H5	1N4148	
D2	Control	Ctrl-C3	1N4148	
D3	Control	Ctrl-C5	1N4148	
D4	Control	Ctrl-K2	1N4148	Only fitted for Morse beacon
D5	Control	Ctrl-K3	1N4148	Only fitted for Morse beacon
D6	Control	Ctrl-K4	1N4148	Only fitted for Morse beacon
D7	Control	Ctrl-F2	1N4148	
D8	Control	Ctrl-K5	1N4148	Only fitted for on/off (i.e. non-Morse) beacon
D9	Top Panel	Gen-B2	1N5822	Fitted to pin 1 of PL1
LED1	Top Panel	Tx-K3, Gen-G10	5mm/T1 $\frac{3}{4}$, tri-colour red/green (FEC 637-282)	Power / Transmit indicator
Q1	Receiver	Rx-B3	2N3819	See note 2
Q2	Receiver	Rx-B3	2N3819	See note 2
Q3	Receiver	Rx-G5	MEF103	If you have difficulty in obtaining the specified MEF103 for Q3 you could substitute a 2N5457. Note, however, that the pin-out is different as shown in the assembly instructions so you will need to cross the leads for the source and drain

				(insulating one of the crossed leads) to match the holes on the PCB.
Q4	Transmitter	Tx-J4	BC548	
Q5	Control	Ctrl-F2	BC441	
X1	Transmitter	Tx-D5	5.568MHz	This is a custom value

Integrated Circuits

Component ID	Board	Grid Reference(s)	Value	Comments
U1	Receiver	Rx-C3	OP37, LM318 or AD711	
U2	Receiver	Rx-C2, Rx-C5	4053	
U3	Receiver	Rx-D2, Rx-E2, Rx-F2	TL074	
U4	Receiver	Rx-D4, Rx-D5, Rx-E4, Rx-F5	TL074	
U5	Receiver	Rx-G3, Rx-J3, Rx-K3, Rx-H5	TL074	
U6	Receiver	Rx-J4	LM380N	
U7	Receiver	Rx-J2	LM78L09ACZ	
U8	Receiver	Rx-B5	741	
U9	Transmitter	Tx-B2, Tx-D2, Tx-E2, Tx-C4	TL074	
U10	Transmitter	Tx-G2, Tx-G3, Tx-G4	TL074	
U11	Transmitter	Tx-H2, Tx-H4	4053	
U12	Transmitter	Tx-D4	4060	
U13	Transmitter	Tx-E4	4013	
U14	Transmitter	Tx-K4	TDA2003H	Can use TDA2003V but pins will have to be bent
U15	Control	Ctrl-B2, Ctrl-C2, Ctrl-E2, Ctrl-C5	4093	
U16	Control	Ctrl-D3, Ctrl-D4	4538	
U17	Control	Ctrl-B4, Ctrl-C4, Ctrl-E3, Ctrl-E4	4093	
U18	Control	Ctrl-B5	4024	
U19	Control	Ctrl-G2, Ctrl-J2	4518	Only fitted for Morse beacon
U20	Control	Ctrl-G3, Ctrl-H2, Ctrl-J4	4093	Only fitted for Morse beacon
U21	Control	Ctrl-G4, Ctrl-H4, Ctrl-J4	4011U	
U22	Top Panel	Gen-E2	78L08	Wired to tag strip. Can use 7808, 78L09 or 7809.

Wound Components / Ferrite / Relays

Component ID	Board	Grid Reference(s)	Value	Comments
FB1	Receiver	Rx-A3, Gen-C9	FX1112 Ferrite bead	Threaded over microphone wire where it connects to point M on Rx board
L1	Receiver	Rx-A3	Toko RW06A6408, 360µH RF coil (Bonex 356408)	
L2	Receiver	Rx-B2	Toko RW06A6408, 360µH RF coil (Bonex 356408)	
L3	Transmitter	Tx-H4	Toko RW06A6408, 360µH RF coil (Bonex 356408)	
L4	Loop Antenna	Ext-F6	786mm square loop of 60-way ribbon cable configured as a 12-turn loop by paralleling groups of adjacent conductors.	Only required for optional loop antenna. Constructed from Cable3, Stripboard1, PL7 and PL8.
RLA1	Transmitter	Tx-J2	12V, 2-pole c/o G5V-212DC (FEC 179-351) BT type 47 is alternative	See note 3
RLA2	Transmitter	Tx-J2, Tx-J3	12V, 2-pole c/o G5V-212DC (FEC 179-351) BT type 47 is alternative	See note 3
T1	Transmitter	Tx-J1	EE42/15/F44 core (RS 231-8785)	Ordinary varnished paper can

			Secondary, wound first, is 100 turns of 24 SWG (closest AWG: 23) enamelled copper wire, wound as three layers. Layers are interleaved with one layer of transformer paper (e.g. Prespahn). Primary, wound second over three layers of transformer paper, is 10 turns of 19 SWG (closest AWG: 18) enamelled copper wire. Finishing insulation is another three layers of transformer paper.	be used instead of transformer paper.
--	--	--	--	---------------------------------------

Switches

Component ID	Board	Grid Reference(s)	Value	Comments
SW1	Top Panel	Rx-J5, Gen-C2, Gen-H4	6-way, 2-pole rotary, Lorlin CK series (FEC 422-393)	Power / Volume control. Since the specified switch isn't waterproof, put silicone oil down the shaft and silicone sealant round the bush. A true waterproof switch (e.g. Bourns miniature waterproof – FEC 146-768) is preferable, albeit more expensive.
SW2	Top Panel	Ctrl-A3, Ctrl-H1, Rx-K6, Gen-A4, Gen-A6, Gen-H7	4-way, 3-pole rotary, Lorlin CK series, (FEC 425-310)	Mode control. Since the specified switch isn't waterproof, put silicone oil down the shaft and silicone sealant round the bush. A true waterproof switch (e.g. Bourns miniature waterproof – FEC 146-769) is preferable, albeit more expensive.

Connectors

Component ID	Board	Grid Reference(s)	Value	Comments
PL1	Top Panel	Gen-A2	3-pin locking panel (Maplin FM51F)	Power
PL2	Microphone	Ext-D1, Ext-D2, Ext-D3	5-pin locking line DIN (FEC 308-894)	The Deltron locking ring DIN connector (e.g. FEC 561-879/661-910) is not an acceptable alternative.
PL3	Loop Antenna	Ext-J7	PL259 UHF	Only required for optional loop antenna
PL4	Earth Antenna	Ext-J2	4mm "banana" plug	
PL5	Earth Antenna	Ext-J3	4mm "banana" plug	
PL6	Bottom Box	Various	25-pin waterproof D-type	Inter-box connection
PL7	Loop Antenna		60-pin, 2-row IDC transition (0.05" ribbon cable to PCB) connector (FEC 327-1500)	Only required for optional loop antenna. This is used in the construction of L4.
PL8	Loop Antenna		60-pin, 2-row IDC transition (0.05" ribbon cable to PCB) connector (FEC 327-1500)	Only required for optional loop antenna. This is used in the construction of L4.
SK1	Battery	Gen-A2, Ext-D5, Ext-D6	3-pin locking line (Maplin FK23A)	
SK2	Top Panel	Rx-K5, Tx-A3, Ctrl-A2, Gen-A4, Gen-A9, Gen-E2, Gen-E3	8-pin locking panel DIN (FEC 437-293)	Microphone. The Deltron locking ring DIN connector (e.g. FEC 662-045) is not an acceptable alternative.
SK3	Top Panel	TX-K2, Gen-G9	SO239 UHF	Loop Antenna
SK4	Top Panel	Tx-K1, Gen-G9	4mm (to take "banana" plug)	Earth Antenna
SK5	Top Panel	Tx-K1, Gen-G9	4mm (to take "banana" plug)	Earth Antenna
SK6	Top Box	Various	25-pin waterproof D-type	Inter-box connection
SK7	Battery	Ext-B5	Insulated spade terminals to fit B1	
SK8	Battery	Ext-B6	Insulated spade terminals to fit B1	

Miscellaneous Electronic Components

B1	Battery	Ext-B6	12V, 1.3Ah maintenance-free lead-acid	Other 12V batteries can be used instead
LS1	Top Panel	Rx-K6, Gen-H8	8Ω, 0.25W, 56mm round, Mylar (Maplin VC85G)	LS1
Mic1	Microphone	Ext-B2	500Ω magnetic (CB type)	Re-wired to new plug (PL2) as shown in external components wiring diagram

Cable / Wire

Component ID	Board	Grid Reference(s)	Value	Comment
Cable1	Battery	Ext-C5, Ext-C6	200mm 3A Red/Black "figure of 8" automobile power cable	
Cable2	Loop Antenna	Ext-H7	2m length RG58 coaxial cable	Only required for optional loop antenna
Cable3	Loop Antenna		3.142m 60-way ribbon cable	Only required for optional loop antenna. This is used in the construction of L4.
Tape1	Earth Antenna	Ext-G1	1.5m length 20mm wide electric fence tape	Underground electrode. Electric fence tape comprises plastic tape with copper wires woven into it. Copper braiding may be used instead.
Tape2	Earth Antenna	Ext-G4	1.5m length 20mm wide electric fence tape	Underground electrode. Electric fence tape comprises plastic tape with copper wires woven into it. Copper braiding may be used instead.
Wire1	Earth Antenna	Ext-J2	15m, 16/0.2 stranded equipment wire	Suggest light/bright colour (e.g. white, yellow) for maximum visibility underground
Wire2	Earth Antenna	Ext-J3	15m, 16/0.2 stranded equipment wire	Suggest light/bright colour (e.g. white, yellow) for maximum visibility underground

Hardware

Component ID	Board	Grid Reference(s)	Value	Comments
Bezel1	Top Panel		Waterproof bezel for LED1 (FEC 232-336)	
Box1	Transceiver		Custom 2-part box	Described elsewhere in documentation set
Box2	Loop Antenna		124mm x 33mm x 30mm ABS box (Maplin FT31J)	Only required for optional loop antenna.
Case1	Overall		Peli 1200 Case	Carry case is optional
Clip1	Earth Antenna	Ext-H1	Heavy-duty (15mm wide jaws) crocodile clip (e.g. Bulldog)	
Clip2	Earth Antenna	Ext-H4	Heavy-duty (15mm wide jaws) crocodile clip (e.g. Bulldog)	
Ferrule1	Earth Antenna	Ext-H1	25mm length 8mm copper tube	Crimped to end of Wire5
Ferrule2	Earth Antenna	Ext-H4	25mm length 8mm copper tube	Crimped to end of Wire6
Grille1	Top Panel		60mm x 60mm perforated metal speaker grille	For LS1. Bare metal grille must be primed and painted to prevent rusting.
Heatsink1	Transmitter		TO-126/TO-220, 27°C/W (FEC 170-076)	For U14
Knob1	Top Panel		Knob with pointer for SW1	
Knob2	Top Panel		Knob with pointer for SW2	
Label1	Top Panel		Combined label for SW1, SW2	
PCB1	Transmitter		Transmitter PCB	
PCB2	Receiver		Receiver PCB	
PCB3	Control		Control PCB	

Peg1	Earth Antenna	Ext-H2	6" L-angle tent peg	Surface electrode. For deeper caves a group of pegs, connected together using a wiring "spider" will be needed in place of Peg1.
Peg2	Earth Antenna	Ext-H2	6" L-angle tent peg	Surface electrode. For deeper caves a group of pegs, connected together using a wiring "spider" will be needed in place of Peg2.

Cumulative Parts List

Resistors (see note 1)

Value	Count	Component IDs	Comments
2R2, 0.5W	2	R97, R98	
100, Type 16	1	R4	
220, Type 16	1	R60	
220, 0.5W	1	R96	
270, Type 16	2	R3, R59	
470, Type 16	2	R58, R94	
820, Type 16	1	R124	
1k, Type 16	6	R13, R14, R17, R18, R57, R119	
1k5, Type 16	6	R8, R9, R10, R11, R30, R78	
2k2, Type 16	3	R56, R95, R100	
4k7, Type 16	5	R63, R74, R75, R101, R102	
5k6, Type 16	3	R6, R7, R55	
6k8, Type 16	8	R42, R43, R44, R46, R65, R66, R67, R69	
8k2, Type 16	5	R23, R27, R47, R48, R73	
10k, Type 16	11 (13)	R12, R15, R16, R19, R20, R24, R49, R53, R70, R107, (R114), (R115), R118	Count and IDs in brackets refer to Morse beacon option
13k, Type 12	2	R45, R68	
15k, Type 16	8	R1, R2, R21, R25, R35, R41, R71, R83	
18k, Type 16	2	R36, R85	
20k, Type 12	3	R22, R26, R72	
22k, Type 16	3	R90, R91, R103	
39k, Type 16	1	R64	
47k, Type 16	10	R38, R39, R40, R86, R87, R88, R89, R92, R93, R105	
56k, Type 16	3	R29, R77, R116	
100k, Type 16	3	R5, R51, R62	
110k, Type 12	2	R34, R82	
160k, Type 12		R120	
180k, Type 16	2	R37, R84	
220k, Type 16	6	R32, R33, R80, R81, R117, R121	
330k, Type 16	2	R31, R79	
430k, Type 12	2	R28, R76	
470k, Type 16	2	R50, R52	
1M, Type 16	8 (9)	R54, R99, R104, R106, R109, R110, R111, R112, (R113)	Count and IDs in brackets refer to Morse beacon option
2M, Type 12	1	R108	
20k, 3/8" Multi-turn vertical cermet trimmer	1	VR1	
10k Miniature horizontal cermet skeletal trimmer	1	VR2	
10k Miniature vertical cermet skeletal trimmer	1	VR3	

Capacitors

Value	Count	Component IDs	Comments
33p Ceramic plate	1	C44	
100p Ceramic plate	1	C45	
430p, 1%, Polystyrene, axial	4	C13, C15, C32, C34	
680p, 1%, Polystyrene, axial	4	C12, C14, C31, C33	
1n Ceramic disk	5	C7, C8, C9, C10, C11	
1n2, 400V polyester	0 (1)	(C61)	Count and IDs in brackets refer to optional loop antenna
2n2 Polyester, 5mm spacing	2	C19, C30	
3n3 Polyester, 5mm spacing	3	C48, C57, C58	
10n Polyester, 5mm spacing	4	C1, C6, C35, C55	

10nF, 2,000V, high performance polypropylene, (FEC 286-850).	0 (1)	(C60)	Count and IDs in brackets refer to optional loop antenna. Originally this was 10nF, 1,600V, high performance polypropylene, Philips 376 series (FEC 577-832) – now obsolete.
15n Polyester, 5mm spacing	2	C27, C47	
22n Polyester, 5mm spacing	4	C17, C18, C28, C29	
47n Polyester, 5mm spacing	1	C3	
100n Polyester, 5mm spacing	6 (7)	C21, C22, C36, C38, C40, (C53), C56	Count and IDs in brackets refer to Morse beacon option
100n Ceramic	2	C62, C63	
150n Polyester, 5mm spacing	1	C2	
220n Polyester, 5mm spacing	1	C52	
330n Polyester, 5mm spacing	1	C51	
470n Multi-layer ceramic	5	C4, C5, C37, C42, C50	
1 μ Polyester, 5mm spacing	3	C20, C23, C39	
2 μ 2 Polyester, 5mm spacing	1	C41	
2 μ 2, 16V Elec., axial	1	C24	
2 μ 2 10V Tantalum	1	C59	
4 μ 7, 16V Elec., axial	1	C46	
4 μ 7 16V Tantalum	1	C54	
47 μ , 16V elec., radial, 3.5mm spacing	1	C16	
100 μ , 16V Elec., radial, 5.5mm spacing	1	C26	
100 μ , 16V Elec., axial	1	C43	
470 μ , 16V Elec., radial, 5.5mm spacing	1	C25	

Discrete Semiconductors / Crystal

Value	Count	Component IDs	Comments
1N4148	7 (8)	D1, D2, D3, D4, D5, D6, D7, (D8)	Count and IDs in brackets refer to on-off (i.e. non Morse) beacon option
1N5822	1	D9	
2N3819	2	Q1, Q2	See note 2
BC441	1	Q5	
BC548	1	Q4	
MEF103	1	Q3	If you have difficulty in obtaining the specified MEF103 for Q3 you could substitute a 2N5457. Note, however, that the pin-out is different as shown in the assembly instructions so you will need to cross the leads for the source and drain (insulating one of the crossed leads) to match the holes on the PCB.
5mm/T1 $\frac{3}{4}$, tri-colour red/green (FEC 637-282)	1	LED1	
5.568MHz crystal	1	X1	This is a custom value

Integrated Circuits

Value	Count	Component IDs	Comments
TL074	5	U3, U4, U5, U9, U10	
TDA2003H	1	U14	Can use TDA2003V but pins will have to be bent
OP37 (or LM318 or AD711)	1	U1	

LM380N	1	U6	
4011U	1	U21	
4013	1	U13	
4024	1	U18	
4053	2	U2, U11	
4060	1	U12	
4093	2 (3)	U15, U17, (U20)	Count and IDs in brackets refer to Morse beacon option
4518	0 (1)	(U19)	Count and IDs in brackets refer to Morse beacon option
4538	1	U16	
741	1	U8	
78L08	1	U22	Can use 7808, 78L09 or 7809.
LM78L09ACZ	1	U7	

Wound Components / Ferrite / Relays

Value	Count	Component IDs	Comments
Toko RW06A6408, 360µH RF coil (Bonex 356408)	3	L1, L2, L3	
786mm square loop of 60-way ribbon cable configured as a 12-turn loop by paralleling groups of adjacent conductors.	0 (1)	(L4)	Count and IDs in brackets refer to optional loop antenna. Constructed from Cable3, Strip1, PL7 and PL8.
EE42/15/F44 core (RS 231-8785) Secondary, wound first, is 100 turns of 24 SWG (closest AWG: 23) enamelled copper wire, wound as three layers. Layers are interleaved with one layer of transformer paper (e.g. Prespahn). Primary, wound second over three layers of transformer paper, is 10 turns of 19 SWG (closest AWG: 18) enamelled copper wire. Finishing insulation is another three layers of transformer paper.	1	T1	Ordinary varnished paper can be used instead of transformer paper.
FX1112 Ferrite Bead	1	FB1	
12V, 2-pole c/o G5V-212DC (FEC 179-351) BT type 47 is alternative	2	RLA1, RLA2	See note 3

Switches

Value	Count	Component IDs	Comments
6-way, 2-pole rotary, Lorlin CK series (FEC 422-393)	1	SW1	Power / Volume control. Since the specified switch isn't waterproof, put silicone oil down the shaft and silicone sealant round the bush. A true waterproof switch (e.g. Bourns miniature waterproof – FEC 146-768) is preferable, albeit more expensive.
4-way, 3-pole rotary, Lorlin CK series, (FEC 425-310)	1	SW2	Mode control. Since the specified switch isn't waterproof, put silicone oil down the shaft and silicone sealant round the bush. A true waterproof switch (e.g. Bourns miniature waterproof – FEC 146-769) is preferable, albeit more expensive.

Connectors

Value	Count	Component IDs	Comments
3-pin locking panel (Maplin FM51F)	1	PL1	
5-pin locking line DIN (FEC 308-894)	1	PL2	The Deltron locking ring DIN connector (e.g. FEC 561-879/661-910) is not an acceptable alternative.
PL259 UHF	0 (1)	(PL3)	Count and IDs in brackets refer to optional loop antenna
4mm "banana" plug	2	PL4, PL5	
25-pin waterproof D-type	1	PL6	
60-pin, 2-row IDC transition (0.05" ribbon cable to PCB) connector (FEC 327-1500)	0 (2)	(PL7), (PL8)	Count and IDs in brackets refer to optional loop antenna. These are used in the construction of L4.
3-pin locking line (Maplin FK23A)	1	SK1	
8-pin locking panel DIN (FEC 437-293)	1	SK2	The Deltron locking ring DIN connector (e.g. FEC 662-045) is not an acceptable alternative.
SO239 UHF	1	SK3	
4mm (to take "banana" plug)	2	SK4, SK5	
25-pin waterproof D-type	1	SK6	
Insulated spade terminals to fit B1	2	SK7, SK8	

Miscellaneous Electronic Components

12V, 1.3Ah maintenance-free lead-acid	1	B1	Other 12V batteries can be used instead
8Ω, 0.25W, 56mm round, Mylar speaker (Maplin VC85G)	1	LS1	
500Ω magnetic microphone (CB type)	1	Mic1	Re-wired to new plug (PL2) as shown in external components wiring diagram

Cable / Wire

Value	Count	Component IDs	Comments
200mm 3A Red/Black "figure of 8" automobile power cable	1	Cable1	
2m length RG58 coaxial cable	0 (1)	(Cable2)	Count and IDs in brackets refer to optional loop antenna
3.142m 60-way ribbon cable	0 (1)	(Cable3)	Count and IDs in brackets refer to optional loop antenna. This is used in the construction of L4.
1.5m length 20mm wide electric fence tape	2	Tape1, Tape2	Underground electrodes. Electric fence tape comprises plastic tape with copper wires woven into it. Copper braiding may be used instead.
15m, 16/0.2 stranded equipment wire	2	Wire1, Wire2	Suggest light/bright colour (e.g. white, yellow) for maximum visibility underground
Insulated, 7/0.2mm stranded equipment wire in the following colours: black, brown, red, orange, yellow, green, blue, purple, grey, white, pink, turquoise	Various		Used for board interconnections and wiring of the top panel components.

Hardware

Value	Count	Component IDs	Comments
Waterproof bezel for LED1 (FEC 232-336)	1	Bezel1	
Custom 2-part box	1	Box1	Described elsewhere in documentation set
124mm x 33mm x 30mm ABS box (Maplin FT31J)	(1)	(Box2)	Count and IDs in brackets refer to optional loop antenna.
Peli 1200 Case	0 (1)	(Case1)	Count and IDs in brackets refer to optional carry case
Heavy-duty (15mm wide jaws) crocodile clip (e.g. Bulldog)	2	Clip1, Clip2	
25mm length 8mm copper tube	2	Ferrule1, Ferrule2	
60mm x 60mm perforated metal speaker grille	1	Grille1	For LS1. Bare metal grille must be primed and painted to prevent rusting.
TO-126/TO-220, 27°C/W Heatsink (FEC 170-076)	1	Heatsink1	For U14
Knob with pointer	2	Knob1, Knob2	For SW1, SW2
Combined label for SW1, SW2	1	Label1	
Transmitter PCB	1	PCB1	
Receiver PCB	1	PCB2	
Control PCB	1	PCB3	
6" L-angle tent peg	2	Peg1, Peg2	Surface electrodes. For deeper caves a group of pegs, connected together using a wiring "spider" will be needed in place of Peg1 and Peg2.
0.1" strip board, 10 holes x 36 holes, copper strips parallel to short edge	0 (1)		Count and IDs in brackets refer to optional loop antenna. This is used in the construction of L4.
Strain relief grommet for Cable 2 (FEC 152-374)	0 (1)		Count and IDs in brackets refer to optional loop antenna
Custom loop antenna spreader	0 (1)		Count and IDs in brackets refer to optional loop antenna. Described elsewhere in documentation set.
10mm M3 machine screw, slotted cheese head	1		
30mm M3 machine screw, slotted cheese head	4		
6mm M3 machine screw, slotted cheese head	7		
6mm M3 machine screw, slotted countersunk head	6		
M3 hexagonal nut	8		
18mm M3 non-insulating female-female PCB spacers (FEC 517-586)	8		Used for spacing of the three PCBs
10mm M3 non-insulating female-female PCB spacer (FEC 517-549)	1		Used for mounting the tag strip in the top box
M3 Solder tag	1		Used for earth connection to SK3
PCB solder pins	25		
8-pin DIL IC sockets	2		
14-pin DIL IC sockets	13		
16-pin DIL IC sockets	4		

Four-tag length of miniature tag-strip (cut from RS 433-781)	1		If the tag strip does not have centre mounting holes (e.g. the specified RS component) then a four tag length is used. One of the tags is removed and this area used for a mounting hole. If you are able to find tag strip with centre mounting holes then only a three-tag length is needed. This is clarified in the assembly instructions.
Short length of Hellerman No.30 rubber sleeving	2		Used in the wiring of the top panel components
Short length of Hellerman No.20 rubber sleeving	1		Used in the wiring of the top panel components

Notes

1. Except for three 0.5W resistors, the PCBs are designed for Type 16 resistors which is the type specified in most cases. If these cannot be found (e.g. 110k, 13k, 20k, 110k and 430k which are not in the E12 series), Type 12 has been specified although they are longer than desired. Longer types are too long. See table below.

Type	Example of Type Number	Length (mm)	Farnell catalogue number for 1M resistor (as example)
16	MRS16T	3.7	332-410
12	MF12	4.2	514-743

2. Note that there are two slightly different packages: for the 2N3819 which is used for Q1 and Q2. The PCB layout diagram corresponds to what we believe to be the more common variant. It would be wise to double check with your supplier, though, since some manufacturers produce a 2N3819 with the leads in the opposite order, i.e. drain, source, gate instead of gate, source, drain. If you use the other variant of 2N3819 you should be mounted the opposite way from shown in the PCB layout diagram. i.e. with the flats on the body towards C1 and C3.
3. The relays specified for RLA1 and RLA2 each dissipate 0.5W in the coil. Relays which are identical in all respects other than having a lower coil current are available, albeit at a higher price. These relays may be substituted to increase battery life.
4. Most of the components are readily available from component suppliers but a few of the components might be a bit harder to track down. The following are contact details (UK phone numbers) for suppliers of some of the less common items. These are the items for which a supplier's name and part number have been shown in brackets after the component description.

Farnell (FEC): 0113 263 6311
Bonex: 01753 549502

Maplin: 01702 554000
CPC: 01772 654455